Town of Manchester, Connecticut

PUBLIC IMPROVEMENT STANDARDS

Prepared By:

Town of Manchester
Public Works Department
Engineering Division

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Town of Manchester
Public Improvement Standards

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Section 01

1.01 APPLICABILITY

The requirements set forth in these Public Improvement Standards shall apply to any and all design and/or construction activity proposed within existing or proposed public rights-of-way or easements. This may include, but is not limited to:

- Design, construction and reconstruction of public roadways and infrastructure
- Improvements to existing public infrastructure required as part of a subdivision or site development approval through the Planning and Zoning Commission
- Improvements, modification, repair and restoration of existing public infrastructure associated with installation of utilities
- Installation of curb and sidewalk per Section 14-57 of the Town of Manchester Code of Ordinances

Portions of this document shall also apply to development within private property that, in some manner, will affect the public right-of-way or adjacent public or private property. This may include, but is not limited to:

- Modifications to private property that increase the amount of impervious area, modify existing drainage patterns or otherwise impact stormwater management for the site
- Modifications to private property that impact sanitary sewer systems, water distribution systems and other utilities
- Modifications to private property that significantly changes existing grades and/or requires installation of retaining walls
- Modifications to private property that impact existing traffic patterns

All proposed work for which these Public Improvement Standards regulate shall be reviewed and approved by the Engineer prior to issuance of any permits or commencement of construction activities.

Nothing in these Public Improvement Standards shall relieve the Developer or Contractor from complying with any federal, state or local permits or regulations.

1.02 AUTHORITY

The following constitute the Town ordinances and State statutes that apply to this document:

Town of Manchester Code of Ordinances, **Sec. 11-3, Director of Public Works**; **powers and duties**. The Director of Public Works shall supervise the granting of all permits to excavate or disturb any highway or other public property or to make any special use thereof and shall exercise such supervision and control over all public utilities in Town as is accorded by law to the Town.

Town of Manchester Code of Ordinances, **Sec. 12-4, Superintendent of the Water and Sewer Department**. The Superintendent of the Water and Sewer Department shall be the executive head of the Department and, as such, shall have charge and control, under the direction of the General Manager, of the administration and discipline of the Department and of the buildings, machinery, equipment and property of all kinds used by the Department.

Town of Manchester Code of Ordinances, **Sec. 279-1, Adoption of regulation governing street work.** The Board of Directors shall, from time to time, adopt such regulations as it deems fitting, necessary or proper to control the issuance of permits for street work and the

work to be done under said permit. These regulations may be amended from time to time by the Board of Directors upon recommendation of the Director of Public Works. (Code 1996, ξ 14-1)

Town of Manchester Code of Ordinances, **Sec. 279-2, Manual for street work.** The Director of Public Works, with the express approval of the Town Planning and Zoning Commission, shall compile, and amend, a manual listing of all types of work to be performed in, on, over or under any of the streets or highways in the town by anyone other than the town for which a permit is required by the ordinances of the town or the statutes of the state. This manual shall include the regulations required by Section 279-1 and shall be filed with the Town Clerk. (Code 1996, ξ 14-2)

State of Connecticut General Statutes, **Sec. 16-229, Excavation in highway.** Any public service company incorporated under the provisions of the statutes or by special act for the purpose of transmitting or distributing gas, water or electricity or for telephone purposes, desiring to open or make any excavation in a portion of any public highway for the carrying out of any purpose for which it may be organized other than the placing or replacing of a pole or of a curb box, shall, if required by the authority having jurisdiction over the maintenance of such highway, make application to such authority, which may, in writing, grant a permit for such opening or excavation upon such terms and conditions as to the manner in which such work shall be carried on as may be reasonable.

1.03 REFERENCES

These Public Improvement Standards may make reference to one or more of the following publications:

- "A Policy on Geometric Design of Highways and Streets" as published by the American Association of State Highway and Transportation Officials, as amended;
- “The Standard Specifications for Roads, Bridges, Facilities and Incidental Construction, Form 818” as published by the Connecticut Department of Transportation, as amended;
- “Highway Design Manual” as published by the Connecticut Department of Transportation, as amended;
- “Highways Standard Drawings Standard Sheets” as published by the Connecticut Department of Transportation, as amended;
- “Highways Standard Drawings Guide Sheets” as published by the Connecticut Department of Transportation, as amended;
- “Traffic Manual” as published by the Connecticut Department of Transportation, as amended;
- “Traffic Control Signal Design Manual” as published by the Connecticut Department of Transportation, as amended;
- “Traffic Engineering Standard Drawings Standard Sheets” as published by the Connecticut Department of Transportation, as amended;
- “Traffic Engineering Standard Drawings Guide Sheets” as published by the Connecticut Department of Transportation, as amended;
- “Traffic Engineering Special Provisions, Traffic Control Plans and Typical Materials” as published by the Connecticut Department of Transportation, as amended;

- “Drainage Manual” as published by the Connecticut Department of Transportation, as amended;
- “Catalog of Signs” as published by the Connecticut Department of Transportation, as amended;
- “Manual of Uniform Traffic Control Devices for Streets and Highways” as published by the U.S. Department of Transportation Federal Highway Administration, as amended;
- “Standard Highway Signs” booklet as published by the U.S. Department of Transportation Federal Highway Administration, as amended;
- “Americans with Disabilities Act (ADA) Standards for Accessible Design” as published by the U.S. Department of Justice, as amended;
- “Minimum Standards for Surveys and Maps in the State of Connecticut” as prepared and adopted by the Connecticut Association of Land Surveyors, September 26, 1996, as amended;
- “Subdivision Regulations” as prepared by the Town of Manchester; as amended;
- “Town of Manchester Zoning Regulations” as prepared by the Town of Manchester, as amended;
- “Inland Wetlands and Watercourses Regulations of the Town of Manchester, Connecticut” as prepared by the Town of Manchester, as amended;
- “Sustainable Design and Low Impact Development Guidelines” as prepared by the Town of Manchester, as amended;
- “Regulations Governing Right-of-Way Permits” as prepared by the Town of Manchester, as amended;
- “Code of Town Ordinances” as prepared by the Town of Manchester, as amended;
- “Town of Manchester Geographic Information Systems Data, Map Products and Policies” as prepared by the Town of Manchester, as amended;
- “Town of Manchester Sidewalk and Curb Plan” as prepared by the Town of Manchester, as amended;
- “Town of Manchester Complete Streets Policy” as prepared by the Town of Manchester, as amended;
- “Rules and Regulations” as published by the Town of Manchester Water and Sewer Department, as amended.
- “Schedule of Rates Charges and Fees” as published by the Town of Manchester Water and Sewer Department, as amended.
- "Guides for the Design of Wastewater Treatment Works, TR-16" as published by the New England Interstate Water Pollution Control Commission, as amended;
- “Recommended Standards for Water Works” (Ten State Standards) published by Health Research Inc.
- “Flood Insurance Study” and “Flood Insurance Rate Map (FIRM)” as published by the Federal Emergency Management Agency (FEMA), as amended;

- "Connecticut Guidelines for Soil Erosion and Sediment Control (DEEP Bulletin 34)" as published by the Connecticut Department of Energy and Environmental Protection, as amended;
- "Connecticut Stormwater Quality Manual" as published by the Connecticut Department of Energy and Environmental Protection, as amended;
- Technical Releases No. 20 and No. 55 (TR-55) as published by Natural Resources Conservation Service (NRCS), as amended;
- Hydraulic Engineering Circular No. 1 (HEC-1) as published by the U.S. Army Corps of Engineers Method, as amended;
- "Public Health Code" as published by the Connecticut Department of Public Health, as amended;
- "Connecticut Public Health Code, Regulations and Technical Standards for Subsurface Sewage Disposal Systems" as published by the Connecticut Department of Public Health, as amended.
- Occupational Safety and Health Administration Laws and Regulations as published by the United States Department of Labor.

1.04 DEFINITIONS

Wherever used in these Public Improvement Standards, the following terms shall have these meanings, which shall be applicable to both the singular and plural thereof:

"Form 817"
Any references to the Form 817 shall be construed to mean the equivalent section of the Form 818 as referenced in Section 1.03.

"Bonds"
Bid, performance, labor and materials payment bonds and other instruments of security, furnished by the Contractor or Developer and his surety in accordance with these Public Improvement Standards.

"Contractor"
The person, firm, utility or corporation doing work within the Town right-of-way.

"Design Engineer"
A Professional Engineer licensed in the State of Connecticut, representing the Developer or Contractor, responsible for the design of the proposed site improvements.

"Developer"
The legal or beneficial owner or owners of land included in a development, including the holder of an option or contract to purchase, or other enforceable proprietary interests in such land. Developer shall include agents, successors and assigns.

"Development"
Any construction or grading activities or removal of vegetation to improved or unimproved real estate.

"Easement"

A non-possessing interest held by one party in land of another, whereby the first party is accorded partial use of such land for a specific purpose. An easement may restrict but does not abridge the rights of the fee owner to the use and enjoyment of his land.

"Engineer"
The Town of Manchester Director of Public Works or Water and Sewer Administrator (as appropriate) acting personally or through a duly authorized representative.

"Field Modification"
A minor change or alteration in the Work.

"Grading"
Any excavating, grubbing, filling or stockpiling of earth materials or any combination thereof.

"Inspection"
The periodic review of the Work for conformance to Town standards by the Inspector.

"Inspector"
The authorized representative of the Engineer or Town who is assigned to the Project or any parts thereof.

"Monumentation"
As referenced in these standards, refer to manmade or natural markers, found or set by a Land Surveyor licensed in the State of Connecticut, which establishes a specific point of reference, with a clear and precise location.

"Record (As-Built) Drawing"
A plan, prepared and certified by a Land Surveyor licensed in the State of Connecticut, confirming the as-built locations and elevations of features installed as part of an approved site plan.

"Shop Drawings"
All drawings, diagrams, illustrations, brochures, schedules and other data which are prepared by the Contractor, a Subcontractor, Manufacturer, Supplier or Distributor and which illustrate the material, equipment or some portion of the Work.

"Streetline"
The property line between the public right-of-way and a private lot.

"Subcontractor"
An individual, firm or corporation having a direct contract with the Contractor or with any other Subcontractor for the performance of a part of the Work at the site.

"Substantial Completion"
The date, as certified by the Engineer, when the construction of the Project or a specified part thereof is sufficiently completed in accordance with the Public Improvement Standards, so that the Project or specified part can be utilized for the purposes for which it was intended.

"Surety"
A corporate bonding company licensed to do business in the State of Connecticut.

"Work"
Any and all obligations, duties and responsibilities necessary for the successful completion of the work for which these Public Improvement Standards regulate, including the furnishing of all materials, equipment, tools, labor and other incidentals necessary to complete the Work.

1.05 ABBREVIATIONS

The following abbreviations are used in these Public Improvement Standards:

"CTDOT" or "ConnDOT" – Connecticut Department of Transportation

"DEEP" – Connecticut Department of Energy and Environmental Protection

"FEMA" – Federal Emergency Management Agency

"FIRM" – Flood Insurance Rate Map

"HEC" – Hydraulic Engineering Circular

"LID" – Low Impact Development

"MUTCD" – Manual of Uniform Traffic Control Devices for Streets and Highways

"NRCS" – Natural Resources Conservation Service

"TR" – Technical Report

1.06 CONTACT INFORMATION

Public Works Department
494 Main Street
P.O. Box 191
Manchester, CT 06045-0191
860-647-3067

Water and Sewer Department
125 Spring Street
P.O. Box 191
Manchester, CT 06045-0191
860-647-3115

Engineering Division
494 Main Street
P.O. Box 191
Manchester, CT 06045-0191
860-647-3152

Planning Department
494 Main Street
P.O. Box 191
Manchester, CT 06045-0191
860-647-3044

Field Services Division
321 Olcott Street
P.O. Box 191
Manchester, CT 06040-0191
860-647-3233

Building Department
494 Main Street
P.O. Box 191
Manchester, CT 06045-0191
860-647-3052

2.01 TYPES OF PLAN REVIEWS

The following are typical means in which plans are reviewed in the Town of Manchester.

2.01.01 Applications before the Planning and Zoning Commission

Most development plans are reviewed as part of an active application before the Manchester Planning and Zoning Commission or Zoning Board of Appeals. These may include an "Erosion and Sediment Control Permit", an "Inland Wetlands Permit", a "Subdivision/Resubdivision Application", a "Zoning Board of Appeals Application" or any other development plan or special exception regulated by the Town of Manchester Planning Department. Contact the Manchester Planning Department to determine if any permits are required for the proposed work.

2.01.02 Applications for Right-of-Way Permit

Any construction activity within Town right-of-way or otherwise affecting Town owned facilities require a Right-of-Way Permit prior to construction. Plans showing the proposed work are required to be reviewed and approved prior to the issuance of the permit. Separate plan review and approval is not required for plans that have been previously approved by the Manchester Planning and Zoning Commission under Section 2.02.01. Refer to Appendix A for the Right-of-Way Permit application and see the "Regulations Governing Right-of-Way Permits" as published by the Town of Manchester Department of Public Works for more information on restoration requirements for work within recently resurfaced roadways and general policies, procedures, rules and regulations for construction activity.

Plans shall meet the minimum requirements outlined in Section 2.03. Two (2) copies of the proposed plan shall be submitted to the Town of Manchester Engineering Division (Maps and Records Office). The approximate review time for Right-of-Way Permit applications is one week.

2.01.03 Applications for Water and Sewer Permit

Any construction activity proposing to install, connect, replace, repair, renew, extend, terminate or otherwise affect Town or privately-owned water and/or sanitary sewer facilities require a Water and Sewer Permit prior to construction. Plans showing the proposed work are required to be reviewed and approved prior to the issuance of the permit. Separate plan review and approval is not required for plans that have been previously approved by the Manchester Planning and Zoning Commission under Section 2.01.01. Refer to Appendix A for the Water and Sewer Permit application and Section 6.04.03 herein for licensing requirements.

Plans shall meet the minimum requirements outlined Section 2.03 and Section 5.02 of the "Rules and Regulations" as published by the Town of Manchester Water and Sewer Department. Two (2) copies of the proposed plan shall be submitted to the Town of Manchester Engineering Division (Maps and Records Office). The approximate review time for Water and Sewer Permit applications is one week.

Note: Most applications for a Water and Sewer Permit also require a Right-of-Way Permit. In this case, a separate plan submittal for the Water and Sewer Permit is not required.

2.01.04 Applications for Driveway Curb Cut

Any person proposing to add a new, or modify an existing, driveway opening within a public right-of-way shall submit a "Driveway Curb Cut Application" to the Engineer for review and approval prior to construction. Refer to Appendix B for the Driveway Curb Cut Application.

One copy of the proposed plan shall be submitted to the Town of Manchester Engineering Division. The approximate review time for driveway curb cut applications is one week.

2.01.05 Tree Removal

Any tree within Town-owned right-of-way to be cut, pruned or removed shall require posting in accordance with the Connecticut General Statutes. Contact the Town of Manchester Field Services Division at 860-647-3233 and refer to Section 6.09 herein for additional information.

2.01.06 Utility Line Assignment Requests

Any utility company proposing to install, extend or upgrade their facilities within a public right-of-way is required to submit plans to the Engineer for review and approval prior to construction.

Exception: If all of the proposed work is overhead (i.e. on existing poles) or within existing conduit and no excavation is proposed within a public right-of-way, then a utility line assignment request is not required.

Plans shall meet the minimum requirements outlined in Section 2.03. Three (3) copies of the proposed plan shall be submitted to the Town of Manchester Engineering Division. The approximate review time for utility line assignment requests is one week.

2.01.07 Plot Plans

Individual plot plans are required for all proposed principal buildings to be built within the Town. Plans shall meet the "Minimum Plot Plan Requirements" provided in Appendix C. Three (3) copies of the proposed plot plan shall be submitted to the Town of Manchester Building Department. The approximate review time for plot plans is one week.

2.01.08 Traffic Control Plans

Depending upon the location and complexity of the work, the Engineer may require a separate plan showing the proposed method for maintaining and protecting traffic through the work area. Plans shall show, at a minimum, the size, type and locations of signs and other traffic control devices to be used. Two (2) copies of the Traffic Control plan shall be submitted to the Town of Manchester Engineering Division. The approximate review time for traffic control plans is one week.

2.01.09 Record (As-Built) Drawings

Record drawings are required for all subdivisions, private developments, water distribution and sanitary sewer system installations, and other work regulated by these Public Improvement Standards. Plans shall meet the "Minimum Record (As-Built) Drawing Requirements" provided in Appendix D. Four (4) copies of the Record Drawings shall be submitted to the Town of Manchester Engineering

Division. Refer to Section 7.01 herein for additional information. The approximate review time for issuing initial comments on record drawings is four (4) weeks.

2.02 PRE-SUBMISSION COOPERATION

Consultation with the Town staff is recommended before any detailed plans are developed to review the project to avoid controversial or problematic designs that will typically increase the time required for approval and to also limit potential construction issues. Town Staff may be able to give feedback and suggest alternative site layouts or design methods, which have proven successful within the Town in the past and are more likely to be accepted in the future. Town Staff may also be aware of other public or private development projects which could conflict with the proposed work.

Early coordination with Town Staff should provide a more efficient review process following formal submission as staff has already had the opportunity to discuss the project with the developer or utility company and minimize potential issues.

For projects requiring a land use permit through the Planning and Zoning Commission, contact the Town of Manchester Planning Department to schedule a pre-submission meeting. For all other projects, contact the Town of Manchester Engineering Division.

2.03 MINIMUM PLAN REQUIREMENTS

Refer to minimum plan requirements outlined in Article I, Section 4 in the Manchester Zoning Regulations for all applications that require approval from the Planning and Zoning Commission.

When plans prepared by a land surveyor are required for approval of an application submitted to the Planning and Zoning Commission, such plans shall be based on the Town of Manchester Horizontal and Vertical Control Network as established in 1998 utilizing published CTDOT values. The horizontal values are based on NAD 83 and the vertical values are based on NAVD 88 utilizing the Geoid 96 model. When using either traditional terrestrial survey methods or utilizing GPS, site values are to be localized with the existing network. Adequate care and methods shall be utilized in accordance the “Minimum Standards for Surveys and Maps in the State of Connecticut” as referenced herein. Plans must be certified by a land surveyor licensed in the State of Connecticut.

The following information shall be noted on all applicable sheets:

- Town Control Stations observed and values utilized
- Method/methods utilized for developing site values
- Coordinates displayed on three (3) physically monumented site or referenced locations

Tie sheets for all existing Network Control Stations are available upon request from the Engineering Division.

Contact the Town of Manchester Engineering Division for plan requirements related to all other approvals outlined herein. The level of detail and extent of information required will be determined on a case-by-case basis.

3.01 GENERAL

The design criteria for improvements impacting public infrastructure and facilities within the Town right-of-way shall meet those set forth in these Public Improvement Standards. In the event these design criteria cannot be met, designs shall meet the minimum criteria identified in the latest revisions of the publications identified herein.

In accordance with the "Town of Manchester Complete Streets Policy," Complete Street principles must be applied to all phases of all transportation projects including, but not limited to planning, design, construction, operation and maintenance. Proposed improvements must be context sensitive and flexible in design to accommodate opportunities for improving safety and access for all users while providing greenscapes through low impact development.

The Engineer reserves the right to modify the requirements outlined in these Public Improvement Standards as deemed necessary to meet the needs of existing and proposed public infrastructure and facilities and to protect private property. The Engineer may require submission of additional information for review and approval.

Improvements regulated by these Public Improvement Standards shall be designed by a Professional Engineer licensed in the State of Connecticut. Plans and specifications depicting proposed construction shall bear the seal of a Professional Engineer licensed in the State of Connecticut and shall be subject to approval by the Engineer.

3.02 DESIGN WAIVER REQUESTS

If field conditions warrant that the Design Engineer cannot meet one or more of the minimum requirements set forth in these Public Improvement Standards, a waiver may be requested from the Engineer. The Design Engineer must submit documentation that clearly indicates why the waiver is being requested and demonstrates the design still meets the desired objectives. The waiver must be approved by the Engineer.

3.03 ROADS

Design criteria provided in this Section is generally based upon road classification. Roadways in the Town are classified as a local road, collector road, or arterial (major or minor). A list of road classifications is provided in Appendix E.

When directed by the Engineer, posted speed limits for existing roads shall be used for determining design criteria and evaluating impacts of proposed developments rather than roadway classification.

3.03.01 Design Speed

Minimum design speeds are based on the roadway classification as follows:

Street Classification	Design Speed
Local Road	30 mph
Collector	40 mph
Arterial	50 mph

3.03.02 Stopping Sight Distance

Stopping sight distances shall be measured from a height of eye of 3.5 feet and a height of object of 2 feet for design of horizontal and vertical curves. Stopping sight distance lines shall be shown on the proposed plan and profile sheets.

The following minimum sight distances shall be met:

Design Speed	Minimum Allowed Stopping Sight Distance
30 mph	200 feet
40 mph	305 feet
50 mph	425 feet

3.03.03 Horizontal Alignment

All centerline tangents shall be connected with a horizontal curve (no angle points are allowed.

Horizontal curves shall be designed to obtain at least the minimum allowed stopping sight distances for the design speed. It is preferable to use flatter curves whenever possible. In no case shall a horizontal curve radius be less than two hundred fifty feet (250').

The following minimum centerline radii shall be met:

Design Speed	Centerline Radius
30 mph	250 feet
40 mph	600 feet
50 mph	950 feet

Reverse, spiral or broken back horizontal curves are not permitted.

Curves shall be connected with a minimum tangent of one hundred feet (100').

3.03.04 Vertical Alignment

The Design Engineer shall utilize a smooth profile with gradual changes to harmoniously blend the proposed roadway with the existing terrain. The maximum longitudinal grade on a local road shall be 10%. Collector and arterial roads shall have a maximum longitudinal grade of 8% and 6%, respectively. No new road shall be constructed having a gradient of less than 1%.

A vertical curve shall be provided at all changes in gradients. The minimum length of vertical curve shall be computed by the following formula:

$\mathbf{L = K(G_1 - G_2)}$ where:

L = Length of vertical curve in feet
K = Coefficient based on Design Speed (see below)
G_1 = Gradient into the curve in percent
G_2 = Gradient out of the curve in percent

Design Speed	Minimum K (In Crest)	Minimum K (In Sag)
30 mph	19	37
40 mph	44	64
50 mph	84	96

Increase vertical curves lengths obtained from the formula above to the next larger fifty (50) or one hundred (100) foot length. In no case shall a vertical curve be less than 100'.

Vertical curves shall be parabolic and symmetric curves are preferred. In the event that an asymmetrical vertical curve is used, the short leg shall be at least one-third (1/3) of the total length of the curve.

3.03.05 Intersections

All streets shall join each other so that, for a distance of at least one hundred feet (100'), the street is at a 90° angle to the street that it intersects.

No more than two streets (four approaches) shall intersect or meet at any one point.

The centerline of all intersecting roads shall pass through a single point.

No point of intersection of any local road shall be closer than one hundred fifty feet (150') from another intersection on the opposite side of the roadway.

The minimum radii, in feet, along the edge of pavement or curb for intersections shall be in accordance with the following table:

Street Classification	Local Road	Collector	Arterial
Local Road	25	25	25
Collector	25	35	40
Arterial	25	40	50

Adjustments may be made by the Engineer based on the expected design vehicle, pedestrian considerations and the width of the existing roadway.

Intersection sight distances shall be measured from a point on the minor road at fifteen feet (15') from the edge of pavement of the major road and from a height of eye at 3.5' on the minor road to a height of object on the major road of 3.5'. Intersection sight distance lines shall be shown on the proposed plan and profile sheets.

The minimum intersection sight distances shall be:

Design Speed	**Classification of Intersecting Street**	**Minimum Allowable Intersection Sight Distance**
30	Local Road	335 feet
40	Collector	445 feet
50	Arterial	555 feet

If the line of sight required to meet the minimum intersection sight distance falls outside of the streetline, sight line easements will be required.

3.03.06 Cul-de-Sacs

Cul-de-sacs shall be designed in accordance with Plates 2.1 and 2.2 provided in Section 9. Temporary cul-de-sacs shall be used if there remains developable land adjacent to the property. (Refer to Section 4.08.03 of the Town of Manchester Subdivision Regulations for additional information) Temporary cul-de-sacs are also required when phasing subdivisions.

3.03.07 Roadway Cross Section

The cross section for new roadways shall be as follows:

Local Road:	2"	Hot Mix Asphalt S0.5
	2"	Hot Mix Asphalt S0.5
	4"	Processed Aggregate Base
	8"	Granular Fill
Collector:	2½ "	Hot Mix Asphalt S0.5
	2½"	Hot Mix Asphalt S0.5
	4"	Processed Aggregate Base
	10"	Granular Fill
Arterial:	4"	Hot Mix Asphalt S0.5 (2 Equal Lifts)
	4"	Hot Mix Asphalt S0.5 (2 Equal Lifts)
	4"	Processed Aggregate Base
	12"	Granular Fill

3.03.08 Curbing

Requirements for the type of curb to be installed are governed by the "Town of Manchester Sidewalk and Curb Plan" as published and amended by the Town of Manchester Planning Department and Section 14-57 (Sidewalk and Curb Ordinance) of the Town Ordinances. Refer to the "Manchester Sidewalk and Curb Ordinance" in Appendix M for additional information.

In general, granite stone curb shall be installed when modifying existing roads or constructing new public roads, unless otherwise approved by the Engineer. Installation of bituminous concrete lip curb may be allowed for Rural Scenic Roadways. Refer to the "Town of Manchester Sidewalk and Curb Plan" or contact the Engineering Division to determine curb type for proposed work.

The Planning and Zoning Commission, in accordance with Section 14-57 of the Town Ordinances, may require a payment in lieu of granite curb installation if the installation of such curb is not advisable by the Engineer. The Developer shall make payment to the Town as determined by the length of granite curb required and the Unit Price List in Appendix J.

Where granite curb is required, radius granite curb shall be used for curves with radius of less than one hundred feet (100').

3.03.09 Road Widening

Where roadway widening is required, the designer must analyze all aspects and impacts of the widening, including, but not limited to: surface drainage, utility relocation, slope limits, transitions, signing, pavement markings and right-of-way acquisitions.

The existing roadway shall be sawcut at a minimum two feet (2') from the existing edge of pavement. If the cross slope of the existing roadway is greater than 3/8" per foot, the existing roadway shall be sawcut at the centerline of road and a shim course shall be installed prior to the roadway widening to ensure a consistent cross slope across the traveled lanes. The sawcut joint shall be sealed with an approved joint seal.

Transition tapers shall be provided from the existing curb/edge of road to the widened roadway section.

Where bypass is required for left-turning movements, the design shall be in accordance with Section 11-5.04 of the "Highway Design Manual" as published by the Connecticut Department of Transportation.

Grading plans at a scale not less than 1" = 10' may be required by the Engineer.

3.03.10 Guide Rails

Guide rail shall be installed at locations where **all of the following** exist:

1. Sideslopes are steeper than four feet (4') horizontal to one foot (1') vertical; and
2. The vertical difference from proposed centerline finish grade to existing grade at toe of slope is greater than five feet (5'); and
3. When the hinge point (top of slope) occurs less than sixteen feet (16') from the edge of traveled way.

It shall also be installed at various other locations due to obstacles and/or other unforeseen conditions or at locations deemed necessary by the Engineer.

Guide rail shall be Metal Beam Rail Type RB-350 or Three Cable Guide Rail designed in accordance with Section 13-4.0 of the "Highway Design Manual" as published by the Connecticut Department of Transportation. Easements may be required for the placement of the guide rail or its anchoring system.

The use of three cable guide rail is preferred over metal beam rail in residential areas for aesthetic purposes provided all safety and design criteria can be achieved. Steel-backed timber rail that meets CTDOT standards may be allowed in historic and other areas when approved by the Engineer.

Timber rail shall not be used as guide rail. Timber rail may be used elsewhere where it is not designed to protect vehicular traffic (i.e. as a landscape treatment, pedestrian rail, to prevent parking, etc.).

3.03.11 Underdrains

Underdrains shall be installed at all areas prone to high groundwater or where directed by the Engineer. Underdrains shall be slotted high-density polyethylene pipe and built in conformance with Plate 17.2 provided in Section 9.

Underdrains shall be located two feet (2') behind the curb and hydraulically connected to the road base with free draining material. All underdrains shall outlet into a catch basin or drainage manhole.

Access cleanouts shall be provided every 250' and utility marking tape shall be placed above all underdrains.

3.03.12 Retaining Walls

Retaining walls within the roadway zone of influence are only permitted by waiver from the Engineer based on extenuating circumstances. When approval to use a retaining wall has been granted, it shall be cast-in-place concrete. The roadway zone of influence is defined as the area located within the 2:1 slope limits extending from the bottom of the typical roadway section (i.e. bottom of bank run gravel base material).

Retaining walls shall be designed by a Professional Engineer licensed in the State of Connecticut.

For walls located within an embankment, a minimum eight foot (8') bench shall be provided in front of the wall for access purposes. An easement may be required to be conveyed to the Town for the purposes of accessing the wall for inspection and repair.

Form liners or other aesthetic treatments may be required for the wall depending upon the proposed location.

3.03.13 Pavement Markings

All proposed pavement markings shall be epoxy coated resin unless otherwise directed by the Engineer and shall be designed in accordance with the latest Connecticut Department of Transportation standards.

When inlaid, 60-mil preformed plastic markings from a manufacturer approved by the Connecticut Department of Transportation may be utilized.

Painted pavement markings may be used for pavement patches if the surrounding pavement markings are paint.

3.03.14 Signs

All traffic and parking signs shall conform to the latest revisions of the "Manual on Uniform Traffic Control Devices for Streets and Highways" and the "Standard Highway Signs" booklet as published by U.S. Department of Transportation Federal Highway Administration, and the "Catalog of Signs" as published by the Connecticut Department of Transportation.

All signs shall be sheet aluminum with prismatic retroreflective sheeting of the appropriate grade for each sign.

Sign posts shall meet the requirements of the Connecticut Department of Transportation galvanized Type II 3 lbs/ft breakaway channel posts. Installation shall be in accordance with the latest Connecticut Department of Transportation standards.

For new subdivisions, traffic and street signs shall be furnished and installed by the Town. The Developer shall make payment to the Town as determined by the number of signs required and the Unit Price List in Appendix J.

3.04 SIDEWALKS

Sidewalks shall be concrete and constructed in accordance with Plates 3.1 and 3.2 provided in Section 9.

The minimum width of concrete sidewalks shall be five feet (5') and the minimum concrete thickness shall be five inches (5").

Sidewalks shall be placed such that the back of walk is located one foot (1') in front of the streetline unless otherwise directed by the Engineer.

Concrete sidewalk ramps shall be installed at all intersections and at mid-block crosswalks. Sidewalk ramps shall be a minimum of six inches (6") thick and constructed in accordance with Plates 5.1 to 5.8 provided in Section 9. Eight-inch (8") thick sidewalk ramps are required in commercial areas, in residential areas where the curb radius is less than 25' or where directed by the Engineer.
All sidewalk ramps shall conform to the latest Americans with Disabilities Act (ADA) Standards for Accessible Design and shall be constructed with prefabricated plastic 24" x 36" detectable warning tiles that are maroon in color.

3.05 DRIVEWAYS

Driveways shall be located so as to provide at least the minimum required intersection sight distances as defined in Section 3.03.05 herein and shall be located a minimum of twenty-five feet (25') from a roadway intersection.

Driveway aprons shall be made of concrete or bituminous concrete in accordance with Plates 7.1 to 7.4 provided in Section 9 herein. All driveway aprons for proposed residential roadways shall be constructed of bituminous concrete within the limits of the grass shelf.

Maximum driveway slopes beyond the Town right-of-way shall not exceed 10% unless otherwise approved by the Engineer. Any driveway exceeding 10% must be paved.

Aprons and curb cuts for commercial driveways must be constructed to match sidewalk grades unless the intersection is controlled by a traffic signal or otherwise approved by the Engineer.

Driveway aisle widths for two-directional vehicle traffic within residential and commercial developments shall be a minimum of twenty-four feet (24')wide and a minimum of sixteen feet (16') wide for one-way traffic flow (18' is recommended).

An application for any proposed or modified curb cut/driveway access that is not associated with an approved subdivision plan, site development plan or plot plan shall be submitted to the Engineer for approval on the "Driveway Curb Cut Application" form provided in Appendix B.

3.06 STORM DRAINAGE SYSTEMS

3.06.01 Components

The objectives of the information provided in this Section are to minimize the negative environmental impacts of development and to conserve the Town's natural resources by:

- Reducing the rate of runoff from newly developed land to minimize increases in flooding
- Preventing pollution of underground sources of drinking water (aquifers)
- Reducing the soil erosion potential from development or construction projects
- Assuring the adequacy of existing and proposed culverts, detention basins, bridges, channels, dams, and other drainage systems
- Increasing water recharge into the ground by promoting infiltration of "clean" runoff from roof areas whenever possible
- Decreasing non-point source pollution and water quality degradation
- Maintaining stream channels for their biological, recreational, functional and aesthetic benefits
- Preserving open space and natural vegetated riparian buffers through stream corridor and floodplain protection
- Emphasizing non-structural approaches to controlling runoff whenever possible
- Preserving existing natural drainage patterns

Each of the following basic components of stormwater management must be investigated and analyzed:

Sustainable Design

Low Impact Development (LID) techniques shall be considered to prioritize the infiltration, filtering, storage, and detention of stormwater close to the source, utilizing pre-development hydrology conditions, and minimizing the post-development discharge of water off-site via storm sewer systems or otherwise. Refer to "Sustainable Design and Low Impact Development Guidelines" as published and amended by the Town of Manchester for additional details and best practices.

Peak Runoff Attenuation

Development projects shall include attenuation of the post-development peak runoff rate to no more than the pre-development peak runoff rate unless otherwise exempt by these regulations. Refer to Section 3.06.05 herein for additional information.

Conveyance Systems

All existing conveyance systems that may be adversely impacted by the proposed development must be analyzed within the downstream zone of influence as directed by the Engineer. Proposed systems must be analyzed, designed and constructed to accommodate both existing off-site runoff and proposed on-site runoff.

Stormwater Treatment

Development projects shall include provisions, in accordance with the "Connecticut Stormwater Quality Manual" as published and amended by the Connecticut Department of Energy and Environmental Protection, for the primary treatment of stormwater runoff to minimize the discharge of pollutants into downstream waterbodies, watercourses, wetlands and stormwater conveyance systems.

Erosion and Sedimentation Control

All development projects shall include measures to control soil erosion and sedimentation during and after construction. All measures shall be designed, installed and maintained accordance with the "Guidelines for Soil Erosion and Sediment Control (DEEP Bulletin 34)" as published and amended by the Connecticut Department of Energy and Environmental Protection. Refer to Section 3.13 herein for additional information.

Operation and Maintenance

Proper operation and maintenance of all drainage facilities not owned by the Town or other government agency shall be the sole responsibility of the property owner. Maintenance requirements and schedules for stormwater conveyance, treatment and detention systems shall be included on all subdivision and site development plans.

3.06.02 Stormwater Management Reports

Stormwater Management Reports are written reports detailing stormwater management for the proposed development that include analysis of both existing and proposed drainage facilities. The report shall detail the basic components of stormwater management outlined in Section 3.06.01 as it pertains to the proposed project. **All Stormwater Management Reports submitted to the Town must be signed and sealed by a Professional Engineer licensed in the State of Connecticut**.

Stormwater Management Reports are required for all site development, including, but not limited to, subdivision, inland wetlands, erosion and sedimentation control and special exception applications to local Commissions and Boards, public road construction, and projects that discharge stormwater runoff to public roadways, drainage systems, wetlands or watercourses.

Exception: When approved by the Engineer, a Stormwater Management Report is not required if:

- The proposed project will have little or no impact to the existing drainage patterns and/or downstream conveyance systems (i.e. building renovation with no site work, construction of a single family house, etc.).
- The proposed project already has an approved Stormwater Management Report on file in the Engineering Division. Note that amendments to the originally approved Stormwater Management Report may be required to address compliance with requirements that were not in effect at the time of approval.

At a minimum, the Stormwater Management Report shall include:

- A narrative summarizing the proposed project, design methods used, and a table comparing pre-development and post-development peak flows for the required design storm events at all critical design points (defined as any areas where runoff leaves the site).
- Drainage Area Maps for pre- and post-development conditions at a scale not to exceed 1"=40', with topographical contours showing the upstream contributing drainage areas and labeled to coincide with the drainage computations used to compare pre- and post-development peak flows and for design of proposed drainage systems.
- Limits of the 100-year flood elevation at the site obtained from the Flood Profiles provided in the "Flood Insurance Study" as published by the Federal Emergency Management Agency (if applicable).
- Inland Wetland boundaries as defined on the Town of Manchester Inland Wetlands and Watercourses Map or as field delineated by a soil scientist in accordance with the Town of Manchester Inland Wetlands and Watercourses Regulations, as amended.
- An inventory and evaluation of the flow capacity and physical condition of on-site hydraulic structures and watercourses located within the downstream "zone of influence". The downstream "zone of influence" generally extends to the next two existing structures located downstream of the proposed development. The Engineer will confirm the exact location of the limit of analysis required.
- Identification of all drainage pipes, structures and watercourses that are insufficient to convey stormwater runoff under existing or reasonably anticipated future conditions.
- Identification of the peak rate of runoff and flow velocities at various design points in the watershed and the relative timing of the peak flow rates.
- Supporting calculations for design of all proposed drainage facilities, including but not limited to, piping, structures, riprap, swales, detention basins, drywells, treatment systems, etc. This information shall include calculations for the time of concentration, runoff coefficients, curve numbers, hydraulic grade line, flow velocities, gutter flow, ponding depths for inlets at low points, detailed hydraulic models for the conveyance system and detention basin sizing, etc.
- Identification of any aquifers or aquifer zones of contribution within the limits of the project.
- Optional: Provide photographs of critical areas and general site conditions to substantiate drainage calculations.

The report shall be supplemented with a complete set of subdivision or site development plans in accordance with the Minimum Plan Requirements outlined in Section 2.03. Construction details shall also be provided for all proposed drainage facilities. Drainage structures and pipe systems shall be labeled to coincide with the drainage calculations.

Electronic copies of drainage computations shall be submitted with the Stormwater Management Report upon request of the Engineer.

3.06.03 Hydrology Methods

The Design Engineer shall analyze the peak rates of runoff from the site for both pre-development and post-development conditions at critical design points using design procedures outlined in the criteria specified herein and the "Drainage Manual" as prepared by the Connecticut Department of Transportation..

The Rational Method (Q=CIA) shall be used to determine peak rates of runoff from simple watersheds with less than 200 acres and no significant surface impoundments (ponds, detention basins, etc.). The rainfall intensity, "I", shall be taken from the "Rainfall Intensity-Duration-Frequency Curves" for the Connecticut as prepared by the U.S. Weather Bureau. Calculations for times of concentration and weighted runoff coefficients shall be clearly outlined within the drainage computations. The Rational Method shall not be used when designing peak flow attenuation (detention) systems.

For watersheds greater than 200 acres in area **or** for any watersheds with existing or proposed detention, one of the following methods shall be used:

- Natural Resources Conservation Service (NRCS) Technical Release No. 55 (TR-55)
- Natural Resources Conservation Service (NRCS) Technical Release No. 20 (TR-20)
- U.S. Army Corps of Engineers Hydraulic Engineering Circular No. 1 (HEC-1)

Hydrograph evaluations shall be conducted for both pre-development and post-development conditions for design storm events with return frequencies of 2, 10, 25,and 100 years (unless analysis of the 50-year design storm event is also required in accordance with Section 3.06.04 herein). The hydrograph analysis shall include determination of runoff for each subwatershed and routing of runoff through storage impoundments and floodplain storage areas. Subwatersheds shall be delineated to isolate and identify that portion of the peak flow at critical downstream points (design points) associated with the proposed project.

If using one of the NRCS methods, the following 24-hour rainfall amounts shall be used:

Storm Frequency (Year)	24-hr Rainfall (Inches)*
2	3.1
10	4.9
25	6.0
50	6.8
100	7.7

* Values obtained from NOAA Atlas 14 rainfall data for Manchester, CT published 9/30/2015 and adopted by CTDOT

The 24-hour Type III rainfall distribution pattern shall be used with Antecedent Moisture Condition II.

The times of concentration used for all hydrology methods shall be based upon the use of multiple segment flow paths as described in the "TR-55" manual as published by the NRCS or the "Drainage Manual" as published by the Connecticut Department of Transportation. All flow paths shall be clearly labeled on the drainage area map.

3.06.04 Design Storm

Design storm frequencies vary for each project and depend on such things as the location of the site, the replacement cost of the structure, the risk of upstream or downstream damage, the potential loss of life, and the impact to the environment. Drainage systems or structures whose failure would cause loss of life or property damage are designed to higher standards than routine systems. At a minimum, the following design storm frequencies shall be used:

Type of Structure	Design Storm Frequency (Years)
Storm Drains in Residential Zone	25**
Storm Drains in Non-Residential Zone	25
Storm Drains in State Highways	10
Catch Basins in Sag*	50
Catch Basins at Low Point	25
Minor Swales, Channels and Ditches	25
Watercourse Channels	50
Cross Culverts (<1 sq. mile watershed area)	50
Cross Culverts (>1 sq. mile watershed area)	100
Bridges	100
Detention Basins	2, 10, 25 and 100
Low Hazard Small Dams	100
High Hazard Large Dams	½ Probable Max. Flood (DEEP)
Flood Control Channels	100 to 500

* Sag is defined as a low point in the roadway profile in a cut section where excess flow cannot be relieved if roadway gets flooded.

** Storm drains shall be designed for the 25-year storm event in residential zones unless the proposed system will discharge directly to an existing drainage system that does not have capacity to convey runoff from the 25-year design storm event. In this case, the proposed system may be designed for a minimum 10-year design storm frequency. However, the Design Engineer must provide calculations demonstrating that the existing drainage system does not have capacity to convey the 25-year design storm event within the downstream zone of influence as defined in Section 3.06.02 herein.

3.06.05 Peak Runoff Attenuation

The discharge of stormwater runoff from the proposed developed site must not cause adverse downstream conditions. A complete hydraulic analysis shall be conducted to compare the existing pre-development peak rate of runoff with the proposed post-development peak rate of runoff for 2-year, 10-year, 25-year and 100-year design storm events considered individually. If the post-development peak rate of runoff for any of these storm events exceeds the pre-development peak rate of runoff, then the Developer must attenuate the peak flows so as not to exceed the pre-development rate of runoff for all storm events analyzed**.** This can be accomplished by limiting impervious coverage, increasing travel times (time of concentration), introducing groundwater recharge, constructing stormwater detention facilities or any other method approved by the Engineer.

Exception: Peak flow attenuation may not be required if:

- The site runoff flows directly to a major watercourse and it is proven by the Design Engineer that the peak flow from the site occurs sufficiently prior to the peak flow of the watercourse such that the increased peak flow from the site will not have any adverse impact downstream. This may require a detailed analysis of the entire watershed draining to the confluence of the existing watercourse and the proposed discharge from the site.
- The Design Engineer must sufficiently demonstrate that a direct release of runoff from the developed site (without attenuation) early in the design storm event is more advantageous than detaining runoff and releasing flow to the watercourse later in the storm event when peak flows and water surface elevations in the watercourse are greater.
- The site was designed as part of a larger development with a regional off-site detention facility.

Peak flow retention (i.e. retention system) may be required in situations where the Engineer determines that an increase in the volume of runoff from the developed site may adversely affect downstream areas, such as areas where excessive downstream erosion or flooding may be caused by an increase in runoff volume. In those instances, the retention system must be designed to infiltrate runoff into the subsurface to mitigate an increase in runoff volume and peak flow.

3.06.06 Detention Facilities

Stormwater detention facilities are any engineered devices or systems specifically designed to attenuate peak flows by retaining and storing runoff and releasing it at a desired maximum rate.

Any detention facility whose failure could cause significant damage or loss of life may be regulated as a dam by Connecticut Department of Energy and Environmental Protection (DEEP) pursuant to Sections 22a-401 through 22a-409 of the General Statutes.

All detention facilities shall be analyzed with hydrograph and storage routing techniques developed by the Natural Resources Conservation Service and the U.S. Army Corps of Engineers. Refer to Section 3.06.03 herein for additional information.

For all privately-owned detention facilities, all subdivision and site development plans shall include an operation and maintenance schedule. It shall identify the following (at a minimum):

- items of routine maintenance
- frequency of routine maintenance
- responsible party for routine maintenance
- emergency operations in the event of a flood

Above Ground Detention Basins

Above ground detention basins shall be designed to temporarily store stormwater runoff using controls at the outlet structure that release the runoff at rates at or below pre-development conditions. Outlet structures shall be multi-staged and designed to attenuate the 2-year, 10-year, 25-year and 100-year storm events.

Basins shall be designed to meet the following conditions:

- Unless otherwise approved by the Engineer, the basin and outlet structure shall be designed such that the basin drains completely after all storm events. The bottom of the basin shall be graded with a minimum 1% slope toward the lowest stage outlet).
- The minimum orifice size for the lowest stage outlet is 8” diameter. If an 8” diameter orifice does not allow for adequate detention within the basin, then a 6” minimum diameter orifice may be used with a trash rack sized in accordance with the “Guidelines for Soil Erosion and Sediment Control (DEEP Bulletin 34)”, as amended.
- The primary outlet pipe from the basin outlet structure shall have sufficient capacity to convey discharge from a 100-year storm event.
- Basins shall be sized to provide a minimum one foot (1’) of freeboard for the 100-year storm event.

- An emergency spillway shall be provided at the water surface elevation during the 100-year storm event. The emergency spillway shall be located such that overflow follows existing drainage patterns (i.e. does not divert water to a different watershed) and does not overflow onto a public roadway.

  If the basin is located upgrade of developed areas and cannot discharge directly to a wetland or watercourse, then the basin shall be designed to provide a minimum eighteen inches (18") of freeboard for the 100-year storm event with an emergency spillway set a minimum of 6" above the water surface elevation for the 100-year storm.

The following information related to design of the detention basin shall be included in the Stormwater Management Report (at a minimum):

- Grading plan with a maximum two foot (2 ft) contour interval at a scale not to exceed 1"=40' that identifies the upstream watershed limits for the basin
- Outlet structure details (including trash rack, if applicable)
- Inflow hydrograph with superimposed outflow hydrograph
- Cross sections of the basin embankment and emergency spillway
- Elevation-Stage-Storage curve or table
- Elevation-Discharge curve or table
- Basin volume required to prevent an increase in runoff
- Information related to subsurface conditions within the basin limits such as historical high water elevations, depth to ledge and soil permeability
- Time required for the basin to drain completely
- Any applicable easements required for future maintenance

The Town will accept ownership of above ground detention basins in residential subdivisions provided it is designed and constructed in accordance with these Public Improvement Standards and includes the following:

- A minimum 10' wide maintenance access path around the perimeter of the detention basin
- Six foot (6') black vinyl coated chain link fence and evergreen landscape plantings approved by the Engineer around the perimeter of the detention basin
- A one-time cash payment of $10,000 per detention basin from the Developer to the Town that will be applied to the costs of future maintenance (mowing, cleaning, etc.) of the detention basin

In no case will the Town accept ownership of above ground detention basins serving commercial sites.

Subsurface Detention Facilities

Subsurface detention facilities are designed to utilize underground storage and/or groundwater infiltration to attenuate peak flows. The same hydrology

methods specified for design of above ground detention basins shall be used to design subsurface facilities.

Subsurface detention facilities shall be connected to a storm drainage system where feasible and designed to overflow for storm events that exceed the storage capacity of the system. Such overflows shall not cause adverse conditions downstream or to abutting properties.

Primary stormwater treatment will typically be required prior to runoff entering the infiltration system. Refer to Section 3.06.08 herein for additional information.

Design of systems that utilize groundwater infiltration shall include the following information obtained from test pits conducted by the Design Engineer in the vicinity of and a minimum of two (2) feet below the proposed infiltration system:

- Soil conditions and associated depths
- Current and historical high groundwater elevations (mottling)
- Percolation test results obtained at the bottom of the system

The location of the test pits and percolation tests, date completed and associated information must be noted on the plans. The Manchester Engineering Division must be contacted a minimum of twenty four (24) hours prior to the test pits, so that the Engineer may be present during the test pits.

Subsurface detention facilities that utilize groundwater infiltration are not permitted within Town designated aquifer protection areas or in close proximity to private water supply wells unless otherwise approved by the Engineer. Contact the Manchester Planning Department for information on aquifer protection regulations and mapping.

Subsurface detention facilities that utilize groundwater infiltration shall be designed as follows:

- The sizing of the infiltration system shall not include any credit for percolation into the subsurface. Percolation is to be considered a factor of safety.
- No credit for storage will be given for any part of the system which is below the mottling elevation.
- The maximum amount of storage allowed for the voids within a stone layer placed around the system is thirty (30) percent of the volume occupied by the stone.
- Stone surrounding the system must be wrapped with filter fabric to maintain the effectiveness of the system.
- Manhole frames or catch basin grates must be raised to grade to provide access for inspection and maintenance of the system.
- The minimum acceptable soil infiltration rate at measured in the field the base of the system is 0.3 inches per hour (200 minutes per inch) and the maximum rate shall not exceed 5.0 inches per hour (12 minutes per inch).

The following information for proposed infiltration systems must be provided on the plan:

- Type and size of proposed structures
- Top of frame and bottom elevations of the system
- Invert elevations of all inlet and outlet pipes (as appropriate)
- Construction details

3.06.07 Conveyance Systems

All stormwater conveyance systems shall be designed and constructed to accommodate runoff from the entire upstream watershed. These systems shall be designed to minimize changes in the runoff travel time (time of concentration) by including overland flow, grass lined channels, surface depression storage, etc. whenever possible. Conveyance systems shall be sized to convey the design storm event in accordance with Section 3.06.04 herein.

Priority should be given to maintaining natural drainage systems, including perennial and intermittent streams and open channels. Conveyance systems should not impede the movement of fish and other aquatic species.

Storm Sewers

Storm sewer systems shall be designed in accordance with the methods and procedures defined in the "Drainage Manual" as published by the Connecticut Department of Transportation, latest edition and as may be amended by the requirements of these Public Improvement Standards. Design computations shall be prepared using standard accepted hydraulic modeling software used in the industry or on the appropriate forms contained in the "Drainage Manual".

Storm sewers within Town right-of-way or easements shall be designed with a maximum allowable headwater in the structures that is no less than one foot (1') below the top of grate for the design storm event, unless approved by the Engineer.

Privately-owned drainage systems shall be designed with a maximum allowable headwater equal to the frame elevations of structures within the system for the design storm event. At a minimum, drainage calculations shall include flow rate, velocity, maximum hydraulic grade line, bypass flow and maximum ponding depth within the conveyance system. Appropriate tailwater conditions must be applied to the sewer system for the design storm event(s) analyzed.

Storm sewers within Town right-of-way or easements shall have a minimum diameter of fifteen inches (15") and a minimum slope of one-half percent (0.5%). Pipes shall be designed to achieve a minimum velocity of two feet per second (2 ft/sec). The maximum allowable velocity within any storm sewer shall be twelve feet per second (12 ft/sec).

All storm sewers within Town-owned right-of-way or easements shall be Class IV reinforced concrete pipe (RCP) designed with a minimum thirty inches (30")

of cover. Class IV RCP with a minimum twenty-four inches (24") of cover, and where this minimum cover cannot be maintained, Class V RCP with a minimum eighteen (18") of cover may be installed with the approval of the Engineer.

The hydraulic design of storm sewer pipes, swales and gutters shall normally be based upon the use of the Manning's Equation. The value of the roughness coefficient, "n", used in the Manning's Equation for reinforced concrete pipe shall be 0.013. The "n" values for other materials and surface conditions shall be obtained from standard published engineering data.

Catch Basins

A complete "Gutter Flow Analysis" shall be performed to determine the proper spacing of catch basins and the need for single or double grate catch basins. The design methods outlined in the "Drainage Manual" as published by the Connecticut Department of Transportation shall be followed. The maximum allowable spread (width of flooding) shall be one half (1/2) of the roadway lane width.

The first catch basin in a storm sewer system shall generally be located within two hundred fifty feet (250') of the roadway summit. A catch basin or manhole shall be placed at each grade change, horizontal direction change and at the junction of two or more storm sewers.

Catch basins at intersections shall be located upstream of sidewalk ramps whenever possible.

CTDOT Double Grate Type I catch basins shall be installed to reduce the flow spread where warranted by the gutter flow analysis.

CTDOT Double Grate Type II double grate catch basins shall be installed in all sags and depressed areas.

All catch basins shall have a sump to trap sediment. The sump shall be a minimum two feet (2') below the lowest pipe invert.

All catch basin grates shall be bicycle type and galvanized.

All single and double grate Type I catch basins within Town-owned right-of-way adjoining existing or proposed granite curb shall have a granite curb inlet. All single and double grate catch basins adjoining concrete or bituminous concrete lip curb shall have concrete inlets designed to accommodate the appropriate curb type.

All double grate Type II catch basins within Town-owned right-of-way shall have concrete inlets designed to accommodate the appropriate curb type.

Culverts and Bridges

All culverts and bridges shall be designed in accordance with the methods and procedures defined in these Public Improvement Standards and the "Drainage

Manual" as published by the Connecticut Department of Transportation and shall meet the following requirements:

1. Bridges and culverts along watercourses stocked with fish or those that may support fish shall be designed to allow passage of fish as recommended by the Department of Energy and Environmental Protection Fisheries Unit.

2. The location of new bridges and culverts shall minimize the relocation of watercourses.

3. Where applicable, rigid structure floors at bridges and culverts should be depressed below the normal streambed to allow an alluvial streambed to form over them and shall account for potential future degradation of the streambed.

4. The use of solid parapet walls at bridges and culverts located within sag vertical curves is discouraged.

5. Debris barriers shall be used upstream of structures prone to blockage by debris, rock slides, or vegetation.

6. The use of a single large culvert or bridge opening is preferred over use of multiple small openings.

7. The underclearances and maximum headwaters stipulated in the "Drainage Manual" may be waived by the Engineer when decreasing the headwater depth could increase downstream peak flows.

8. All wingwalls, endwalls and culvert ends with vertical drops of more than four feet shall have barrier rails or fences. Object markers shall be used for vertical drops of less than four feet.

The hydraulic analysis and design of culverts shall consider the capacity of the pipe and the inlet and outlet control conditions. Appropriate tailwater conditions must be applied to the culvert for the design storm event(s) analyzed. All flow conditions shall be analyzed to ensure the design is based on the most restrictive condition.

Note that for culverts and bridges on local roads (not State highways) and driveways with low traffic volumes and where alternate routes are available, lower design criteria may be acceptable if approved by the Engineer. Stormwater discharges may be allowed to cross over roads and driveways that are at or below the 100-year flood elevation obtained from the Flood Profiles provided in the "Flood Insurance Study" as published by the Federal Emergency Management Agency. However, the following conditions must be met:

- Maximum water surface elevations during the design storm event shall not be increased by more than one foot or allowed to cause damage to upstream properties;

- Provisions are made to barricade the road when overtopped;
- The road or driveway is posted as being subject to flooding.

Open Channels

The analysis and design of open channels shall be consistent with the type of channel and its intended purpose. Channels shall be classified as local drainage channels or as watercourse channels, depending on use, and shall be classified as alluvial or non-alluvial based upon their geologic characteristics.

Land clearing and grading within a natural stream corridor should be avoided or minimized so that streams remain in a natural state.

Care should be exercised to ensure that riparian vegetation, including grasses, shrubs and trees in the stream corridor or along the watercourse, remain undisturbed during land clearing, grading, and development. Preservation of a fifty foot (50') wide vegetated buffer area is desired along both sides of natural streams.

Type "A" open channels are local drainage channels with a primary purpose of conveying urban parking lot and road runoff from small watersheds, frequently with intermittent flow, limited ecological value, and are intended to convey their design flow within their banks. They shall be designed in accordance with the "Drainage Manual" as published by the Connecticut Department of Transportation and the following:

- Freeboard allowances shall be provided based on potential damage that could occur in the event of overtopping as determined by the Engineer;
- The use of impervious linings is discouraged except for very high flow velocity and steep slopes; and
- Channels shall be designed with a compact cross-section to concentrate low flows.

Type "B" open channels are natural perennial watercourses or man-made channels planned to simulate a natural watercourse. They shall be designed in accordance with the "Drainage Manual" and the following where appropriate:

- Channels shall be sized to convey the 25-year design storm event;
- Channels shall contain an inner channel to concentrate low flows that is sized to convey the 2-year design storm event;
- Water surface profiles for the 2, 25, and 100 year design storm events must be prepared by the Design Engineer and submitted to the Engineer for review;
- Channels shall have a sediment transport capacity similar to existing upstream and downstream channels;
- Channels shall be designed to minimize the need for artificial linings (concrete, riprap, etc.) for flows in excess of the 2-year design storm event;
- Channels shall encourage ecological productivity and variety;
- Channels shall be visually compatible with its surroundings;

- The alignment and slope shall be compatible with the natural channels in similar site conditions;
- Variations in width, depth, bottom elevations, and side slopes are encouraged for aquatic and visual diversity;
- The ”straightening” of channels and decreasing their length is discouraged;
- The cross-sections used to define the channel and floodplain geometry for water surface profile computations shall be provided upstream and downstream of hydraulic structures, at changes in bed slope or cross-section shape, and generally at intervals of not more than ten times the width of the 100-year floodplain; and
- The friction coefficients used in the hydraulic analysis are to assume maximum seasonal vegetation conditions and should be adjusted to the depth of flow.

Channel restoration plans shall be prepared for all projects impacting open channels. The plan shall restore and/or create an aquatic habitat suitable for fisheries, while maintaining or improving water quality, recreation, aesthetics and flow capacity. Coordination with the Fisheries and Wildlife Units of the Connecticut Department of Energy and Environmental Protection (DEEP) is recommended. The channel restoration plan shall include the following (as appropriate):

- Avoidance of barriers to fish movement;
- Formation of pools and riffles;
- Formation of areas of sheltered flow with use of deflectors, boulders and low check dams;
- Preservation of stream bank vegetation and establishment of new vegetation;
- Use of clean natural bed materials of a suitable size;
- Scheduling work to minimize conflicts with spawning, stocking, and fishing seasons;
- Removal of excess debris.

The design of rock riprap in channels with uniform flow shall be based upon the tractive force methods defined in both the “Drainage Manual” and the “Connecticut Guidelines for Erosion and Sediment Control (DEEP Bulletin 34)” as published by the DEEP.

The hydraulic analysis and modification of watercourses prone to ice jams or floods due to ice should be coordinated directly with the DEEP.

Storm Drainage Discharge Points

All stormwater that has been collected or otherwise artificially channeled shall be discharged into natural wetlands, watercourses, or with approval, into Town or State-owned drainage systems with adequate capacity to convey the discharge. There shall be no discharge onto or over private property within or adjoining the street unless:

1. Proper easements and discharge rights have been secured by the Developer;

2. Such easements and rights are transferable; and
3. There will be adequate safeguards against soil erosion and flood hazards.

No stormwater shall be diverted from one watershed to another without proper Diversion Permits from the Connecticut Department of Energy and Environmental Protection (DEEP) and an evaluation of downstream impacts.

Storm drainage systems discharging into watercourses tributary to public water supply reservoirs shall be in compliance with the "Public Health Code" as published by the Connecticut Department of Public Health. The storm drain outlets should be 100 feet (minimum) from water supply reservoirs or their tributaries, whenever possible.

Storm drainage discharge points shall be selected to minimize their environmental impact and potential scour conditions.

All storm drain system outlets shall be designed in accordance with the "Drainage Manual" as published by the DEEP to minimize soil erosion.

Design of storm drains that discharges into rivers and lakes shall include the hydraulic impact of having drainage outlets submerged (i.e. with a tailwater condition). Tailwater elevations for non-tidal rivers should be obtained from the Flood Profiles provided in the "Flood Insurance Study" as published by the Federal Emergency Management Agency that are available from the Town Clerk's Office and the DEEP. Published studies are available for most rivers with watersheds of over one square mile and include flood water elevations for storm events with return frequencies of 10, 50, 100 and 500 years.

Historic flood levels and high water marks may be visible in some areas and are useful in estimating tailwater elevations. Tailwater elevations can also be computed by determining the water surface profiles in rivers using the Manning's Equation for uniform flow and the standard step method for non-uniform flow.

3.06.08 Stormwater Treatment

All proposed site development shall include provisions for the treatment of surface runoff in order to minimize the transport of pollutants into downstream waterbodies, watercourses, wetlands and stormwater conveyance systems after construction is complete.

These Public Improvement Standards incorporate the latest recommendations from the Connecticut Department of Energy and Environmental Protection (DEEP). For a description of acceptable stormwater treatment practices and detailed design guidance, refer to the "Connecticut Stormwater Quality Manual" as published by the DEEP.

Primary stormwater treatment systems are defined as an engineered system or device that is documented to remove at least 80% of the average annual total suspended solids (TSS) load and at least 80% of floatable debris, including oil and petroleum products from either the design Water Quality Volume (WQV) or Water Quality Flow (WQF).

Secondary stormwater treatment systems are defined as a system or device that is documented to remove sediment or pollutants from stormwater but are not capable of meeting the minimum pollutant removal requirements for primary stormwater treatment.

The requirement to provide primary or secondary stormwater treatment is based on the amount of increased impervious area at the site and the location of discharge. Unless otherwise approved by the Engineer, the type of treatment system required is based on the following:

- Primary treatment is required when the proposed impervious area drains directly to a waterbody, watercourse, or wetland AND that surface equals or exceeds 2,000 square feet. In this case, new or reconstructed impervious areas that are less than 2,000 sf require only secondary treatment.
- Primary treatment is required when the proposed impervious area DOES NOT drain directly to a waterbody, watercourse, or wetland AND that surface equals or exceeds 5,000 square feet. In this case, new or reconstructed impervious areas that are less than 5,000 sf require only secondary treatment.

Stormwater Treatment Facilities

Stormwater treatment facilities are designed to treat either the water quality volume (WQV) or water quality flow (WQF). For both methods, the calculations use the "water quality design storm event", which is defined as the first one (1) inch of runoff from impervious surfaces.

The Water Quality Volume is calculated using the following equation:

$$\mathbf{WQV = \frac{(1") \times (R) \times (A)}{12}}$$

where: WQV = water quality volume (acre-feet)
R = volumetric runoff coefficient = 0.05+0.009(I)
I = percent impervious cover
A = site area directly connected to treatment facility (acres)

Facilities sized to treat the WQV and WQF shall be designed in accordance with Chapter 7, Hydrologic Sizing Criteria for Stormwater Treatment Practices, of the "Connecticut Stormwater Quality Manual".

Hydrodynamic Separators

Hydrodynamic separators may be used as primary stormwater treatment if the system meets the definition provided above. These systems must be designed

to treat the WQF. The following information for hydrodynamic separators must be provided on all subdivision and site development plans:

- Maximum *treated flow* for the specified system, which must equal or exceed the WQF
- Maximum *conveyed flow* for the specified system, which must equal or exceed the design storm flow.
- Calculations or documentation verifying that 80% (min.) of the average annual total suspended solids (TSS) are removed from the WQF if the system is intended to provide primary treatment of stormwater.
- If the system is to be located "off-line", detailed flow diversion calculations must be provided to verify that the WQF will be directed to the system and larger flows will bypass. The design must conform to procedures outlined in Appendix B of the "Connecticut Stormwater Quality Manual".
- In critical locations, calculations identifying impacts to the hydraulic grade line of the proposed drainage system caused by installation of the treatment system must be provided.
- Maintenance requirements for the system that are in accordance with the "Connecticut Stormwater Quality Manual".
- A note stating "Shop drawings of the proposed system must first be approved by the design engineer then submitted to the Town for review prior to fabrication. The shop drawings must clearly identify the proposed size and elevation of the internal orifices, weirs and other design elements that correspond to the approved hydraulic analysis of the system. The use of an alternate type of system is subject to approval by the Town."

The following requirements apply to hydrodynamic separators that will be owned and maintained by the Town:

- Hydrodynamic separators listed on the "List of ConnDOT Approved Hydrodynamic Separators" as published by Connecticut Department of Transportation are preferred; however, other types of systems will be considered.
- The system must be located within the Town-owned right-of-way or easements in an area that is easily accessible by Town equipment for maintenance and cleaning. If located behind a concrete sidewalk or sidewalk ramp, the sidewalk and ramp must be installed with increased concrete thickness and steel reinforcement to support anticipated vehicle loads. Depressed granite curb may be required in the vicinity of the system to facilitate access to the structure.
- The dimension from the frame to the bottom of the sump within the structure cannot be greater than 12 ft (10 ft is preferred) to facilitate cleaning and maintenance operations.

Drywells

Drywells are typically considered secondary stormwater treatment and function as infiltration systems to reduce the quantity of runoff by recharging

groundwater. The use of drywells as the sole method of reducing stormwater runoff may only be considered after all other methods have been reviewed and found to be unacceptable by the Design Engineer and approved by the Engineer.

Drywells should only be used to infiltrate “clean” stormwater runoff from roof areas and sump pumps. However, if the existing topography does not allow for drainage from the site and/or connection to a suitable drainage system is not feasible, drywells may be installed to collect surface runoff. In this case, the maximum watershed to a drywell shall be one (1) acre and primary or secondary stormwater treatment may be required by the Engineer prior to runoff entering the infiltration system.

Drywells shall be designed to completely drain within 48 hours and shall be designed to overflow for storm events that exceed the storage capacity of the system (wherever feasible). Such overflows shall not cause adverse conditions downstream or impact abutting properties.

Drywell design shall include following information obtained from test pits conducted by the Design Engineer in the vicinity of and a minimum of two (2) feet below the proposed drywell system:

- Soil types and associated depths
- Current and historical high groundwater elevations (mottling)
- Percolation test results obtained at the bottom of the system

The location of the test pits and percolation tests, date completed and associated information must be noted on the plans. The Manchester Engineering Division must be contacted a minimum of twenty four (24) hours prior to the test pits, so that the Engineer may be present during the test pits.

Drywell systems require constant maintenance to keep them effective. Cleaning and maintenance requirements to keep the system operation shall be included on the plans.

Drywells are not to be installed in the public right of way unless specifically approved by the Engineer.

Drywells that collect surface runoff are not permitted within Town designated aquifer protection areas unless otherwise approved by the Engineer. Contact the Manchester Planning Department for information on aquifer protection regulations and mapping.

Drywells shall be designed as follows:

- Drywells shall be sized to contain the water quality volume (WQV). The drywell sizing shall not include any credit for percolation into the subsurface. Percolation is to be considered a factor of safety.
- No credit for storage will be given for any part of the system which is below the mottling elevation.

- The maximum amount of storage allowed for the voids within a stone layer placed around the drywell is thirty (30) percent of the volume occupied by the stone.
- Stone surrounding the drywell must be wrapped with filter fabric to maintain the effectiveness of the system.
- A manhole frame or catch basin grate must be raised to grade to provide access to the structure for inspection and maintenance of the system.
- The minimum acceptable soil infiltration rate measured in the field at the base of the system is 0.3 inches per hour (200 minutes per inch) and the maximum rate shall not exceed 5.0 inches per hour (12 minutes per inch).

The following information for proposed drywells must be provided on the plan:

- Type and size of proposed structure
- The WQV for which the unit was sized to contain
- Top of frame and bottom elevations of the structure
- Invert elevations of all inlet and outlet pipes (as appropriate)
- Construction details

Best Management Practices

Best Management Practices (BMPs) are design techniques and facilities that the Developer can utilize within the site to effectively provide treatment and reduce the amount of stormwater runoff from a developed site. Developers are not required to use these BMPs; however, their use is encouraged as they can potentially reduce the required size of stormwater treatment facilities.

Examples of simple cost-effective BMPs include, but are not limited to, minimizing unnecessary impervious surface area, promoting overland sheet flow, retaining native vegetation, constructing on-site vegetated buffers, swales, filter strips and rain gardens, and installing roof leaders that discharge “clean” runoff to infiltration systems. The “Sustainable Design and Low Impact Development Guidelines” should be consulted for more information.

3.07 WATER DISTRIBUTION SYSTEMS

Refer to the “Rules and Regulations” as published by the Town of Manchester Water and Sewer Department for additional information.

3.07.01 Design Flow Requirements

General

Water distribution systems shall be designed to transmit an adequate flow of water that satisfies initial and future demands. Mains shall be sized to convey average daily flows, peak hourly flows and fire flows. The Design Engineer shall submit engineering computations that identify initial and future demands to the Engineer for approval.

Flows shall be computed based upon planned land use. In general, initial average daily consumption shall be calculated using the following unit flow factors:

Land Type	Average Demand	Max. Hourly Peaking Factor
Residential (Single Family)	255 GPD/Unit	3.0
Residential (Multi-Family)	188 GPD/Unit	3.0
Commercial/Retail	1,000 GPD/Acre	3.0
Industrial	2,000 GPD/Acre	3.0

GPD = Gallons Per Day

These factors shall be adjusted upward as appropriate to reflect anticipated future water consumption rates. The Design Engineer shall consult with the Engineer for guidance if appropriate factors are not found herein.

The Design Engineer shall consult with the Engineer and prepare separate estimates for structures with high demand, such as wet commercial or industrial properties, food processing establishments, or properties with extensive irrigation systems.

Initial flows shall be based upon existing and proposed development in accordance with current zoning and land use requirements. Incremental flows shall be computed for the 5-year, 20-year, 50-year and full development periods. Additional flow increments shall be computed as required by the Engineer.

Ultimate flows (i.e., full development) flows shall be calculated for the entire (100%) "net developable area" attributable to the site in accordance with current zoning and land use requirements. When determining the “net developable area”, deductions may be made for such items as wetlands, flood plains, severely sloping land, roadways, sidewalks, deeded open space, etc. Care shall be taken when making deductions not to artificially reduce the development potential of the site.

In the case of existing or proposed developments with unusually high water demands, the Engineer reserves the right to require an evaluation of the impact the proposed connection will have on the existing distribution system.

Peak Hourly Demand

The Design Engineer shall submit computations of the peak hourly demand for the project to the Engineer for approval. Peak hourly demand shall be computed by multiplying the average daily flow rate by a factor of 3.0.

Under special circumstances, the Engineer may require the use of an alternate peaking factor to reflect unusual or unique demand characteristics.

Pipes shall be designed to transmit the peak hourly flow rate without exceeding a flow velocity of ten feet per second (10 ft/sec).

Fire Flow Requirements

Water distribution piping shall be designed to carry sufficient water to satisfy fire protection requirements. Fire flow requirements shall be computed using Insurance Service Office (ISO) methods.

The Design Engineer shall submit computations demonstrating the required fire flow per ISO methodology shall be submitted to the Engineer for approval.

The Design Engineer shall consult with the Manchester Building Department and Fire Marshall to determine particular fire protection requirements for proposed or existing structures. The Design Engineer shall comply with all applicable state and local fire protection requirements.

The Engineer reserves the right to adjust design flows as deemed appropriate.

3.07.02 Operating Pressure Requirements

Water distribution facilities shall be designed to operate within pressure limits identified by the Engineer under anticipated operating conditions and flows.

Operating pressures within new mains shall not exceed one hundred and twenty-five pounds per square inch, gauge (125 psi) or be less than forty pounds per square inch, gauge (40 psig) under average daily and peak hourly demand, and shall not fall below twenty five pounds per square inch, gauge (25 psig) during fire flow conditions.

Operating pressures within building structures shall not exceed one hundred pounds per square inch, gauge (100 psi) and the recommended minimum pressure is forty pounds per square inch, gauge (40 psig) under average daily and peak hourly demand.

The system within building structures shall be designed and installed as may be required to satisfy specified operating pressures, including installation of pressure reducing valves and booster pumps (as appropriate) to meet these requirements.

3.07.03 Distribution System Layout

Dead ends shall be minimized by looping whenever possible. A fire hydrant shall be installed at all permanent dead ends (blowoff valves are not to be installed at these locations).

Special attention should be given to minimize crossings with other utilities.

3.07.04 Water Mains

The minimum water main size, regardless of flow conditions, shall be eight inches (8") nominal diameter.

All water main pipe shall be cement lined ductile iron pipe (CLDIP) unless otherwise approved by the Engineer.

The location of water mains in streets shall be in accordance with Plates 1.1 to 1.3 provided in Section 9.

Water mains within easements shall be located a minimum of ten feet (10') from the easement lines.

All water mains and appurtenances shall have restrained joints and be installed with a minimum of four feet and six inches (4'-6") of cover from finished grade to the top of pipe. If existing conditions make achievement of the minimum cover impossible or impractical in the opinion of the Engineer, installation of shallower pipes may be allowed for short runs provided:

- The pipe is insulated to protect it from freezing and has a minimum cover of 2'-6".
- The pipe is of sufficient strength to resist the additional loads caused by the shallow depth of burial.

Poured concrete thrust blocks shall be provided at all horizontal bends, mechanical joint caps and tees and all locations directed by the Engineer.

Changes in pipe direction exceeding allowable pipe deflection limits established by the manufacturer shall require bends in all instances. Any proposed deflection of ductile iron pipe shall be according to the manufacturer's recommendations only. Proposed plans shall show all distances and degrees of deflection.

3.07.05 Water Services

For approved subdivisions, capped services shall be installed to the right-of-way limit (streetline) for all approved lots to avoid the need to disturb public infrastructure for future connections. The limits of water services extend from the connection at the public water main to the water meter in the building served. Ownership and maintenance responsibilities of water services shall be in accordance with the "Rules and Regulations" as published by the Town of Manchester Water and Sewer Department.

Services shall include the following components:

- Double strap tapping saddle
- Corporation stop
- Copper tubing
- Curb stop with curb box

Water services shall be one inch (1") or two inches (2”) in diameter and shall be Type K seamless copper tubing and shall meet the requirements of ASTM Specification B 88 of latest revision. Proposed pipe materials and associated appurtenances for any other size services must be approved by the Engineer.

Services shall be installed with a minimum of four feet and six inches (4’-6”) of cover for frost protection.

Use of tapping sleeves or cut-in tees and valve must be approved by the Engineer.

Curb boxes shall be installed at the street/easement line over all buried curb s*tops on water service connections. Curb boxes shall be of the sliding type to* accommodate minor movement following construction. Curb boxes shall extend to grade and shall be provided with suitable covers that can withstand the anticipated wheel loads.

Services installed for commercial/industrial facilities, fire suppression and irrigation shall be sized by the Design Engineer and approved by the Engineer.

3.07.06 Valves

Valves shall be placed with a maximum spacing of eight hundred feet (800’) in residential areas, five hundred feet (500’) in commercial and industrial areas, and shall be placed to ensure that only one fire hydrant will be out of service in the event of a water main shut down or main break.

Gate valves shall be installed on water mains up to 12” in diameter and butterfly valves shall be installed for larger size pipe.

Three (3) valves are required at all tees unless otherwise approved by the Engineer.

Valves shall be placed at each end of a water main running through an easement on private property, on both sides of a water main installed beneath a watercourse and on each side of services to a hospital, school or large industrial user.

Valve boxes shall be installed over all buried valves with frames located at finished grade.

3.07.07 Fire Hydrants

Fire hydrants for fire protection purposes shall be installed throughout the water distribution system. Fire hydrants shall be installed on the same side of the street as the water main as far from other utilities as possible and with the center not less than two feet and six inches (2’-6”) behind the curb line of the roadway and edge of the fire hydrant not less than six inches (6”) from sidewalks and the streetline.

Unless otherwise approved or directed by the Engineer, at a maximum, fire hydrants shall be installed every five hundred feet (500’) in residential areas, every two hundred and fifty feet (250’) in commercial and industrial areas and at every street intersection. Development considerations may warrant a closer spacing as directed by the Engineer.

Fire hydrant assemblies shall be equipped with concrete thrust blocks to provide adequate bracing against operating forces. All pipes and fittings are to have restrained mechanical joints from the branch on the main to the fire hydrant assembly. Restrained joints shall be installed in addition to concrete thrust blocks.

3.07.08 Booster Pumping Stations

General

When approved by the Engineer, booster pumping stations shall be installed as required to maintain system operating pressures within acceptable limits. In general, pumping stations shall be designed in accordance with the "Recommended Standards for Water Works" (Ten State Standards) as published by Health Research Inc. and the "Public Health Code" as published by the Connecticut Department of Public Health. Specific pumping station requirements shall be discussed with the Engineer prior to initiating design.

Pumping station structures shall be designed for a service life of fifty (50) years. Pumps and appurtenances shall be designed for a service life of twenty (20) years and shall be designed to accommodate the 20-year peak hourly flow conditions.

Pumping stations shall be located a minimum of one hundred fifty feet (150') from any occupied structure.

Access ways, entrances, hatchways, superstructure floor slabs and all equipment including control panels, emergency generators, etc. shall be constructed at least one foot (1') above the 100-year flood elevation determined from the Flood Profiles provided in the "Flood Insurance Studies" as published by the Federal Emergency Management Agency. Higher structure and equipment elevations may be required by the Engineer.

The property occupied by the pumping station shall be deeded to the Town. Easements in favor of the Town shall be granted as needed for access to the pumping station site. Landscaping and other means shall be used to provide a buffer between the pumping station and other structures and to shield the station from public view. Sites shall be graded and landscaped so as to be aesthetically pleasing.

Superstructures, if provided, shall be matched architecturally with surrounding structures.

A 6-foot high chain link fence shall be installed around the perimeter of the pumping station site to prevent access by the general public. The fence shall be equipped with a minimum twelve foot (12') wide gate to permit access by maintenance vehicles and a separate minimum three foot (3') wide pedestrian gate. The fence and all components shall be fabricated of polyvinylchloride (PVC) coated galvanized steel or aluminum.

An emergency generator shall be provided for each pumping station to provide electricity to operate the station during power outages. The generator shall be

sized to provide power to pumps and incidental station power for a minimum of 72 hours unless otherwise approved by the Engineer.

Pump Design

A minimum of two (2) pumps shall be provided for each pumping station. One pump shall serve as the duty pump and the other pump shall serve as the stand-by pump. Each pump shall be of adequate size to handle the design flow at the station so one pump can be taken out of service for maintenance or repairs. Pump motors larger than five (5) horsepower shall be equipped with variable speed drives to reduce pump power costs.

Alarms

An alarm panel shall be installed at the pumping station to indicate the status of alarm conditions. The panel shall be equipped with both an annunciator as well as illuminated buttons to provide both audible and visual warnings in the event of an alarm condition. The annunciator system shall include acknowledge/reset and test buttons mounted on the exterior of the panel door.

Alarm signals shall be sent to the Town's water treatment facility. Signal transmission shall be compatible with the existing Town-owned existing monitoring equipment.

Supervisory Control and Data Acquisition (SCADA)

SCADA will be required for all equipment that the Engineer deems necessary to monitor. SCADA shall be compatible with the existing Town-owned system and shall be approved by the Engineer.

3.07.09 Storage Tanks

Storage tanks shall be installed as required by the Engineer to provide additional water and/or pressure to the distribution system. In general, storage tanks shall be designed in accordance with the “Recommended Standards for Water Works” (Ten State Standards) as published by Health Research Inc., the “Public Health Code” as published by the Connecticut Department of Public Health, and the Occupational Safety and Health Laws and Regulations as published by the United States Department of Labor. Specific storage tank requirements shall be discussed with the Engineer prior to initiating design.

The Design Engineer shall prepare and submit complete design calculations to the Engineer for review.

Storage tanks shall be above-ground with an epoxy internal coating system, and equipped with adequate vents with screens, two access manholes, and separate inlet and outlet pipes with the inlet pipe at ¾ (75%) of the tank height.

Storage tanks shall be equipped with suitable above-grade overflow structures to safely discharge water from the tank in the event of an overfill. The overflow structure shall discharge to a storm drain or other location approved by the Engineer that is adequately sized to receive the maximum flow from the tank.

Storage tanks shall be equipped with suitable valves to control the water level and allow for isolation and draining of the tank.

SCADA will be required for all equipment that the Engineer deems necessary to monitor. SCADA shall be compatible with the existing Town-owned system and shall be approved by the Engineer.

Storage tanks shall be properly disinfected prior to being placed into service. Disinfection procedures shall be subject to the approval of the Engineer.

A 6-foot high chain link fence shall be installed around the perimeter of the storage tank site to prevent access by the general public. The fence shall be equipped with a minimum twelve foot (12') wide gate to permit access by maintenance vehicles and a separate minimum three foot (3') wide pedestrian gate. The fence and all components shall be fabricated of polyvinylchloride (PVC) coated galvanized steel or aluminum.

Tank design shall comply with all local, state and Federal Aviation Administration requirements pertaining to the need for a warning beacon on the tank structure.

3.07.10 Special Facilities

Air/Vacuum Release Valves

Air/vacuum release valves shall be located within a concrete manhole installed at all local high points within the water distribution system where air may accumulate. The need for and proposed location of all air/vacuum release valves shall be reviewed and approved by the Engineer.

The air/vacuum release valve shall be connected to the top of the water main by means of a copper tube with a corporation stop. The portion of the water main located within the manhole shall be insulated.

The air/vacuum release valve and corporation stop within the manhole shall be enclosed in an insulated wooden box. The box shall be equipped with a removable cover with handle to permit access to the air/vacuum release valve and corporation stop.

Manholes containing air/vacuum release valves shall be provided with a means of venting air which is expelled from the valve during operation. These manholes shall be capable of dissipating water discharged from air/vacuum release valves during normal valve operation and shall be designed and installed to ensure that the air/vacuum release valve is positioned above seasonal high ground water levels.

Blowoff Valves

Blowoff valves shall be located at local low points within the water distribution system to permit the removal of accumulated solids from water mains. If present, fire hydrants may be used as blowoffs. Blowoffs valves are not to be installed at permanent dead ends of water mains.

The need and proposed location of all blowoff valves shall be reviewed and approved by the Engineer.

Bridge Crossings

Water mains shall traverse local depressions at bridges (such as roadways, railroad tracks, streams, etc.) by means of attachment to bridge structures. This method shall only be used upon approval of the Engineer.

The Developer shall secure any and all permits from agencies having jurisdiction over the bridge structure.

Water mains attached to bridge structures shall be positioned so they are protected from pedestrian and vehicular traffic. In the case of mains crossing over roadways or navigable waterways, under no circumstances shall the main, or any part thereof, extend below the bottom chord of the supporting bridge structure.

Supported water mains that are exposed to the atmosphere or have less than the minimum burial depth (when measured from any exposed direction) shall be designed in a manner that will accommodate thermal expansion and contraction and shall be properly insulated to protect pipes from freezing during winter months. Suitable pipe joints shall be provided at appropriate locations to permit axial movement of the piping system and pipe insulation shall be encased in a rigid material to protect it from the elements and vandalism.

Water mains that cross bridge structures with the formation of high points shall be provided with air/vacuum release valves as specified herein. Valves shall be provided on either side of the bridge crossing to isolate the water main and no services shall be provided in between the valves.

River Crossings

Water mains shall be suspended from bridges whenever possible. However, wherever water mains must be installed across rivers, streams or other surface water bodies, extreme care shall be used to minimize the impact of construction on wetland areas. The Developer shall be solely responsible for obtaining all necessary permits and/or approvals from local, state, and/or federal regulatory agencies prior to construction in and adjacent to wetland areas. Copies of all state and federal permits/approvals shall be provided to the Engineer prior to construction.

Valves shall be provided on either side of the river, stream or other surface water body crossing to isolate the water main and no services shall be provided in between the valves.

Railroad Crossings

The installation of water mains across railroad rights-of-way shall be conducted in strict accordance with the requirements of the affected railroad. The Developer shall be solely responsible for obtaining the necessary permits and/or approvals from the railroad.

The Developer shall obtain an easement from the property owner that is in favor of the Town or provide other appropriate documentation that insures the Town has the right of access to water distribution facilities located within the railroad property.

All water mains crossing railroad rights-of-way shall be sleeved within a carrier pipe of a sufficient size and material approved by the Engineer.

Valves shall be provided on either side of railroad right-of-way crossing to isolate the water main and no services shall be provided in between the valves.

Concrete Valve Chambers

Concrete valve chambers are vaults installed to contain meters and valves and can only be installed where approved by the Engineer. Valve chambers shall be constructed of precast reinforced concrete designed to withstand HS-20 wheel loading where appropriate.

Valve chambers shall be sized to accommodate the equipment to be housed. A minimum of twelve inches (12") of free space shall be provided in each direction around equipment to provide for maintenance and removal.

Valve chambers shall be provided with a minimum of one access manway to grade with an aluminum access hatch, unless otherwise approved by the Engineer. Manways shall have a minimum 24 inch (24”) clear opening and shall be of adequate size to permit the removal of equipment without the need for disassembly of the equipment.

Valve chambers shall have power and alarms and be designed to permit the removal of water that may accumulate as approved by the Engineer. Valve chambers that are located below the 100-year flood elevation obtained from the Flood Profiles provided in the “Flood Insurance Study” as published by the Federal Emergency Management Agency shall be equipped with water-tight covers.

Cross Connection Prevention

Methods for cross connection prevention shall be utilized at all points of connection for non-potable water consumption uses (such as irrigation, process water, etc.). All methods shall meet the applicable requirements of the “Public Health Code” as published by the Connecticut Department of Public Health and the “Rules and Regulations” as published by the Town of Manchester Water and Sewer Department. All installations shall be in accordance with manufacturer’s specifications and be approved by the Engineer.

An Air Gap or a Reduced Pressure Principle Backflow Preventer (RPD) shall be installed for Irrigation Systems. An Air Gap, RPD or Double Check Valve Assembly (DCVA) shall be installed on the service line to all fire services with Fire Department Connections. An RPD shall be installed on services for

commercial and industrial facilities where toxic or objectionable substances are used unless otherwise approved by the Engineer.

All Backflow Prevention Devices (BPDs) shall not be installed underground or within vaults and must be easily accessible for repair, testing and inspection without the need for entering confined spaces, hazardous environments, flooding potential, freezing temperatures etc. All BPDs must be located within building structures or locations approved by the Engineer.

All BPDs that require annual testing shall have permanently installed one-quarter inch (1/4") flared test adapters on each test cock.

Testing for BPDs that require testing shall be completed by the Manchester Water and Sewer Department on an annual basis.

3.07.11 Disinfection

All potable water mains and related appurtenances shall be disinfected prior to being placed into service. Disinfection procedures shall meet all state and local health codes.

Water main disinfection shall be conducted in accordance with requirements outlined in Section 8 herein and shall be performed under the supervision of the Engineer.

3.07.12 Testing

All potable water mains and appurtenances shall be pressure tested to verify materials and workmanship prior to being placed into service. All testing shall be conducted in accordance with requirements outlined in Section 8 herein and shall be performed under the supervision of the Engineer.

Test segments which fail shall be repaired and defects corrected. Upon completion of repairs, the failed section shall be retested and this process repeated until satisfactory results are achieved.

Copies of test results (including results of failed test efforts) shall be delivered to the Engineer upon completion of pipe testing activities.

The Engineer shall identify testing requirements for other water distribution system facilities on a case-by-case basis.

3.07.13 Utility Clearances

Water mains and services shall be installed within their own trench and under no circumstances shall they be installed in a trench shared with another utility.

Horizontal Separation

Water mains and services shall be installed at least ten feet (10') laterally from any existing or proposed sanitary sewers (mains or laterals) and a minimum of five feet (5') from all other utilities.

Should conditions prevent a ten foot (10') lateral separation between water mains or services and sanitary sewers, the water main or service may be installed a minimum of five feet (5') away provided the following conditions are met:

- the water main or service is installed in a separate trench, and
- the bottom of the water main or service is installed a minimum of eighteen inches (18") above the crown of the sanitary sewer

Water mains shall be installed a minimum of two feet (2') from catch basins or other drainage structures.

Vertical Separation

Water mains and services crossing sanitary sewers shall be installed such that the bottom of the main or service is a minimum of eighteen (18") inches above the crown of the sanitary sewer unless otherwise approved by the Engineer.

Where a water main crosses above a sanitary sewer with less than eighteen inches (18") of clearance, the water main shall be positioned such that the point of crossing occurs at the midpoint of the water pipe segment and that the joints of the water main are positioned as far as possible from the point of crossing.

If, as a last resort, the water main or service must be installed below the sanitary sewer, the water main shall be installed such that the top of the water main is a minimum of eighteen inches (18") below the invert of the sanitary sewer and the sewer pipe shall be encased in concrete to a distance at least five feet (5') on either side of the point of crossing if any joints fall within these limits. Any other proposed measures must be approved by the Engineer.

Where the water main crosses above, below, or within twelve inches (12") of any other underground utility (except sanitary sewers or services as provided for herein), a concrete cradle as shown in Plate 24.1 in Section 9 shall be provided at the point of crossing to support the pipes. Water mains shall be wrapped with plastic within limits of concrete cradle as directed by the Engineer.

Extra care shall be taken wherever water mains or services cross other utilities to ensure that the soils and bedding around water mains are adequately compacted and that the pipe is adequately supported.

When designing new water distribution systems, efforts shall be taken to minimize the number of utility crossings. Whenever crossings are unavoidable, they shall be made as nearly perpendicular as possible (i.e. long, shallow angled crossings shall be avoided).

Wherever a water main crosses another utility, the water main shall be positioned such that the point of crossing occurs at the midpoint of the water pipe segment and that the joints of the water main are positioned as far as possible from the point of crossing.

3.07.14 Approved Construction Materials

The Town maintains a list of approved construction materials for the water distribution system. Refer to Appendix F for the "Approved List of Construction Materials". Note that the list may be updated periodically; therefore, contact the Maps and Records Office at 860-647-3119 for the latest information.

3.07.15 Approved Wet Tap Contractors

The Town maintains a list of contractors approved to conduct large diameter "wet taps" for water mains with 4" or larger diameter within the Town-owned water distribution system. Refer to Appendix G for a list of "Approved Wet Tap Contractors". Note that the list may be updated periodically; therefore, contact the Maps and Records Office at 860-647-3119 for the latest information.

3.08 WASTEWATER COLLECTION SYSTEMS

Sanitary sewer design standards provided herein apply to systems located within the Sanitary Sewer Service Areas of the Town of Manchester Water and Sewer Department and the Eighth Utilities District. The Eighth Utilities District should be consulted for any additional design standards that apply. Refer to the map showing the Eighth Utilities Sewer District limits in Appendix N and the “Rules and Regulations” as published by the Town of Manchester Water and Sewer Department for additional information.

3.08.01 Design Flow Requirements

General

Computations for initial, incremental and ultimate wastewater flows shall be determined for average and peak rates for both the project area and the land tributary to the project area that does not have sanitary sewers.

Initial flows shall be based upon existing and proposed development in accordance with current zoning and land use requirements.

Incremental flows shall be computed for the 5-year, 20-year, 50-year and full development periods for both the project area and the land tributary to the project area that does not have sanitary sewers; but could be served by the proposed facilities. Additional flow increments shall be computed as required by the Engineer.

Ultimate flows (i.e. full development) shall be calculated for the entire (100%) "net developable area" attributable to the site in accordance with current zoning and land use requirements. When determining the “net developable area”, deductions may be made for such items as wetlands, flood plains, severely sloping land, roadways, sidewalks, deeded open space, etc. Care shall be taken when making deductions not to artificially reduce the development potential of the site.

Average Daily Flows

Residential wastewater flows shall be estimated as follows:

Land Type	Average Demand
Residential (Single Family)	255 GPD/Unit
Residential (Multi-Family)	188 GPD/Unit

GPD = Gallons Per Day

Flows from other types of development shall be computed using factors presented in Table 4 in Section IV of the “Connecticut Public Health Code, Regulations and Technical Standards for Subsurface Sewage Disposal Systems” as published by the Connecticut Department of Public Health. If an appropriate factor is not found for an existing or proposed development, the Design Engineer shall consult with the Engineer for guidance.

Flows estimated for undeveloped lands zoned for commercial/retail development shall be computed using a rate of 1,000 gal/acre/day.

Flows estimated for undeveloped lands zoned for industrial development shall be computed using a rate of 2,000 gal/acre/day.

Infiltration and Inflow Adjustment

All wastewater flow computations shall be increased to allow for infiltration and inflow as follows:

- Developed Land: Infiltration and inflow for developed lands shall be computed by multiplying the total length of sewers (including building service laterals) by 250-500 gpd/inch-diameter/mile of pipe.
- Undeveloped Land: Infiltration and inflow for undeveloped lands shall be computed by multiplying the total area of undeveloped land (in acres) by 75 gal/day/acre.

Infiltration and inflow rates shall be increased for areas where excessive infiltration is reasonably anticipated as directed by the Engineer to account for the deterioration of the wastewater collection system over time.

Peaking Factor

Peak wastewater flows shall be computed to show the maximum instantaneous sewage flow based upon the type of discharge. To compute peak flows, an appropriate peaking factor shall be developed to reflect the ratio of maximum sewage flow to average daily flow.

Peak flows shall be computed by multiplying the average daily flow by an appropriate peaking factor, then adding infiltration and inflow (expressed in gpm). For residential flows, the peaking factor shall be computed as follows:

$$\text{Peaking Factor} = \frac{14}{4 + \sqrt{P}} + 1$$

where P = Population (in thousands)

Peaking factors for non-residential flow sources shall be determined by computing an equivalent population using a rate of 75 gpcd after accounting for such factors as daily flow pattern, nature of flow and hours of discharge.

Design Flows

Wastewater collection systems shall be designed for the 50-year peak flow plus infiltration and inflow.

Wastewater pumping facilities shall be designed for the 20-year peak flow plus infiltration and inflow.

Alternate Methods

Other means of computing wastewater flows may be used provided adequate justification is provided to support the proposed method. The Engineer

reserves the right to reject the methodology employed or to require adjustment to the methodology.

3.08.02 System Layout

Sanitary sewers shall be installed in public streets parallel to and along the centerline wherever possible.

When an area outside the limits of the proposed development can logically be served by future extension of the sewer, the proposed sanitary sewer shall extend beyond paved roadway limits to the right-of-way to facilitate future extension with minimal disturbance to public infrastructure. Sanitary sewer stubs shall extend a minimum of six feet (6') beyond terminal manholes to facilitate a future connection to the system.

3.08.03 Sanitary Sewer Mains

Minimum Size

Sanitary sewer mains shall be a minimum of eight inches (8") in diameter. Unless otherwise approved by the Engineer, sanitary sewer mains between 8" and 15" in diameter shall be designed to flow no more than half (50%) full during peak flow and sanitary sewer mains over 15" in diameter shall be designed to flow 75% full during peak flow.

Material

All sanitary sewer mains shall be polyvinyl chloride (PVC) pipe (SDR 35). Epoxy lined ductile iron pipe may be used in areas of minimal cover or excessive depth, or in other areas approved by the Engineer.

Slope and Velocity Requirements

Sewer pipes shall be laid at a slope that will insure sufficient velocity within the system to prevent the deposition of solids. Therefore, sewers shall be installed at a slope that will result in a velocity of not less than two feet per second (2 ft/sec) when flowing full using Manning's formula with a roughness coefficient ("n") of 0.013 that is constant with depth. In no case shall pipes be installed less than the following minimum allowable slopes:

Pipe Size (Inches)	Minimum Slope (Feet/Foot)
6 (lateral)	0.0200
6 (main)*	0.0050*
8	0.0040
10	0.0028
12	0.0022
14	0.0017
15	0.0015
16	0.0014
18	0.0012
21	0.0010
24	0.0008

* Subject to approval by the Engineer

Sewers serving less than 15 residential properties (or their equivalent average daily flow) shall be installed at a slope of 0.0100 feet/foot or greater. Under special circumstances the Engineer, by written approval, may allow the installation of 6" main to serve more than one user. The decision of the Engineer shall be final.

Sewers shall be installed at uniform slopes between manholes.

Sewage velocities less than two feet per second (2 ft/sec) in gravity sewer pipes are not allowed unless the Design Engineer can demonstrate to the satisfaction of the Engineer that sufficient flushing will occur to prevent the accumulation of solids and/or generation of odors from within the system.

Sewage velocities greater than twelve feet per second (12 ft/sec) in gravity sewer pipes shall not be permitted under any flow conditions.

Minimum Cover

Sanitary sewers shall be designed to provide basement service to buildings wherever feasible; however, the minimum depth of cover for sewer pipes shall be four feet (4') measured from finished grade to the crown of the pipe. If existing conditions make achievement of the minimum cover impossible or impractical in the opinion of the Engineer, installation of shallower pipes may be allowed for short runs provided:

- The pipe is insulated to protect it from freezing and has a minimum cover of 2'-6".
- The pipe is of sufficient strength to resist the additional loads caused by the shallow depth of burial.

Connections to Existing Mains

Manholes shall be installed at all locations where new sanitary sewer main is to connect to an existing sanitary sewer main, unless otherwise approved by the Engineer.

Sanitary sewer laterals shall connect to existing or proposed sanitary sewer mains with a "tee-wye" connection with the lateral invert set above the sewer main invert a distance equal to ¾ of full-flow depth (75% of the main diameter), unless otherwise approved by the Engineer.

Sanitary Sewer Force Main

Except in cases where grinder pumps are used, sanitary sewer force mains shall be a minimum of four inches (4") in diameter.

The force mail shall be sized to provide a minimum velocity of two and one-half feet per second (2.5 ft/sec) under single pump operation to aid in the re-suspension of solids.

All force main pipe shall be epoxy lined ductile iron pipe unless otherwise approved by the Engineer.

Hydraulic calculations shall be prepared by the Design Engineer indicating the magnitude of water hammer that may be generated within the force main and the ability of the pipe and related components to withstand this shock. Special equipment such as slow closing check valves, surge tanks, pressure relief valves, etc. shall be used in the pump station to prevent system damage caused by water hammer. Force main material selection shall take into account potential stresses caused by water hammer.

3.08.04 Sanitary Sewer Laterals

The limits of sanitary sewer laterals are from the fitting connection at the public sanitary sewer main to the building served in accordance with the "Rules and Regulations" as published by the Town of Manchester Water and Sewer Department.

Wherever it is known or can be reasonably assumed that a building sewer connection will be required either immediately or in the future, a service lateral shall be shown on the plans and installed to the property line. Unused pipe ends shall be sufficiently capped and supported in a manner to facilitate a future connection. Record drawings with a minimum of two (2) swing ties from physical features shown on the approved plans to ends of all lateral stubs shall be provided to the Engineer immediately after installation.

All sanitary sewer laterals shall be polyvinyl chloride (PVC) pipe (SDR 35) and the minimum pipe size shall be six inches (6") in diameter.

Sanitary sewer laterals shall be designed and constructed at a uniform slope of not less than two percent (2%) grade unless otherwise approved by the Engineer. The minimum depth for a sanitary sewer lateral shall be four feet (4') measured at the property line.

Sanitary sewer laterals shall either tie directly into a manhole or into the sanitary sewer main using a "tee-wye" connection. Sewer saddles may be used for connection to an existing sewer main if approved by the Engineer.

Cleanouts shall be installed on laterals at a spacing of no more than one hundred feet (100'). Cleanouts shall be installed with a cast iron cover at grade to facilitate access for cleaning.

Bends shall not exceed 45 degrees and associated cleanouts shall be installed where directed by the Engineer.

It is the responsibility of the Design Engineer to design the sanitary sewer system to minimize the possibility of reverse flow in laterals serving lots or buildings. Wherever possible, plumbing fixtures shall be located above the frame elevation of the nearest upstream sanitary sewer manhole.

The installation of individual grinder pumps is not permitted unless otherwise approved by the Engineer.

3.08.05 Sanitary Sewer Manholes

Sanitary sewer manholes shall be precast concrete with a minimum diameter of four feet (4'). Manholes on sewer mains larger than 12" in diameter, or with 3 or more pipe connections, shall have a minimum diameter of six feet (6'). Installation of larger diameter manholes may be required based on the proposed depth, size and angle of incoming pipes.

Manholes shall be constructed at the ends of sanitary sewer mains and at all changes in pipe size, slope and horizontal alignment. At manholes where pipe diameters change, the flow energy gradient shall be continuous. The point of $^4/_5$ of full flow depth (80% of pipe diameter) for the two sewer pipes shall be placed at the same elevation, with proper allowance for any manhole head loss or as required to provide proper flow.

The maximum distance between manholes shall be four hundred feet (400').

Inverts shall be constructed of precast concrete or cast-in-place concrete and shall conform accurately to the size of the adjoining pipes. Brick and mortar inverts shall be installed where directed by the Engineer.

Drop manholes shall not be installed, unless otherwise approved by the Engineer. If approved, exterior drop manholes are typically required; however, interior drop manholes may be allowed on a case-by-case basis when approved by the Engineer

Bolted/locking covers shall be provided for all manholes in unpaved areas and watertight manhole covers shall be provided in areas prone to flooding.

3.08.06 Wastewater Pumping Stations

General

Except as otherwise provided herein, wastewater pumping stations shall be designed in accordance with the applicable requirements of "Guides for the Design of Wastewater Treatment Works, TR-16" as published by the New England Interstate Water Pollution Control Commission, as amended.

Pumping stations shall be of the submersible type unless otherwise dictated by projected sewage flows, which shall include an integral slide rail and pump combination provided by the same manufacturer.

Pumping stations shall be located a minimum of one hundred fifty feet (150') from any occupied structure.

Accessways, entrances, hatchways, superstructure floor slabs and all equipment including control panels, emergency generators, etc. shall be constructed at least one foot (1') above the 100-year flood elevation obtained from the Flood Profiles provided in the "Flood Insurance Study" as published by the Federal Emergency Management Agency. Higher structure and equipment elevations may be required by the Engineer.

The property occupied by the pumping station shall be deeded to the Town. Easements in favor of the Town shall be granted as needed for access to the pumping station site.

Landscaping and other means shall be used to provide a visual buffer between the pumping station and other structures and to shield the station from public view.

Sites shall be graded and landscaped so as to be aesthetically pleasing. Existing vegetation supplemented by new plantings shall be used as a screening.

Superstructures, if provided, shall be matched architecturally with surrounding structures.

A six foot (6') high chain link fence shall be installed around the perimeter of the pumping station site to prevent access by the general public. The fence shall be equipped with a minimum twelve foot (12') wide gate to permit access by maintenance vehicles and a separate minimum three foot (3') wide pedestrian gate. The fence and all components shall be fabricated of polyvinylchloride (PVC) coated galvanized steel or aluminum.

Access to the site and within the fenced area shall be paved to allow vehicle entry.

An emergency generator shall be provided for each pumping station to provide electricity to operate the station during power outages. The generator shall be sized to provide power to pumps and incidental station power for a minimum of 72 hours unless otherwise approved by the Engineer.

All buried structures shall be properly waterproofed to prevent infiltration into the system.

Pumping stations shall be provided with a non-freeze, post type yard hydrant with one inch (1") National Pipe Thread (NPT) discharge connected to a suitable water supply.

Pump Design

A minimum of two (2) pumps shall be provided for each pumping station. One pump shall serve as the duty pump and the other pump shall serve as the stand-by pump. Each pump shall be of adequate size to handle the design flow to the station so one pump can be taken out of service for maintenance or repairs.

Pumps shall be capable of passing a 3-inch sphere without clogging or otherwise damaging the pump. Pumps shall be specifically designed and manufactured for use in sewage pumping applications.

Pumps with motors larger than five (5) horsepower shall be provided with variable speed motors to reduce power costs.

Pumping stations shall be equipped with a bypass pumping connection located on the force main, downstream of the wastewater pumps. The bypass pumping connection shall consist of a branch, gate valve, and hose connector for the temporary connection of bypass pumping facilities. The connection shall be accessible even in the event of station flooding.

The use of grinder pumps will only be considered where design constraints prohibit the use of solids handling pumps. The use of this type of station shall be evaluated and approved by the Engineer on a case-by-case basis.

Submersible pumps shall not be provided with variable speed drive motors.

Wet Well Sizing

The wet well shall be designed to provide adequate time between pumping cycles to prevent "short cycling" of the pumps under design flow conditions. Calculations shall be performed by the Design Engineer to determine the minimum required wet well volume. For duplex stations, the minimum wet well volume shall be calculated as follows:

$$V_{min} = \frac{\theta \times q}{4}$$

where V_{min} = minimum required wet well volume(gallons)

θ = time between successive pump starts (minutes). For stations with pump motors rated at 100 horsepower or less, the minimum allowable θ shall be 15 minutes.

q = maximum station pumping rate under normal operating conditions (i.e. single pump rate for duplex stations, gallons per minute).

For pumping stations where a significant increase in flow is anticipated over the design period,, consideration shall be given to future expansion of the wet well to accommodate the anticipated variation in flows. The Design Engineer should consider the use of compartmentalized wet wells or modular construction.

Detention Time

Maximum detention time shall be determined based on the minimum dry weather wastewater flow into the wet well (*i)*. Wet well detention time shall be calculated using the following equation:

$$T_{Det} = t_f - t_e$$

where: $\frac{V}{i}$

$t_e = \frac{V}{q-i}$

t_f = time to fill the wet well (minutes)

t_e = time to empty the wet well (minutes)

V = volume of the wet well between "pump on" and "pump off" elevations (gallons)

q = pump rate (gallons per minute). For duplex stations, the pump rate with only one pump running shall be used

i = wastewater flow into the wet well (gallons per minute based on initial average daily flow

For stations where 75% or more of the flow is received from commercial and/or industrial sources, wet well detention time shall be calculated as follows:

T_{Det} = (24 hrs/day - # of employee shift hours/day)

The maximum allowable wet well detention time shall be ten (10) minutes. Calculations shall be prepared by the Design Engineer using initial and incremental flows. If the detention time exceeds sixty (60) minutes, an odor control system approved by the Engineer shall be installed at the pumping station.

Buoyancy

Buoyancy calculations shall be prepared by the Design Engineer to verify that the station and ancillary underground structures will not float during periods of high groundwater.

When computing the weight of structures, the weight of internal equipment shall be neglected.

When computing the net buoyant force acting on a structure, the frictional force of soil against the exterior of the structure shall be neglected.

At a minimum, buoyant force shall be calculated assuming that groundwater elevation is equal to the finished grade elevation. Where pumping station sites are subject to flooding, the 100-year flood elevation obtained from Flood

Profiles in the “Flood Insurance Study” as prepared by the Federal Emergency Management Agency or historical high water elevations shall be used.

A minimum factor of safety of 1.2 shall be provided against flotation for all buried structures. The factor of safety shall be computed as follows:

$$F.S. = \frac{\text{Weight of Structure}}{\text{Buoyant Force}}$$

Additional ballasts in the form of reinforced concrete fill shall be added to buried structures as required to meet the required factor of safety.

Alarms

An alarm panel shall be installed at the station to indicate the status of alarm conditions. The panel shall be equipped with both an annunciator as well as illuminated buttons to provide both audible and visual warnings in the event of an alarm condition. The annunciator system shall include acknowledge/reset and test buttons mounted on the exterior of the panel door.

Alarm signals shall be sent to the Town's wastewater treatment facility. Signal transmission shall be compatible with the existing Town-owned monitoring equipment.

At a minimum, the following alarm conditions shall be monitored:

- high wet well level
- low wet well level
- Pump 1 seal failure
- Pump 2 seal failure
- Pump 1 motor overload
- Pump 2 motor overload
- Pump 1 high temperature
- Pump 2 high temperature
- Loss of primary power
- Emergency generator failure (if applicable)
- spare
- spare

Supervisory Control and Data Acquisition (SCADA)

SCADA will be required for all equipment that the Engineer deems necessary to monitor. SCADA shall be compatible with the existing Town-owned system and shall be approved by the Engineer.

3.08.07 Special Facilities

Bridge Crossings

When approved by the Engineer, gravity sewers and sanitary sewer force mains may traverse local depressions (such as roadways, railroad tracks, streams, etc.) by means of attachment to bridge structures.

The Developer shall secure any and all permits from agencies having jurisdiction over the bridge structure.

All pipes attached to bridge structures shall be positioned so they are protected from pedestrian and vehicular traffic. In the case of pipes crossing over roadways or navigable waterways, under no circumstances shall the pipe, or any part thereof, extend below the bottom chord of the supporting bridge structure.

Supported pipes that are exposed to the atmosphere or have less than the minimum burial depth (when measured from any exposed direction) shall be designed in a manner that will accommodate thermal expansion and contraction and shall be properly insulated to protect pipes from freezing during winter months. Suitable pipe joints shall be provided at appropriate locations to permit axial movement of the piping system and pipe insulation shall be encased in rigid piping material to protect it from the elements and vandalism.

Sanitary sewer force mains that cross bridge structures with the formation of localized high points shall be provided with air/vacuum release mechanisms as specified in these Public Improvement Standards.

River Crossings

Wherever sanitary sewers must be installed across rivers, streams or other surface water bodies, extreme care shall be used to minimize the impact of construction on wetland areas. The Developer shall be responsible for obtaining all necessary permits and/or approvals from local, state, and/or federal regulatory agencies prior to construction in and adjacent to wetland areas. Copies of state and federal permits/approvals shall be provided to the Engineer prior to construction.

Manholes that are located below the 100-year flood elevation obtained from the Flood Profiles provided in the “Flood Insurance Study” as published by the Federal Emergency Management Agency shall be equipped with water-tight covers.

Inverted Siphons

Inverted siphons shall be double-barrel (i.e. twin pipes) and may be used to convey sewage across streams, rivers, or other local low points only upon approval of the Engineer.

Where the use of an inverted siphon is approved, the Design Engineer shall submit complete engineering computations and design documents for the

approval of the Engineer that outline the operating hydraulics of the system. System head losses under initial and future flow conditions shall be computed.

Pipe materials shall be subject to the approval of the Engineer. In general, siphon pipes shall be as smooth as possible with a minimum number of joints.

The inlet to the siphon piping in the structure immediately upstream shall be equipped with a bar rack or other approved means of removing gross solids from the siphon structure. Suitable solids handling equipment shall be provided for the storage and removal of screenings.

Railroad Crossings

The installation of sanitary sewers across railroad rights-of-way shall be conducted in strict accordance with the requirements of the affected railroad. The Developer shall be solely responsible for obtaining the necessary permits and/or approvals from the railroad.

The Developer shall obtain an easement from the property owner in favor of the Town or provide other appropriate documentation that insures the Town has the right of access to wastewater collection facilities located within the railroad property.

All sanitary sewer mains crossing railroad rights-of-way shall be sleeved within a carrier pipe of a sufficient size and material approved by the Engineer.

3.08.08 Proximity to Wells

Sanitary sewer main and lateral separation distances from water supply wells shall meet requirements outlined in the “Public Health Code” as published by the Connecticut Department of Public Health.

Where a sanitary sewer main or laterals must be installed within these separation distances, the pipes in that area shall be constructed of ductile iron pipe (ANSI A21.51), polyvinyl chloride pipe (ASTM D3034 or ASTM F679), or equal. These sewer mains and laterals shall be tested after backfilling to meet a maximum infiltration/exfiltration rate of 25 gallons per day per linear mile of sewer per inch of pipe diameter (gpd/mi./in).

Under no circumstances shall a sanitary sewer (either gravity or force main) be installed less than twenty-five feet (25’) from an existing water supply well with a maximum withdrawal rate less than ten (10) gpm. Larger minimum separation distances are required for wells with withdrawal rates of ten (10) gpm or greater.

3.08.09 Testing

Sanitary sewers and force mains shall be tested for materials and workmanship prior to being placed into service and acceptance by the Town. Testing shall only be performed after all work is complete, including installation of building service lateral pipes and trench backfill and compaction.

All testing shall be conducted in accordance with requirements outlined in Section 8 herein and shall be performed under the supervision of the Engineer.

Test segments that fail shall be repaired and defects corrected. Upon completion of repairs, the failed section shall be retested and this process repeated until satisfactory results are achieved.

Copies of test results (including results of failed test efforts) shall be delivered to the Engineer upon completion of pipe testing activities.

The Engineer shall identify testing requirements for other sanitary sewer system facilities on a case-by-case basis.

3.08.10 Utility Clearances

Sanitary sewers (mains and laterals) shall be installed within their own trench. Under no circumstances shall sanitary sewers be installed in a trench shared with another utility.

Horizontal Separation

Sanitary sewers shall be installed at least ten feet (10') laterally away from any existing or proposed water mains or services and a minimum of five feet (5') from all other utilities.

Should conditions prevent a ten foot (10') lateral separation between sanitary sewers and water mains or services, the sanitary sewer may be installed a minimum of five feet (5') away provided the following conditions are met:

- the sanitary sewer is installed in a separate trench, and
- the crown of the sewer pipe is installed a minimum of eighteen inches (18") below the bottom of the water main or service

If a sanitary sewer must be installed less than five feet (5') from an existing or proposed water main or service, the sanitary sewer shall be encased in concrete.

Vertical Separation

When crossing water mains and services, sanitary sewers shall be installed such that the crown of the pipe is a minimum of eighteen (18") inches below the invert of the water main unless otherwise approved by the Engineer.

Where a sanitary sewer crosses below a water main or service with less than eighteen inches (18") of clearance, the sewer shall be installed such that pipe joints are as far as possible from the water main or service.

If, as a last resort, the sanitary sewer must cross over the water main or service, the sewer shall be installed such that the bottom of the sewer is a minimum of eighteen inches (18") above the top of the water main and the water main shall be encased in concrete to a distance at least five feet (5') on either side of the point of crossing if any joints fall within these limits. If required by the Engineer, the water main or service shall be re-laid to achieve the eighteen inch (18") separation distance. Any other proposed measures must be approved by the Engineer

Where the sanitary sewer crosses above, below, or within twelve inches (12") of any other underground utility (except water mains or services as provided for herein), a concrete cradle as shown in Plate 24.1 in Section 9 shall be provided at the point of crossing to support the pipes. Sanitary sewers shall be wrapped with plastic within limits of concrete cradle as directed by the Engineer.

Extra care shall be taken wherever sanitary sewers cross other utilities to ensure that the soils and bedding around pipes are adequately compacted and that the pipe is sufficiently supported.

When designing new sanitary sewer systems, efforts shall be taken to minimize the number of utility crossings. Whenever crossings are unavoidable, they shall be made as nearly perpendicular as possible (i.e. long, shallow angled crossings shall be avoided).

3.08.11 Commercial and Industrial Facilities

Grease Traps/Interceptors

Grease traps/interceptors shall be installed at all Class III and Class IV food service establishments as defined by the "Public Health Code" as published by the Connecticut Department of Public Health; where fats, oils and grease (FOG) or other floatables comprise a significant component of the wastewater discharge; and at other locations directed by the Engineer.

Exterior grease traps/interceptors shall be sized to handle the maximum daily flow from all fixtures connected to the interceptor or a minimum 1,000 gallons of storage capacity, whichever is greater.

Interior automatic grease recovery units (AGRUs) shall be sized in accordance with the Fixture-Based Method outlined in Document 11 of the "Resource Documents for the Discharge of Wastewater Associated with Food Preparation Establishments" as published by the Connecticut Department of Energy and Environmental Protection (DEEP).

Installation and maintenance of grease traps/interceptors shall meet the DEEP General Permit for Discharge of Wastewater Associated with Food Service Establishments.

Where directed by the Engineer, grease traps/interceptors shall be installed on the exterior of buildings to permit access by Town personnel. Each grease trap shall be equipped with a minimum of two (2) manholes covers to enable inspection of the structure and its contents.

Grease traps shall be maintained so as to prevent the discharge of accumulated grease and other floatable materials to the Town-owned sanitary sewer system. The contents of grease traps shall be pumped on a regular basis. Records of pump-outs shall be maintained for a period of not less than two (2) years and shall be available for Town inspection.

Oil/Water Separators

Oil/Water separators shall be installed on the sanitary sewer laterals from locations where grease, oils, or other floatables comprise a significant component of the discharge; and at other locations directed by the Engineer. Sanitary sewer laterals discharging to the oil/water separator shall not include any sources of domestic sewage or stormwater and the outlet pipe shall discharge to the sanitary sewer system.

Oil/water separators have a minimum retention time of six (6) hours at the average daily flow or a minimum 1,000 gallons of storage capacity, whichever is greater. Oil/water separators shall be equipped with appropriate baffles to minimize the discharge of floatables.

Oil/water separators shall be constructed of precast concrete or precast polymer concrete; other materials and designed, constructed, installed and maintained in conformance with the DEEP General Permit for Discharge of Vehicle Maintenance Wastewater.

Each oil/water separator shall be equipped with a minimum of two (2) access ports to enable inspection of the structure and its contents.

Oil/water separators shall be maintained so as to prevent the discharge of accumulated oil and other floatable materials to the Town-owned sanitary sewer system. The contents of oil/water separator shall be pumped on a regular basis. Records of pump-outs shall be maintained for a period of not less than two (2) years and shall be available for Town inspection.

Inspection Manholes for Industrial Facilities

A precast concrete sanitary sewer manhole for observing, sampling and measuring wastewater from industrial facilities shall be installed on the sanitary sewer lateral at the limit of the right-of-way as directed by the Engineer. Refer to Section 3.08.05 herein for additional information.

3.08.12 Approved Construction Materials

The Town maintains a list of approved construction materials for the sanitary sewer system. Refer to Appendix F for the "Approved List of Construction Materials". Note that the list may be updated periodically; therefore, contact the Maps and Records Office at 860-647-3119 for the latest information.

3.09 TRAFFIC SIGNALS

When determined as appropriate by the Engineer, traffic signals, including modifications to existing traffic signals, shall be designed by the Design Engineer and installed by the Developer in accordance with the latest edition of the "Manual on Uniform Traffic Control Devices" as published by the U.S. Department of Transportation Federal Highway Administration and the "Traffic Control Signal Design Manual" as published by the Connecticut Department of Transportation. Plans and specifications shall be prepared by a Professional Engineer licensed in the State of Connecticut and shall be subject to review by the Engineer at preliminary, semi-final and final design stages.

The Developer is required to submit a lump sum payment to the Town for the first twenty-four (24) months of energy costs for new traffic signals, prior to the Town issuing a Certificate of Occupancy, or prior to any conveyance of any building lots.

Costs associated with integrating traffic flow changes resulting from a proposed development into the Town-owned Closed Loop Traffic Signal System(s), including the Town consulting fees, shall be borne by the Developer. If changes to the Closed Loop Traffic Signal System are required, the Developer shall pay all costs associated with modifying the system, including design and implementation by the Town consultant.

3.10 STREETLIGHTS

High efficiency, light-emitting diode (LED) streetlights shall be provided on all approved subdivision and site development plans.

Streetlights shall be spaced no more than two hundred feet (200') apart. The exact layout of proposed streetlight locations shall be approved by the Engineer.

All pole locations must be shown on the plan along with the type of poles, fixtures and associated materials in accordance with requirements provided in Section 9 herein and shall be approved by the Engineer prior to the Town approving the subdivision or site development.

All wiring for streetlights shall be underground. All streetlights must have underground copper wiring installed in a schedule 40 PVC conduit at a minimum depth of thirty inches (30"). Identification ribbon is to be placed within the trench area twelve inches (12") above the installed conduit.

The Developer is required to submit a lump sum payment to the Town for the first twenty-four (24) months of energy costs for all streetlights, prior to the Town issuing of any building permits, or prior to any conveyance of any building lots. Payment shall be in accordance with the "Partial Streetlighting Service - Rate Structure 117 for Energy Only" as prepared by the Connecticut Light and Power Company, as amended.

The Developer will also be required to reimburse the Town for all installation costs in conformance with the current Town contract for Streetlighting and Maintenance Services. Upon request, the Engineer will provide the developer with a cost estimate for the installation of streetlights.

3.11 MONUMENTATION

Monuments shall be set at right angles to and opposite all points of curvature and points of tangency of all curves, street intersections, right-of-way angle points, and other points as directed by the Engineer. Granite monuments shall conform to Plate 8.1 provided in Section 9 and be set so the top of monument is flush with final grade.

Iron rods shall be set at all property corners, easement corners and other points as directed by the Engineer.

If a proposed monument falls within a paved, concrete or rock surfaced area, the Surveyor will be allowed to utilize a MAG or PK nail within pavement areas and a bronze disk within concrete or rock areas.

All proposed monumentation shall be furnished and installed by the Developer. The accuracy of such monumentation shall be certified by a Professional Land Surveyor licensed in the State of Connecticut and identified as such on the Record Drawings submitted to the Town.

Any existing monumentation shown on original subdivision and site development plans or found in the field after the start of construction that is destroyed, damaged or disturbed will be replaced by the Town at the Contractor's expense. Refer to Section 6.02.01 herein for additional information.

3.12 SOIL EROSION AND SEDIMENT CONTROL

All subdivision and site development plans shall include provisions for minimizing soil erosion and sedimentation both during and after construction in accordance with the "Guidelines for Soil Erosion and Sediment Control (DEEP Bulletin 34)" as published by the Connecticut Department of Energy and Environmental Protection.

Nothing in this section is intended to relieve the Developer or Contractor from the requirements of any federal, state or local regulations concerning soil erosion and sediment control.

A construction entrance shall be installed at all locations where construction equipment will enter the site or exit onto a Town or State-owned roadway.

Slopes steeper than 3:1 should be avoided wherever possible. No slopes shall be steeper than 1:1. Slopes that are steeper than 3:1 shall incorporate engineered structural design features (landscaped planting, mulch, turf reinforcement mat, riprap, etc.). Slopes greater than fifteen feet (15') in height and steeper than 3:1 shall be benched in accordance with the "Connecticut Guidelines for Soil Erosion and Sedimentation Control".

Significant grading operations and grading of steep slopes upgrade of sensitive areas (i.e. wetlands, existing drainage systems, developed areas, etc.) and abutting properties are not allowed during winter months when exposed slopes cannot be stabilized by vegetation unless otherwise approved by the Engineer.

All subdivision and site development plans shall include the proposed location of soil stockpile areas surrounded by appropriate erosion control measures.

Projects involving disturbed areas greater than one (1) acre or projects located upgrade of sensitive areas (i.e. wetlands, existing drainage systems, developed areas, etc.) shall require design and construction of sediment control measures such as, but not limited to, diversion swales, temporary sediment traps, and/or temporary sediment basins. Detailed sizing calculations in accordance with the "Guidelines for Soil Erosion and Sediment Control" must be submitted to the Engineer for review.

All subdivision and site development plans shall include an operations and maintenance schedule identifying the person(s) responsible for maintaining erosion control measures, the frequency of inspection, and the anticipated start and completion dates for construction.

3.13 SUBSURFACE EXPLORATION

Test pits and/or soil borings shall be shall be conducted at maximum intervals of two-hundred and fifty feet (250') along proposed roadways, sanitary sewer systems and other utilities as necessary to adequately identify subsurface conditions along the proposed route. Exploration depth shall extend a minimum of five feet (5') below the deepest anticipated excavation. Additional explorations and deeper investigation depths may be required at the discretion of the Engineer.

Documentation clearly identifying the horizontal and vertical location of subsurface explorations and all associated lab test results and information obtained during the work shall be submitted to the Engineer for review during the design process.

3.14 LOW IMPACT DEVELOPMENT

Design and construction of Low Impact Development (LID) is encouraged for private site developments to replicate pre-development hydrology through installation of small-scale controls integrated throughout the site. LID features can be provided to reduce runoff volume and pollutant loads through infiltration, evapotranspiration and reuse of stormwater runoff. Some examples of LID practices include installation of:

- Vegetated Swales
- Bioretention/Rain Gardens
- Dry Wells (for "clean" runoff from roof areas)
- Leaching Trenches
- Rainwater Harvesting
- Vegetated Roof Covers (Green Roofs)

Refer to the "Connecticut Stormwater Quality Manual" as published by the DEEP and the "Sustainable Design and Low Impact Development Guidelines" as published by the Town of Manchester for additional information related to LID.

4.01 WARRANTY DEEDS AND EASEMENT DOCUMENTS

All warranty deeds and easement documents for easements to be acquired by the Town of Manchester within the approved subdivision or private site development shall be fully executed and submitted to the Town of Manchester prior to the posting of a public improvements bond, unless the interests of the Town of Manchester require a later submission.

The Developer shall submit to the Engineer for review, documentation for all easements identified on the approved plan. Upon approval, the Developer shall deliver executed conveyances for all easements to the Engineer in an approved format.

Easements shall include language that restricts the property owner from installing any structure or improvement, (i.e. fence, shed, driveway, landscaping), within the limits of the easement without prior approval from the Town.

Conveyances for any and all proposed road rights-of-way will not be executed until all phases of the construction are complete and the Engineer is in receipt of approved record drawings.

Wherever a public utility such as a storm sewer, water main or appurtenance (not including services), or public sanitary sewer and/or force main crosses or otherwise encroaches upon private property, a permanent easement shall be granted by the owner of the property to the Town to permit access by the Town for purposes of operation, repairs and/or maintenance.

Required width of permanent easements shall be determined by the Engineer and shall not be less than twenty feet (20') in width unless otherwise approved.

For subdivisions and private site development projects that may require the future installation of public utilities, appropriate easements for future facilities shall be granted at the time of project approval by the Engineer.

Land for pumping stations, storage tanks, and related facilities shall be conveyed to the Town by warranty deed, and not by easement.

Refer to Section 7.02 herein and the Standard Easement Format in Appendix H for additional information.

5.01 REQUIRED PERMITS

It is the Developer's responsibility to determine what permits will be required for the proposed work.

Development plans are generally reviewed and approved as part of one or more permit applications regulated by the Manchester Planning and Zoning Commission. These include, but are not limited to, Erosion and Sediment Control Permit, Inland Wetlands Permit, Floodplain Permit, Special Exception Permit and Subdivision/Resubdivision Permit. Contact the Manchester Planning Department to determine which permits may be required for the proposed work.

Regardless of whether or not the work received approval through one or more of the permits regulated by the Manchester Planning and Zoning Commission, one or both of the following permits are required when working within the public right-of-way or when work on private property will impact the public right-of-way or Town-owned utility:

Right-of-Way Permit

Any person, company or utility proposing work within the public right-of-way or otherwise impacting the public right-of-way or utility must take out a Right-of-Way Permit from the Manchester Engineering Division prior to any construction activity. See the "Regulations Governing Right-of-Way Permits" as published by the Town of Manchester for more information on restoration requirements for work within recently resurfaced roadways and general policies, procedures, rules and regulations for construction activity.

Plans showing the proposed work are required to be reviewed and approved by the Engineer prior to the issuance of the permit. Separate plan review is not required for plans that have been approved by the Manchester Planning and Zoning Commission. See Appendix A for the Right-of-Way Permit application.

Water and Sewer Permit

Any construction activity proposing to install, connect, or otherwise affect Town-owned water and/or sanitary sewer facilities require a Water and Sewer Permit prior to construction.

Plans showing the proposed work are required to be reviewed and approved by the Engineer prior to the issuance of the permit. Separate plan review and approval is not required for plans that have been previously approved by the Manchester Planning and Zoning Commission. See Appendix A for the Water and Sewer Permit application.

Tree Removal

A permit application is not required; however, any tree within Town-owned right-of-way to be cut, pruned or removed shall require posting in accordance with the Connecticut General Statutes. Contact the Town of Manchester Field Services at 860-647-3233 and refer to Section 6.09 herein for additional information.

5.02 BONDING

Bond(s) must be posted for any type of work regulated by these Public Improvement Standards. The types of bonds the Town of Manchester requires are:

1. Erosion Control Bonds
2. Subdivision Bonds
3. Public Improvements Bonds
4. Landscape Bonds

All bonds must be valid and enforceable for a period of not less than five (5) years. Any institution issuing a bond or letter of credit must be licensed to do business in the State of Connecticut. Any institution or individual issuing a Bond or Letter of Credit must be approved as financially secure by the Town.

All public improvement items and the total cost of these items must be shown on the bond submission to the Engineer. The Engineer shall establish and publish a rate of unit prices for the standardized items used for street and public infrastructure construction based on recent bid data received by the municipal sector. This list of unit prices shall be reviewed and updated each January. Refer to the Standard Bond Forms in Appendix I and the Unit Price List in Appendix J for additional information.

Erosion Control Bonds

An Erosion Control Bond is required for any approved subdivision or site plan or any other work that will disturb more than one-half ($^1/_2$) acre of land. The erosion control bond must be posted prior to any site work, including clearing and grubbing. No work will be allowed to begin until such time as all erosion control devices have been installed in accordance with the approved erosion control plan, or in the absence of such plan, in accordance with best management practices. All Erosion Control Bonds must be posted with the Town of Manchester Engineering Division.

Subdivision Bonds

A Subdivision Bond is required for all public improvements within subdivisions approved by the Town of Manchester. The Subdivision Bond must be posted prior to the issuance of any building permits and prior to the sale of any lots contained within the subdivision.

The Town will only act on bond requests from the approved plans that bear the final stamp of approval from the Manchester Planning and Zoning Commission.

See Section 8, Bonding Requirement, in the “Subdivision Regulations” as prepared by the Town of Manchester for additional bonding requirements for subdivisions, such as cash payment for street lighting, street acceptance, etc.

Subdivision Bonds may be in the form of a surety, cash or letter of credit payable to the Town of Manchester.

Public Improvements Bonds

A Public Improvements Bond is required for all public improvements associated with a Right-of-Way Permit or a site development, other than subdivisions, approved by the Town of Manchester. The Public Improvement Bond must be posted prior to the

issuance of any building permits. See the "Regulations Governing Right-of-Way Permits" as published by the Town of Manchester for more information. Public Improvements Bonds must be in the form of a surety bond (of a minimum amount of $10,000.00), letter of credit or a certified check payable to the Town of Manchester.

Landscape Bonds

Depending on the nature of the approved plan, a separate landscape bond may be required for trees, shrubs, fences, timber walls, restoration of lawn, etc. For most developments, landscape items can be included in the Public Improvement Bond or Subdivision Bond.

Bond Reductions/Certificate of Occupancy Remedies

The Town of Manchester may permit all Letters of Credit or Certified Checks to be reduced on a monthly basis a maximum of four (4) times. The reduction will be based on the percentage of work completed. A balance of 10% of the total amount of public improvement work must be maintained at all times throughout the life of the development. Bond reductions do not constitute acceptance of work by the Town.

In the event the Town determines that the outstanding amount on any such Public Improvements Bond, Letter of Credit or Certified Check is insufficient to fund the completion of any outstanding items of work, it may require the Contractor/Developer to provide additional security sufficient to fund completion of the work.

If the Town at any time determines that any security which has been provided is insufficient, or if the Contractor/Developer fails to provide additional sufficient security, or if the Contractor/Developer fails to complete to the Town's satisfaction any necessary items of work not adequately covered by such security, the Town may withhold the issuance of any certificates of occupancy or of any permits or may seek any other legal remedies to enforce the completion of such.

5.03 INSURANCE

The Contractor shall provide, pay for, and maintain in full force and in effect the insurance outlined here for coverages at not less than the prescribed minimum limits of liability. Such coverage is to remain in force until final acceptance of the work and for such additional time as may be required, and will cover the Contractor's activities, those of any and all subcontractors, or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable.

The Contractor will give the owner a certificate of insurance completed by a duly authorized representative of their insurer certifying that at least the minimum coverages required here are in effect and specifying that the liability coverages are written on an occurrence form and that the coverages will not be canceled, non-renewed, or materially changed by endorsement or through issuance of other policy(ies) of insurance without sixty (60) days advance written notice to the Engineer. Failure of the owner to demand such certificate or other evidence of full compliance with these insurance requirements or failure of the owner to identify a deficiency from evidence provided will not be construed as a waiver of the Contractor's obligation to maintain such insurance. The original certificate of insurance form must be on file in the Manchester Engineering Division.

All insurance will be provided through companies authorized to do business in the state of Connecticut and considered acceptable by the Town.

To the extent commercially available at no additional cost, the policy or policies providing insurance as required, with the exception of professional liability and workers' compensation, will defend and include the Town and its architects, directors, officers, representatives, agents, and employees as additional insured on a primary basis.

If any insurance required here is to be issued or renewed on a claims-made form as opposed to the occurrence form, the retroactive date for coverage will be no later than the commencement date of the project and will state that in the event of cancellation or nonrenewal, the discovery period for insurance claims (tail coverage) will be at least thirty-six (36) months.

The Contractor will cause each subcontractor employed by the Contractor to purchase and maintain insurance of the types specified below. When requested by the Town, the Contractor will furnish copies of certificates of insurance evidencing coverage for each subcontractor.

The Contractor will require all insurance policies in any way related to the work and secured and maintained by the Contractor to include clauses stating each underwriter will waive all rights of recovery, under subrogation or otherwise, against owner, architect, and all tiers of contractors or consultants engaged by them. The Contractor will require of subcontractors, by appropriate written agreements, similar waivers each in favor of all parties enumerated in this Section.

The Contractor shall indemnify and hold harmless the Town and, if applicable, the Engineer and their agents and employees from and against all claims, damages, losses and expenses, including attorney's fees of counsel selected by the owner, arising out of or resulting from the performance of the work and/or the supplying of materials, provided that any such claim, damage, loss or expense (a) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property including the loss of use resulting therefrom, and (b) is caused in whole or in part by any negligent act or omission of the contractor/insured, any subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not they are caused in part by a party indemnified hereunder.

Insurance Limits and Coverage

To the extent applicable, the amounts and types of insurance will conform to the minimum terms, conditions and coverages of Insurance Services Office (ISO) policies, forms and endorsements.

If the Contractor has self-insured retentions or deductibles under any of the following minimum required coverages, the Contractor must identify on the certificate of insurance the nature and amount of such self-insured retentions or deductibles and provide satisfactory evidence of financial responsibility for such obligations. All self-insured retentions or deductibles will be the Contractor's sole responsibility.

Commercial General Liability: The Contractor will maintain commercial general liability insurance covering all operations by or on behalf of the Contractor on an occurrence basis against claims for personal injury (including bodily injury and death) and property damage (including loss of use).

Such insurance will have these minimum limits:

$1,000,000 each occurrence
$2,000,000 each occurrence if blasting is required
$2,000,000 general aggregate with dedicated limits per project site
$2,000,000 products and completed operations aggregate
$1,000,000 personal and advertising injury

Should blasting be required, all necessary permits for the use of explosives shall be obtained from the Manchester Fire Marshal by the Contractor.

Automobile Liability: The Contractor will maintain business auto liability coverage for liability arising out of any auto, including owned, hired, and non-owned autos.

Minimum Limits: $1,000,000 combined single limit each accident

Workers' Compensation and Employer's Liability: The Contractor will maintain workers compensation and employers liability insurance.

Minimum Limits: Workers' Compensation: Statutory Limit
Employers Liability:
$1,000,000 bodily injury for each accident
$1,000,000 bodily injury by disease for each employee
$1,000,000 bodily injury disease aggregate

5.04 CHANGES TO APPROVED PLAN

Any changes to the approved plans require review and approval prior to construction. Depending upon the nature of the change and/or its impacts, the modification may require application to the Planning and Zoning Commission or other regulatory agencies.

The Contractor should notify the Engineer immediately of any potential changes to the approved plan. If deemed necessary by the Engineer, the Contractor must submit a plan, prepared and certified by the Design Engineer of record, documenting the changes to the approved plan. If the changes affect any previously submitted computations (i.e. design of drainage systems, detention basins, treatments systems, temporary sediment traps/basins, etc.), then revised computations shall also be submitted.

Based on the nature of the proposed changes, allow two (2) to four (4) weeks for review and determination. The Engineer may require two sets of revised fixed line mylars to be submitted that are signed and sealed by the appropriate professional(s) licensed in the State of Connecticut.

6.01 TESTING, INSPECTION AND USE OF TOWN PERSONNEL AND EQUIPMENT

If the Contract Documents, Engineer's instructions, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any Work to be specially inspected, tested or approved by someone other than the Contractor, the Contractor will give the Engineer timely notice of readiness therefore. The Contractor will furnish the Engineer the required certificates of inspection, testing, or approval.

If the inspection is to be made by another authority other than the Engineer, the date fixed for such inspection shall be provided. All such tests will be in accordance with the methods prescribed by the American Society for Testing and Materials or such other applicable organization as may be required by law or the Contract Documents.

If any such Work required so to be inspected, tested or approved is covered up without written approval or consent of the Engineer, it must, if directed by the Engineer, be uncovered for observation at the Contractor's expense. The cost of all such inspections, tests and approvals shall be borne by the Contractor unless otherwise provided.

Any Work which fails to meet the requirements of any such test, inspection or approval, and any Work which meets the requirements of any such test or approval but does not meet the requirements of the Contract Documents shall be considered defective. Such defective Work may be rejected, corrected or accepted as provided by the Engineer.

Neither observations by the Engineer nor inspections, tests or approvals by persons other than the Contractor, shall relieve the Contractor from his/her obligations to perform the Work in accordance with the requirements of the Contract Documents.

6.01.01 Payment for Use of Public Works Department Personnel

The Contractor shall be responsible for coordinating the Work within the public right-of-way with the Engineer at all times. For instances when it is necessary to utilize Public Works Department inspectors during other than normal Department working hours, the Contractor shall make payment to the Town of Manchester for such use. Normal working hours for the Public Works Department are from 7:30 a.m. to 4:00 p.m. daily, Monday through Friday, excluding holidays.

Payment will be made in accordance with the following:

1. For each Public Works Department employee utilized by the Contractor, the Town shall receive the standard overtime rate paid to the employee by the Department.
2. In the event a Public Works Department employee is called out after the end of normal working hours, minimum payment to the Town by the Contractor for each Department employee utilized shall be at the standard overtime rate for a period no less than four (4) hours. Payment for overtime that is a continuation of the normal working day shall be at the standard overtime rate for the actual hours worked.

There will be no charge for use of Public Works Department personnel during normal working hours for services provided by the Department.

6.01.02 Payment for Use of Water and Sewer Department Personnel and Equipment

The Contractor shall be responsible for coordinating the Work with the Engineer and Manchester Water and Sewer Department at all times. For instances when it is necessary to utilize Water and Sewer Department personnel and equipment during other than normal Department working hours, the Contractor shall make payment to the Town of Manchester for such use. Normal working hours for the Water and Sewer Department are from 7:00 a.m. to 3:30 p.m. daily, Monday through Friday excluding holidays.

Payment shall be made in accordance with the following:

1. For each Water and Sewer Department employee utilized by the Contractor, the Town shall receive the standard overtime rate paid to the employee by the Department.
2. In the event a Water and Sewer Department employee is called out after the end of normal working hours, minimum payment to the Town by the Contractor for each Department employee utilized shall be at the standard overtime rate for a period no less than four (4) hours. Payment for overtime that is a continuation of the normal workday shall be at the standard overtime rate for the actual hours worked.
3. For Water and Sewer Department equipment required for use in conjunction with utilization of Department personnel, the Town shall receive the standard rates identified in the "Schedule of Rates, Charges and Fees" as published by the Town of Manchester Water and Sewer Department.

There will be no charge for use of Water and Sewer Department personnel and equipment during normal working hours for routine services provided by the Department (i.e., open/close valves, shut down mains, shut down notification, etc.). However, use of Water and Sewer Department personnel and equipment for non-routine services (i.e., use of vacuum truck, video inspection equipment, etc.) requires the Contractor to reimburse the Town at the standard rates identified in the "Schedule of Rates, Charges and Fees" as published by the Town of Manchester Water and Sewer Department.

6.02 PROTECTION OF EXISTING FACILITIES

In general, the Contractor shall protect all existing features, public or private, within or adjacent to the Work area that is not called out to be removed or replaced.

6.02.01 Existing Monumentation

The Contractor shall be responsible for the protection and replacement of all survey markers such as control network monuments, streetline monuments and private property markers. Any existing monumentation shown on the original development plan or found in the field after the start of construction that is destroyed, damaged or disturbed will be replaced by the Town at the Contractor's expense.

The fee for replacement of monumentation is as follows:

Type of Monumentation Replaced	Fee
Iron Pipes/Rods/Drill Holes	$150.00 each
Concrete Monuments (Private Property)	$300.00 each
Natural Stone Monuments (Private Property)	$300.00 each
Intersection, Street Corner, Point of Curvature Markers	$500.00 each
Town GPS Control Network Monument	$2,500.00 each

6.02.02 Contract Work

The Contractor shall protect the Work so as to prevent damage and/or vandalism to newly poured sidewalks, ramps and other concrete surfaces. Any newly poured concrete surfaces that are damaged or defaced shall be promptly repaired or replaced at the Contractor's expense. The determination to repair or replace will be at the sole discretion of the Engineer.

6.02.03 Trees and Shrubs

The Contractor will take precautionary measures to protect all public and private trees or shrubs remaining within or adjacent to the project area. This also includes protection of root systems that may become damaged due to the excavation activities near or adjacent to vegetation designated to remain. The Contractor shall be solely responsible for compensation, repair, or replacement of any damaged tree or shrub because of neglect by the Contractor or any of his/her assigned Subcontractors.

6.02.04 Utilities

All existing utilities shall be protected and supported according to the specific utility company's requirements. It is the Contractor's sole responsibility to coordinate and communicate with the applicable utility company regarding their requirements.

The Contractor shall contact the Engineer to discuss specific requirements for protection of water distribution and sanitary sewer utilities prior to construction.

6.02.05 Traffic Control Facilities

The Contractor shall note there are underground traffic control facilities (loop detectors) at various intersections in the Town. Should these facilities become damaged during the course of the Work, the Contractor will be responsible for replacement of the detectors. Splicing of the existing detectors will not be permitted.

6.02.06 Private Property

Any claims for damage to private property as a result of the Contractor's operations or lack of providing protective measures to prevent such damage will be forwarded directly to the Contractor for action. For each claim, the Contractor shall provide evidence to the Engineer that the claim has been resolved. The Engineer will not release any bonds for the Work if there are any unresolved claims.

6.02.07 Archaeological Finds

If human burials or human skeletal remains are encountered during construction, agricultural, archaeological or other activity that might alter, destroy or otherwise impair the integrity of such burials or remains, the activity shall cease and not resume unless authorized by the Chief Medical Examiner and the State

Archaeologist. Such authorization shall be made within five (5) days of completion of the investigation of the Chief Medical Examiner pursuant to the following:

> "After notification under subsection (a) of this section, the Chief Medical Examiner shall determine if the remains represent a human death required to be investigated under section 19a-406. After completion of his investigation, if the Chief Medical Examiner determines that the remains may be the remains of a Native American or were found in the subsurface and buried for more than fifty years, the Chief Medical Examiner shall notify the State Archaeologist of such fact. The State Archaeologist, upon such notification, shall in consultation with the Connecticut Commission on Culture and Tourism, the Native American Heritage Advisory Council, established under section 10-382, the Commissioner of Energy and Environmental Protection, and the landowner determine, within seventy-two hours, if the site where such remains were discovered can be preserved in situ and protected by a preservation restriction as defined in section 47-42a."

6.03 CONTROL OF SITE

6.03.01 General Housekeeping
The Contractor will keep the Work area free from accumulations of waste materials, rubbish and other debris resulting from the Work and legally dispose of same, and at the completion of the Work will remove all waste materials, rubbish and debris from and about the premises and legally dispose of same, as well as all tools, construction equipment and machinery, and surplus materials. The Contractor will leave the site clean and ready for occupancy.

6.03.02 Dust Control
During the progress of the Work, the Contractor shall conduct his/her operations and maintain the area of activities so as to minimize the creation and dispersion of dust. If the Engineer determines that it is necessary to use water or calcium chloride for more effective dust control, the Contractor shall furnish and spread the materials as directed.

6.03.03 Maintenance Operations
The Contractor must accommodate routine and emergency maintenance operations performed by the Town (i.e. refuse pickup, leaf collection, snow plowing, etc.) within the Work area.

6.03.04 Sanitary Provisions
The Contractor shall provide and maintain in a neat and sanitary condition such accommodations for the use of its employees as may be necessary to comply with the regulations and requirements of the State Department of Public Health.

6.04 OPERATION OF WATER AND SEWER FACILITIES

For instances when it is necessary to operate valves or hydrants that are the property of the Town of Manchester, the Contractor shall coordinate his/her activities with the Manchester Water and Sewer Department and arrange for the Department to operate such facilities. A

minimum of forty-eight (48) hours notice shall be given the Department to minimize delay and allow public notice where necessary.

6.04.01 Continuance of Service

All Work is to be accomplished in such manner as to minimize the time water and sanitary sewer service will be interrupted. The Contractor shall be responsible for coordinating his/her activities to insure minimal disruption of service and shall contact the Manchester Water and Sewer Department a minimum of forty-eight (48) hours in advance of all service interruptions.

The Contractor is made aware that discontinuation of water service to some customers in the construction area during normal working hours may not be allowed; and therefore, work may need to be completed during off hours or temporary water services may need to be provided.

6.04.02 Licensing Requirements

Any person involved in the installation of a water main and/or appurtenances must have a P-1, P-6 or P-7 license or be an apprentice registered with the State of Connecticut Labor Department working under the direct (on-site) supervision of a person possessing a P-1, P-6 or P-7 license.

Any person involved in the installation of a sanitary sewer and/or appurtenances must have a P-1, P-6, P-7, W-8 or W-9 license or be an apprentice registered with the State of Connecticut Labor Department working under the direct (on-site) supervision of a person possessing a P-1, P-6, P-7, W-8 or W-9 license.

6.05 MAINTENANCE AND PROTECTION OF TRAFFIC

The Contractor shall furnish, install, maintain, adjust, clean, store and remove (when no longer required) all temporary signs, cones, barricades or other approved traffic control devices required to safely maintain and protect traffic within the project area.

Any work where the Contractor will encroach into an existing travel lane shall require the use of certified, uniformed flagpersons capable of safely directing traffic around the work area. Flaggers must be certified by the American Traffic Safety Services Association (ATSSA) or the National Safety Council (NSC). Certain arterial roads in the Town of Manchester require the use of uniformed Manchester police officers for traffic control by ordinance. Refer to the "Manchester Traffic Control Ordinance" in Appendix L for additional information.

Temporary traffic detours must be approved by the Engineer prior to implementation. The Contractor shall submit a plan of the proposed detour, complete with sign patterns, and estimated duration of detour to the Engineer for approval at least fourteen (14) days in advance of implementation.

6.05.01 Traffic Control Devices

Traffic drums shall be manufactured plastic or rubber designed in accordance with the latest edition of the "Manual of Uniform Traffic Control Devices for Streets and Highways (MUTCD)" as published by the U.S. Department of Transportation Federal Highway Administration. The device shall be stabilized with sandbags or other approved means.

Traffic drums shall conform to the requirements of Section 9.78 Traffic Drums of Form 818.

Construction barricades shall conform to the requirements of Section 9.79 of Form 818.

42" Traffic cones shall conform to the requirements of Section 9.81 of Form 818.

Temporary construction signs shall conform to the requirements of Section 12.20 of Form 818.

Any other traffic control devices shall meet the minimum requirements of Form 818 and the MUTCD.

The Contractor shall maintain all traffic control devices on the project. Traffic control devices shall be cleaned periodically to maintain retroreflectivity. Any damaged traffic control devices shall be immediately removed and replaced. It is the Contractors responsibility to move, adjust or relocate traffic control devices as his/her operations change.

6.05.02 Advanced Warning

It shall be the sole responsibility of the Contractor to forewarn the Town's Local Regulatory Agencies (including but not limited to the Police and Fire Departments and Board of Education) at least seventy-two (72) hours in advance of changes in traffic patterns or closing of streets.

6.05.03 Non-Performance

Should the Contractor neglect to maintain traffic control devices as required, the Engineer may shut the Work down immediately until such traffic control devices are in place. If the Contractor does not comply, the Engineer may immediately and without notice, furnish, install and maintain traffic control devices or require uniformed police officers to control the site. The cost thereof shall be borne by the Contractor. The Contractor will be held responsible for any damages that the Town, Engineer, Governmental units, or their heirs or assigns may have to pay as a consequence of the Contractor's failure to protect the public from injury, and the same may be deducted from any performance or permit bonds.

The Contractor shall observe and obey all local and state laws, ordinances, regulations and permits in relation to the obstruction of streets and highways, keeping passageways open and protecting traffic where there may be danger from blasting or other construction activities.

The Contractor shall conduct the Work at all times in such a manner as to ensure the least possible obstruction to both vehicular and pedestrian traffic. All equipment and materials shall be placed or stored in such a way and in such locations as will not create a hazard to the general public.

The Contractor shall notify residents in writing at least twenty-four (24) hours in advance of any Work which will close or restrict access to their property. Work shall be coordinated such that no residential driveway access is closed for more than a twenty-four (24) hour period and such that no commercial driveway access is fully closed at any time.

Work shall be coordinated such that it does not leave any excavated area open for more than one day without prior approval of the Engineer.

Not more than one block at a time of the street shall be torn up, obstructed or closed without the permission of the Engineer. The Contractor shall provide such barricades, signs, warnings, flagmen and shall conduct his/her Work in such a manner so that hazards to vehicular and pedestrian traffic are at a minimum. If, in the opinion of the Engineer or other Town Public Safety Authorities, additional precautions or measures should be taken in the interest of public safety, the Contractor shall so comply promptly.

Access shall be provided at all times to fire hydrants and precautions shall be taken to prevent freezing of any exposed or partially uncovered water lines.

6.06 INTERFERENCE WITH MAINTENANCE ACTIVITIES

If the Contractor's operations interfere with snow removal or deicing operations, leaf removal, or any other routine maintenance activities conducted by public authorities or adjoining land owners, the Contractor shall be required to perform such services for the public authorities or adjoining owners without charge. If the Contractor fails to do so, he/she shall reimburse the said authorities, adjoining owners or the Town for any additional cost to them for doing such work occasioned by conditions arising from the Contractor's operations, occupancy, or trench surfaces, together with any damage to the equipment of said parties by those conditions, or claims of any parties for damage or injury or loss by reason of failure to perform routine maintenance operations under these conditions.

6.07 SAFETY

The Contractor shall comply with all requirements of the Occupational Safety and Health Act (OSHA), applicable laws, building and construction codes.

The Contractor shall furnish to the Engineer a report in duplicate on each accident on the Project or related to the prosecution of the Project which involves personal injury requiring medical treatment or which causes an employee’s loss of work time. The Contractor shall also furnish to the Engineer a report in duplicate regarding any accident involving public liability or property damage in connection with the Project.

At all times, the Contractor shall protect his/her work from the motoring or walking public. It will be the Contractor’s responsibility to supply and utilize flagmen or Town Police personnel, barricades, signs, drums, cones, etc. throughout the construction. Any sidewalk left excavated at the end of the work shift shall be cordoned off and properly signed to restrict pedestrian access.

The Contractor shall utilize OSHA approved safety caps on all pins or other protruding metal.

Depending upon the work, the Engineer may require the Contractor to submit one copy of its “Trenching and Shoring” safety plan.

If any of the Work requires any person to enter into a confined space as defined by OSHA, the Contractor shall submit to the Engineer a copy of its “Confined Space Entry” procedures.

The Contractor will be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. The Contractor will take all necessary precautions for the safety of, and will provide the necessary protection to prevent damage, injury or loss to:

1. All employees on the Work and other persons who may be affected thereby.
2. All the Work and materials or equipment to be incorporated therein, whether in storage on or off the site, and
3. Other property at the site or adjacent thereto, including but not limited to trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement during the course of construction.

The Contractor shall take all proper precautions to protect existing access to properties by preventing impacts and unnecessary interference wherever possible. The Contractor shall provide proper means of access to any property where the existing access is impacted by the Contractor. The Contractor shall take all proper precautions to protect persons from injury or unnecessary inconvenience and leave an unobstructed way along public and private properties for pedestrians and vehicles, and for access to fire hydrants.

No materials or other obstruction shall be placed within fifteen (15) feet of any fire hydrant which, at all times, must be readily accessible to the Fire Department.

The Contractor will comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss. The Contractor shall provide and maintain all necessary flagmen, barricades, lights and warning signs and take all necessary precautions for the protection of the public.

The Contractor shall continuously maintain adequate protection of all Work from damage, and shall take all reasonable precautions to protect the public from injury or loss arising in connection with this Contract. The Contractor shall be responsible for any damage or impact to his/her Work, private property or the property of the Town resulting from lack of reasonable protective precautions. The Contractor will notify owners of adjacent utilities when prosecution of the Work may affect them.

When the use or storage of explosives or other hazardous materials is necessary for the prosecution of the Work, the Contractor will exercise the utmost care and will carry on such activities under the supervision of properly qualified personnel. All damage, injury or loss to any property referred to in the above paragraphs caused, directly or indirectly, in whole or in part, by the Contractor, Subcontractor or anyone directly or indirectly employed by either of them or anyone for whose acts either of them may be liable for, will be remedied by the Contractor.

In emergencies affecting the safety of persons, the Work, or property at the site or adjacent thereto, the Contractor, without special instruction or authorization from the Engineer or Town Public Safety Authorities, is obligated to act, at his/her discretion, to prevent threatened damage, injury or loss. The Contractor shall give the Engineer prompt written notice of any significant changes in the Work.

6.08 APPROVAL OF MATERIALS

Unless otherwise specified, all materials and equipment incorporated in the Work shall be new. If required by the Engineer, the Contractor will furnish satisfactory evidence as to the kind and quality of materials and equipment. The submission of shop drawings, certificates of compliance or samples may be required by the Engineer.

All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the instructions of the applicable manufacturer, fabricator or processors.

For materials requiring shop drawings, the Contractor shall submit to the Engineer for approval, five (5) copies of all Shop Drawings, which shall have been checked by and stamped with the approval of the Contractor and identified as the Engineer may require. The data shown on the Shop Drawings will be complete with respect to dimensions, design criteria, materials of construction, manufacturer's certificates and the like to enable the Engineer to review the information as required.

For materials requiring samples, the Contractor shall submit to the Engineer for approval all samples required. Samples will have been checked by and stamped with the approval of the Contractor, identified clearly as to material, manufacturer, any pertinent catalog numbers and the use for which intended.

No work requiring a Shop Drawing or sample submission shall be commenced until the submission has been approved by the Engineer.

6.09 TREE REMOVAL

Any tree within Town-owned right-of-way to be cut, pruned or removed shall require posting in accordance with Section 23-58, 59 and 60 of the Connecticut General Statutes. The Contractor shall contact Town of Manchester Field Services Division at 860-647-3233 for additional information.

The cutting, pruning or removal of any tree or shrub within the limits of any public roads or grounds, except those along State right-of-way, require at least a fourteen (14) day notice to the Manchester Tree Warden.

The Contractor is responsible for clearly marking the limits of any easement or property line adjacent to the removal by stake and flagging before any trees can be posted.

No tree removal shall occur until such time the Manchester Tree Warden has notified the Contractor the proposed removal has been approved.

6.10 BLASTING

The Contractor shall secure all necessary permits from the Manchester Fire Marshall and other appropriate parties and observe all local and state ordinances relating to transportation, storage and handling of explosives. A pre-blast survey of the surrounding area is required and a copy of the report MUST be submitted to the Engineer prior to any blasting. When blasting is to take place near adjacent structures or services, the same shall be carefully protected against damage.

The explosives must be of such number and size of charge and be so placed so as not to cause unduly large excavation or unnecessarily shatter rock adjacent to the excavation. All rock loosened or shattered in the sides of the excavation shall be completely removed by wedging or other approved means.

6.11 COORDINATION WITH UTILITIES

At least two (2) full business days, but not more than thirty (30) days, before commencing excavation; the Contractor shall call 1-800-922-4455 (Call Before You Dig) to allow notification of utilities. The Contractor shall be responsible for coordinating his/her own work and that of his/her Subcontractors with any and all utilities in the work area.

The Contractor shall schedule his/her operations in such a manner as to minimize interference with the operation of the utility companies or the Town for the installation of new facilities as shown on the plans or relocation of their existing facilities.

The Contractor shall be responsible to support all utility poles in the vicinity of excavations necessary to perform the work. The Contractor must obtain all approvals required by the custodian of the utility pole and to coordinate all work.

6.12 JACKING AND BORING

Pipes and conduits shall generally be placed by the open cut method. In individual cases where deep installation is required, heavy traffic is present or other special circumstances, the Engineer may allow or even require that the installation be completed by jacking or boring when such method is of definite benefit to the traveling public.

No jetting or other use of water shall be allowed in connection with jacking or boring. The Contractor shall be responsible for careful investigation of the work area to determine the location of all existing utility, municipal and privately-owned pipe or conduit lines. The Contractor may be required to perform test pits and submit a plan and profile showing all such lines and detailed methods of proposed operations.

6.13 PROJECT REQUIREMENTS

The Developer and/or Contractor are required to provide the Town specific information prior to and during various stages of the project before construction activities can commence or continue and prior to release of bonds. Refer to the Project Requirements in Appendix K for additional information.

7.01 RECORD (AS-BUILT) DRAWINGS

Record drawings are required for all subdivisions, private developments, water distribution and sanitary sewer system installations, and other work regulated by these Public Improvement Standards. Record drawings shall be prepared by a land surveyor licensed in the State of Connecticut in conformance with "Minimum Standards for Surveys and Maps in the State of Connecticut", prepared and adopted by the Connecticut Association of Land Surveyors, September 26, 1996, as amended.

For subdivisions, record drawings shall be submitted to the Engineer for review prior to the issuance of building permits for 50% of the approved bonded lots (i.e. for a subdivision with twelve (12) lots, record drawings must be submitted before a building permit can be issued for the sixth lot).

For all other work, record drawings shall be submitted to the Engineering Division for review prior to the reduction of the Public Improvement Bond below 50%.

Prior to final acceptance of any subdivision, private development, water distribution and sanitary sewer system installations, or other work regulated by these Public Improvement Standards, the Developer/Contractor shall submit to the Engineer four (4) complete sets of record drawings for review. Upon approval of record drawings, the Developer/Contractor shall submit two (2) complete sets of mylars. This data will be incorporated into the Manchester Geographic Information Systems (GIS) map. See the "Town of Manchester Geographic Information Systems Data, Map Products and Policies" as prepared by the Town of Manchester for more information.

Mylars shall be sealed and signed (embossed seal and wet signature) by the Land Surveyor licensed in the State of Connecticut that is responsible for the record drawing and shall be wash-off, fixed line, or original ink drawing. The mylar material used shall be no less than 4 mil (0.004 inch) thickness. Refer to the "Minimum Record (As-Built) Drawing Requirements" provided in Appendix D for additional information.

7.02 FILING OF DEEDS AND EASEMENTS

The Developer or Owner will be responsible to make whatever corrections are required, including the re-execution of any documents and/or to make the Deeds and Easement description comply with as-built field conditions. The Developer will also be responsible for furnishing a mylar with all necessary revisions, suitable for filing on the land records with the Deeds and Easement.

In addition, the Developer shall furnish a title policy or attorneys certificate evidencing clear title in the Grantor(s) of all deeds and easements. All outstanding interests in third parties must be released or subordinated to the interest or estate, which is to be conveyed to the Town. Releases or subordinations shall also be submitted.

The Town of Manchester will then file the approved Deeds and Easement documents and the mylar within the Town Clerk's office. The Developer will be required to file the necessary maps associated with the Deeds and Easement within the Town Clerk's office.

Refer to Section 4 herein Standards for additional information.

7.03 PROCEDURE FOR ACCEPTANCE OF STREETS AND OTHER PUBLIC IMPROVEMENTS WITHIN SUBDIVISIONS

A petition asking for acceptance and adoption of streets and other public improvements shall be made by the Developer to the Engineer. The petition shall include:

- A request in writing for a final inspection of all completed public improvements.
- All warranty deeds for land constituting public rights-of-way.
- Utility easements in favor of the Town of Manchester, if required.
- Drainage rights in favor of the Town of Manchester, if required.
- A title policy or attorney's certificate evidencing clear title in the grantor(s) of all deeds and easements. All outstanding interests in third parties must be released or subordinated to the interest or estate, which is to be conveyed to the Town. Releases or subordinations shall also be submitted.
- A set of record (as-built) drawings in accordance with Section 7.01 herein.
- Results of testing of water distribution and sanitary sewer systems in accordance with these Public Improvement Standards.
- Certification from the Manchester Water and Sewer Department that all applicable water distribution and sanitary sewer system fees and/or charges have been paid.

8.01 GENERAL

All improvements that impact public infrastructure and facilities within the Town right-of-way shall conform to the following standard construction specifications, unless otherwise approved by the Engineer. The Engineer reserves the right to modify these standard construction specifications at any time as deemed necessary to meet the needs of existing and proposed public infrastructure and facilities and to protect private property.

8.02 STANDARD CONSTRUCTION SPECIFICATIONS

Specification No.	Specification Title
CS-1	Granular Fill
CS-2	Processed Aggregate Base
CS-3	Bituminous Concrete (Hot Mix Asphalt)
CS-4	Bituminous Concrete Trench Repair
CS-5	Milling, Reclamation and Removal of Bituminous Concrete
CS-6	Bituminous Concrete Driveway
CS-7	Concrete Driveway Apron
CS-8	Concrete Sidewalk and Sidewalk Ramps
CS-9	Granite Stone Curb
CS-10	Precast Concrete Curb
CS-11	Bituminous Concrete Curb
CS-12	Catch Basins and Storm Manholes
CS-13	Reset Manhole to Grade
CS-14	Culverts
CS-15	Concrete Endwalls
CS-16	Underdrain
CS-17	Metal Beam Rail
CS-18	Chain Link Fence
CS-19	Water Main
CS-20	Water Service
CS-21	Hydrant Assembly
CS-22	Air Release Valve Manhole
CS-23	Replace Valve Box
CS-24	Water Bypass Piping
CS-25	Sanitary Sewer Main
CS-26	Sanitary Sewer Lateral
CS-27	Sanitary Sewer Manholes
CS-28	Sanitary Sewer Bypass System
CS-29	Erosion and Sedimentation Controls
CS-30	Riprap
CS-31	Restoration of Lawn Areas, Wetland Areas and Erosion Control Blanket
CS-32	Landscaping

Specification No.	Specification Title
CS-33	Conduit
CS-34	Concrete Handhole
CS-35	Loop Detector
CS-36	Pedestals
CS-37	Traffic Control Signs
CS-38	Traffic Control Foundation
CS-39	Pavement Markings
CS-40	Granite Stone Monument
CS-41	Maintenance and Protection of Traffic

GRANULAR FILL

DESCRIPTION

"Granular Fill" includes the furnishing and installation of material to be used as a foundation for structures, to replace unstable material in slopes and shoulders, to replace rock and unsuitable material in trenches, and elsewhere as indicated on the Plans or Specifications or where directed by the Engineer. It shall consist of gravel conforming to the requirements of these specifications.

MATERIALS

Granular fill shall conform to the requirements of Section M.02.01 of Form 818.

CONSTRUCTION DETAILS

When granular fill is used for foundation for structures, as backfill or to replace rock or unsuitable material in trenches, it shall be deposited in layers not over six (6) inches in depth, with each layer thoroughly compacted before the addition of other layers.

PROCESSED AGGREGATE BASE

DESCRIPTION

"Processed Aggregate Base" shall consist of furnishing and installing processed aggregate base as a foundation for bituminous concrete roadways, concrete sidewalks, curbs, driveways and other items where shown on the Plans in accordance with these Specifications and in conformity with the lines, grades, compacted thickness and typical cross-section as shown on the Plans.

MATERIALS

At the discretion of the Engineer, contractors shall supply copies of material test results, certified by an approved testing laboratory.

The materials for this work shall conform to the following requirements:

1. Gradation: Coarse and fine aggregates shall be combined and mixed by approved methods so that the resulting material shall conform to requirements of Section M.05.01 of Form 816 as follows:

Square Mesh Sieves	Percent Passing By Weight
Pass 2 1/2"	100
Pass 2"	95 100
Pass 3/4"	50 75
Pass 1/4"	25 - 45
Pass #40	5 - 20
Pass #100	2 12

2. Coarse Aggregate: Coarse aggregate shall be broken stone. The broken angular stone shall be the product resulting from the artificial crushing of rocks, boulders, or large cobblestones, substantially all faces of which have resulted from the crushing operation. It shall be free of soft disintegrating pieces, mud, dirt, organic or other injurious material.

   When tested by means of the Los Angeles Machine, using AASHTO Method T 96, the coarse aggregate shall not have a loss of more than 50 percent.

   When tested by magnesium sulfate solution for soundness, using AASHTO Method T104, the coarse aggregate shall show a loss of not more than 15 percent at the end of 5 cycles.

3. Fine Aggregate: Fine aggregate shall be natural sand, stone sand, screenings or any combination thereof.

   The fine aggregate shall be limited to material 95 percent of which passes a No. 4 sieve having square openings and not more than 8 percent of which passes a No. 200 sieve. The material shall be free from clay, loam and deleterious materials.

4. Plasticity: When screenings or any combination of screenings and natural sand or any combination of stone sand and natural sand are used, the following requirements shall apply:

When the fraction of the dry sample passing the No. 100 mesh sieve is 6 percent or less by weight, no plastic limit test will be made.

When the fraction of the dry sample passing the No. 100 mesh sieve is greater than 6 percent and not greater than 10 percent by weight, that fraction shall not have sufficient plasticity to permit the performing of the plastic limit test, using AASHTO Method T 90.

When the fraction of the dry sample passing the No. 100 mesh sieve is greater than 10 percent by weight, the sample shall be washed; and additional material passing the No. 100 mesh sieve shall be determined by AASHTO Method T 146, except that the No. 100 mesh sieve shall be substituted for the No. 40 mesh sieve where the latter is specified in AASHTO Method T 146. The combined materials that have passed the No. 100 mesh sieve shall not have sufficient plasticity to permit the performing of the plastic limit test using AASHTO Method T 90.

CONSTRUCTION DETAILS

Coarse aggregate shall be broken stone. Only one type of coarse aggregate shall be used on a project unless otherwise permitted by the Engineer.

Prior to placing the bottom coarse of the processed aggregate base, the prepared subbase shall be maintained true to line and grade. After the aggregate is spread, it shall be thoroughly compacted and bound by use of equipment approved by the Engineer. Water may be used during the compaction and binding operation.

When the bottom course has been completed, as specified above, the top course aggregate shall be spread over it to such thickness that, after final compaction and binding, the total thickness of the two courses will equal that thickness specified for the completed base. The top course shall be spread, compacted and bound exactly as specified above for the bottom course.

The final surface of the subbase course shall be fine graded so that, after final compaction and just prior to placement of base or pavement courses, the surface elevation shall not vary more than one-quarter inch above or below the design grade at any location. The surface shall be completed to the above tolerance and approved by the Engineer prior to any work at a given location to place an overlying course. If after approval, the course becomes displaced or disturbed in any way for any reason, the Contractor shall repair and regrade the damage to the satisfaction of the Engineer prior to placing the overlying course. All repaired sections shall be recompacted until they meet the requirements as stated herein.

BITUMINOUS CONCRETE (HOT MIX ASPHALT)

DESCRIPTION

"Bituminous Concrete (Hot Mix Asphalt)", hereafter referred to as HMA, of the type specified includes the furnishing and installation of a bituminous concrete constructed on a prepared processed aggregate base or existing pavement course in accordance with the lines, grades and depths shown on the Plans or as directed by the Engineer. It also includes furnishing quality control testing as required in the Specification.

All references to the "State" or "State Inspector" shall mean the Town of Manchester or the Town of Manchester's designated inspector.

MATERIALS

HMA shall conform to the requirements of Section M.04 "Bituminous Concrete" of Form 818, latest edition.

Unless otherwise directed by the Engineer, Superpave Design Level 2 shall be used.

CONSTRUCTION DETAILS

HMA shall be installed in accordance with Section 4.06 "Bituminous Concrete" of Form 818, latest edition.

Core correlation density samples as described in Section 4.06.03.10 are required.

If less than 5,000 tons, the furnishing of a "Material Transfer Vehicle" as described in Section 4.06.03.3 will not be required.

BITUMINOUS CONCRETE TRENCH REPAIR

DESCRIPTION

"Permanent Trench Repair" shall consist of permanently constructing a full depth trench repair in existing roadways where shown on the Plan or where directed by the Engineer. The surface course pavement structure shall consist of bituminous concrete constructed on a prepared stabilized base and in accordance with lines, grades as shown on the Plans, or as directed by the Engineer. It shall also include all excavation, furnishing, installing and compacting of processed aggregate base, sawcutting the existing pavement, and the resetting of storm drainage and utility structures and any pavement surrounding these structures.

"Temporary Trench Repair" shall consist of temporarily constructing a full depth trench repair in existing roadways where shown on the Plan or where directed by the Engineer. The surface course pavement structure shall consist of bituminous concrete constructed on a prepared stabilized base and in accordance with lines, grades as shown on the Plans, or as directed by the Engineer. It shall also include all excavation, furnishing, installing and compacting of processed aggregate base, sawcutting the existing pavement, and the resetting of storm drainage and utility structures and any pavement surrounding these structures.

MATERIALS

Bituminous Concrete shall conform to the requirements of Section M.04 of Form 816.

All materials will be supplied from a plant certified and approved by the State of Connecticut, Department of Transportation.

Processed aggregate base shall conform to the specification for "Processed Aggregate Base" elsewhere in these Specifications.

If it is found that any Bituminous Mixture, even though meeting the requirements of the Job Mix Formula, fails to perform satisfactorily, the producer shall on notice (1) immediately cease furnishing the material, (2) take immediate corrective steps to provide a mix which does perform satisfactorily.

When bituminous concrete is laid, only material conforming to the requirements of these specifications and approved by the Engineer shall be used in the work. If tests of samples removed from the work reveal that the mixture is inconsistent or that other than approved materials have been incorporated in the mixture, or that the mixture is not in accordance with the specifications and the product proves unsatisfactory, the Town reserves the right to demand the replacement of the unsatisfactory bituminous concrete. All expenses of the Town incidental to such replacement, including all costs incurred in putting the road in satisfactory condition, shall be paid by the Contractor.

The tack coat to be used on all cold joints shall conform to the requirements of Section M.04 of the Form 816.

CONSTRUCTION DETAILS

Transportation of Mixtures: The mixture shall be transported from the paving plant in trucks having tight bodies, which have previously been cleaned of all foreign material. The use of kerosene, gasoline, fuel or similar products for the coating of the inside of truck bodies is strictly

prohibited. Such coatings may consist of soapy water or commercial oil emulsions (also known

as soluble oils) in the proportion of one (1) part oil to six (6) parts water. When such coatings are applied, truck bodies shall be raised immediately prior to loading to remove any excess coating material. Loaded trucks shall be covered with waterproof canvas or other suitable covers.

The mixture shall be delivered at a temperature within -4 degrees Celsius (25 degrees Fahrenheit) of the approved job mix formula.

Paving Equipment: The paving machine to be used shall be a self-powered type with an adapter to provide guidance of the screeding action. The screed or strike-off member shall be adjustable to the shape of the cross section of the existing pavement. Some method shall be provided for the tilting of the screed while in operation to secure the proper "pulling" and to result in a uniformly screeded surface. The machine shall have sufficient number of driving wheels so that there will be no undue amount of slippage. Means shall be provided for heating the screeding members by some method that will prevent accumulations of bituminous materials.

Placement of Mixture: The areas to be repaired shall be sawcut and the existing pavement and base material removed to the depth shown on the Plan. The excavated area shall then be filled with processed aggregate base to the depth identified on the Plans and shall be installed and compacted in maximum 6” lifts.

The mixture shall be laid only when the surface is free of frost, dried to the satisfaction of the Engineer, and when the weather is not foggy or rainy. Operations shall be carried only when the atmospheric temperature in the shade is not less than 4 degrees Celsius (40 degrees Fahrenheit) unless approval is given by the Engineer. Upon arrival, the mixture shall be immediately spread and struck-off to the width required and to such appropriate loose depth so that the compacted pavement will conform to the specified depth.

In order to obtain tight and well-compacted longitudinal joints, the sequence of the bituminous concrete placing operations shall be subject to the control of the Engineer.

Before any compaction is started, the surface shall be checked and inequities adjusted; all “drippings,” i.e. fat, sandy accumulations, and all fat spots from any source, shall be removed and replaced by satisfactory material.

In areas where, on account of physical limitations, it is impractical to operate the paving equipment, the Engineer will permit the use of other type spreader or the mixture may be spread and screeded by hand.

The Contractor shall cut to the limits of the area to be repaired a minimum of 150 mm (six (6) inches) beyond each side of the disturbed area or into the existing pavement with a cutting saw. The saw cut shall be vertical and in straight lines. After the pavement has been removed to a depth of 450 mm (eighteen (18) inches) below the existing pavement surface, the roadway base shall be installed, graded and compacted in accordance with the specification for “Processed Aggregate Base (Broken Angular Stone)”. The roadway base shall be placed in layers not to exceed 150 mm (six (6) inches) in depth and to such a depth that after compaction it shall be at the specified depth shown on the plans. Contact surfaces of curbing, manholes, etc. shall be painted with a thin uniform coat of hot asphalt cement or tack coat just before the material is placed against them. Such asphalt cement or tack coat shall not be paid for. Hot-laid bituminous concrete shall be placed evenly and uniformly to a minimum compacted thickness of six (6) inches. The maximum thickness to be placed per course shall be two (2) inches. Immediately before placing the mixture, the road surface shall be cleaned by brooming or as otherwise directed by the Engineer.

Refueling of equipment in such a position that fuel might be spilled on bituminous concrete mixtures already placed or to be placed is prohibited.

Solvents and cleaners for use in cleaning mechanical equipment or hand tools shall be stored well clear of areas paved or to be paved.

Compaction: After spreading and when sufficient set has developed to permit proper compaction, each course shall be compacted by rolling, consisting of initial or breakdown rolling, intermediate rolling and final or finish rolling. Initial rolling shall be performed with a power driven steel wheel tandem or three wheel rollers weighing not less than ten (10) tons. Intermediate rolling shall be done by a power driven steel wheel tandem roller. Final rolling shall be done with a self-propelled pneumatic tire roller equipped with Wide-tread compaction tires capable of exerting an average contact pressure from 60 to 90 pounds per square inch uniformly over the surface, adjusting ballast and tire inflation pressure as required. The Contractor shall furnish evidence regarding tire size, pressure and loading to confirm that the proper contact pressure is being developed and that the loading and contact pressure are uniform for all wheels.

Rolling shall begin at the sides and progress toward the center, parallel to the centerline of the roadway. Alternate trips of the roller shall be terminated in stops at least three feet distant from any preceding stop.

Other rolling procedures may be directed by the Engineer, as conditions may require. Rolling shall be discontinued if the surface shows signs of excessive cracking or displacement and shall be continued later as directed. If it is found that the cracking and displacement continues, the paving operation shall be discontinued until the cause of the condition is corrected.
Rolling shall proceed continuously and in such a manner that all roller marks are eliminated. The rollers shall be in good condition. They shall be operated by experienced roller operators and must be kept in continuous operation as nearly as practicable in such manner that all parts of the pavement shall receive substantially equal compression.

In no case shall the Contractor use methods or equipment, which will result in fractured aggregate or lateral displacement of the material.

In all places inaccessible to a roller, such as adjacent to curbs, headers, gutters, and manholes, the required compression shall be secured with tamps. Depressions which may develop before the completion of the rolling shall be remedied by adding new material to bring such depressions to a true surface. Should any depressions remain after the final compaction has been obtained, new material shall be added to form a true and even surface. All high spots, high joints and other defects shall be adjusted as directed by the Engineer.

Placing of the pavement shall be as nearly continuous as possible and the roller shall pass over the unprotected end of the freshly laid mixture only when laying of the pavement is discontinued or interrupted for an appreciable period and joints shall be formed at such point. Where joints are to be formed, the edge of the existing pavement shall be cut square with the pavement. Before new material is laid, a thin coating of hot asphalt shall be applied to the vertical face of the cut pavement.

Depressions which may develop after initial rolling shall be remedied by scarifying the surface mixture laid and adding new material to bring such depressions to a true surface.

All joints between new and existing pavements shall be sealed with an approved liquid bituminous concrete sealer material.

Protection of the Work: Sections of the newly finished bituminous work shall be protected from traffic to prevent damage to the finished mat.

Pavement Repair Schedule: All disturbed areas shall have processed aggregate base installed to match the road surface immediately after subsurface work is complete and temporary or permanent paving in shall be installed within one (1) week of disturbance.

MILLING, RECLAMATION AND REMOVAL OF BITUMINOUS CONCRETE PAVEMENT

DESCRIPTION

"Mill Bituminous Concrete Pavement" of the thickness specified includes the milling, removal and disposal of existing bituminous concrete pavement within the limits shown on the Plans or where directed by the Engineer.

"Reclaim Bituminous Concrete Pavement" of the thickness specified includes the in-place pulverization of the existing pavement surface and the mixing of the pulverized material in place where shown on the Plans or where directed by the Engineer.

"Remove Bituminous Concrete Pavement" of the thickness specified includes the complete removal and disposal of existing pavement where shown on the Plans or where directed by the Engineer. This work may be accomplished by milling, cold-planing or excavating the entire pavement section.

EQUIPMENT

Methods, equipment and tools to be used shall be approved by the Engineer prior to construction.

The equipment used to mill the pavement shall have a minimum 6 foot cutting width and shall be capable to maintain a minimum speed of ten feet (10') per minute and be able to provide a 2 inch deep cut in one pass. The milling equipment shall be equipped with a built-in automatic grade averaging control system that can control the longitudinal profile and transverse cross slope to a specified result.

The equipment used for reclaiming pavement shall be capable of pulverizing and mixing to a minimum width of six feet (6') and a minimum depth of one foot (1').

Planing machines or grinders shall be self-propelled and capable of grinding pavement material and accurately establishing profile grades within a tolerance of 0.02 foot by reference from either the existing pavement or from independent grade control. It shall have positive means for controlling cross slope elevations. It shall also have an effective means of removing loosened material from the surface and minimizing dust from escaping into the air.

CONSTRUCTION DETAILS

All milled, reclaimed or removed pavement material identified as to be hauled and disposed by the Contractor shall become the property of the Contractor and removed from the site and disposed of in accordance with federal, state and local regulations.

Care shall be taken to avoid damage to existing facilities (curb, sidewalk, driveway apron, utility structures, etc.) within or adjacent to the work. Any existing facilities damaged as a result of the work shall be replaced at the Contractor's expense.

Work shall be such that the milling depth is maintained throughout the project limits. The milled surface shall be free from gouges, excessive longitudinal grooves and ridges, oil film, and other imperfections. Any unsatisfactory surfaces shall be corrected at the Contractor's expense.

Immediately after milling is complete, the pavement surface shall be swept with a sweeper equipped with a water tank or calcium chloride to control dust that is capable of removing excess millings and loose debris.

For removal of pavement, the entire bituminous concrete pavement section shall be removed to the top of granular base material.

A clean, vertical face shall be sawcut at all limits of milling, reclamation or pavement removal.

BITUMINOUS CONCRETE DRIVEWAY

DESCRIPTION

"Bituminous Concrete Driveway" includes the construction of a bituminous concrete surfaced driveway or driveway apron, constructed on a processed aggregate base course in the locations and to the dimensions and details shown on the Plans, as directed by the Engineer and in accordance with these Specifications.

MATERIALS

Processed Aggregate Base shall conform to the requirements of "Processed Aggregate Base" elsewhere in these Specifications.

Bituminous concrete shall meet the requirements of Section M.04, HMA S0.375, of Form 818.

Tack coat to be used on all cold joints shall conform to the requirements of Section M.04.01.5 of Form 818.

Joint seal shall conform to the requirements of Section M.04.01.8 of Form 818.

CONSTRUCTION DETAILS

1. Excavation: Excavation, including removal of any existing sidewalk, driveway, or driveway apron shall be made to the required depth below the finished grade, as shown on the Plans or as directed by the Engineer. All soft and yielding material shall be removed and replaced with suitable material.

2. Forms: When the bituminous concrete is spread by hand, forms shall be used. Forms shall be of metal or wood, straight, free from warp and of sufficient strength to resist springing from the impact of the roller. If of wood, they shall be of two (2) inch surfaced plank except that at sharp curves thinner material may be used; if of metal, they shall be of an approved section. All forms shall be of a depth equal to the depth of the sidewalks or driveways and shall be securely staked, braced, and held firmly to the required line and grade. All forms shall be cleaned and oiled each time they are used.

3. Base Course: Processed Aggregate Base for the base course shall be uniformly spread upon the subgrade to the required depth and thoroughly compacted with a roller weighing not less than 500 pounds.

4. Bituminous Concrete Surface: This surface shall be constructed in accordance with the Plans and details and the requirements of Section 4.06 of Form 818, except that the material may be spread by hand and thoroughly compacted by multiple passes of a roller weighing not less than 500 pounds.

5. Backfilling and Removal of Surplus Material: The sides of the driveway or apron shall be backfilled with suitable material and thoroughly compacted and finished flush with the top of the driveway. All surplus material shall be removed and the site left in a neat and presentable condition to the satisfaction of the Engineer. In sections inaccessible to the roller, the base course, surface course and backfill shall be hand-tamped with tampers

weighing not less than 12 pounds, the face of which shall not exceed 50 square inches in area.

6. Where a joint is formed, the old pavement shall be sawcut square with the pavement in a vertical and horizontal direction. The exposed edge shall receive a thin coating of RS-1 or other approved bitumen. The joint between the new and old pavement shall be sealed with an approved joint sealant.

CONCRETE DRIVEWAY APRON

DESCRIPTION

"Concrete Driveway Apron" includes the construction of concrete driveways and concrete driveway aprons on a prepared processed aggregate base in the locations and to the dimensions and details shown on the Plans, as directed by the Engineer, and in accordance with these Specifications.

MATERIALS

Portland cement, fine and coarse aggregate, air-entraining admixtures and water shall conform to the requirements of Section M.03.01 of Form 816 for Class "F" Concrete.

Processed aggregate base shall conform to the requirements of "Processed Aggregate Base" elsewhere in these Specifications.

Reinforcement shall conform to the requirements of Section M.06.01 of Form 816 for concrete pavement.

Granite stone transition curb and associated concrete and mortar shall conform to the requirements of "Granite Stone Curb" elsewhere in these Specifications.

CONSTRUCTION DETAILS

Construction methods shall conform to the requirement of the Item, "Concrete Sidewalk and Concrete Sidewalk Ramps". The surface shall be finished and marked off as directed. The driveways shall be reinforced as indicated on the Plans. The concrete shall contain not less than five (5) or more than seven (7) percent entrained air at the time the concrete is deposited in the forms.

The Contractor shall sawcut the existing pavement and excavate as necessary to perform the work under this item as shown on the Plans.

Curb transitions shall be provided when concrete driveway aprons are adjacent to existing and proposed curb. Granite stone curb transitions shall be provided adjacent to granite curb and concrete curb transitions shall be provided adjacent to concrete curb and bituminous concrete curb unless approved otherwise by the Engineer.

CONCRETE SIDEWALK AND SIDEWALK RAMPS

DESCRIPTION

"Concrete Sidewalk" of the thickness specified includes the construction of concrete sidewalk on a prepared processed aggregate base course in conformance with the lines, grades, dimensions and details as shown on the Plans, or as directed by the Engineer. It shall also include the sawcutting, removal and disposal of existing sidewalk, steps, ramps or pavement within the excavation limits for "Concrete Sidewalk".

"Concrete Sidewalk and Curb Monolithic" of the thickness specified includes the construction of concrete curb and sidewalk, monolithically poured, on a prepared processed aggregate base course in conformance with the lines, grades, dimensions and details as shown on the Plans, or as directed by the Engineer. It shall also include the sawcutting, removal and disposal of existing sidewalk, steps, ramps or pavement within the excavation limits for "Concrete Sidewalk and Curb Monolithic".

"Reinforced Concrete Sidewalk" of the thickness specified includes the construction of concrete sidewalk reinforced with welded wire fabric on a prepared processed aggregate base course in conformance with the lines, grades, dimensions and details as shown on the Plans, or as directed by the Engineer. It shall also include the sawcutting, removal and disposal of existing sidewalk, steps, ramps or pavement within the excavation limits for "Reinforced Concrete Sidewalk".

"Concrete Sidewalk Ramp" of the thickness specified includes the construction of a concrete ramp on a prepared processed aggregate base course in conformance with the lines, grades, dimensions and details as shown on the Plans, or as directed by the Engineer. It shall also include the sawcutting, removal and disposal of existing sidewalk, steps, ramps or pavement within the excavation limits and installation of detectable warning tiles for "Concrete Sidewalk Ramp".

MATERIALS

1. Concrete

   a. The concrete furnished shall conform in respects to composition, transportation, mixing and placing to Class "F" Concrete as specified in Section M.03.01 of Form 816 or as modified herein.

   b. Test concrete in accordance with AASHTO or ASTM Standard Test Methods as listed herein.

   c. All concrete mixes shall include air entraining and water reducing admixtures and, as needed, a retarder or accelerator. All admixtures must be on the CTDOT approved list.

   d. Entrained air contents shall be maintained as follows:

Nominal Max Aggregate Size	Average Air Content
3/8"	7.5%
1/2"	7.0%
3/4"	6.0%

   A range of ±1.5% from the required average is permissible for field tests.
   Slump at the point of placement shall be 4" ±1".

e. No additional materials will be added to the concrete mix at the job site without the prior approval of the Engineer.

2. Reinforcing

   a. Welded Wire Mesh: WWM shall be used in all driveways and specified sidewalk locations. The WWM shall be W1.4xW1.4 and conform to the latest AASHTO M 55M/M 55-94 "Standard Specifications for Welded Steel Wire Fabric for Concrete Reinforcement."

      Written requests may be made to substitute synthetic fibers such as Fibermesh or approved equal for welded wire mesh with written approval of the Engineer. The addition rate shall be 1.5 lb/cu yard.

   b. Smooth Metal Dowels: Smooth metal dowels shall be ⅝" in diameter and 18 inches in length. All metal dowels shall conform to the requirements of AASHTO M31-92, Grade 60.

   c. Deformed Bars: Deformed bars shall conform to AASHTO M31-92, Grade 60.

   d. Bond Breaker: Bond breaker shall be Reed Wax #100 Emulsion as manufactured by Roger A. Reed, Inc., Reading, MA (1-781-944-4640) or approved equal.

3. Construction/Isolation Joint Material: Joint material shall be one-half (½) inch in thickness, equal in width to the slab thickness and conform to AASHTO M33-93, Asphaltic Expansion Joint Materials.

4. Forms: Forms used shall be straight and firmly supported and staked to the line and grades as shown on the plans or as directed by the Engineer. The forms shall be free from warp and shall be of sufficient strength to resist springing out of shape. All forms shall be cleaned and oiled before use.

5. Curing Materials: A liquid membrane curing compound such as Masterkure by Master Builders or approved equal and meeting AASHTO M148-91 shall be applied in accordance with the manufacturer's instructions over the completed concrete surface area.

6. Processed Aggregate Base (Broken Angular Stone): Processed aggregate base shall conform to the requirements of "Processed Aggregate Base" elsewhere in these Specifications.

7. Granite Stone Transition Curb: Granite stone transition curb and associated concrete and mortar shall conform to the requirements of "Granite Stone Curb" elsewhere in these Specifications.

8. Detectable Warning Tiles: Prefabricated detectable warning tile shall be prefabricated chosen from CTDOT Qualified Product List.

CONSTRUCTION DETAILS

1. Excavation: Excavation, including the removal and disposal of any type of existing sidewalk, curb, ramp, steps or pavement, shall be made to the required depths below the finished grade as shown on the plans or as directed. All soft and yielding material shall be removed and replaced with suitable material.

2. Processed Aggregate Base (Broken Angular Stone): The base course shall be placed in layers not to exceed six inches (6”) in depth and to such a depth that after compaction it shall be at the specified depth below the finished grade of the walk.

3. Forms: Forms shall be straight, free from warp and of sufficient strength to resist springing from the pressure of the concrete. Forms shall be of minimum 5” depth and shall have a flat surface on the top. Forms shall be securely staked, braced and held firmly to the required line and grade and shall be sufficiently tight to prevent leakage of mortar. All forms shall be cleaned and oiled or wetted before concrete is placed against them. Sheet metal templates one-eighth (⅛) inch in thickness, of the full depth and width of the walk, shall be spaced at intervals of fifteen feet (15’) or as directed by the Engineer. If the concrete is placed in alternate sections, these templates shall remain in place until concrete has been placed on both sides of the template. As soon as the concrete has obtained its initial set, the templates shall be removed.

4. Joints

    a. Construction Joints: At maximum intervals of thirty feet (30’), install a construction joint as detailed on the drawings. Install dowels as shown on the drawings. Minimum embedment on each side of the joints shall be six inches (6”). All dowels shall be straight, square on the ends with no burrs. Locate at the center of the slab on 12" centers. Bars must be carefully aligned and square with the form face. Prevent bonding to the concrete on one side of the joint by using a plastic sleeve over the dowel or coat with an approved bond breaker. Alternate protected end on each side of the joints.

        Dowels are also to be installed between new and existing concrete slabs. Where new or repaired walks abut existing concrete sidewalks, the contractor shall drill holes measuring 3/4 of an inch in diameter and twelve (12) inches in depth at 24" on centers into the existing concrete slab. The dowels, dipped in a liquid asphalt and coated with an approved bond breaker or plastic sleeve, shall be set into the existing sidewalk slab prior to the placement of concrete. The dowels are to be level with the latitude pitch of the sidewalk and shall conform to the details of these specifications. Any variations in dowel installation procedures must be approved by the Engineer.

        Other locations to which dowels may be required will be directed by the Engineer.

    b. Control Joints: Follow joint spacing as shown on the drawings. At intervals of approximately fifteen (15) feet, a full control joint shall be provided. A tooled joint, to the depth of 3/8 of an inch, shall be installed at approximately five (5) foot intervals along the sidewalk. The resulting areas should be as square as practical. All joints shall be installed using straight guides set at right angles to the longitudinal direction of the walk.

    c. Isolation Joints will be installed wherever concrete is placed against already installed concrete of structures such a curbing, building, or other, previously existing paving.

If it becomes necessary to adjust the locations, horizontal or vertical dimensions of the above listed items due to interference with utilities or for other valid reasons, the Contractor, with the approval of the Engineer, shall construct said items to the modified dimensions and locations.

5. Concrete Placement and Finishing

   a. Subgrade preparation: The subgrade shall be approved by the Engineer prior to placement of concrete. The grade will be free of soft areas, roots, rubble and large stones. It shall be fully compacted and graded to provide the specified slab thickness within ±¼".
   b. Forms: Align forms as shown on drawings and secure to provide straight edges and uniform curves. Remove only after the concrete has gained sufficient strength to prevent chipping or raveling of the edges.

   c. Where required, install welded wire mesh. Support the mesh on concrete bricks or other supports so that it will remain in the upper third of the slab.

   d. Moisten the subgrade before starting concrete placement to eliminate water loss.

   e. Place continuously, using construction joints at locations shown on the drawings or as approved by the Engineer. If an interruption occurs of a duration that may cause a cold joint, install a construction joint as described in this specification.

   f. Water may be added to the truck mixer to adjust the slump when the discharge begins, only if the concrete is below the specified water cement ratio and maximum slump upon arrival at the job site. Water shall not be added to the batch at any later time. If higher slumps are required, use a high range water reducer such as Rheobuild 1000 by Master Builders or equal as approved by the Engineer.

   g. Screed the concrete to grade, bull float or darbie, consolidate formed edges by spading with a hand float, and leave until edging can begin. Allow to harden sufficiently so that a foot leaves only a slight imprint. Floating should not begin until the water sheen has disappeared. The surface shall be worked and floated with a wooden, aluminum or magnesium float or finishing machine using float blades. The outside edges of the slab shall be edged with one-quarter (¼) inch radius tool.

      The slab shall then be broomed crosswise with a fine hair broom leaving the surface free from all tool marks.

   h. Immediately upon the disappearance of the water sheen following the final finishing and before any marked dehydration or checking occurs, the curing compound shall be applied using an approved spraying device. The sprayer shall deliver a fine spray with uniform coverage. Coverage rate shall be that recommended by the curing compound manufacturer.

   i. The Contractor shall have on the job, at all times, sufficient polyethylene film or waterproof paper to provide complete coverage in the event of rain. Protect the surface if rain occurs before final set or use for curing in the event of a breakdown of the spray equipment.

   j. If rain falls on the newly coated sidewalk before the curing film has dried sufficiently to resist damage, or if the film is damaged in any other manner, the contractor shall reapply same. Treated surfaces shall be protected from all foot or vehicular traffic for a sufficient period of time to prevent damage.

   k. Within 24 hours, spray curing compound on newly poured sidewalks.

6. Reinforcing: Reinforcing of the type specified shall be used in all concrete sidewalk ramps and at concrete sidewalks which cross driveways. Welded wire fabric for concrete reinforcement shall be embedded at mid-depth in the slab.

7. Detectable Warning Tile: All sidewalk ramps shall have detectable warning tiles as shown on the Plan or as directed by the Engineer. The detectable warning tile shall be set directly in poured concrete according to the Plans, the manufacturer's specifications or as directed by the Engineer. The Contractor shall place two 25 pound concrete blocks or sandbags on each tile to prevent the tile from floating after installation in wet concrete. Detectable warning tiles shall be furnished by the Town.
8. Special Conditions

    a. Low Temperature Placements: No concrete is to be placed when air temperature is below 50°F unless additional precautions are taken and prior approval is given by the Engineer. The Engineer must approve all placements below 50°F. No concrete will be placed on frozen sub-grade or at temperatures below 20°F. Concrete exposed to temperatures below 40°F after placement must be protected through the use of insulating blankets, a six (6) inch layer of straw that is maintained in a dry condition by a covering of plastic sheeting, or other appropriate methods. Any concrete placed during cold weather that is damaged because of freezing shall be replaced at the Contractor's own expense.

    b. Special consideration for high temperature placements and rapid drying conditions should be discussed with the Engineer. No additional materials will be added to the concrete mix at the job site without the prior approval of the Engineer.

    c. Where reconstruction of an existing approach walk is required, the reconstructed portion of the approach walk shall match the existing approach walk in color, texture and appearance.

9. Curb Transitions: Curb transitions shall be provided when sidewalk ramps are adjacent to existing and proposed curb. Granite stone curb transitions shall be provided adjacent to granite curb and concrete curb transitions shall be provided adjacent to concrete curb and bituminous concrete curb unless approved otherwise by the Engineer.

10. Backfilling and Removal of Surplus Material: The sides of all finished concrete work shall be backfilled to the limits shown on the drawings or as directed by the Engineer, with suitable material thoroughly compacted and finished flush with the top of the concrete. All surplus material shall be removed and the site left in a neat and presentable condition to the satisfaction of the Engineer.

11. Protection: The Contractor shall protect newly poured concrete surfaces so as to prevent damage from falling objects, vandalism, etc. The Contractor shall repair or remove and replace any damaged or defaced concrete surface at his own expense. Determination to repair or remove and replace will be at the sole discretion of the Engineer.

12. Utility Adjustments: If an existing utility box, valve box or manhole is located within the limits of the new sidewalk or ramp, the Contractor shall be responsible for the coordination and scheduling with the owner of the facility, for the adjustment of the facility to grade, if necessary.

13. Signs: The Contractor shall provide temporary support posts during the construction of new sidewalk for all existing signs within the limits of construction. The Contractor shall also provide a PVC sleeve set flush to the grade of the new sidewalk, at the locations directed by the Engineer, to accommodate sign posts in the new sidewalk.

GRANITE STONE CURB

DESCRIPTION

"Granite Stone Curb" and "Radius Granite Stone Curb" includes the furnishing and installing of straight or curved granite stone curb on a prepared base at the location and to the details shown on the Plans or as directed by the Engineer and in accordance with these Specifications.

"Reset Granite Stone Curb" includes the removal of existing granite stone curb and the resetting of the curb at a new location on a prepared base in accordance with the details shown on the Plans or as directed by the Engineer and in accordance with these Specifications. This work includes reset of both straight and radius granite stone curb.

"Trim and Cut Granite Stone Curb" includes the sawcutting of existing granite stone curb as required to match new curb, sidewalk or apron to existing or where directed by the Engineer. It shall not include the sawcutting of new granite stone curb sections.

"Remove Granite Stone Curb" includes the removal of existing granite stone curb where shown on the Plans or as directed by the Engineer and in accordance with these Specifications. This work includes removal of both straight and radius granite stone curb and return of such curb to the Town when requested.

MATERIALS

All curbing material shall be created from hard and durable granite, light gray in color, free from seams which impair its structural integrity, and of a smooth splitting character. Natural color variations characteristic of the deposit will be permitted. Granite shall come from approved quarries acceptable to the Engineer.

1. Curved Granite Curb

   Type V 6 x 18 curbstones set on a radius of one hundred (100) feet or less shall be cut to the curve required.

   All radius granite stone curb shall be set in a subbase of Class "C" concrete.

2. Straight Granite Stone Curb

   Straight Granite Stone Curb shall be cut to the following dimensions:

Type	Width At Top, Inches	Depth, Inches	Minimum Length, Feet	Minimum Width At Bot. Inches
V 5 x 18	5	18"-22"	4	5

   Straight granite curb shall be set in a subbase of Class "C" concrete at the joints only.

3. Mortar

   Mortar for pointing joints shall conform to Section M.11.04 of Form 817.

4. Concrete

   Class ‘C’ Concrete shall conform to Section M.03.01 of Form 817.

5. Processed Aggregate Base

   Processed Aggregate Base shall conform to the material requirements of the item “Processed Aggregate Base” elsewhere in these Specifications.

CONSTRUCTION DETAILS

1. Delivery

   All granite curb shall be accepted by the Town at the time of delivery and prior to installation.

2. Excavation

   Excavation shall be made of sufficient depth and width to accommodate the processed aggregate base as shown on the Plans. The processed aggregate base shall be compacted to a firm, even surface and shall be approved by the Engineer.

3. Transition Sections

   Roadway Transitions: A six foot (6’) transition section of granite curb shall be installed at all end sections that do not match to other types of curbing. The end section shall match flush with the existing edge of the pavement or the top of adjacent existing curb.

   Driveway Transitions: All transition sections of granite curbing along driveways shall be set in Class "C" concrete and meet the requirements of the Plans.

4. Backfilling

   After all curb is set, the space between it and the wall of the trench shall be backfilled with processed aggregate base material thoroughly tamped to the depth directed, care being taken not to affect the line or grade of the curb. All curbing shall be properly installed and backfilled prior to the placement of the bituminous concrete pavement.

   All radius granite stone curbing shall be set in Class "C" concrete as shown on the Plans.

5. Protection

   The contractor shall protect all curbing until completion and acceptance.

6. Joints

   The maximum joint openings between sections of curbing shall not exceed ½ inch over the entire width of the exposed curb.

   Joints are to be mortared to the full depth and width of the curb, and all excess mortar wiped clean off face of curb. At intervals of fifty feet (50’), one joint shall be left open for expansion purposes.

Joints in straight granite curb sections shall be set in a subbase of Class “C” concrete as shown on the Plan or as directed by the Engineer.

7. Removal

The removal of granite curb shall be made in conformity with the requirements of the plans and as ordered by the Engineer. All concrete, dowels, forms and joint material shall be removed. The base material, if any, may remain in place if the required depth for the materials to be placed in that area is provided. All existing curb which is designated to remain, shall be sawcut at the contract limits or the nearest joint as directed by the Engineer. Sawcut edges shall be protected during construction. Any edges damaged shall be recut and any material required to be placed in that area shall not be measured for payment.

Unless directed otherwise by the Engineer, granite stone curb removed for this project shall be disposed of in accordance with all applicable regulations. No stockpiling of removed material shall be allowed on site.

PRECAST CONCRETE CURB

DESCRIPTION

"Precast Concrete Curb" and "Radius Precast Concrete Curb" includes the furnishing and installation of precast concrete curbing, straight or curved, placed on a prepared subbase in accordance with the dimensions and details shown on the Plans or as directed by the Engineer.

MATERIALS

Precast concrete shall conform to Section M.08.02-4 of Form 818. Concrete shall be Class "PCC04460".

Joint filler shall conform to the requirements of Section M.03.08-2 of Form 818.

The tack coat to be used on all cold joints shall conform to the requirements of Section M.04 of Form 818.

Processed Aggregate Base shall conform to the requirements of "Processed Aggregate Base" elsewhere in these Specifications.

CONSTRUCTION DETAILS

Excavation: Excavation shall be made to the required depth, and the base upon which the curbing is to be set shall be compacted to a firm, even surface.

Placement: Precast concrete curbing units shall be constructed in six (6) foot or longer lengths for straight or curved sections.

Protection: Precast curbing shall not be shipped to the project until the 28 day compressive strength is acquired. Precast curbing that has been damaged shall be removed from the project at the Contractor's expense.

Backfilling: After the curb has been placed, the grading shall be completed to the lines shown on the Plans, or as directed by the Engineer, by refilling to the required elevation with approved material which shall be placed in layers of not over six (6) inches in depth and compacted until firm and solid.

BITUMINOUS CONCRETE CURB

DESCRIPTION

"Bituminous Concrete Curb" of the type specified includes the furnishing and installation of machine laid bituminous concrete, constructed on a prepared bituminous concrete pavement to the dimensions and details shown on the Plans, or as directed by the Engineer, and in conformity with the Specifications.

MATERIALS

Bituminous concrete shall conform to the requirements of Section M.04, Bituminous Class 3, of Form 816.

Tack coat shall conform to the requirements of Section M.04.01.4 of Form 816.

CONSTRUCTION DETAILS

The methods employed in performing the work and all equipment, tools machinery and plant used in handling material and executing any part of the work shall be subject to the approval of the Engineer before the work is started, and whenever found unsatisfactory, it shall be changed and improved as required by the Engineer. All equipment, tools, machinery and plant used must be maintained in a satisfactory working condition. The curbing shall be constructed in accordance with the following requirements:

Prior to the arrival of the mixture on the work, the surface of the pavement where the curbing is to be constructed shall be cleaned of all loose and foreign material. The surface, which shall be perfectly dry and clean at the time the mix is placed, shall be coated with an approved bitumen tack coat just prior to placing the mixture.

On arrival at the site, the mixture shall be transferred from the truck to the hopper of the curbing machine; and the mixture shall be kept clean and free from dirt or foreign materials at all times.

The surface of the curbing shall be tested with a 10-foot straight-edge, and any variation from a true line exceeding one-quarter of an inch (¼") shall be satisfactorily corrected. The only compaction required shall be that obtained by the approved mechanical curbing machine.

Where machine work is impractical, the Engineer may permit hand laid curbing to be constructed.

If the design of the curbing machine is such that the outside wheels operate outside of the curb, the Contractor will be required to obtain a smooth surface by grading and consolidating the area on which the outside wheel of the machine rides, and this work shall be done at his expense.
After the completion of curbing, traffic shall be kept at a safe distance for a period of not less than 24 hours and until the curbing has set sufficiently to prevent damage to the work. Fill material will be placed behind the curb immediately thereafter.

CATCH BASINS AND STORM MANHOLES

DESCRIPTION

"Catch Basin" and "Double Grate Catch Basin" of the type and depth specified shall consist of the construction of a new catch basin and catch basin top in accordance with the Plans and Specifications. It also includes the removal of existing catch basins within the excavation limits or in conflict with the new catch basin location.

"Reset Catch Basin Top (Type) (New Top)" includes removal of existing catch basin tops and furnishing and installing a new catch basin top in accordance with the Plans and Specifications. It also includes reconstructing the existing structure walls as necessary to accommodate the proposed elevations. Curb inlets for new catch basin tops shall match dimensions of adjacent curb.

"Reset Catch Basin Top (Type) (Existing Top)" includes the resetting of the existing catch basin top to grade. It also includes reconstructing the existing structure walls to accommodate the proposed elevations.

"Convert Catch Basin to Manhole" includes all work necessary to reconstruct an existing catch basin to a manhole in accordance with the Plans and Specifications.

"Modify Drop Inlet to Combination Catch Basin/Manhole" includes all work necessary to reconstruct an existing drop inlet structure as shown on the Plans to accommodate a new catch basin top. It also includes furnishing and installing a new manhole top, frame and cover.

"Reconstruct Drainage Structure" includes all work necessary to reconstruct an existing drainage structure as shown on the Plans.

"Storm Manhole" of the type and depth specified includes the construction of a new precast concrete manhole in accordance with the Plans and Specifications.

"Remove Drainage Structure" shall consist of the removal and disposal of an existing drainage structure called out on the plans and backfilling with granular fill.

"Abandon Drainage Structure" shall consist of the abandonment of existing drainage structures where shown on the Plans or directed by the Engineer.

Work under these items shall also include the sawcutting of existing pavement and curb, excavation, backfill and adjustment of existing structures to accommodate resetting of catch basin tops.

MATERIALS

Materials used for construction shall be those indicated on the Plans or as directed by the Engineer and shall conform to Section M.08.02 of Form 816.

Concrete inlets for Type "C" catch basin tops shall be formed to match the adjacent curb dimensions.

Manhole covers shall be cast with the words "TOWN OF MANCHESTER DRAIN" or "MANCHESTER DRAIN".

Protective compound material shall conform to Section M.03.01.11 of Form 816.

Mortar shall conform to Section M.11.04 of Form 816.

Pervious material shall conform to Section M.02.05 of Form 816, 3/4" size on the Gradation Table.

Materials for damp-proofing shall conform to Section M.12.05 of Form 816.

Granular Fill, if required by the Engineer to replace unsuitable material below the excavation limits shown on the plans, shall conform to the requirements of “Granular Fill” elsewhere in these Specifications.

Sand for filling structures to be abandoned shall conform to the requirements of Article M.08.01-21 of Form 816.

Steel sheeting for excavation support systems, if required, shall conform to the requirements of ASTM A328, ASTM A572 or ASTM A690 as appropriate.

CONSTRUCTION DETAILS

These structures shall be constructed in accordance with the requirements contained herein for the character of work involved. The provisions of Section 6.02.03 of Form 816 pertaining to bar reinforcement shall apply except that shop drawings need not be submitted for approval.

The surfaces of the tops of all catch basins, junction boxes and drop inlets shall be given a coat of protective compound material immediately upon completion of the concrete curing period at the rate of .04 gallons per square yard.

All masonry units shall be laid in full mortar beds of at least ½” thickness.

Metal fittings for catch basins, junction boxes, manholes or drop inlets shall be set in full mortar beds or otherwise secured as shown on the plans.

Inlet and outlet pipes shall extend through the walls for a sufficient distance beyond the outside surface to allow for satisfactory connections and the concrete or masonry shall be constructed around them neatly to prevent leakage along their outer surfaces. The pipe shall be cut flush with the inside face of the wall, or as shown on the plans.

If unsuitable material is encountered during the excavation at the base of a structure, then a minimum of 12 inches of granular fill shall be used as a base for the structure.

All structures shall be precast and shall be constructed with at least one row of concrete block between the structure walls and the precast top to accommodate future adjustment.

Frames, covers and tops which are to be reset shall be removed from their present beds, the walls or sides of the basin shall be rebuilt as required to accommodate the new top. The limits of reconstruction of the structure side walls shall be 3’ (measured vertically) unless determined otherwise by the Engineer. At least one row of concrete block shall be placed between the structure walls and the newly placed top.

When directed by the engineer, frames and covers for new manholes located within limits of road reconstruction shall be temporarily set at the binder course elevation and raised to the final course elevation immediately prior to paving.

Structures to be abandoned shall have frames, covers, tops and grates removed and properly disposed of off-site. All pipes in the structure shall be plugged with concrete. The Contractor may substitute bricks with permission of the Engineer. The existing structure shall be removed to a level a minimum of two (2) feet below the surface. The remaining structure shall be filled with sand and compacted. The remaining void shall be backfilled with granular fill to the subgrade elevation of the surface restoration treatment. The portions of the structure removed shall not be used for any other Work performed on this project.

The Contractor shall furnish, put in place and maintain such excavation support systems (i.e. trench boxes, steel plates, steel sheeting, etc.) as may be necessary to support the sides of the excavation and to prevent any movement of earth other than that intended to be accomplished by the excavation. Trench support systems shall be designed to support earth pressures, hydrostatic pressures, equipment and construction loads, and other surcharge loads, to allow safe and expeditious construction with minimal movement or settlement of ground, to prevent damage to, or movement or settlement of, adjacent buildings, structures, or utilities. Such systems shall be installed as may be necessary for the protection of the Work and for the safety of personnel, and shall comply with the safety precautions as outlined in the Associated General Contractors of America, "Manual of Accident Prevention in Construction," the "Occupational Safety and Health Act" of 1970 (OSHA) of latest revision and OSHA Reference: U.S. Dept. Of Labor O.S.H.A. Safety and Health Standards (29 CFR 1926/1910) revised March 5, 1990, Subpart P-Excavations, Trenching & Shoring Selection of Protective Systems, 1926-652 Appendix F.

RESET MANHOLE TO GRADE

DESCRIPTION

"Reset Manhole to Grade (Existing Frame and Cover)" includes the resetting of an existing manhole frame and cover to grade. It also includes reconstructing the existing structure walls and modifying riser sections as required to accommodate proposed elevations.

"Reset Manhole to Grade (New Frame and Cover)" includes the removal of an existing manhole frame and cover and furnishing, installing and adjusting a new manhole frame and cover to grade. It also includes reconstructing the existing structure walls and modifying riser sections as required to accommodate proposed elevations. The Engineer will identify manholes requiring installation of new frame and covers in the field during construction.

MATERIALS

Materials used for reconstruction shall be those indicated on the Plans or as directed by the Engineer and shall conform to Section M.08.02 of Form 816.

Storm manhole covers shall be cast with the words "TOWN OF MANCHESTER DRAIN" or "MANCHESTER DRAIN".

Sanitary sewer manhole frames and covers shall be heavy duty and shall be Model 1027C as manufactured by Campbell Foundry Company, Model 2927E as manufactured by Laperle Foundry Company or Model/Product Numbers 00133872 and 00124811 as manufactured by East Jordan Ironworks.

Sanitary sewer manhole covers shall be cast with the words "MANCHESTER SEWER" and shall be coated with a bitumastic coating. Cast iron shall conform to ASTM A-48 Class 30B or its latest revisions.

Protective compound material shall conform to Section M.03.01.11 of Form 816.

Mortar shall conform to Section M.11.04 of Form 816.

Materials for damp-proofing shall conform to Section M.12.05 of Form 816.

CONSTRUCTION DETAILS

Frames and covers which are to be removed or reset shall be removed from their present beds, the walls or risers of the manhole shall be reconstructed in accordance with the requirements contained herein for the character of work involved to accommodate the new frame elevation. The limits of reconstruction of the structure walls and risers shall be 3' (measured vertically) unless determined otherwise by the Engineer.

All masonry units shall be laid in full mortar beds of at least ½" thickness.

Steel frames shall be set in full mortar beds or otherwise secured as shown on the plans.

All new manhole risers sections shall be precast concrete. Manholes shall be reconstructed with at least one precast concrete riser ring between the structure walls and the manhole frame to accommodate future adjustment. Concrete block or bricks may be used with the approval of the Engineer.

When directed by the engineer, frames and covers for new manholes located within limits of road reconstruction shall be temporarily set at the binder course elevation and raised to the final course elevation immediately prior to paving at no additional cost.

CULVERTS

DESCRIPTION

"Culvert" of the size and type specified includes the furnishing and installing of new pipe culverts and/or relaying existing pipe culverts of the type, size and length called for on the Plans at the locations and to the lines and grades designated on the Plans, or as directed by the Engineer. This item includes other incidental work associated with the installation of pipe culverts, including trench excavation, stockpiling and placement of approved native material as backfill, disposal of native material, furnishing and installing granular fill bedding material, trench support systems, making connections to existing culverts, modifying existing structures to accommodate new pipe, and trench backfilling to the lines and grades designated on the Plans, or as directed by the Engineer.

"Culvert End" of the size and type specified includes the furnishing and installing of new culvert ends at the locations and to the lines and grades designated on the Plans, or as directed by the Engineer, and in conformity with these Specifications. This item includes other incidental work associated with the installation of culvert ends, including excavation, furnishing and compaction of bedding material, and connecting to existing culverts.

"Plug Pipe" shall consist of the plugging of existing pipes with cement masonry where shown on the Plans or as directed by the Engineer.

"Abandon Pipe" shall consist of the abandonment of existing pipes by bulkheading both ends and filling the remainder of the pipe with flowable concrete.

"Remove Pipe" shall consist of the removal and disposal of existing pipes and the proper backfilling of the associated trench.

MATERIALS

Reinforced Concrete Pipe shall conform to Section M.08.01.06 of Form 816. Joint sealant shall conform to the requirements of Section M.08.01.20, "Flexible, Watertight, Rubber-Type Gaskets". Portland cement mortar or bituminous sealers shall not be used for sealing pipe joints.

Slotted reinforced concrete pipe shall conform to the requirements of Section M.08.01.6 of Form 816 and shall be slotted in accordance with AASHTO M175, Type 2 or as shown on the plans.

High density polyethylene (H.D.P.E.) pipe and flared ends shall have a smooth interior and conform to requirements for Corrugated Polyethylene Pipe in Section M.08.01.25 of Form 816.

Ductile iron pipe shall meet the requirements of the latest revision of AWWA C151 (ANSI A21.51). Joint restraints are not required and all joints shall be rubber gasket push-on type manufactured in accordance with the latest revision of AWWA C111 (ANSI A21.11). Pipe shall be supplied with the standard exterior bituminous coating of either coal tar or asphalt base approximately one mil thick. The interior shall be double cement lined in accordance with the latest revision of AWWA C104 (ANSI A21.4), and pipe shall be of thickness Class 52 unless otherwise indicated. Pipe shall be manufactured by American Pipe, Griffin, U.S. Pipe, McWane Ductile or approved equal.

Reinforced concrete culvert ends (R.C.C.E.) shall conform to Section M.08.01.22 of Form 816. Bedding material for reinforced concrete pipe shall conform to the requirements of Section M.08.01.21 of Form 816.

Bedding material for plastic pipe shall be bank run or crushed gravel that conforms to the requirements of Section M.02.01 of Form 816.

Class "A" Concrete shall conform to the requirements of Article M.03.01 of the Form 816.

Flowable concrete fill used for abandoning pipelines shall be excavatable with a maximum 28-day compressive strength of 150 psi. Concrete mix design shall be submitted to the Engineer for review and approval.

Granular fill shall conform to the requirements of the specification “Granular Fill” elsewhere in these Specifications.

Processed Aggregate Base shall conform to the requirements of the specification “Processed Aggregate Base” elsewhere in these Specifications.

Steel sheeting for trench stabilization, if required, shall conform to the requirements of ASTM A328, ASTM A572 or ASTM A690 as appropriate.

CONSTRUCTION DETAILS

Unless otherwise directed by the Engineer, all new or relaid pipe culverts shall be installed in bedding material in accordance with the details and these specifications.

Pipe with an internal diameter of less than 48 inches, including pipe-arch of an equivalent horizontal span, shall be installed in a Type I installation. All plastic pipe and other pipe materials of 48 inches internal diameter or more, including pipe-arch of equivalent horizontal span, shall be installed in a Type II installation.

Type I installation shall consist of installing the pipe, or pipe-arch, in bedding material with a thickness directly under the pipe of four (4) inches (12 inches in rock) and pre-shaped to a height of ten (10) percent of the total height of the pipe. After the pipe has been installed, the trench shall be backfilled with bedding material to a height of twenty-five (25) percent of the total height of the pipe.

Type II installation shall consist of installing the pipe or pipe-arch in bedding material, with a thickness directly under the pipe of four (4) inches (12 inches in rock) and pre-shaped to a height of ten (10) percent of the total height of the pipe. After the pipe has been installed, the trench shall be backfilled with bedding material to a minimum height of twelve (12) inches above the top of the pipe.

Reinforced concrete pipe shall be Class IV with a minimum cover of 2 feet. Class V reinforced concrete pipe shall be installed in locations where 1.5 to 2 feet of cover is achievable and ductile iron pipe shall be installed for pipe with less than 1.5 feet of cover with the approval of the Engineer. All pipe shall have one (1) foot minimum cover.

Where pipe is to be laid below the ground lines, a trench shall be excavated to the required depth, the bottom of which shall be graded to the elevation of the bottom of the bedding material or to afford a uniform firm bearing for the pipe throughout its entire length, whichever the case may be. When rock is encountered, it shall be excavated to not less than 12 inches below the bottom of the pipe, and this depth shall be refilled with compacted bedding material.

Where pipe is to be laid in a fill area, the embankment shall be placed and compacted to an elevation 12 inches above the top of the proposed pipe, whereupon the trench excavation shall be made and the pipe installed.

Where the nature of the foundation is poor, the culvert shall be relocated in firm material if possible. Where this cannot be done, the poor material shall be removed and replaced with a layer of bedding of such depth as the Engineer may direct; or special construction of the character shown on the plans, special provisions or as ordered by the Engineer, may be employed.

The placement of pipe shall start at the downstream end and progress upstream. All pipe shall be carefully laid, true to the lines and grades given, hubs upgrade and with spigot ends fully entered into the adjacent hubs.

The joints in concrete pipe shall be sealed with flexible, watertight rubber-type gaskets conforming to the requirements of Subarticle M.08.01.20. Where shown on the plans or directed by the Engineer, the Contractor shall connect the proposed drainage system(s) with existing drainage structures or pipes. This work shall be performed in a skillful and competent manner.

Pipes shall extend through structure walls for a sufficient distance beyond the outside surface to allow for satisfactory connections and the concrete or masonry shall be constructed around them neatly to prevent leakage along their outer surfaces. The pipe shall be cut flush with the inside face of the structure walls, headwalls and endwalls, or as shown on the plans.

Where shown on the plans or directed by the Engineer, the Contractor shall plug or abandon existing pipes with cement masonry.

Where shown on the plans to remove pipe, the Contractor shall remove and dispose of existing pipes to the limits shown on the Plans or as directed by the Engineer.

Trenches shall be backfilled above the bedding material with material approved by the Engineer. All excavated materials not required or unsuitable for backfill, (i.e., clay, silt, sand, muck, gravel, hardpan, loose shale, loose stone in masses and boulders greater than 5” in diameter) shall be removed and properly disposed of by the Contractor. Unsuitable soils that exhibit obvious evidence of heavy contamination or have been identified as containing elevated concentrations of contamination should be removed and stockpiled for characterization and possible off-site disposal. If contaminated soils are stockpiled best management practices must be employed to reduce human and environmental exposure to the stockpiled materials. Granular fill shall be used to replace all unsuitable material.

Any utility service or lateral damaged by the Contractor shall be repaired or replaced at the Contractor’s expense.

The Contractor shall furnish, put in place and maintain such trench support systems (i.e., trench boxes, steel plates, steel sheeting, etc.) as may be necessary to support the sides of the excavation and to prevent any movement of earth other than that intended to be accomplished by the excavation. Trench support systems shall be designed to support earth pressures, hydrostatic pressures, equipment and construction loads, and other surcharge loads, to allow safe and expeditious construction with minimal movement or settlement of ground, to prevent damage to, or movement or settlement of, adjacent buildings, structures, or utilities. Such systems shall be installed as may be necessary for the protection of the Work and for the safety of personnel, and shall comply with the safety precautions as outlined in the Associated General Contractors of America, "Manual of Accident Prevention in Construction," the "Occupational Safety and Health Act" of 1970 (OSHA) of latest revision and OSHA Reference: U.S. Dept. Of Labor O.S.H.A. Safety and Health Standards (29 CFR

1926/1910) revised March 5, 1990, Subpart P-Excavations, Trenching & Shoring Selection of Protective Systems, 1926-652 Appendix F.

CONCRETE ENDWALLS

DESCRIPTION

"Concrete Endwalls" includes all work necessary to construct endwalls, wingwalls or other miscellaneous concrete structures in accordance with the lines, grades, dimensions and details shown on the plans.

MATERIALS

Concrete shall be Class "A" concrete conforming to Section M.03.01 of Form 816.

CONSTRUCTION DETAILS

Concrete endwalls shall be built in accordance with the requirements of Section M.05.06.03 of Form 816

UNDERDRAIN

DESCRIPTION

This work shall include the furnishing and installing of underdrain as shown on the plans or designated by the Engineer.

MATERIALS

1. Pipe: The Contractor shall use slotted corrugated high-density polyethylene (HDPE) pipe, Type SP, conforming to the requirements of Section M.08.01-25. Unless otherwise specified, pipe shall have a minimum inside diameter of six inches (6”). Number and spacing of perforations shall be approved by the Engineer. Pipe shall conform to the requirements of Section M.08.01 of Form 816.

2. Cleanout: Cleanouts shall be ADS Nyloplast inline drain with cast iron grate with size to match pipe diameter.

3. Stone: 3/8” crushed stone shall be clean, tough, durable, screened gravel meeting the graduation requirements noted in Section M.01 of Form 816. On-half inch or ¾” crushed stone may be used with the approval of the Engineer.

4. Granular Fill: Granular fill shall conform to the requirements of “Granular Fill” elsewhere in these Specifications.

5. Bedding Material: Bedding material shall consist of sand or sandy soil, all of which passes a 3/8” sieve, and not more than ten percent (10%) passes a No. 200 sieve. Native material may be used if it meets these requirements.

6. Filter fabric will be similar or equal to Mirafi 140 or Dupont Typar.

7. Processed Aggregate Base shall conform to the requirements of the section entitled “Processed Aggregate Base” elsewhere in these Specifications.

CONSTRUCTION DETAILS

The trench for the underdrain shall be constructed to dimensions shown on the plans or as ordered by the Engineer. Where trench bottom is unsuitable, the Contractor shall remove the unsuitable materials to the depth directed by the Engineer or until suitable material is encountered and then replace with compacted processed gravel (layers not to exceed 12") to the prescribed elevation. Processed aggregate will be placed and compacted to a finish depth of 6" or as directed by the Engineer. Filter fabric will be carefully spread over the processed aggregate and up the sides of the trench. The 1/2" stone for the trench shall be placed to a depth of six (6) inches and tamped. The pipe with perforations, up or down as specified, shall be carefully laid and aligned on top of the aggregated bed. Pipe shall be tightly joined in the manner and using appropriate joining materials recommended by the manufacturer.

After the pipe has been installed, the stone shall be placed carefully around and over the pipe to a height of and a minimum of six (6) inches above the top of the pipe. Filter fabric will then be lapped

full width over the 1/2" stone. The remainder of the trench may be backfilled with suitable material removed during the excavation, or with gravel fill around and over the pipe to a height of 12" above the top of the pipe. The remainder of the trench shall be filled with processed aggregate and tamped in layers as shown on the plans.

The entire length of each pipe shall be wrapped with the geotextile fabric and the seams lapped and welded or bonded. Where the seams of geotextile are not welded or bonded, they shall be lapped to a minimum width equal to the diameter of the pipe for six (6) inch pipe and larger and a minimum of six (6) inches for smaller pipe.

In all cases where subbase material or gravel is to be placed over the pipe, a layer of at least twelve (12) inches of subbase material or gravel shall be placed over the underdrain immediately after its completion.

METAL BEAM RAIL

DESCRIPTION

"Metal Beam Rail" of the type specified includes the furnishing and installation of metal beam railing, consisting of a single or double line of rail elements fastened to steel posts with or without rub rail as shown on the Plans. It shall be erected in the locations sited and fabricated in conformity with the designations, dimensions, and details shown on the Plans or as directed by the Engineer.

"End Anchorage" of the type specified includes the furnishing and installation of metal beam railing anchorage systems as shown on the Plans. It shall be erected in the locations sited and fabricated in conformity with the designations, dimensions, and details shown on the Plans or as directed by the Engineer.

"Remove Metal Beam Rail" includes the removal and disposal of existing metal beam rail and end anchorages in their entirety where shown on the Plans or where directed by the Engineer.

MATERIALS

The materials for metal beam rail and anchorages shall conform to the requirements of Article M.10.02 of Form 818.

Metal beam rail delineators shall conform to the requirements of Article M.18.09 and M.18.13.

CONSTRUCTION DETAILS

Metal beam rail shall be installed in accordance with Section 9.10.03 of Form 818.

CHAIN LINK FENCE

DESCRIPTION

"Chain Link Fence" of the size and type specified includes the furnishing and installation of vinyl coated woven wire fencing of the type and height specified and supported by metal posts where indicated on the plans or as ordered and in conformity with these Specifications.

"Remove Chain Link Fence" includes the removal of existing chain link fence at the locations shown on the Plans or where directed by the Engineer.

"Reset Chain Link Fence" shall consist of the removal and resetting of existing chain link fence at the locations shown on the Plans or where directed by the Engineer.

"Chain Link Gate" of the size and type specified includes the furnishing and installation of vinyl coated woven wire gates of the width and height specified and supported by metal posts where indicated on the plans or as ordered and in conformity with these Specifications.

MATERIALS

Chain Link Fence Fabric

Provide fabric in one-piece heights measured between top and bottom of outer edge or selvage knuckle or twist according to "CLFMI Product Manual" and requirements indicated below:

1. Fabric Height: As shown on the Plans
2. Wire: 8 gauge (finished)
3. Mesh Size: 1 ¾ inches; unless otherwise shown on the Plans
4. Zinc Coated Fabric: ASTM A392, Type II, Class 2, 2.0 oz/sf
5. Polymer Coated Fabric: ASTM F 668, Class 2b over zinc coated wire
   Color: Black

Fence Framework

Framework, including rails; braces and line, terminal and corner posts shall conform to ASTM F 1043. Provide members with minimum dimensions and wall thickness according to ASTM F 1043 or ASTM F 1083 based on the following:

1. Fence Height: As shown on the Plans
2. Heavy-Industrial-Strength Material: Group IA, round steel pipe, Schedule 40
3. Post/pipe dimensions: As shown on the Plans
4. Coating: Powder coated black for all framework

Swing Gates

1. Posts/Frames: Round powder coated black tubular steel (ASTM F900)
2. Width: Gate leaf width as shown on Plans
3. Framework: Based on gate fabric height as indicated
4. Hinges: 180-degree outward swing, self-closing
5. Latch: Permitting operation from both sides of gate
6. All hardware shall be powder coated black.

Fittings
Fittings shall conform to ASTM F626 and as follows:

1. Provide post caps for each post.
2. Provide rail and brace ends for each gate, corner, pull and end post
3. Rail Fittings: Top rail sleeves shall be pressed or round steel tubing not less than 6 inches long; Provide line and corner boulevard clamps for connecting intermediate and bottom rails to posts.
4. Tension Bars: Steel; Provide one bar for each gate and end post and two for each corner and pull post.
5. Tie Wire: Vinyl coated or powder coated No. 6 gage steel wire
6. Coating: Powder coated black for all fittings.

Grout and Anchoring Cement

1. Non-shrink Grout: Factory-packaged, non-staining, non-corrosive grout complying with ASTM C 1107, specifically for exterior applications.
2. Anchoring Cement: Factory packaged, non-shrink, non-staining, hydraulic-controlled expansion cement formulation for mixing with water at project site to create pourable anchoring, patching and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating, and that is recommended by manufacturer for exterior applications.

CONSTRUCTION DETAILS

Stake locations of fence lines, gates and terminal posts for approval by the Engineer prior to installation.

Install chain link fence according to ASTM F 567 and as specified herein.

Drill or hand excavate post holes to diameters and spacing indicated on Plan.

Set posts plumb in concrete and vibrate or tamp for consolidation. Exposed concrete shall be flush to grade. Install dome caps on top of posts.

For fence five (5) feet in height or less where runs of fence are 100 feet over, end posts shall be braced. All corner posts where runs are over 100 feet in either direction shall have two braces. For fence more than five (5) feet in height, end posts shall be braced; and corner posts shall have two braces.

Pull posts with two braces shall be provided for all heights where changes in horizontal or vertical alignment of ten (10) degrees or more occur.

Where braces are required, they shall be spaced as indicated on the plans.

Braces shall be securely fastened to posts by suitable connections and trussed from line post back to post requiring bracing with 3/8-inch round rod, having a turnbuckle adjustment.

The top rail shall pass through the base of the line post cap and form a continuous brace from end to end of fence. The rail shall be provided with couplings approximately every 20 feet. The couplings shall be of the outside-sleeve type and at least seven inches (7”) long, one (1) coupling in every five (5) to have a heavy spring to take up expansion and contraction in the top rail.

Install intermediate rails if shown on the Plan. Secure to posts with fittings.

Fabric shall be fastened to line posts with bands or wire clamps of No. 6-gage PVC coated steel wire 4-3/4 inches long. These bands shall be spaced approximately 14 inches apart. The fabric shall be fastened to the top rail with tie wires after the fabric has been pulled taut. These tie wires shall be 6-1/4 inches long, spaced approximately 24 inches apart.

Where it is not practicable to conform the fence to the general contour of the ground, as at ditches, channels, etc., the opening beneath the fence shall be enclosed with chain link fabric and sufficiently braced to preclude access, but not to restrict the flow of water.

Install gates in accordance with manufacturer's written instructions, level, plumb and secure for full opening without interference. Gates in fences over 6' high shall include transom section. Attach hardware using tamper-resistant or concealed means. Adjust gates to operate smoothly, easily and quietly, free of binding, warp, excessive deflection, distortion or malfunction throughout the entire operating range. Confirm that latches and locks engage accurately and securely without forcing. Lubricate hardware and other moving parts.

Remove all traces of dirt and soiled areas in accordance with the manufacturer's recommendations or as directed by the Engineer.

WATER MAIN

DESCRIPTION

"Water Main" of the size and type specified shall consist of the furnishing and installation water pipe; and disinfection, flushing and testing of all ductile iron water pipe, fittings, valves, joint restraint and other appurtenances as indicated on the Plans or directed by the Engineer. Placement and compaction of backfill, filter fabric, bedding material, trench support systems, abandonment of existing water mains, valves, blow-offs, and salvage of indicated items shall also be included as part of this item. Existing water mains located within the excavation limits of new main will not be measured separately for payment, but shall be considered as included in the unit price bid for the new water main.

Fittings, valves and joint restraints of the size and type specified shall consist of furnishing and installing these appurtenances where shown on the plans or as directed by the Engineer.

"Cut and Cap Water Main" shall include excavation; cutting and capping of existing pipe to remain in service; and backfilling where shown on the plans or as directed by the Engineer.

Refer to the General Conditions elsewhere in these specifications for licensing requirements for any person involved in the installation of a water main and/or appurtenances.

MATERIALS

Unless otherwise specified by the Engineer, the pipe, fittings, valves and appurtenances to be utilized in this work shall be new and unused, shall be of the types and materials specified herein and shall meet the requirements specified herein. All material found during the progress of the work to have cracks, flaws or other defects will be rejected by the Engineer. All defective materials shall be promptly removed from the work site and replaced at no additional expense to the Town.

Ductile Iron Pipe: Ductile iron pipe shall meet the requirements of the latest revision of AWWA C151 (ANSI A21.51). Joints shall be "Tyton Joint" or "Fastite Joint" design, rubber gasket push-on type manufactured in accordance with the latest revision of AWWA C111 (ANSI A21.11). Pipe shall be supplied with the standard exterior bituminous coating of either coal tar or asphalt base approximately one mil thick. The interior shall be double cement lined in accordance with the latest revision of AWWA C104 (ANSI A21.4), and pipe shall be of thickness Class 52 unless otherwise indicated. Pipe shall be manufactured by Griffin, U.S. Pipe, McWane Ductile, American or approved equal.

Joint Restraint: Restrained bell and spigot push on joints for ductile iron pipe shall meet the requirements of the latest revision of AWWA C151 (ANSI A21.51). Each restrained bell and spigot joint shall be achieved using a single rubber FIELD LOK 350 gasket, a Series 1700 Megalug push on pipe bell restraint harness as manufactured by Ebaa Iron, Inc., Eastland, Texas, a Fast-Grip Gasket, or approved equal, manufactured in accordance with the latest revision of AWWA C111 (ANSI A21.11). The bell and spigot push on joint restraint provided shall be sufficient to restrain working pressures of 350 psi.

Mechanical joint thrust restraining glands, for valves and fittings, shall be the Megalug Series 1100, manufactured by Ebaa Iron, Eastland, Texas, Ford series 1400, or approved equal.

Tiebolts, tiebolt nuts, rod couplings, threaded rods and rod nuts, retainer clamps, and round flat washers may be used for restrained joints and shall be steel meeting the requirements of ASTM A 36-77a. These components shall be similar or equal to the following figure numbers manufactured by Star National Products.

ITEM	STAR FIGURE
Tiebolt	7, 7-5, or SST 7
Tiebolt and Rod Nut	8
Rod Coupling	10
Retainer Clamp	11
Threaded Rod	12
Round Flat Washer	17

Gate Valves:

All gate valves shall be resilient wedge gate valves and shall meet the requirements of AWWA C515 of latest revision. The valve body, bonnet, stuffing box and operating nut shall be composed of ASTM A536 ductile iron. The body and bonnet shall adhere to the minimum wall thickness as set forth in AWWA C515-09 Table 2, Section 4.4.1.2. Wall thicknesses that do not meet AWWA minimums are not acceptable. Valves shall have non-rising stems, mechanical joint ends meeting the requirements of AWWA C111 of latest revision and have O-ring stem seals. Each valve shall be supplied with two (2) sets of mechanical joint retainer glands. Valves shall be wrench-operated and rated at a minimum working pressure of 200 psi. **Valves shall be right opening (clockwise) or left opening (counterclockwise) as indicated on the plans or as directed by the Engineer, which is dependent on where they are located in Town.**

Wedge shall be encapsulated in EPDM rubber per AWWA C515. Valve shall be coated with a fusion bonded epoxy-resin both inside and outside. Coating shall be a minimum of 10 mils thick and be in full compliance with (i.e. meet or exceed) all requirements of the latest revision of AWWA C550. All exterior nuts and bolts shall be 5/8” minimum diameter and shall be Type 18-8, Series 300, stainless steel at a minimum.

Resilient wedge gate valves shall be only those models and manufacturers listed below.

Manufacturer	Model
American Flow Control	Series 2500
AVK	Series 65
Clow	2638
M & H	Style 7000
Mueller	A-2361
U.S. Pipe	A-USP1

Butterfly Valves:

Valves shall be wrench operated, non-rising stem with O-ring stem seals and have mechanical joints on both ends. Each valve shall be supplied with two (2) sets of mechanical joint retainer glands. Valves shall meet or exceed the requirements of the latest revision of AWWA C504. Valves shall have epoxy coated cast iron bodies with mechanical joint ends complying with the latest revisions of ANSI A21.11 (AWWA C111). Valves shall be a minimum Class 150B and suitable for a maximum nonshock shutoff pressure of 140 psi. The valves shall provide bubble-tight shutoff at 150 psi when tested in accordance with AWWA C504. Valve discs shall seat at an angle of 90 degrees to the axis of the pipe.

Valve seats shall be molded natural rubber. Rubber seats may be attached to the body or the disc. If the rubber seat is attached to the disc, the seat ring on the body shall be of stainless steel. The valve disc shall be of either case Ni-Resist of cast iron Class 40 conforming to ASTM A48. Rubber seats mounted on the disc shall be securely clamped to the disc. All clamps, retaining rings, and their fasteners shall be Series 300 stainless steel.

The valve shaft shall be Type 300 stainless steel or carbon steel with stainless steel joints. The valve disc and shaft connection shall be by means of mechanically secured taper pins extending through the disc and shaft. Taper pins, lockwashers and nuts shall be 18-8 stainless steel. The shaft seals shall be designed for the use of standard "O" -ring seals.

The manual operating mechanism shall be firmly fixed to the valve body and shall be rated at 450 lb. The operator shall be permanently lubricated, shall be totally enclosed with a cast iron case. The operator shall be suitable for submersion. The operator shall have adjustable threaded collars at each end of stroke. **Valves shall be right opening (clockwise) or left opening (counterclockwise) as indicated on the plans or as directed by the Engineer, which is dependent on where they are located in Town.**

Butterfly Valves shall be only those models and manufacturers listed below.

Manufacturer	Model
Mueller	Lineseal III
M & H	Style 450

Tapping Sleeve and Valve TYPE I (CIP):

Tapping sleeves shall consist of a full body two-piece ductile iron or cast iron sleeve/tee with mechanical joint ends on the run and a flanged end on the branch. Each sleeve shall be supplied with two (2) sets of mechanical joint retainer glands. Tapping valves shall be resilient wedge gate valves meeting the requirements described below. The tapping valve shall have one flanged end and one mechanical joint end.

Valves shall be wrench operated, non-rising stem with O-ring stem seals. Each valve shall be supplied with one (1) set of type I-Mechanical Joint Retainer Glands. **Valves shall be right opening (clockwise) or left opening (counterclockwise) as indicated on the plans or as directed by the Engineer, which is dependent on where they are located in Town.**

Wedge shall be encapsulated in molded rubber.

Valve shall be coated with a fusion bonded epoxy-resin both inside and outside. Coating shall be a minimum of 10 mils thick and be in full compliance with (i.e. meet or exceed) all requirements of the latest revision of AWWA C550.

Valves and joints shall be in full compliance with (i.e. meet or exceed) all requirements of the latest revision of AWWA C515 and AWWA C111 respectively.

Valves shall be only those models and manufacturers listed below.

Manufacturer	Model
American Flow Control	Series 2500
AVK	Series 65
Clow	2638
M & H	Style 7000
Mueller	A-2361
U.S. Pipe	A-USP1

Tapping sleeves shall be manufactured by U.S. Pipe, Mueller, American Flow Control or approved equal.

Tapping Sleeve and Valve TYPE II (DIP):

Tapping sleeve shall consist of a stainless steel body with either a stainless steel or carbon steel integral mechanical joint outlet flange. Gasket shall be full circumference. Tapping valves shall be resilient wedge gate valves meeting the requirements described below. The tapping valve shall have mechanical joint ends.

Valves shall be wrench operated, non-rising stem with O-ring stem steals. Each valve shall be supplied with two (2) sets of mechanical joint retainer glands. **Valves shall be right opening (clockwise) or left opening (counterclockwise) as indicated on the plans or as directed by the Engineer, which is dependent on where they are located in Town.**

Wedge shall be encapsulated in molded rubber.

Valve shall be coated with a fusion bonded epoxy-resin both inside and outside. Coating shall be a minimum of 10 mils thick and be in full compliance with (i.e. meet or exceed) all requirements of the latest revision of AWWA C550.

Valves and joints shall be in full compliance with (i.e. meet or exceed) all requirements of the latest revision of AWWA C515 and AWWA C111 respectively.

Valves shall be only those models and manufacturers listed below.

Manufacturer	Model
American Flow Control	Series 2500
AVK	Series 65
Clow	2638
M & H	Style 7000
Mueller	A-2361
U.S. Pipe	A-USP1

Tapping sleeves shall be only those models and manufacturers listed below.

Manufacturer	Model
Ford	FAST-MJ
JCM	439 or 469
Smith-Blair	662-MJ or 663-MJ

Blow offs: Blow offs shall be 2” in diameter with a 30” pipe length, as manufactured by Wedge Manufacturing, Ansonia, CT., or approved equal.

Valve Boxes: Valve boxes shall be 5-1/4”, consisting of a base and adjustable slide type top section with top flange and cover that is adjustable from 4' to 5'. Valve boxes shall be made of centrifugally spun iron with ¼” uniform wall thickness. Box cover shall have the word "WATER" cast on top. Valve boxes shall be coated with heavy bituminous coating and be manufactured in the United States or Canada by Water Quality Products, Bibby Ste. Croix, Charlotte, Tyler, Bingham and Taylor, or approved equal.

Fittings: Fittings, including mechanical joint plugs and caps, shall be ductile iron meeting the requirements of AWWA C110 (ANSI A21.10) with mechanical joints in conformance with AWWA C111 (ANSI A21.11). Fittings shall have a minimum pressure rating of 350 psi and shall have an inside lining of cement-mortar in accordance with AWWA C104 (ANSI A21.4). Compact fittings meeting the requirements of AWWA C153 (ANSI A21.53) of latest revision may be used. Fittings shall have an asphalt coating both inside and outside, and be manufactured in the United States or Canada by Griffin, Tyler, U.S. Pipe, Sigma, Clow, Union or approved equal.

Sleeves: Sleeves for connecting new mains to existing mains shall be mechanical joint solid sleeves with the mechanical joint ends restrained by the means of retainer glands. Solid sleeves shall meet the requirements of the latest revision of AWWA C110 (ANSI A21.10) and shall be Model F-1014 as manufactured by the Clow Corporation, Oak Brook, Illinois, or approved equal.

Connecting sleeves for connecting new water mains to existing metal lined cement mains (stovepipe) shall be Model 227 as manufactured by Rockwell, Pittsburgh, PA or approved equal.

Couplings: Couplings for connecting new main to oversized cast iron pipe shall be Rockwell Model 441 Cast Transition Couplings, or approved equal. These

couplings shall be used only when oversized cast iron pipe is encountered which does not allow the use of solid sleeves.

Concrete: Concrete for thrust blocks, pipe cradles, sealing abandoned pipe, etc., shall conform to the requirements of the pertinent section of these Specifications.

Polyethylene Wrap: Polyethylene wrap for fittings with poured concrete thrust blocks shall meet the requirements for the latest revision of AWWA C105.

Pipe Insulation: Insulation boards for water main pipe shall be closed cell, extruded polystyrene foam meeting ASTM C578, manufactured by Thermal Foams Inc., Buffalo, NY., or 2" thick Cellular Glass Insulation meeting the requirements of the latest revision of ASTM C552 with an aluminum jacket. Insulation shall be Foamglas Cellular Glass manufactured by Pittsburgh Corning, Pittsburgh, PA., or approved equal.

Bedding Material: Bedding material shall be as indicated on the Plans and shall meet the requirements of Article M.08.01-21 for sand, Article M.02.01-1 for crushed stone, and Article M.02.01-2 (Grading "C") of Form 817 for bank run gravel.

Backfill: Backfill material above bedding material shall be suitable material from the excavation which is free from large or frozen lumps of soil, wood or other extraneous material or, if directed by the Engineer, shall be approved backfill material meeting the requirements of Article M.02.06 (Grading "B") of Form 817.

Filter Fabric: Filter fabric shall be a non-woven fabric similar or equal to Mirafi 140 as manufactured by Celanese Fibers Marketing Company, Bidim C22 as manufactured by Monsanto Textiles Company or approved equal.

Warning Tape: Underground pipe warning (marking) tape shall be plastic and metallic-coated to permit detection by a magnetic sensing device. The tape shall be blue in color, not less than 3 inches in width, and shall have the words "CAUTION - BURIED WATER MAIN BELOW" repeated along the full length of the tape in letters not less than 1" high permanently fused into the tape. Pipe marking tape shall be "Terra-Tape" detectable pipe marking tape as manufactured by Reef Industries, Inc., Houston, Texas or approved equal.

Steel Sheeting: Steel sheeting for trench stabilization, if required, shall conform to the requirements of ASTM A328, ASTM A572 or ASTM A690 as appropriate.

Pavement Markings: Pavement markings installed to replace disturbed markings shall be painted, match the size and color of existing markings, and meet the requirements of "Painted Pavement Markings" as defined in the pertinent sections of these Specifications.

CONSTRUCTION DETAILS

General

Trench excavation and surface restoration shall conform to the requirements of the pertinent section of these Specifications. Water mains shall only be installed in trench conditions; embankment conditions will not be permitted.

Ductile iron pipe, fittings and valves shall be installed as detailed and directed, and in full accordance with the latest revision of AWWA C600, manufacturer's recommendations, and accepted best practice, with the below listed qualifications and clarifications. The methods employed in performing the work, and all equipment, tools and machinery used in handling material and executing any part of the work shall be subject to the approval of the Engineer before the work is started and, whenever found unsatisfactory, shall be changed and improved as required by the Engineer. All equipment, tools and machinery used shall be maintained in a satisfactory working condition.

It shall be the responsibility of the Contractor to coordinate his work schedule, where required, with that of the Manchester Water Department through the Engineer. The Contractor shall provide a minimum seventy-two (72) hour notice for all water main shutdowns required to complete the proposed work.

At all installations where connection is to be made by gating off sections of main which are normally open, the excavation may be required to be made the day before work is to start on the installation with all material on hand. The work shall be done as quickly as possible so that normal operation of the system will be interrupted a minimum amount of time. Any required operating of valves for this work will be performed by personnel of the Manchester Water Department, and ample notice shall be given to the Engineer so that a minimum of two (2) full working days notice may be given to any user whose service will be discontinued for any reason. **BECAUSE OF THE NATURE AND SCHEDULES OF CERTAIN CUSTOMERS, IT MAY BE NECESSARY FOR WORK TO BE DONE OUTSIDE OF NORMAL WORKING HOURS IF SERVICE INTERRUPTION IS REQUIRED.** The Contractor shall be responsible for coordinating his work with said customers and the Manchester Water Department with the approval of the Engineer. If the work extends beyond normal working hours of the Water and Sewer Department, the Contractor shall be responsible for paying Department employees at their prevailing overtime wage rate, as well as prevailing usage rate for vehicles and other equipment which are utilized.

Proper implements, tools and facilities shall be provided and used by the Contractor for the safe and convenient performance of the work. All pipe, fittings and valves shall be lowered into the trench with a suitable device that will not damage protective coatings and lining. Under no circumstances shall water main material be dropped or dumped into the trench. Any damaged lining, coating or wrapping shall be satisfactorily repaired or replaced.

Every precaution shall be taken to prevent foreign matter from entering the pipe while it is being placed in the line. If the pipe laying crew cannot put the pipe into the trench and in place without getting earth into it, the Engineer may require that before lowering the pipe into the trench, a heavy, tightly woven canvas bag of suitable size be placed over each end and left there until the connection is to be made to the adjacent pipe. If necessary, the line shall be swabbed or flushed out to remove all foreign matter prior to testing.

Before joining lengths of push-on pipe, the inside of the bell and the outside of the spigot shall be thoroughly cleaned to remove oil, grit, excess coating and other foreign matter.

Pipe shall be laid with bell ends being in the direction of laying unless otherwise directed by the Engineer. When pipe is laid on a grade of 10 percent or greater, laying shall start at the bottom and shall proceed upward with the bell ends of the pipe upgrade.

The cutting of pipe for inserting valves, fittings or closure pieces shall be done in a neat manner without damage to the pipe or cement lining and so as to leave a smooth end at right angles to the axis of the pipe.

The deflection at pipe joints to accommodate changes in horizontal or vertical alignment shall be in accordance with the recommendations of the manufacturer. Where bends are called for on the plans, a standard bend may be used with any additional deflection required accomplished by deflecting joints on adjacent pipes.

Bends shall be used only at the locations shown on the plans or at other locations approved by the Engineer.

Underground valves shall rest on concrete masonry units. Valve boxes shall not transmit shock or stress to the valve and shall be centered and plumb over the wrench nut of the valve. The valve box cover shall be flush with the surface of the finished pavement or such other level as may be directed.

Valves set with a depth to operating nut greater than 6 feet shall be equipped with extension stems providing an operating nut depth of 4.5 feet. Extension stems shall be installed such as to preclude accidental disconnection from the valve, shall stand plumb and shall be supported at the upper end with a centering device attached to the stem or valve box.

Water main installed with less than 4.5 feet of cover must be insulated unless approved otherwise by the Engineer. Insulated water main must have 2.5 feet of minimum cover.

Water main shall be installed with a minimum 2 feet of clearance from existing structures unless indicated otherwise on the plans or directed by the Engineer.

Care shall be taken not to excavate below the depths required to perform the Work. The Contractor shall furnish and employ such trench boxes, steel plates, shores, braces, sheeting, pumps, etc., as may be necessary for the protection of property, proper completion of the Work and the safety of the public and employees of the Contractor and the Town. All bracing, sheeting, etc., shall be removed when no longer required for the construction or safety of the Work.

All excavated materials not required or unsuitable for backfill, (i.e., clay, silt, sand, muck, gravel, hardpan, loose shale, loose stone in masses and boulders greater than 5” in diameter) shall be removed and properly disposed of by the Contractor. Unsuitable soils that exhibit obvious evidence of heavy contamination or have been identified as containing elevated concentrations of contamination should be removed and stockpiled for characterization and possible off-site disposal. If contaminated soils are stockpiled best management practices must be employed to reduce human and environmental exposure to the stockpiled materials. Granular fill shall be used to replace all unsuitable material.

The trench shall be excavated to the depth required and so as to provide a uniform and continuous bearing and support for the pipe on solid and undisturbed ground except that bell depressions shall be provided at each joint to permit the joint to be made properly. Further, it will not be permissible to disturb and otherwise damage the finished surface over a maximum length of eighteen (18) inches near the middle of each length of pipe by the withdrawal of pipe slings or other lifting tackle. Any part of the bottom of the trench excavated below the specified grade shall be corrected with approved material and thoroughly compacted as directed by the Engineer. The finished trench bottom shall be

prepared accurately by means of hand tools.

The Contractor shall furnish, put in place and maintain such trench support systems (i.e. trench boxes, steel plates, steel sheeting, etc.) as may be necessary to support the sides of the excavation and to prevent any movement of earth other than that intended to be accomplished by the excavation. Trench support systems shall be designed to support earth pressures, hydrostatic pressures, equipment and construction loads, and other surcharge loads, to allow safe and expeditious construction with minimal movement or settlement of ground, to prevent damage to, or movement or settlement of, adjacent buildings, structures, or utilities. Such systems shall be installed as may be necessary for the protection of the Work and for the safety of personnel, and shall comply with the safety precautions as outlined in the Associated General Contractors of America, "Manual of Accident Prevention in Construction," the "Occupational Safety and Health Act" of 1970 (OSHA) of latest revision and OSHA Reference: U.S. Dept. Of Labor O.S.H.A. Safety and Health Standards (29 CFR 1926/1910) revised March 5, 1990, Subpart P-Excavations, Trenching & Shoring Selection of Protective Systems, 1926-652 Appendix F.

To insure proper conditions at all times during construction, the Contractor shall provide and maintain ample means and devices with which to intercept and/or remove promptly and dispose properly of all water entering excavations. Excavations shall be kept dry until the structures, pipes and appurtenances to be built therein have been completed to such extent that they will not be floated or otherwise damaged. All water pumped or drained from the Work shall be disposed of in a suitable manner without undue interference with other work or damage to pavements, other surfaces or property. Prior to discharge, the Contractor shall be responsible for removing all particulate matter which may be deposited in a stream or storm drainage system. The Contractor shall submit his proposed methods or procedures to the Engineer for approval. The Contractor shall be responsible for complying with all Federal, State and Town regulations which may be associated with said discharges.

Bedding material installed in all trenches shall be backfilled by hand from the bottom of the trench to the centerline of the pipe in layers of three (3) inches, compacted by tamping to at least ninety-five percent (95%) of maximum dry density at optimum moisture content as determined in accordance with the requirements of Method D of ASTM Test Method D-1557 (latest revision). Bedding material shall be deposited in the trench for its full width on each side of the pipe, fittings and appurtenances simultaneously. Care shall be taken that the fill is made compact and tight under the rounded lower half of the pipe. Iron tools suitable for tamping material under and on sides of pipe shall be used, and sufficient space for this tamping shall be provided. In general, wooden sticks, shovel handles and similar make-shift devices will not be considered as suitable tamping tools for use on sides of pipe.

From the centerline of the pipe, fittings and appurtenances to a depth of one (1) foot above the top of the pipe, the trench shall be backfilled by hand or by approved mechanical methods. Compaction shall not be less than ninety five percent (95%) of maximum dry density as determined by ASTM Test Method D-1557 (latest revision). The Contractor shall use special care in placing this portion of the backfill so as to avoid damaging or moving the pipe. This layer of backfill shall be consolidated by means of hand held vibratory compactors.

From one (1) foot above the pipe, the remainder of the backfill shall be placed and compacted in one (1) foot lifts. Each layer shall be compacted to not less than ninety five percent (95%) of maximum dry density as determined by ASTM Test Method D-1557 (latest revision).

Compaction methods shall be submitted in writing to and approved by the Engineer prior to commencement of any work.

There is no guarantee that all excavation can be done by use of machinery. In some cases, the pipe location may preclude the use of machinery. In this event, the Contractor will be required to perform this Work at the same unit price bid in his proposal.

Thrust Restraint

Poured concrete thrust blocks shall be provided at all horizontal bends, mechanical joint caps and tees and all locations indicated on the plans. Joints at fittings where thrust blocks are poured shall be wrapped with polyethylene. All mechanical joints (i.e., valves and fittings) shall be restrained by means of ductile iron retainer glands except where rod type restraint is specifically called for on the plans or ordered by the Engineer. Push-on joint restrainers shall be used on all push-on pipe joints for a distance of 27 feet on each side of all retainer glands. No more than one pipe joint shall be allowed within that 27 feet of pipe. Concrete shall be mixed and placed in accordance with the pertinent section of these Specifications.

Restraint of push-on joints shall be accomplished by means of using FIELD LOK 350 gaskets or approved equal push-on joint restrainers. The push-on pipe joint restrainers shall be installed in accordance with the manufacturer's recommendations.

Mechanical joint restrainer glands shall be installed by first tightening the tee head bolts and then making the set screws finger-tight against the pipe. All set screws shall be torqued to manufacturer's recommendations, proceeding alternately on opposite sides of the pipe.

At mechanical joints to be restrained by rods, the proper number of tee head bolts for the particular pipe size shall be removed and replaced with tiebolts. Tiebolts with washers shall be used on bell flange slots. The mechanical joint gland shall be restrained by nuts on the threaded portion of the tiebolts. Joint restraint shall be accomplished by placing threaded rods through corresponding tiebolts at glands on each end of the length to be restrained and by running nuts on the rods until tension is obtained. Four-inch, six-inch and eight-inch joints shall be restrained by two rods; 10-inch, 12-inch and 16-inch joints shall be restrained by four rods.

The Contractor shall be responsible for providing any temporary thrust restraint which may be required.

Connections to Existing Mains

Where connections are to be made between new water mains and existing water mains, any unspecified materials required shall be utilized only after inspection and approval by the Engineer. All connections between new mains and existing mains shall be made only at such times as, and in a manner, approved by the Engineer. The approximate locations of connections between new mains and existing mains are shown on the drawings; the exact locations will be determined in the field by the Engineer.

The cutting of an existing water main where connection is to be made to a new water main shall be done in a neat manner so as to leave a smooth end at right angles to the axis of the pipe. The open end of the section of existing water main to be abandoned shall be sealed with concrete before backfilling a minimum of 5' from the new facilities.

Abandonment of Existing Facilities

Abandonment of water facilities shall be as described on the plans. All open ends of abandoned pipelines or conduits which are created or exposed by the Contractor and will not be removed from the roadway, shall be sealed with concrete before backfilling. Valves to be abandoned shall be closed (unless otherwise indicated on the Plans) and the valve box tops shall be removed and

properly disposed of. Where the plans call for salvaging existing water main and appurtenances, materials shall be delivered to the Water Department at the former Line Street Water Treatment Plant.

Leakage Testing

Leakage testing shall be performed on all cleaned and lined water mains as well as new installations where it is not possible to perform a pressure test. Leakage testing shall consist of a visual inspection of all new facilities and connections under system pressure. The Contractor shall furnish any temporary thrust restraint required for testing and any other apparatus and personnel necessary to conduct the test at no cost to the Town. All visual leaks shall be repaired by the Contractor at his own expense regardless of the amount of leakage. Any defective pipe, fitting, valve or hydrant discovered as a consequence of this test shall become the property of the Contractor and shall be removed from the job site and replaced at the Contractor's expense with sound material. When hydrants are in the test section, the test shall be made against the closed hydrant valve with the auxiliary gate valve open.

Any section failing the test shall be retested after the repairs have been made. The test shall be repeated until satisfactory to the Engineer. The main shall be disinfected again if so directed by the Engineer.

Any required coordination between the Contractor and the Manchester Water Department shall be coordinated through the Engineer and shall be the responsibility of the Contractor.

Disinfection

Disinfection shall be carried out in accordance with Method 2 under Methods of Disinfecting Pipe in the Connecticut State Department of Health's Bulletin, "Protection and Disinfection of Water Works Pipes and Structures", as required by Section 19-13-B47 of the Connecticut State Sanitary Code.

Coordination with the Manchester Water Department through the Engineer will be necessary and shall be the responsibility of the Contractor.

Water mains less than 24-inches in diameter and up to 2,500 feet in length may be disinfected using the Tablet Method instead of the Continuous Feed Method. Disinfection using the Tablet Method shall be performed in accordance with the most current version of AWWA Standard C651. Chemicals used in the Tablet Method shall meet the requirements of AWWA B300 of latest revision and shall be certified to ANSI/NSF Standard 60. The Tablet Method shall not be used if trench water or foreign material has entered the main.

When disinfecting using the Continuous Feed Method, mains shall be completely flushed after the leakage test until all evidence of sediment is removed. A sodium hypochlorite solution or a mixture of calcium hypochlorite and water shall be applied, with a proper regulating device at the beginning of the pipe section to be disinfected, through a corporation stop in the newly lined pipe. Hypochlorites utilized in this work shall meet the requirements of AWWA B300 of latest revision.

Water from the existing distribution system entering the newly lined pipe shall be controlled to flow slowly during the application of hypochlorite. The rate of sodium hypochlorite application shall be in such proportion to the rate of water flowing through the pipe that the treated water entering the newly lined pipe will have a concentration of chlorine residual of 50 parts per million. There shall be a retention period of at least twenty-four (24) hours and preferably more. The non-spore forming organisms shall be destroyed, and the chlorine residual after the retention period at the extremity of the pipe shall be at least ten parts per million. When disinfecting newly lined and/or installed water

pipe involving more than one valved section, all valves shall be operated while the pipeline is filled with the disinfecting agent. Hydrants and other appurtenances shall also be operated for disinfection.

Final Flushing and Testing

After disinfecting for the minimum retention period, the pipe section shall be flushed until, upon test, the quality of the water, both chemically and bacteriologically, is equal to the quality of the water served to the public from the existing water supply. The procedure shall be repeated if necessary until the water from the pipe section is satisfactory.

Care must be exercised when disposing of water with high free chlorine residuals and shall be performed in a manner that will not adversely impact the environment. Disposal of highly chlorinated water to storm sewers shall be avoided without neutralization of the chlorine residual. Neutralization of the chlorine residual remaining in the water can be accomplished by application of a neutralization chemical. Chlorine neutralization methods and equipment shall be submitted to the Engineer for approval. Discharge of highly chlorinated water directly to the sanitary sewer maybe permitted in cases where surface discharge will pose a safety risk to the general public.

Tests to determine the chlorine residual and the quality of the water in the new pipeline will be performed by the Manchester Water Department. It shall be the responsibility of the Contractor to coordinate with the Water Department to arrange for the testing at the proper time. No less than twenty-four (24) hour notice shall be given when tests are to be performed.

Where connections are to be made between new water mains and existing water mains after disinfection and flushing are completed, new materials shall be swabbed with a suitable hypochlorite solution.

Pressure Testing

Newly installed water mains shall be pressure tested as directed by the Engineer. Pressure testing and leakage testing shall be carried out in accordance with the appropriate paragraphs of Section 4 of the latest revision of ANSI/AWWA C600 with the following clarifications and qualifications.

All testing shall be performed after backfilling the completed pipeline. Before testing, the Contractor shall submit in writing to the Engineer, his proposed method of testing the completed pipeline. Testing shall begin only after approval by the Engineer of the proposed methods. Any required coordination with the Water Department shall be conducted through the Engineer and shall be the responsibility of the Contractor.

All new sections of water main shall be hydrostatically tested at a pressure of 150 pounds per square inch for a period of at least two hours. "Pressurization" and "air removal" shall be accomplished as specified in Sections 4.1.2 and 4.1.3 of the latest revision of ANSI/AWWA C600. After the test pressure is applied, any defective pipe, fitting, valve or hydrant discovered as a consequence of this pressure test shall become the property of the Contractor and shall be removed from the job site and replaced at the Contractor's expense with sound material. The test shall be repeated until satisfactory to the Engineer.

A leakage test shall be conducted concurrently with the pressure test. The Contractor shall furnish all material, equipment, tools, labor and incidentals necessary to conduct the test.

Leakage will be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within 5 psi of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water. No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{SD(P)^{1/2}}{133{,}200}$$

L= Allowable leakage in gallons per hour
S= Length of the pipe tested, in feet
D= The nominal diameter of the pipe in inches
P= The average test pressure during the leakage test in pounds per square inch, gage (use 150 pounds per square inch)

When testing against closed metal-seated valves, an additional leakage per closed valve of 0.0078 gallons per hour per inch of nominal valve size will be allowed.

When hydrants are in the test section, the test shall be made against the closed hydrant valve (with the auxiliary gate valve open).

If any test of pipe laid discloses leakage greater than that specified above, the Contractor shall, at his own expense, locate and repair the defective materials until the leakage is within the specified allowance. All visible leaks shall be repaired regardless of the amount of leakage.

Any temporary thrust restraint required for testing sections of completed water main installation and later removed as directed by the Engineer shall be provided by the Contractor at no additional cost to the Town.

WATER SERVICE

DESCRIPTION

"Copper Service" of the size specified, includes the furnishing and installation of new water services where shown on the plans or as directed by the Engineer. It includes, but is not limited to, furnishing and installing corporation stops, service saddles, curb stops, curb boxes and copper tubing; testing and disinfection; tapping of the water main; abandonment or removal of existing service; and excavation and backfill.

"Copper Service to Building/Replumb Meter" of the size specified, includes furnishing and installing new copper piping and fittings and relocating and replumbing existing water meter within existing buildings as necessary to connect new copper services, abandonment of existing water service entrance in basement as directed by the Engineer, and all of the work defined above for "Copper Service". It also includes, but is not limited to, securing a "Building Permit" for the work internal to the building.

"Reconnect Copper Service" includes reconnecting ¾", 1" and 2" existing services to a new water main. It includes, but is not limited to furnishing and installing corporation stops and service saddles; tapping of water main; abandonment or removal of existing service (between old main and new main); excavation and backfill; and extension of existing copper services to a new main with the use of couplings only where approved by the Engineer.

"Interior Water Piping" of the size and type specified shall consist of the furnishing and installation of water piping within building structures including all required fittings, valves and other appurtenances, removing pipes, supporting pipes to remain and capping pipe ends as indicated on the Plans or directed by the Engineer.

"Abandon Water Service" includes the abandoning of existing water services **only where specifically shown on the Plan**. It is intended to be used only where the existing service to be abandoned is not located close to the new service being installed or the existing service to be abandoned is no longer required. Abandoning or removing existing services located within the trench excavation limits for new services will not be measured separately for payment, but its costs shall be considered as included in the unit price bid for "Copper Service" of the size specified or "Copper Service to Building/Replumb Meter" of the size specified.

"Abandon Water Service in Building" shall consist of the abandonment of existing water service pipes within building structures by furnishing and installation all required fittings, valves and other appurtenances, removing pipes, supporting pipes to remain and capping pipe ends as directed by the Engineer.

Contact the Town for licensing requirements for any person involved in the installation of a water main and/or appurtenances.

MATERIALS

Corporation Stop: Corporation Stops shall have a male iron pipe thread inlet, pack or quick joint connection for copper tubing outlet, a ball style valve, and shall meet the requirements of ANSI/AWWA C800 with latest revisions. Brass shall be "no-lead brass" meeting the requirements of USEPA's Reduction of Lead in Drinking Water Act. The corporation stop shall be a one (1) inch or two (2)

inch: Model No. FB1100-4-NL, FB1100-4-Q-NL, FB1100-7-NL or FB1100-7-Q-NL as manufactured by the Ford Meter Box Co., Inc., Wabash, IN.; Model No. P-25028N or B-25028N as manufactured by Mueller Co., Decatur, IL.; or Model No. NL 74704B-22, NL 74704BT or NL 74704BQ as manufactured by A.Y. McDonald Mfg. Co., Dubuque, IA.

Service Saddle: The service saddle shall have a double strap with a one (1) inch iron pipe thread tapping, and shall be one of the following: Model FCD202 manufactured by the Ford Meter Box Company, Inc., Wabash, Indiana, Model JCM 406 by JCM Industries, Inc., Nash, Texas, Model 317 by Smith-Blair, Inc., Texarkana, Arkansas, or Model 202NS by Romac Industries, Inc., Bothell, WA.

Copper Tubing: Water service lines shall be Type K seamless copper tubing of one (1) inch or two (2) inch nominal diameter. Tubing shall meet the requirements of ASTM Specification B 88 of latest revision.

Couplings: Couplings for reconnecting existing ¾", 1", 1¼", 1½" and 2" copper, brass or galvanized steel services shall be compression couplings meeting the requirements of ANSI/AWWA C800 with latest revisions. Brass shall be "no-lead brass" meeting the requirements of the USEPA's Reduction of Lead in Drinking Water Act. Couplings shall be Model No. C44-XX-NL or C44-XX-Q-NL as manufactured by Ford Meter Box Co., Inc., Wabash, IN.; Model No. P-15403N or H-15403N as manufactured by Mueller Co., Decatur, IL.; Model No. 74758-22, 74758T or 74758Q as manufactured by A.Y. McDonald Mfg. Co., Dubuque, IA. Couplings used for connections to other pipe sizes and materials shall be approved by the Engineer.

Curb Stop: Curb Stops shall meet the requirements of ANSI/AWWA C800 with latest revisions. Brass shall be "no-lead brass" meeting the requirements of the USEPA's Reduction of Lead in Drinking Water Act. The curb stop shall be a one (1) inch or two (2) inch: Model No. B44-444-NL, B44-444-Q-NL, B44-777-NL or B44-777-Q-NL as manufactured by Ford Meter Box Co., Inc., Wabash, IN.; Model No. P-25209N or B-25209N as manufactured by Mueller Co., Decatur, IL.; or Model No. 76100-22, 76100T or 76100Q as manufactured by A.Y. McDonald Mfg. Co., Dubuque, IA.

Curb Box: The curb box shall be the extension type with a 42" or 45" stationary rod. Box shall be adjustable from 4' to 5' and be provided with a foot piece for 2" services. Curb boxes shall be manufactured in North America by Mueller, Ford, A.Y. McDonald, Sames, Trumball, Bibby St. Croix, Fonderie La Roche or approved equal. Only curb boxes manufactured in North America will be accepted. The upper sections of slide type curb boxes shall have drop type cover with the word "WATER" or "W" cast on top and shall be a 2-hole Erie style. Valve boxes shall be installed for curb boxes located in paved areas and sidewalk, and for blow offs, and shall meet the requirements of "Valve Boxes" as defined in the pertinent sections of these Specifications.

Backflow Preventer: Backflow preventers shall be Watts Series 009 with air gap assembly or approved equal.

Pavement Markings: Pavement markings installed to replace disturbed markings shall be painted, match the size and color of existing markings, and meet the requirements of

"Painted Pavement Markings" as defined in the pertinent sections of these Specifications.

CONSTRUCTION DETAILS

The Contractor shall be responsible for all materials and work required for water service installations, but he will coordinate all activities with the Manchester Water Department. When temporary discontinuance of service is required to accomplish service replacement, the Contractor shall notify the customer and the Manchester Water Department two (2) full work days in advance of the discontinuance. He shall have all materials on hand necessary to do the work and shall perform as much excavation and installation of new materials as possible in advance to minimize the time water will be shut off.

Trench excavation, backfill, testing, disinfection and surface restoration required for water service installation shall be carried out in accordance with the pertinent section of these Technical Specifications.

Tapping ductile iron pipe, installation of corporation stops, curb stops, curb boxes and backflow preventers, and appurtenant work, shall be done in conformity with manufacturer's recommendations and accepted best practice and shall be subject to approval by the Engineer.

Valve boxes shall be installed for curb boxes located in paved areas and sidewalk, and for blow offs, and shall be installed as specified for "Valve Boxes" as defined in the pertinent sections of these Specifications.

Copper tubing shall be installed as indicated on the plans and in accordance with the pertinent sections of these Technical Specifications. There shall be no couplings installed on the water service between the water main and the building being served unless approved otherwise by the Engineer.

The location of couplings installed on the water service shall be approved by the Engineer prior to installation. Couplings shall not be located below any building or structure foundation, sidewalk, steps, decks or in other locations that may inhibit access to the water service for future maintenance and repair.

Where existing water services are to be replaced in place, the Contractor shall have the option of pulling the new copper service through the existing service. The copper service pipe which is pulled shall be a continuous length of pipe; no couplings shall be utilized to join together two or more lengths of pipe which are to be pulled. Any service which has been installed by pulling shall be subjected to a pressure test of 150 psi for 15 minutes prior to acceptance. Methodology for installation shall be approved by the Engineer.

Where existing water services are to be replaced, the existing curb stop shall be replaced, and a new copper service installed to the new water main at a minimum depth of 4.5 feet as indicated on the plans.

Where excavations are to be made in grass covered areas, loam and topsoil shall be carefully removed and separately stored to be used again. If the Contractor prefers not to separate surface materials he shall furnish, as directed by the Engineer, loam and topsoil at least equal in quality to that excavated.

The Contractor shall be fully responsible for damage done to trees and shrubs as a result of this work. It shall be the Contractor's responsibility to preserve existing trees and shrubs, including those

temporarily removed where necessary. All trees and shrubs that are removed, killed, or that have, in the opinion of the Engineer, suffered significant permanent damage shall be replaced, at no additional costs, in an acceptable manner with trees or shrubs approved by the Engineer.

Where it appears as though permanent damage to existing trees and shrubs is unavoidable, the Contractor may petition the Engineer to request moving the curb stop and box from the location specified. The Contractor shall not be allowed to vary the curb stop and box location from that specified herein and as shown on the Plans without specific permission of the Engineer.

Where existing water services are to be abandoned, the existing corporation stop shall be closed and the existing pipe shall be disconnected from the corporation stop.

Reconnection of existing copper services shall apply to ¾", 1" or 2" services only. Any reconnection shall consist of the tapping of a new corporation in accordance with the pertinent sections of these Technical Specifications. Whenever possible, the existing copper tubing shall be reused for reconnection to the new corporation. If for any reason the existing copper cannot be reused without the insertion of a coupling, the Engineer shall be notified immediately.

Reconnection of existing copper services shall also include installing copper tubing and couplings to extend existing copper services that are deemed to be in good condition from the old main to the new main. This work shall only be allowed where approved by the Engineer.

The Contractor will be responsible for obtaining a “Building Permit” from the Town of Manchester Building Department for work associated with the items “Copper Service”, “Copper Service to Building/Replumb Meter”, and “Interior Water Piping”.

HYDRANT ASSEMBLY

DESCRIPTION

"Hydrant Assembly" of the type required includes the furnishing and installation of new fire hydrant assemblies off a new water main where shown on the plans or directed by the Engineer. It shall include, but not be limited to, trench excavation and backfill, furnishing and installation of the hydrant lead complete with hydrant tee, thrust block, pipe, fittings, auxiliary gate valve, mechanical joint retainer glands, push-on joint restrainers and furnishing and installation of the hydrant with concrete masonry units, drainage stone and painting after installation.

"Hydrant Assembly with Anchor Tee and Valve" of the size and type required includes the furnishing and installation of new fire hydrant assemblies off an existing water main by means of installing an anchor tee and valve where shown on the plans or as directed by the Engineer. It shall include, but not be limited to, trench excavation and backfill, furnishing and installation of the hydrant lead complete with anchor tee and auxiliary gate valve, thrust block, pipe, fittings, mechanical joint retainer glands, push-on joint restrainers, cutting, removal anddisposal of existing water main, and furnishing and installation of the hydrant with concrete masonry units, drainage stone and painting after installation.

"Hydrant Assembly with Tapping Sleeve and Valve" of the size and type required includes the furnishing and installation of new fire hydrant assemblies off an existing water main by means of tapping sleeve and valve where shown on the plans or as directed by the Engineer. It shall include, but not be limited to, trench excavation and backfill, furnishing and installation of the hydrant lead complete with tapping sleeve and auxiliary gate valve, thrust block, pipe, fittings, mechanical joint retainer glands, push-on joint restrainers, cutting, removal and disposal of existing water main, and furnishing and installation of the hydrant with concrete masonry units, drainage stone and painting after installation.

"Remove Hydrant Assembly" includes the removal of existing hydrant assemblies where shown on the plans or as directed by the Engineer. It shall include, but not be limited to, salvaging the existing hydrant; removing the existing hydrant tee from the main and replacing with new cement-lined ductile iron pipe connected via solid sleeves; removing the valve box from the road and sealing the open ends of the existing hydrant lead with concrete.

"Replace Hydrant Assembly" includes the furnishing and installation of new fire hydrant assemblies to replace existing where shown on the plans or as directed by the Engineer. It shall include, but not be limited to, trench excavation and backfill, furnishing and installation of the hydrant lead complete with hydrant tee, thrust block, pipe, fittings, auxiliary gate valve, mechanical joint retainer glands, push-on joint restrainers, furnishing and installation of the hydrant with concrete masonry unit, drainage stone and painting after installation; removing the existing hydrant assembly and salvaging the existing hydrant.

"Relocate Hydrant Assembly" includes the removal, storage, protection, reinstallation of existing fire hydrant assemblies on the water distribution system, drainage stone and painting after installation.

MATERIALS

Hydrants: Hydrants shall be dry-barrel, post-type hydrants, with compression shut-offs which open with the pressure. Hydrants shall meet the requirements of AWWA C502. They shall have a main valve opening of 5-1/4 inches and have a 6-inch mechanical joint inlet. Bury length shall be 5-1/2 feet. Two 2-

1/2 inch hose and one 4-1/2 inch pumper nozzles shall be provided in standard nozzle arrangement. Outlet nozzle threads shall meet the requirements of ANSI B26, "National Standard Fire-Hose Coupling Screw Threads." Hydrants shall be of break flange construction, shall have 0-ring seals and **shall be right opening (clockwise) or left opening (counter clockwise) as indicated on the plans or as directed by the Engineer, which is dependent on where they are located in Town.**

Interior and exterior coatings shall meet the requirements of the latest revision of AWWA C502, and the color for that portion of the hydrant above the ground line shall be as directed by the Manchester Water Department.

In addition, that portion of each hydrant below finished grade shall be given a coating of hot bitumastic material, equal to that used for exterior coating of pipe and fittings, prior to installation. A drain outlet is required. Hydrants shall be Eddy Model F-2640 manufactured by Clow Corporation, Bensenville, Illinois, the Pacer Model WB-67 with 16" traffic section manufactured by Waterous, South St. Paul, Minnesota, the Metropolitan 250-Model 94 manufactured by U.S.Pipe and Foundry Co., Birmingham, AL., or Super Centurion 250 by Mueller Co., Decatur, IL. Hydrants shall be installed so as to maintain an 18-inch nozzle height above finished grade without use of extension sections.

The type of hydrant to be installed shall be determined in the field by the Engineer.

Ductile Iron Pipe: Ductile iron push-on joint pipe shall meet the requirements specified in the pertinent section of these Technical Specifications.

Fittings: Mechanical joint fittings, exterior and interior coatings, and valve boxes shall meet the requirements specified in the pertinent section of these Technical Specifications.

Anchor Tee: Mechanical joint anchor tees shall be used to connect the hydrant lead to the water main.

Auxiliary Gate Valves: All auxiliary gate valves shall be resilient wedge gate valves and shall meet the requirements specified in the pertinent section of these Technical Specifications. **Auxiliary gate valves shall be right opening (clockwise) or left opening (counterclockwise) as indicated on the plans or as directed by the Engineer, which is dependent on where they are located in Town.**

Tapping Sleeves and Valves: All tapping sleeve and valve configurations and installations shall meet the requirements specified in the pertinent section of these Technical Specifications.

Hydrant Paint: Paint for hydrants shall be high performance industrial coating alkyd enamel. Paint shall have a high gloss finish. Paint colors shall be Fire Hydrant Red (245385) for left-opening (counter clockwise) hydrants or Yellow (245488) for right-opening (clockwise) hydrants as manufactured by Rust-Oleum Corporation or approved equal. Surface preparation and paint application

after hydrant installation shall be in accordance with the manufacturer's recommendations.

Concrete: Concrete shall meet the requirements of Section M.03.01 of Form 816 for Class "A." Precast concrete masonry units shall meet the requirements of ASTM C139.

Bedding Material: Three-quarter inch crushed stone shall meet the gradation requirements specified for stone and gravel in Section M.01.01 of Form 816.

Joint Restraint: Mechanical joint retainer glands and push-on joint restrainers shall meet the requirements specified in the pertinent section of these Technical Specifications.

Connecting Sleeves: Sleeves for connecting new water mains to existing water mains shall be as described in the pertinent section of these Technical Specifications.

CONSTRUCTION DETAILS

Trench excavation and backfill, installation of water main and appurtenances, testing, disinfection, pavement repair and surface restoration will be carried out as defined in the pertinent sections of these Technical Specifications.

Fire hydrants shall be provided and located as shown on the plans or as directed by the Engineer. Installation shall be as detailed on the plans and as defined in these Technical Specifications.

Hydrants shall stand plumb with the center a minimum of 2'-6" from the face of curb or edge of road. Hydrant nozzles shall be parallel with, or at right angles to the road, with the pumper nozzle facing the road. Hydrants shall be set to the established grade with a 5-1/2 foot bury and with nozzles 18 inches above the ground or as directed by the Engineer without the use of extension sections. It is the Contractor's responsibility to ensure final nozzle height is based on the finished grades shown on the plans and shall request clarification from the Engineer if proposed grades are unclear.

A mechanical joint offset or two 1/8 bends shall be utilized in the hydrant lead to achieve the proper grade of the fire hydrant when the depth of the water main does not permit these requirements to be met using only straight pipe. Offset or bends shall be located as close to the auxiliary gate valve as field conditions permit.

Auxiliary gate valves shall be set in accordance with the requirements of the pertinent section of these Technical Specifications. Depth of bury shall be as shown on the plans.

Tapping sleeve and auxiliary gate valves shall be installed in accordance with requirements of the pertinent section of these Technical Specifications.

All mechanical joints in hydrant leads shall have ductile iron retainer glands.

All push-on joints in hydrant leads shall have push-on joint restrainers.

A poured concrete thrust block shall be provided behind the hydrant. The thrust block shall rest against undisturbed earth and shall not obstruct the hydrant drain.

A concrete collar shall be poured around the hydrant barrel as indicated on the plans.

The Contractor shall place and secure a burlap bag or plastic bag over each new hydrant indicating the hydrant is “out-of service” and shall be responsible for maintaining this identification until the hydrant is put into service, at which time the cover shall be removed and disposed of.

All existing hydrants that are removed or replaced shall be salvaged. The hydrants shall be delivered to the Water Department facilities on Line Street, Manchester. The Contractor shall be responsible for properly unloading all salvaged materials.

Where the plans call for existing hydrants to be removed (but not replaced), the existing hydrant shall be salvaged and the existing hydrant tee shall be removed from the main and replaced with new cement-lined ductile iron pipe connected to the existing main using solid sleeves. The valve box shall be removed from the road and the open ends of the existing hydrant lead shall be sealed with concrete.

Where the plans call for existing hydrants to be replaced, the existing hydrant shall be salvaged and the existing hydrant tee shall be removed from the main. The existing hydrant assembly shall be replaced with a new hydrant assembly in accordance with the provisions of this section.

Where excavations are to be made in grass covered areas, loam and topsoil shall be carefully removed and separately stored to be used again. If the Contractor prefers not to separate surface materials he shall furnish, as directed by the Engineer, loam and topsoil at least equal in quality to that excavated.

Hydrants shall be painted after installation entirely red or yellow based on the opening direction as specified herein.

AIR RELEASE VALVE MANHOLE

DESCRIPTION

"Air Release Valve Manhole" includes the furnishing and installation of all materials necessary for the construction of an air release valve and manhole as indicated on the plans or directed by the Engineer. It includes, but is not limited to: trench excavation and backfill and the furnishing and installing pipe, fittings, air release valve, precast concrete manhole and drainage stone.

MATERIALS

Precast manhole sections shall be similar or equal to that shown on the plans and shall conform to ASTM C-478 and C-443 (joint).

Precast concrete masonry units shall meet the requirements of ASTM C139.

Brick shall conform to ASTM Specifications C-32 for sewer brick, grade MS.

Standard mortar shall consist of one (1) part cement and two (2) parts clean sand. No lime shall be added to the mortar.

Manhole frames and covers located within paved areas shall be heavy duty and shall be Model 1027C as manufactured by Campbell Foundry Company, Model 2927E as manufactured by Laperle Foundry Company or Model/Product Numbers 00133872 and 00124811 as manufactured by East Jordan Ironworks.

Manhole frames and covers located within unpaved areas shall be heavy duty and water-tight (bolted and gasketed) with ½" stainless steel bolts and shall be Model 1502 as manufactured by Campbell Foundry Company, Model 6502 as manufactured by Laperle Foundry Company or Model/Product Numbers 00124872 and 0124872W03 as manufactured by East Jordan Ironworks.

The cover shall be cast with the words "MANCHESTER WATER". Cast iron shall conform to ASTM A-48 Class 30B or its latest revisions. Frames and covers shall be coated with a bitumastic coating.

Coating for exterior surfaces of all manholes shall be bituminous waterproofing material. The material shall be Minwax Fibrous Brush Coat made by Minwax Co., New York, New York; Tremco 121 Foundation Coating made by the Tremco Manufacturing Company, Cleveland, Ohio; Bitumastic Black Solution made by the Koppers Company, Inc., Pittsburgh, Pennsylvania; or approved equal product.

Air release valve shall have 1-inch inlet and 3/8-inch outlet with 1/16-inch orifice. Valve shall be Figure No. 910 as manufactured by Golden Anderson Industries of Mars, PA or approved equal.

The corporation stop shall have an iron pipe thread inlet, and the outlet shall be packed joint for copper tubing. The corporation stop shall be a one (1) inch No. FB1100 manufactured by the Ford Meter Box Company, Inc., Wabash, Indiana, No. B-25028 manufactured by Mueller Co., Decatur, IL., No. 4704 BT or 4704 BQ manufactured by A.Y. McDonald Mfg. Co., Dubuque, IA., or No. J-1935 manufactured by James Jones Co., El Monte, CA..

Concrete shall meet the requirements of Section M.03.01 of Form 816 for Class "A."

Bedding material shall be three-quarter inch crushed stone shall meet the gradation requirements specified for stone and gravel in Section M.01.01 of Form 816.

CONSTRUCTION DETAILS

Trench excavation and backfill, installation of water main and appurtenances, testing, disinfection, pavement repair and surface restoration will be carried out as defined in the pertinent sections of these Specifications.

Air release valves manholes shall be provided and located as shown on the plans or as directed by the Engineer. Installation shall be as detailed on the plans and as defined in these Technical Specifications.

REPLACE VALVE BOX

DESCRIPTION

"Replace Valve Box" includes the complete removal, furnishing and installation of entire gate boxes and curb boxes on the water distribution system where shown on the plans or directed by the Engineer.

"Replace Valve Box (Town Furnished)" includes the complete removal and installation of entire gate boxes and curb boxes or only the top section of gate boxes or curb boxes on the water distribution system that are found to be damaged prior to construction or as directed by the Engineer. The Town will furnish new boxes or top sections as necessary for installation by the Contractor.

"Reset Valve Box" includes the removal, furnishing and installation of only the top section or extensions stems for gate boxes and curb boxes on the water distribution system when existing top sections cannot be adjusted to match finished grade as determined by the Engineer.

MATERIALS

Gate boxes shall be 5-1/4", consisting of a base and adjustable slide type top section with cover. Gate boxes shall be made of centrifugally spun iron with ¼" uniform wall thickness. Box cover shall have the word "WATER" cast on top. Gate boxes shall be coated with heavy bituminous coating and be manufactured in North America by Water Quality Products, Bibby Ste. Croix, Charlotte, Tyler, Bingham and Taylor, or approved equal.

Curb boxes shall consist of a base and adjustable slide type top section with cover. Curb boxes shall be made of centrifugally spun iron with ¼" uniform wall thickness. Box cover shall have the word "WATER" cast on top. Curb boxes shall be coated with heavy bituminous coating and be manufactured in North America by Water Quality Products, Bibby Ste. Croix, Charlotte, Tyler, Bingham and Taylor, or approved equal.

Extension stems all other components related to this work shall be manufactured in North America by Water Quality Products, Bibby Ste. Croix, Charlotte, Tyler, Bingham and Taylor, or approved equal.

CONSTRUCTION DETAILS

When required, the existing gate box or curb box shall be completely removed and new box installed plumb such that the top of the box is flush with finished grade. The box shall be seated on a bedding of compacted granular fill to prevent lateral movement, rocking or settlement.

If the Contractor damages an existing gate box or curb box during construction, the Contractor shall be responsible for all costs associated with replacing the entire box. The Contractor may be allowed to only replace the top section of the box if approved by the Engineer.

It is the Contractor's responsibility to identify any existing damaged gate boxes and curb boxes within the project limits and notify the Engineer prior to commencement of work. In these instances, the Town will furnish a new box, top section or extension stem as necessary for installation by the Contractor.

Rings for raising box covers to grade shall only be allowed with approval from the Engineer.

WATER BYPASS PIPING

DESCRIPTION

"Water Bypass Piping" of the size specified shall consist of the furnishing of all equipment, labor, supervision, incidentals and material necessary for temporarily bypassing the water distribution system around the work area as required for construction. This Work includes maintaining continuous and reliable water service in all water distribution pipes including individual service connections during construction, and disinfection, flushing, testing and removal of the temporary system.

Construction that may require a temporary water bypass system includes, but is not limited to, cleaning and lining of existing water mains, replacement of existing water mains, connection of new water distribution mains to existing mains, booster pump station improvements, installation of valves, fittings and other appurtenances, and disinfection, flushing and testing of new water main. Water bypass piping shall only be used where approved by the Engineer.

Contact the Town for licensing requirements for any person involved in the installation of a water main and/or appurtenances.

MATERIALS

Water bypass piping materials and appurtenances shall not cause the water delivered to customers to become non-potable, produce aesthetic problems such as taste and odors, or promote bacterial growth after being placed into service. All bypass pipe materials and products (especially plastic), paints, linings, coatings, adhesives, lubricants, etc. in direct contact with potable water shall be NSF or UL certified to NSF/ANSI Standard 61 and shall meet these minimum standards:

1. The pipe materials shall conform to the same standards as permanent piping.
2. The provision of temporary bypass piping must be made in a reliable and sanitary manner such that impurities are not imparted to the water.
3. Piping, couplings, fittings and appurtenances shall be watertight and pressure rated for 200 psi minimum operating pressure.
4. The pipe and/or hose must be designated or certified for potable/residential water use and must meet the latest revision of NSF Standard 61 certification and or AWWA standards.
5. Disinfection of temporary bypass pipes and hoses must be performed in accordance with AWWA standards.
6. Flexible fire hose shall not be permitted.
7. The allowable pipe materials are as follows:
    (a) Ductile iron pipe
    (b) Steel pipe
    (c) Plastic pipe:
        - Polyvinyl chloride (PVC) pressure pipe
        - Standard polyethylene (PE) pressure pipe and tubing, ½ inch (13 mm) through 3 inches (76 mm)
        - Standard polyethylene–aluminum–polyethylene & cross linked polyethylene–aluminum

- Molecularly oriented polyvinyl chloride (PVCO) pressure pipe, 4 inches through 12 inches
- Others as approved in writing by the Engineer

All provisions of ANSI/AWWA G200-09 Standard for Distribution Systems Operation and Management shall be followed during bypassing of the water distribution system.

CONSTRUCTION DETAILS

Temporary Bypass Piping

The Contractor shall submit to the Engineer a water distribution system bypass schedule required to complete the Work. At a minimum, the schedule will include the proposed sequencing and coordination of cleaning and lining of existing water mains, replacement of existing water mains, connection of new water distribution mains to existing mains, booster pump station improvements, installation of valves, fittings and other appurtenances, disinfection, flushing and testing of new water main and the handling of water flow during all aspects of construction. The Engineer shall approve such schedule prior to implementation.

The Contractor shall prepare a specific, detailed description of the proposed water distribution bypass system (Water Bypass Piping Plan). The Water Bypass Piping Plan shall be submitted at least two (2) weeks prior to its intended use and must be approved by the Engineer prior to the mobilization of any of the equipment included in the Water Bypass Piping Plan. The Water Bypass Piping Plan shall outline all provisions and precautions to be taken by the Contractor regarding handling of existing water flows.

This Water Bypass Piping Plan must be specific and complete, including such items as schedules, locations, materials, disinfection methods, and all other incidental items necessary and/or required to ensure proper protection of the facilities, including protection of bypass piping from damage.

The Contractor shall schedule work as required to install new water main, services and appurtenances without the need for a bypass system, unless such system is deemed necessary by the Engineer. No construction shall begin until the Water Bypass Piping Plan including all provisions and requirements have been reviewed and approved by the Engineer.

The Water Bypass Piping Plan shall include, but is not limited to, the following details:

1. Plan indicating location, size and type of proposed temporary water bypass piping including all temporary service piping, associated valves, fittings, hydrants, backflow prevention devices and other appurtenances.
2. Proposed locations of connecting temporary bypass pipe to the active water distribution system.
3. Size and material of the water distribution main to be bypassed.
4. Proposed methods of disinfecting the temporary bypass system.
5. Method of protecting bypass piping from damage.
6. Any temporary pipe supports, anchoring requirements, thrust and restraint block sizes and locations.
7. Calculations for bypass piping sizing.
8. Schedule for installation of and maintenance of bypass piping.

9. Contractor's plan for providing continuous monitoring of the bypass operation as well as the monitoring person's qualifications.

The Contractor shall furnish, install, maintain and remove temporary service pipe of the size required, from which connections shall be made to all water customers. Temporary fire hydrants shall be provided when existing hydrants are out of service due to the work. Temporary service pipe shall not be installed without prior approval of the Engineer. Water distribution systems shall only be bypassed around construction activities when long periods of system shutdown are anticipated and when authorized by the Engineer.

The bypass piping size identified as a Contract bid item is approximate. Bypass piping shall be sized to provide a minimum fire flow of 750 gpm or as required by the Engineer to provide adequate service to customers.

The Contractor shall do all excavating for connections of temporary service pipes to existing live water mains and make all such connections. Whenever possible, two feeds shall be provided to the temporary piping system. The Contractor shall also furnish, install, maintain, connect, disconnect and remove individual service lines to all water customers.

The design, installation, disinfection, operation, repair and maintenance of all temporary bypass systems shall be the responsibility of the Contractor.

The Contractor shall provide a suitable backflow prevention device for all connections of temporary service pipes to existing live water mains. Backflow prevention devices to be used shall be as approved by the Engineer.

The work of providing suitable safety precautions during the temporary service period shall be the responsibility of the Contractor.

Before starting any work that will affect service to customers, the Contractor shall notify the Manchester Water Department in advance so that a minimum of two (2) full working days notice may be given to any user whose service will be interrupted for any reason.

Contractor shall construct, maintain and repair all temporary water bypass piping systems and shall be responsible for providing appropriate conditions for proper installation, disinfection, flushing and testing of water pipe during construction. Any required repairs to bypass systems shall be immediately completed to prevent any interruption in service within the water distribution system. The Contractor shall promptly repair and or replace any leaking or faulty temporary service pipe as ordered by the Engineer.

The Contractor shall be responsible for after-hours maintenance of the temporary facilities. He may do so in one of the following manners:

1. Hire an individual who will be available for contact by the Town after normal working hours. This individual must be provided with a pager and be available between the hours of 3:30 p.m. and 7:00 a.m., seven (7) days a week including holidays. His response time shall be one (1) hour or less. The individual shall have all licenses necessary to allow him to work on a public water supply system. The pager number shall be provided to the Town's on-call personnel.

2. Utilize Town of Manchester Water Department personnel for after-hours maintenance. The Town's on-call personnel will assign Department staff on a rotating basis utilizing the Town's overtime list. The contractor will be billed on a "per call" basis in accordance with the current union contracts and the "Schedule of Rates, Charges and Fees" for the Water Division. The

Contractor shall be responsible for providing access by Town personnel to a supply of repair materials for the purpose of making after hours repairs. These materials will be supplied at no cost to the Town.

Care shall be exercised throughout to avoid any possible pollution of mains, house services, or temporary service pipe.

Generally, temporary service pipe shall be laid in gutters. At driveways, pipe crossings shall be provided by cold patch cover or other approved method. At street intersections, pipe shall be laid in a shallow trench covered with temporary surfacing. Sanitary precautions shall be satisfactory to the Engineer.

The interior of temporary service pipe shall be disinfected, flushed and tested as described in "Water Main" elsewhere in these Specifications.

All service pipe shall be suitably valved and meet the approval of the Engineer. A valve shall be provided at each tap hole connection. Valves shall be located no further than one (1) block apart when directed by the Engineer.

Whether it is being installed, in service, or being removed, the amount of temporary service pipe kept on the job shall be the minimum that will allow the Work to continue at a reasonable rate.

The Contractor shall be responsible for all consumer connections. The Water Department will enter upon all private property and assist the Contractor in making final service connections. The Contractor shall provide a minimum of twenty-four (24) hours notice to the Water Department so that a man may be available when required.

Pipe Access Openings

The Contractor shall make openings in the pipeline as necessary to properly perform his Work. Openings in the pipe shall be made by cutting and removing pipe sections. All pipe shall be cut square and true. Except as otherwise approved, all cutting shall be done with a machine suitable for cutting cast iron pipe. Hydraulic squeeze cutters are not acceptable for cutting cast iron pipe. Travel type cutters or rotary type abrasive saws may be used. All cut ends shall be examined for possible cracks caused by cutting.

Any pipe sections removed, damaged and/or not cut square and true shall be replaced with a new pipe section. The section of pipe removed shall become the property of the Contractor.

At openings adjacent to sections under pressure or in service, the Contractor shall install adequate temporary joint restraint devices to prevent movement of closed valves.

At all times when the work is not actually in progress, the openings in the pipe shall be closed by temporary watertight plugs or other approved means. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe has passed.

Closing Pipe Openings

The Contractor shall furnish all labor, materials, tools and equipment necessary to satisfactorily close and make watertight all pipe openings in the mains. Closures shall be made with new cement-lined ductile iron pipe of equivalent wall thickness and diameter as the pipe, which is to be replaced. All couplings and pipe required to close the pipe openings shall conform to the requirements of "Water Main" elsewhere in these Specifications.

Disinfection and Flushing

The Contractor shall disinfect all mains carrying potable water. Disinfection shall be performed as described “Water Main” elsewhere in these Specifications.

Backfilling Operations

As soon as practicable after pipe openings have been closed, backfilling shall be started. All backfilling shall be done in accordance with the requirements of “Water Main” elsewhere in these Specifications. Excavations shall not be backfilled at pipe openings until after those joints created in closing pipe openings have successfully passed leakage tests required.

The Contractor's attention is directed to the fact that he will be responsible for the replacement of pavement. Therefore, in backfilling excavations occurring where pavement is to be replaced, the Contractor will be held responsible for providing a temporary pavement repair in accordance with the requirements of “Pavement Repair” elsewhere in these Specifications.

SANITARY SEWER MAIN

DESCRIPTION

"Sanitary Sewer" of the size and type specified shall consist of the furnishing, installation and testing of all sanitary sewer mains, including fittings and other appurtenances, trench support systems, and abandonment or removal of existing sewers as indicated on the Plans that are within the trench excavation limits or directed by the Engineer. Placement and compaction of backfill, filter fabric and bedding material shall also be included as part of this item. Removal of existing sanitary sewers and manholes located within the trench excavation limits of new sewer main will not be measured separately for payment, but shall be considered as included in the unit price bid for the new sanitary sewer main.

"Chimneys" shall consist of the furnishing and installation of sanitary sewer chimneys at the locations shown on the Plans or directed by the Engineer.

"Plug Pipe" shall consist of the plugging of existing pipes up to 12" diameter with cement masonry where shown on the Plans or as directed by the Engineer.

"Abandon Pipe with Flowable Fill" shall consist of the abandonment of existing pipes up to 12" diameter by bulkheading both ends and filling the remainder of the pipe with flowable concrete.

Contact the Town for licensing requirements for any person involved in the installation of a sanitary sewer and/or appurtenances.

MATERIALS

Unless otherwise specified by the Engineer, all materials shall be new and unused, shall be of the types and materials specified herein and shall meet the requirements specified herein. All material found during the progress of the work to have cracks, flaws or other defects will be rejected by the Engineer. All defective materials shall be promptly removed from the work site and replaced at no additional expense to the Town.

PVC Pipe: Polyvinyl chloride (PVC) pipe and fittings shall conform to the requirements of the latest revisions of either ASTM D3034, "Standard Specifications for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings" or ASTM F789, "Standard Specifications for Type PS-46 Poly (Vinyl Chloride) (PVC) Plastic Gravity Flow Sewer Pipe and Fittings." The pipe shall have a maximum pipe diameter to wall thickness ratio (SDR) of 35 or minimum pipe stiffness (PS) of 46 psi. Saddle Y-branches will not be allowed. Joints for PVC pipe shall be push-on bell and spigot joints using elastomeric ring gasket. The gaskets shall be securely fixed into place in the bells so that they cannot be dislodged during joint assembly. The gaskets shall be of a composition and texture which is resistant to common ingredients of sewage and industrial wastes, including oil and groundwater, and which will endure permanently under the conditions of the proposed use. The joints shall conform to the requirements of the latest revision of ASTM D-3212.

Flexible Couplings: Flexible couplings for connecting new PVC laterals to existing laterals shall be manufactured by Fernco, Inc., Davison, Michigan, or approved equal.

Repair Sleeves: Repair sleeves for connecting clay to clay, clay to plastic and plastic to plastic sanitary sewers shall be Strong Back Couplings – 1000 RC Series stainless steel shielded with a molded in flexible PVC gasket as manufactured by Fernco, Inc., Stainless Steel Shear Rings for use with flexible PVC gaskets as manufactured by Fernco, Inc., or SDR 35 PVC Gasketed Repair Coupling Sleeves (without stop) as manufactured by Harco, Inc.

Chimneys: Chimneys shall be precast sewer chimneys as manufactured by Superior Products Distributors, Inc., Milldale, CT, or equal. The materials incorporated into the precast chimney shall be 4,000 psi concrete, cement per ASTM C150-81, reinforcing per ASTM A615, captive "O" rings and captive seal unit gaskets shall be vulcanized natural rubber or vulcanized synthetic rubber and PVC fittings per ASTM D3034.

The sewer chimney assembly and design shall consist of three basic units:

Base Section: shall be of bridge and base pad design with both pads and bridge cast as a monolithic unit and with pads having a total minimum bearing area of 6 square feet. Bridge section shall encapsulate a captive gasket unit and be joined to the mainline vertical positioned Tee with a 6" PVC nipple, minimum length 12" tapered at both ends. Upper side of captive gasketed unit shall receive 6" PVC SDR-35 pipe. Vertical riser pipe shall be of sufficient length to protrude up through the uppermost intermediate section. Multiple sections of pipe with gasketed bell shall be acceptable to make up the necessary rise. Bridge outside width perpendicular to mainline pipe shall be 36" for mainline pipe 15" and smaller and 48" for mainline pipe 18" and larger unless approved otherwise by the Engineer.

Intermediate Section: Desired ultimate elevation of sewer chimney to the lateral shall be obtained through the use of 12", 24", 36" or 48" vertical intermediate sections, used individually or in combination. Sections shall be hollow cored with minimum outside measurement of 18" square and a round 8.4" inside diameter. Intermediate sections shall be installed by lowering over 6" PVC riser pipe and seal to the base, or other intermediate sections and captive "O" rings. PVC riser pipe shall be cut-off and have taper 2" above last intermediate section.

Cap Block (Top Section): Cap block shall be precast and capable of rotation of 180 degrees and/or 15 degrees from right angle to accept lateral connections of various degrees of angle. Precast cap shall encapsulate a 6" x 6" PVC Tee to accept lateral on one side and have 6" PVC plug clean-out on top. Bottom side of encapsulated Tee in Cap Block shall be gasketed and form a tight seal when installed over tapered riser pipe. Lateral connection (bell) in cap block shall be capable of accepting PVC SDR-35 or C-900, SDR-18 with tight sealing gasket. PVC lateral pipe entering chimney cap shall be SDR-35. If the distance between the main sewer centerline and the beginning of undisturbed trench wall at the lateral invert elevation exceeds four feet, PVC C-900, SDR-18 pipe shall be used to a distance not less than

three feet beyond the beginning of undisturbed trench wall. Transition back to SDR-35 shall be accomplished with a tight sealing rubber of PVC coupling.

Cap, intermediate and base sections shall be attached to each other on opposite sides with 2-1/2" x 2-1/2" x 1/4" bolt-on brackets with bolts and nuts. Chimney shall eliminate infiltration and exfiltration and shall accept normal low pressure air testing. Bridge and pad assembly shall allow for normal amount of settling to occur without transmitting weight of assembly to the mainline pipe.

Ductile Iron Pipe: Ductile iron pipe shall meet the requirements of the latest revision of AWWA C151 (ANSI A21.51). Joints shall be “Tyton Joint” design, rubber gasket push-on type manufactured in accordance with the latest revision of AWWA C111 (ANSI A21.11). Pipe shall be supplied with the standard exterior bituminous coating of either coal tar or asphalt base approximately one mil thick. The interior shall be double cement lined in accordance with the latest revision of AWWA C104 (ANSI A21.4), and pipe shall be of thickness Class 52 unless otherwise indicated. The interior of the pipe shall receive a factory applied 40 mil nominal thickness of PROTECTO 401 Ceramic Epoxy Lining, as manufactured by Induron Coatings, Inc., Birmington, AL. Pipe shall be manufactured by Griffin, U.S. Pipe, McWane Ductile or approved equal.

Bedding Material: Bedding material shall be crushed stone that meets the requirements of Article M.02.01-1 of Form 817.

Backfill: Backfill material above bedding material shall be suitable material from the excavation which is free from large or frozen lumps of soil, wood or other extraneous material or, if directed by the Engineer, shall be approved backfill material meeting the requirements of Article M.02.06 (Grading “B”) of Form 817.

Filter Fabric: Filter fabric shall be a non-woven fabric similar or equal to Mirafi 140 as manufactured by Celanese Fibers Marketing Company, Bidim C22 as manufactured by Monsanto Textiles Company or approved equal.

Warning Tape: Underground pipe warning (marking) tape shall be plastic and metallic-coated to permit detection by a magnetic sensing device. The tape shall be green in color, not less than 3 inches in width, and shall have the words "CAUTION - BURIED SEWER MAIN BELOW" repeated along the full length of the tape in letters not less than 1" high permanently fused into the tape. Pipe marking tape shall be "Terra-Tape" detectable pipe marking tape as manufactured by Reef Industries, Inc., Houston, Texas or approved equal.

Steel Sheeting: Steel sheeting for trench stabilization, if required, shall conform to the requirements of ASTM A328, ASTM A572 or ASTM A690 as appropriate.

Pavement Markings: Pavement markings installed to replace disturbed markings shall be painted, match the size and color of existing markings, and meet the requirements of “Painted Pavement Markings” as defined in the pertinent sections of these Specifications.

Concrete: Concrete used for plugging ends of abandoned pipes shall conform to the requirements of Article M.03.01 of Form 817 for Class “A” Concrete.

Flowable concrete fill used for abandoning pipelines shall be excavatable with a maximum 28-day compressive strength of 150 psi. Concrete mix design shall be submitted to the Engineer for review and approval.

CONSTRUCTION DETAILS

Trench excavation and surface restoration shall conform to the requirements of the pertinent section of these Specifications. Sanitary sewer mains shall only be installed in trench conditions; embankment conditions will not be permitted.

All pipe delivered to the job site shall be accompanied by test reports certifying that the pipe and fittings conform to the above-mentioned ASTM specifications. In addition, the pipe shall be subject to thorough inspection and tests, the right being reserved for the Engineer to apply such tests as he deems necessary.

All tests shall be made in accordance with the methods prescribed by the above-mentioned ASTM specifications, and the acceptance or rejection shall be based on the test results.

The Contractor shall furnish all labor necessary to assist the Engineer in inspecting the pipe. Pipe will be inspected upon delivery, and all that does not conform to the requirements of these specifications shall be rejected and shall immediately be removed by the Contractor.

Prior to installation, all pipe shall be stored at the site until installation in a manner acceptable to the Engineer and which will keep the pipe at ambient outdoor temperatures. Temporary shading shall be provided as required. Simply covering the pipe or structures, which allows temperature build-up when exposed to direct sunlight, shall not be done.

Each pipe unit shall be handled into its position in the trench only in such manner, and by such means as acceptable to the Engineer. Care shall be taken to avoid damaging the pipe and fittings. Where any two-pipe units do not fit each other closely enough to enable them to be properly jointed, they shall be removed and replaced with suitable units and new gaskets.

Details of gasket installation and joint assembly shall follow the directions of the manufacturers of the joint material and of the pipe, all subject to review by the Engineer. The resulting joints shall be watertight and flexible.

All premolded gasket joint polyvinyl chloride pipe of a particular manufacturer may be rejected if there are more than five unsatisfactory joint assembly operations or "belt breaks" in 100 consecutive joints, even though the pipe and joint conform to the appropriate ASTM specifications as previously specified. If the pipe is unsatisfactory as determined above, the Contractor shall, if required, remove all pipe of that manufacturer of the same shipment from the work and shall furnish pipe from another manufacturer which will conform to all of the requirements of these specifications.

Open ends of pipe and branches shall be closed with polyvinyl chloride stoppers secured in place in an acceptable manner.

After each pipe has been properly bedded, enough pipe bedding shall be placed between the pipe and the sides of the trench and thoroughly compacted to hold the pipe in correct alignment. Bell holes provided for jointing shall be filled with pipe bedding and compacted. Then pipe bedding shall be

placed and compacted to complete the pipe bedding, as indicated on the drawings.

The Contractor shall take all necessary precautions to prevent flotation of the pipe in the trench. At all times when pipe installation is not in progress, the open ends of the pipe shall be closed with temporary watertight plugs, or by other acceptable means.

If water is in the trench when work is to be resumed, the plug shall not be removed until suitable provisions have been made to prevent water, earth or other substances from entering the pipe.

Each pipe unit shall be inspected before being installed. No single piece of pipe shall be laid unless it is generally straight. The centerline of the pipe shall not deviate from a straight line drawn between the centers of the openings at the ends of the pipe by more than 1/16 inch per foot of length. If a piece of pipe fails to meet this requirement for straightness, it shall be rejected and removed from the site. All pipe units or fittings discovered to be defective either before or after installation shall be removed and replaced with a sound unit.

Except as otherwise indicated on the drawings, the pipe shall be supported by compacted bedding. No pipe or fittings shall be permanently supported on saddles, blocking or stones. Bedding shall be as specified in the pertinent section of these Technical Specifications.
Suitable bell holes shall be provided so that after placement, only the barrel of the pipe receives bearing pressure from the supporting material.

All pipe and fittings shall be cleared of all debris, dirt, etc., before being installed and shall be kept clean until accepted in the completed work.

Pipe and fittings shall be installed to the lines and grades indicated on the drawings or as required by the Engineer. Care shall be taken to ensure true alignments and gradients.

Before any joint is made, the previously installed unit shall be checked to assure that a close joint with the adjoining unit has been maintained and that the inverts are matched and conform to the required grade. The pipe shall not be driven down to the required grade by striking it with a shovel handle, timber or other unyielding object.

All joint surfaces shall be cleaned. Immediately before jointing the pipe, the bell or groove shall be lubricated in accordance with the manufacturer's recommendation. Each pipe unit shall then be carefully pushed into place without damage to pipe or gasket. Suitable devices shall be used to force the pipe units together so that they will fit with a minimum open recess inside and outside and have tightly sealed joints. Care shall be taken not to use such force as to wedge apart and split the bell or groove ends.

Wye fittings, lateral connections and connections to new and existing manholes shall be installed where shown on the plans or where directed in the field by the Engineer, and shall be in accordance with the details shown on the plans. Modifying joints and inverts in existing manholes shall conform with the pertinent sections of these specifications.

Proper implements, tools and facilities shall be provided and used by the Contractor for the safe and convenient performance of the work. All pipe shall be lowered into the trench with a suitable device that will not damage protective coatings and lining. Under no circumstances shall material be dropped or dumped into the trench. Any damaged lining, coating or wrapping shall be satisfactorily repaired or replaced.

Every precaution shall be taken to prevent foreign matter from entering the pipe while it is being placed in the line. If the pipe laying crew cannot put the pipe into the trench and in place without getting earth into it, the Engineer may require that before lowering the pipe into the trench, a heavy, tightly woven canvas bag of suitable size be placed over the end and left until the connection is made to the adjacent pipe. If necessary, the line shall be swabbed or flushed out to remove all foreign matter prior to testing.

Before joining lengths of push-on pipe, the inside of the bell and the outside of the spigot shall be thoroughly cleaned to remove oil, grit, excess coating and other foreign matter.

Connection of the proposed sewer to the existing sewers shall be made in a careful manner acceptable to the Engineer. Any adapters or other material required for this connection shall be subject to approval of the Engineer.

Chimneys shall be furnished by the Contractor as shown on the Plans and where ordered by the Engineer. The Contractor shall install the precast sewer chimney in accordance with the manufacturer's installation instructions.

As in the case of the branches, the exact number and location of chimneys shall be determined as the work progresses in the field. At locations designated by the Engineer to receive precast sewer chimneys, crushed stone shall be placed and compacted in 6-inch lifts from the bottom of the trench to the top of the pipe. The area of crushed stone foundation shall be at least as great as the base of the precast chimney and the stone shall be compacted to at least 95% maximum density, per ASTM D1557 Method C. After installation, crushed stone bedding shall be placed in void area under base-bridge, but shall not be overfilled, chinked or compacted.

Earth Backfill around the chimney shall be placed with extreme care and compacted evenly to avoid unbalanced earth pressure on the chimney.

All open ends of abandoned pipelines which are created or exposed by the Contractor shall be removed to a distance of 5’ (minimum) from new facilities and then plugged with concrete at that point prior to backfilling.

Where pipes are to be abandoned, the Contractor shall plug ends of existing pipes with cement masonry or plug pipe ends and fill with flowable concrete fill where shown on the plans or directed by the Engineer. Presence of plugs in abandoned pipes shall be field verified by the Engineer prior to backfill.

Where pipes are abandoned with flowable concrete fill, the Contractor shall inject flowable fill at the upstream end of the pipe and visually verify the fill has reached the downstream end of the pipe for complete filling.

Care shall be taken not to excavate below the depths required to perform the Work. The Contractor shall furnish and employ such trench boxes, steel plates, shores, braces, sheeting, pumps, etc., as may be necessary for the protection of property, proper completion of the Work and the safety of the public and employees of the Contractor and the Town. All bracing, sheeting, etc., shall be removed when no longer required for the construction or safety of the Work.

All excavated materials not required or unsuitable for backfill, (i.e., clay, silt, sand, muck, gravel, hardpan, loose shale, loose stone in masses and boulders greater than 5” in diameter) shall be removed and properly disposed of by the Contractor. Unsuitable soils that exhibit obvious evidence of heavy contamination or have been identified as containing elevated concentrations of contamination should be removed and stockpiled for characterization and possible off-site disposal. If

contaminated soils are stockpiled best management practices must be employed to reduce human and environmental exposure to the stockpiled materials. Granular fill shall be used to replace all unsuitable material.

The trench shall be excavated to the depth required and so as to provide a uniform and continuous bearing and support for the pipe on solid and undisturbed ground except that bell depressions shall be provided at each joint to permit the joint to be made properly. Further, it will not be permissible to disturb and otherwise damage the finished surface over a maximum length of eighteen (18) inches near the middle of each length of pipe by the withdrawal of pipe slings or other lifting tackle. Any part of the bottom of the trench excavated below the specified grade shall be corrected with approved material and thoroughly compacted as directed by the Engineer. The finished trench bottom shall be prepared accurately by means of hand tools.

The Contractor shall furnish, put in place and maintain such trench support systems (i.e. trench boxes, steel plates, steel sheeting, etc.) as may be necessary to support the sides of the excavation and to prevent any movement of earth other than that intended to be accomplished by the excavation. Trench support systems shall be designed to support earth pressures, hydrostatic pressures, equipment and construction loads, and other surcharge loads, to allow safe and expeditious construction with minimal movement or settlement of ground, to prevent damage to, or movement or settlement of, adjacent buildings, structures, or utilities. Such systems shall be installed as may be necessary for the protection of the Work and for the safety of personnel, and shall comply with the safety precautions as outlined in the Associated General Contractors of America, "Manual of Accident Prevention in Construction," the "Occupational Safety and Health Act" of 1970 (OSHA) of latest revision and OSHA Reference: U.S. Dept. Of Labor O.S.H.A. Safety and Health Standards (29 CFR 1926/1910) revised March 5, 1990, Subpart P-Excavations, Trenching & Shoring Selection of Protective Systems, 1926-652 Appendix F.

To insure proper conditions at all times during construction, the Contractor shall provide and maintain ample means and devices with which to intercept and/or remove promptly and dispose properly of all water entering excavations. Excavations shall be kept dry until the structures, pipes and appurtenances to be built therein have been completed to such extent that they will not be floated or otherwise damaged. All water pumped or drained from the Work shall be disposed of in a suitable manner without undue interference with other work or damage to pavements, other surfaces or property. Prior to discharge, the Contractor shall be responsible for removing all particulate matter which may be deposited in a stream or storm drainage system. The Contractor shall submit his proposed methods or procedures to the Engineer for approval. The Contractor shall be responsible for complying with all Federal, State and Town regulations which may be associated with said discharges.

Bedding material installed in all trenches shall be backfilled by hand from the bottom of the trench to the top of the pipe in layers of three (3) inches, compacted by tamping to at least ninety-five percent (95%) of maximum dry density at optimum moisture content as determined in accordance with the requirements of Method D of ASTM Test Method D-1557 (latest revision). Bedding material shall be deposited in the trench for its full width on each side of the pipe, fittings and appurtenances simultaneously and the entire width of bedding material within the trench shall be covered with filter fabric. The Contractor shall use special care in placing this bedding material to avoid damaging or moving the pipe and to ensure the material is made compact and tight under and around the pipe. Iron tools suitable for tamping material under and on sides of pipe shall be used, and sufficient space for this tamping shall be provided. In general, wooden sticks, shovel handles and similar make-shift devices will not be considered as suitable tamping tools for use on sides of pipe.

In areas with high groundwater, rock and where directed by the Engineer, bedding material shall also be installed to a depth of one (1) foot above the top of the pipe in layers of six (6) inches or less and with all bedding material completely wrapped in filter fabric with a 12" overlap at the top. Bedding material installed above the top of the pipe shall be backfilled by hand or by approved mechanical methods and compacted to not be less than ninety five percent (95%) of maximum dry density as determined by ASTM Test Method D-1557 (latest revision). The Contractor shall use special care in placing backfill so as to avoid damaging or moving the pipe.

The remainder of the backfill above the bedding material shall be placed and compacted in one (1) foot lifts. Each layer shall be compacted to not less than ninety five percent (95%) of maximum dry density as determined by ASTM Test Method D-1557 (latest revision).

Compaction methods shall be submitted in writing to and approved by the Engineer prior to commencement of any work.

There is no guarantee that all excavation can be done by use of machinery. In some cases, the pipe location may preclude the use of machinery. In this event, the Contractor will be required to perform this Work at the same unit price bid in his proposal.

TESTING

Prior to any testing, the pipe installation shall be cleaned in the following manner, in the presence of the Engineer or his authorized Inspector.

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

Sanitary sewers will be checked by the Inspector to determine whether any displacement of the pipe has occurred, after the trench has been backfilled and compacted. Should any pipe displacement be detected, the Contractor shall do all corrective work as is necessary, to the satisfaction of the Engineer, without additional compensation.

All sanitary sewers to be accepted by the Town will be tested by low pressure air.

Tests will be made after the pipe installation is complete, including the installation of laterals and manholes. The trench shall be backfilled and compacted or consolidated as required by the Engineer. Tests shall be completed before any permanent pavement is in place but after the roadway base has been constructed.

The Contractor is required to provide all equipment, test plugs in the required sizes, appurtenances, connecting hose or pipe, labor and materials necessary to conduct and control the low pressure air test. The test shall be performed using the below stated equipment, according to stated procedures and under the supervision of the inspecting Engineer or his authorized Inspector. The Contractor or his subcontractor shall keep a written record, which will show the results of the tests conducted. The

records should include sufficient data on length of line, pressure levels, time for pressure drop, and related features noted during the testing of each segment of the line. A copy of this record shall be given to the Engineer. Equipment used shall meet the following minimum requirements and shall be subject to approval by the Engineer:

1. Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be inspected.

2. Pneumatic plugs shall resist internal test pressures without requiring external bracing or blocking.

3. All air used shall pass through a single control panel.

4. Three (3) individual hoses shall be used for the following connections:
    a. From control panel to pneumatic plugs for inflation.
    b. From control panel to sealed line for introducing the low pressure air.
    c. From sealed line to control panel for continually monitoring the air pressure rise in the sealed line.

5. All pneumatic plugs shall be seal tested before being used in the actual test installation. One length of pipe shall be laid on the ground and sealed at both ends with the pneumatic plugs to be checked. Air shall be introduced into the plugs to 25 psig. The sealed pipe shall be pressurized to 5 psig. The plugs shall hold against this pressure without bracing and without movement of the plugs out of the pipe.

All tests shall be conducted on the completed sewer pipeline between manholes. Testing of shorter sections of pipeline will only be permitted with the approval of the Engineer.

All gages, controls and appurtenances for equipment used to conduct the test will be located out of manholes. No one will be permitted in a manhole containing a test plug while air is under pressure in the pipeline being subjected to the test.

The Contractor shall determine the elevation of the ground water table in the area of the pipeline being subjected to the low pressure air test.

After a manhole-to-manhole section of pipe has been completed, cleaned and the pneumatic plugs checked by the above procedure, the plugs shall be placed in the line at each manhole and inflated to 25 psig. Low pressure air shall be introduced into this sealed line until the internal air pressure reaches 4 psig greater than the average back pressure of any groundwater that may be over the pipe. At least two (2) minutes shall be allowed for the air pressure to stabilize.

After the stabilization period, the pressure shall be set at 3.5 psig greater than the average back pressure due to groundwater and the air hose from the control panel to the air supply shall be disconnected. The portion of line being tested shall be termed "Acceptable" if the time required in minutes and seconds for the pressure to decrease from 3.5 psig greater than the average back pressure due to groundwater to 2.5 psig greater than the average back pressure due to groundwater is not less than the time shown for the given diameters in the following table:

Pipe Diameter (in)	Time (Minutes:Seconds)
6	2:50
8	3:47
10	4:43
12	5:40
15	7:05
18	8:30
21	9:55
24	11:20

NOTE: When one or more laterals are connected to the main, the allowable time in the table will be decreased by 30 seconds.

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

Whenever groundwater is present, the Contractor shall, as directed by the Engineer, perform infiltration and exfiltration tests. Groundwater infiltration or exfiltration into any sewer shall not exceed a maximum of 100 gallons per inch of pipe diameter per day per mile of sewer. The procedure for these tests is as follows:

1. Infiltration Test: All labor, temporary equipment, and materials, including weirs necessary for such tests, shall be furnished by the Contractor. The installation of the weir shall be made in such manholes as directed by the Engineer. Where weir measurements are not suitable in the Engineer's opinion, other methods of measurement, as he shall determine, may be adopted. In making infiltration tests, the Engineer may flood the trench with water if, in his opinion, such procedure is necessary to fairly represent actual service conditions as they may vary throughout the year.

2. Exfiltration Test: The Contractor shall supply all water, plugs and all labor and equipment required for that test.

   The exfiltration test shall be made by filling the sewer line with water so as to obtain a hydrostatic head, on top of the pipe in the upstream manhole of the line under test, of at least four (4) feet, but not greater than ten (10) feet. The amount of exfiltration will be obtained by observing the rate of drop in the water level at the upstream manhole hourly for the first six (6) hours and thereafter, at intervals of time as directed by the Engineer.

After cleaning, deflection testing (i.e., 7 1/2% deflection mandrel) shall be performed on all PVC sanitary sewer installations. Dimensions for the 7 1/2% deflection mandrels shall be as indicated in ASTM D3034 of latest revision. Testing shall be done not less than 30 days following completion of installation. The sequence of all testing shall be as specified by the Engineer.

After cleaning, television inspection shall be performed on all new sanitary sewer installations unless otherwise directed by the Engineer. It is the intent to have the testing take place under a no-flow condition.

The television camera used for the inspection shall be one specifically designed and constructed for

such inspection. Lighting for the camera shall be suitable to allow a clear picture of the entire periphery of the pipe. The camera shall be operative in 100% humidity conditions. The camera, television monitor, and other components of the video system shall be capable of producing picture quality to the satisfaction of the Engineer and, if unsatisfactory, equipment shall be removed and new equipment provided.

1. The camera shall be moved through the line in either direction at a moderate rate, stopping when necessary to permit proper documentation of the sewer's condition. In no case will the television camera be pulled at a speed greater than 30 feet per minute. Manual winches, power winches, TV cable, and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions shall be used to move the camera through the sewer line. If, during the inspection operation, the television camera will not pass through the section, the Contractor shall set up his equipment so that the inspection can be performed from the opposite manhole.

2. When manually operated winches are used to pull the television camera through the line, telephones or other suitable means of communication shall be set up between the two (2) manholes of the section being inspected to insure good communications between members of the crew.

3. The importance of accurate distance measurements is emphasized. Measurement for location of defects shall be above ground by means of a meter device. Marking on the cable, or the like, which would require interpolation for depth of manhole, will not be allowed. Accuracy of the distance meter shall be checked by use of a walking meter, roll-a-tape, or other suitable device, and the accuracy shall be satisfactory to the Engineer.

4. Documentation of the television results shall be as follows:

    a. Television Inspection Logs: Printed location records shall be kept by the Contractor and will clearly show the location in relation to an adjacent manhole of each infiltration point observed during inspection. In addition, other points of significance such as location of laterals, unusual conditions, broken pipe and other discernible features will be recorded and a copy of such records will be supplied to the Town.

    b. Digital Recordings: The purpose of digital recordings shall be to supply a visual and audio record of problem areas of the lines that may be replayed. Media recording playback shall be at the same speed that it was recorded. Slow motion or stop-motion playback features may be supplied at the option of the Contractor. The digital files shall be turned over to the Town at the completion of the Project.

5. The Contractor shall have all video inspections readily accessible for review by the Town during the Project.

6. If any testing of sewers indicates problems, additional television testing may be ordered by the Engineer.

Final inspection of the work will include a visual inspection of each section of sewer by looking from the manhole with the aid of reflected sunlight or an electric torch. The pipe shall be true to both line and grade; shall show no leaks; shall be free from cracks and from protruding joint materials and contain no deposits of sand, dirt, or other materials which will reduce the full cross-sectional area. Groundwater infiltration shall not exceed the rates hereinbefore stipulated. Wall joints shall be tight. All finished work shall be neat in appearance and of first class workmanship. The Contractor shall furnish two (2) laborers to assist in this inspection. In addition, all dwelling units will be dye tested to

insure that each unit is connected to the new facilities. Sewer Department personnel will assist with the dye tests during normal working hours.

SANITARY SEWER LATERAL

DESCRIPTION

"Sanitary Sewer Lateral" of the size and type specified shall consist of the furnishing, installation and testing of all sanitary sewer building connections, including fittings and other appurtenances as indicated on the Plans or directed by the Engineer. It shall also include connecting new laterals to existing sanitary sewer mains, and abandonment and removal of existing laterals located within the trench excavation limits or directed by the Engineer.

"Relocate Sanitary Sewer Lateral" of the size and type specified includes relocating existing sanitary sewer laterals where shown on the Plans or where directed by the Engineer. It includes, but is not limited to: removing existing lateral; furnishing and installing new PVC lateral and appurtenances; connecting new lateral to existing sanitary sewer main; and handling of existing sewage flows.

"Reconnect Sanitary Sewer Lateral" of the size and type specified includes reconnecting existing sanitary sewer laterals where shown on the Plans or where directed by the Engineer. It includes, but is not limited to: abandonment or removal of existing sanitary sewer lateral (between old main and new main); furnishing and installing new PVC lateral, wye, fittings, bends, couplings, and appurtenances to connect the existing lateral to new sanitary sewer main; handling of existing sewage flows; and excavation and backfill.

"Abandon Sanitary Sewer Lateral" includes disconnecting a sanitary lateral from the sewer main where located outside the limits of trench excavation as shown on the Plans or where directed by the Engineer. It includes, but is not limited to disconnecting the existing lateral at the wye or tee fitting; plugging the lateral and fitting with cement masonry so it does not impede flow in the sewer main; and handling of existing sewage flows as required.

"Cleanout" of the size and type specified includes furnishing and installing polyvinyl chloride sanitary sewer cleanouts at the locations shown on the Plan or where directed by the Engineer.

"Interior Sanitary Sewer Piping" of the size and type specified shall consist of the furnishing and installation of sanitary sewer piping within building structures including all required fittings and other appurtenances, removing pipes, supporting pipes to remain and capping pipe ends as indicated on the Plans or directed by the Engineer.

Contact the Town for licensing requirements for any person involved in the installation of a sanitary sewer and/or appurtenances.

MATERIALS

PVC Pipe: Polyvinyl chloride (PVC) pipe and fittings shall conform to the requirements of the latest revisions of either ASTM D-3034, "Standard Specifications for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings" or ASTM F-789, "Standard Specifications for Type PS-46 Poly (Vinyl Chloride) (PVC) Plastic Gravity Flow Sewer Pipe and Fittings." The pipe shall have a maximum pipe diameter to wall thickness ratio (SDR) of 35 or a minimum pipe stiffness (PS) of 46 psi.

Saddle connections may be used for connections to existing sanitary sewer mains only where approved by the Engineer.

Joints for PVC pipe shall be push-on bell and spigot joints using elastomeric ring gasket. The gaskets shall be securely fixed into place in the bells so that they cannot be dislodged during joint assembly. The gaskets shall be of a composition and texture which is resistant to common ingredients of sewage and industrial wastes, including oil and groundwater, and which will endure permanently under the conditions of the proposed use. The joints shall conform to the requirements of the latest revision of ASTM D-3212.

Flexible Couplings: Flexible couplings for connecting relocated PVC laterals to existing laterals shall be manufactured by Fernco, Inc., Davison, Michigan, or approved equal.

Frame and Covers: Frames and covers for sanitary sewer cleanouts shall be heavy duty Pattern No. 4155 as manufactured by Campbell Foundry Co., Harrison, NJ or Catalog No. R-1975-A2 as manufactured by Neenah Foundry, Neenah, WI. Frames and covers located within paved areas shall be rated for AASHTO-H20-44 loading. Cast iron shall conform to ASTM A-48 Class 25, with latest revisions. Castings shall be coated with a bituminous waterproofing material.

Mechanical Plugs: Mechanical plugs to be used in sanitary sewer cleanouts shall be the Econo-Grip No. 271-578 as manufactured by Cherne.

Bedding Material: Bedding material shall be crushed stone that meets the requirements of Article M.02.01-1 of Form 817.

Backfill: Backfill material above bedding material shall be suitable material from the excavation which is free from large or frozen lumps of soil, wood or other extraneous material or, if directed by the Engineer, shall be approved backfill material meeting the requirements of Article M.02.06 (Grading “B”) of Form 817.

Filter Fabric: Filter fabric shall be a non-woven fabric similar or equal to Mirafi 140 as manufactured by Celanese Fibers Marketing Company, Bidim C22 as manufactured by Monsanto Textiles Company or approved equal.

Pavement Markings: Pavement markings installed to replace disturbed markings shall be painted, match the size and color of existing markings, and meet the requirements of “Painted Pavement Markings” as defined in the pertinent sections of these Specifications.

CONSTRUCTION DETAILS

Trench excavation and backfill and surface restoration shall be done in accordance with the pertinent sections of these Technical Specifications.

All pipe and fittings delivered to the job site shall be accompanied by test reports certifying that the pipe and fittings conform to the above-mentioned ASTM specifications. In addition, the pipe shall be subject to thorough inspection and tests, the right being reserved for the Engineer to apply such tests as he deems necessary.

All tests shall be made in accordance with the methods prescribed by the above-mentioned ASTM specifications, and the acceptance or rejection shall be based on the test results.

The Contractor shall furnish all labor necessary to assist the Engineer in inspecting the pipe. Pipe will be inspected upon delivery, and all that does not conform to the requirements of these specifications shall be rejected and shall immediately be removed by the Contractor.

Prior to installation, all pipe shall be stored at the site until installation in a manner acceptable to the Engineer and which will keep the pipe at ambient outdoor temperatures. Temporary shading shall be provided as required. Simply covering the pipe or structures, which allows temperature build-up when exposed to direct sunlight, shall not be done.

Each pipe unit shall be handled into its position in the trench only in such manner, and by such means as acceptable to the Engineer. Care shall be taken to avoid damaging the pipe and fittings. Where any two pipe units do not fit each other closely enough to enable them to be properly jointed, they shall be removed and replaced with suitable units and new gaskets.

Installation and joint assembly shall follow the directions of the manufacturers of the joint material and of the pipe. The resulting joints shall be watertight and flexible.

All pre-molded gasket joint polyvinyl chloride pipe of a particular manufacturer may be rejected if there are more than five unsatisfactory joint assembly operations or "belt breaks" in 100 consecutive joints, even though the pipe and joint conform to the appropriate ASTM specifications as hereinbefore specified. If the pipe is unsatisfactory as determined above, the Contractor shall, if required, remove all pipe of that manufacturer of the same shipment from the work and shall furnish pipe from another manufacturer which will conform to all of the requirements of these Technical Specifications.

Open ends of pipe and branches shall be closed with polyvinyl chloride stoppers secured in place in an acceptable manner.

All laterals shall be installed with the minimal number of bends between the building being served and the sanitary sewer main and individual bends shall not exceed 45 degrees.

Cleanouts shall be installed at all cumulative changes of lateral direction exceeding 45 degrees, at a spacing of no more than one hundred feet (100') and where shown on the Plans or directed by the Engineer. Cleanouts shall be installed with a cover at grade to facilitate access for cleaning.

Bedding material installed in all trenches shall be backfilled by hand from the bottom of the trench (located a minimum of six inches below the pipe) to the top of the pipe in layers of three (3) inches, compacted by tamping to at least ninety-five percent (95%) of maximum dry density at optimum moisture content as determined in accordance with the requirements of Method D of ASTM Test Method D-1557 (latest revision). Bedding material shall be deposited in the trench for its full width on each side of the pipe, fittings and appurtenances simultaneously and the entire width of bedding material within the trench shall be covered with filter fabric. The Contractor shall use special care in placing this bedding material so as to avoid damaging or moving the pipe and to ensure the material is made compact and tight under and around the pipe. Iron tools suitable for tamping material under and on sides of pipe shall be used, and sufficient space for this tamping shall be provided. In general, wooden sticks, shovel handles and similar make-shift devices will not be considered as suitable tamping tools for use on sides of pipe.

In areas with high groundwater, rock and where directed by the Engineer, bedding material shall also be installed to a depth of six (6) inches above the top of the pipe in layers of six (6) inches or less and with all bedding material completely wrapped in filter fabric with a 12" overlap at the top. Bedding

material shall be compacted by tamping to at least ninety five percent (95%) of maximum dry density as determined by ASTM Test Method D-1557 (latest revision). The layer of bedding above the top of the pipe shall be consolidated by means of hand held vibratory compactors.

After each pipe has been properly bedded, enough pipe bedding shall be placed between the pipe and the sides of the trench and thoroughly compacted to hold the pipe in correct alignment. Bell holes provided for jointing shall be filled with pipe bedding and compacted.

The remainder of the backfill above the bedding material shall be placed and compacted in one (1) foot lifts. Each layer shall be compacted to not less than ninety five percent (95%) of maximum dry density as determined by ASTM Test Method D-1557 (latest revision).

Compaction methods shall be submitted in writing to and approved by the Engineer prior to commencement of any work.

The Contractor shall take all necessary precautions to prevent flotation of the pipe in the trench. At all times when pipe installation is not in progress, the open ends of the pipe shall be closed with temporary watertight plugs, or by other acceptable means.

If water is in the trench when work is to be resumed, the plug shall not be removed until suitable provisions have been made to prevent water, earth or other substances from entering the pipe.

Each pipe unit shall be inspected before being installed. No single piece of pipe shall be laid unless it is generally straight. The centerline of the pipe shall not deviate from a straight line drawn between the centers of the openings at the ends of the pipe by more than 1/16 inch per foot of length. If a piece of pipe fails to meet this requirement for straightness, it shall be rejected and removed from the site. All pipe units or fittings discovered to be defective either before or after installation shall be removed and replaced with a sound unit.

Except as otherwise indicated on the drawings, the pipe shall be supported by compacted bedding. No pipe or fitting shall be permanently supported on saddles, blocking or stones.

Suitable bell holes shall be provided so that after placement, only the barrel of the pipe receives bearing pressure from the supporting material.

All pipe and fittings shall be cleared of all debris, dirt, etc., before being installed and shall be kept clean until accepted in the completed Work.

Pipe and fittings shall be installed to the lines and grades indicated on the drawings or as required by the Engineer. Care shall be taken to ensure true alignments and gradients.

Before any joint is made, the previously installed unit shall be checked to assure that a close joint with the adjoining unit has been maintained and that the inverts are matched and conform to the required grade. The pipe shall not be driven down to the required grade by striking it with a shovel handle, timber or other unyielding object.

All joint surfaces shall be cleaned. Immediately before jointing the pipe, the bell or groove shall be lubricated in accordance with the manufacturer's recommendation. Each pipe unit shall then be carefully pushed into place without damage to pipe or gasket. Suitable devices shall be used to force the pipe units together so that they will fit with a minimum open recess inside and outside and have tightly sealed joints. Care shall be taken not to use such force as to wedge apart and split the bell or groove ends.

Wye fittings, laterals and connections to manholes shall be installed where shown on the plans or where directed in the field by the Engineer, and shall be in accordance with the details shown on the plans. Modifying joints and inverts in existing manholes shall conform with the pertinent sections of these specifications.

Proper implements, tools and facilities shall be provided and used by the Contractor for the safe and convenient performance of the work. All pipe shall be lowered into the trench with a suitable device that will not damage protective coatings and lining. Under no circumstances shall material be dropped or dumped into the trench. Any damaged lining, coating or wrapping shall be satisfactorily repaired or replaced.

Every precaution shall be taken to prevent foreign matter from entering the pipe while it is being placed in the line. If the pipe laying crew cannot put the pipe into the trench and in place without getting earth into it, the Engineer may require that before lowering the pipe into the trench, a heavy, tightly woven canvas bag of suitable size be placed over each end and left there until the connection is to be made to the adjacent pipe. If necessary, the line shall be swabbed or flushed out to remove all foreign matter prior to testing.

Before joining lengths of push-on pipe, the inside of the bell and the outside of the spigot shall be thoroughly cleaned to remove oil, grit, excess coating and other foreign matter.

Connection of the proposed sewer to the existing sewers shall be made in a careful manner acceptable to the Engineer. Any adaptors or other material required for this connection shall be subject to approval of the Engineer.

Trenches shall be backfilled above the bedding material with material approved by the Engineer. All excavated materials not required or unsuitable for backfill, (i.e., clay, silt, sand, muck, gravel, hardpan, loose shale, loose stone in masses and boulders greater than 5” in diameter) shall be removed and properly disposed of by the Contractor. Unsuitable soils that exhibit obvious evidence of heavy contamination or have been identified as containing elevated concentrations of contamination should be removed and stockpiled for characterization and possible off-site disposal. If contaminated soils are stockpiled best management practices must be employed to reduce human and environmental exposure to the stockpiled materials. Granular fill shall be used to replace all unsuitable material.

Sanitary sewer laterals shall be relocated as directed in the field by the Engineer, and shall be in accordance with the details shown on the plans.

Sanitary sewer laterals shall be abandoned by disconnecting the existing lateral from the fitting on the existing sewer main and plugging the ends of the lateral and fitting with cement masonry as directed in the field by the Engineer so flow within the sewer is not impeded.

Any lateral which is interrupted shall be reconnected on the same working day and in no case shall service be interrupted for more than 6 hours.

After relocation, the trench shall be backfilled and all areas disturbed during the installation shall be restored to at least its original condition, to the satisfaction of the Engineer.

Connection of laterals to PVC pipe shall be made with either wyes or tee/wyes. They shall be installed as recommended by the manufacturer.

Where existing laterals are to be reconnected, the reconnection shall be made using a flexible coupling.

Sanitary sewer clean-outs shall be placed in laterals as directed by the Engineer.

All open ends of abandoned pipelines which are created or exposed by the Contractor shall be removed to a distance of 5' (minimum) from new facilities and then sealed with cement masonry at that point prior to backfilling.

Where excavations are to be made in grass covered areas, loam and topsoil shall be carefully removed and separately stored to be used again. If the Contractor prefers not to separate surface materials he shall furnish, as directed by the Engineer, loam and topsoil at least equal in quality to that excavated.

The Contractor shall be fully responsible for damage done to trees and shrubs as a result of this work. It shall be the Contractor's responsibility to preserve existing trees and shrubs, including those temporarily removed where necessary. All trees and shrubs that are removed, killed, or that have, in the opinion of the Engineer, suffered significant permanent damage shall be replaced, at no additional costs, in an acceptable manner with trees or shrubs approved by the Engineer.

Where it appears as though permanent damage to existing trees and shrubs is unavoidable, the Contractor may petition the Engineer to request moving the lateral from the location specified. The Contractor shall not be allowed to vary the lateral location from that specified herein and as shown on the Plans without specific permission of the Engineer.

Reconnection of existing sanitary sewer laterals shall apply to 4” and 6” laterals only. Any reconnection shall consist of a new wye and the fittings, bends, couplings and appurtenances, as deemed necessary.

A final inspection of the work will include a visual inspection of each section of lateral. The pipe shall be true to both line and grade; shall show no leaks; shall be free from cracks and from protruding joint materials and contain no deposits of sand, dirt, or other materials which will reduce the full cross-sectional area. Groundwater infiltration shall not be present. Wall joints shall be tight. All finished work shall be neat in appearance and of first class workmanship. The Contractor shall furnish two (2) laborers to assist in this inspection.

SANITARY SEWER MANHOLES

DESCRIPTION

"Sanitary Manhole" of the size and type specified shall consist of the furnishing and construction of all sanitary sewer manholes in conformity with the lines, grades, dimensions and details shown on the plans.

"Remove Sanitary Manhole" shall consist of the complete removal of existing sanitary sewer manhole and the backfilling and compacting of the remaining void with granular fill. Only manholes specifically called out on the Plans to be removed will be measured for payment under this item; existing manholes removed within the excavation limits of new pipe and manholes will not be measured for payment, but its costs are considered included in the unit price for "Sanitary Sewer Main" and "Sanitary Manhole", respectively.

"Abandon Sanitary Manhole" shall consist of the abandonment of existing sanitary sewer manholes where shown on the Plans or directed by the Engineer.

MATERIALS

Precast manhole sections shall be similar or equal to that shown on the Plans and shall conform to ASTM C-478 and C-443 (joint).

Precast concrete masonry units shall meet the requirements of ASTM C139.

Concrete shall be Class "A" and shall conform to the requirements of Section M.03 of Form 816.

Brick shall conform to ASTM Specifications C-32 for sewer brick. Brick for manhole shelves and inverts shall be dense, hard-burned brick and shall conform to grade SS. All other brick shall conform to grade MS.

Standard mortar shall consist of one (1) part cement and two (2) parts clean sand. No lime shall be added to the mortar.

Manhole frame adjustment rings shall be pressure injected molding consisting of a polypropylene/fiberglass mixture, precast concrete, concrete block or brick. Polypropylene/fiberglass adjustment rings shall be manufactured by the Turner Company of Raleigh, NC or Markham, Ontario.

Manhole frames and covers located within paved areas shall be heavy duty and shall be Model 1027C with an 8" high frame as manufactured by Campbell Foundry Company, Model 2927E as manufactured by Laperle Foundry Company or Model/Product Numbers 00133872 and 00124811 as manufactured by East Jordan Ironworks.

Manhole frames and covers located within unpaved areas shall be heavy duty and water-tight (bolted and gasketed) with ½" stainless steel bolts and shall be Model 1009 as manufactured by Campbell Foundry Company, Model 6502 as manufactured by Laperle Foundry Company or Model/Product Numbers 00124872 and 0124872W03 as manufactured by East Jordan Ironworks.

The cover shall be cast with the words "MANCHESTER SEWER". Cast iron shall conform to ASTM A-48 Class 30B or its latest revisions. Frames and covers shall be coated with a bitumastic coating.

Flexible joints shall be used where indicated on the plans and details for all manhole to pipe connections and shall be Kor-N-Seal as manufactured by NPC, Inc., Milford, New Hampshire, “Press Wedge II” as manufactured by Press Seal Gasket Corp., Fort Wayne, Indiana or “Lock Joint Flexible Manhole Sleeve” as manufactured by Interpace Corp., Parsippany, New Jersey.

Pipe and fittings for manhole drops shall conform to the requirements of the associated detail pertinent section of these Specifications.

Coating for exterior surfaces of all manhole components shall be bituminous waterproofing material. The material shall be Minwax Fibrous Brush Coat made by Minwax Co., New York, New York; Tremco 121 Foundation Coating made by the Tremco Manufacturing Company, Cleveland, Ohio; Bitumastic Black Solution made by the Koppers Company, Inc., Pittsburgh, Pennsylvania; or approved equal product.

Sand for filling manholes to be abandoned shall conform to the requirements of Article M.08.01-21 of Form 816.

Granular Fill shall conform to the requirements of “Granular Fill” elsewhere in these Specifications.

Steel sheeting for excavation support systems, if required, shall conform to the requirements of ASTM A328, ASTM A572 or ASTM A690 as appropriate.

CONSTRUCTION DETAILS

Bases shall be precast concrete. The precast riser and cone sections shall be installed truly plumb.

The Contractor's attention is directed to the requirement for neoprene gaskets or bituminous sealer for joints, which shall be installed in accordance with manufacturer's recommendations. After assembly of all sections is completed, the joints shall be pointed with mortar on both inside and outside surfaces of the manhole. All lifting holes shall be filled with mortar.

Inverts shall be constructed of precast concrete or cast-in-place concrete and shall conform accurately to the size of the adjoining pipes. Brick and mortar inverts shall be installed where directed by the Engineer.

Side inverts shall be curved and main inverts, where direction changes, shall be laid out in smooth curves of the longest possible radius which is tangent, within the manhole, to the centerlines of the adjoining pipelines.

Manhole frames shall be set with the tops conforming to the finished grade of the pavement, ground surface or as directed by the Engineer.

Precast concrete, concrete blocks and/or bricks, or polypropylene/fiberglass grade adjustment rings shall be installed as directed by the Engineer, with a minimum 4 inch and a maximum 12 inch height, to adjust the manhole to the grade as shown on the drawings and to accommodate future adjustment. Frames shall be set concentric with the top of the concrete or brick riser section and in a full bed of mortar so that the space between the top of the riser and the bottom flange of the frame shall be completely filled and made watertight.

A thick ring of mortar extending to the outer edge of the riser section shall be placed all around and on the top of the bottom flange for manholes in unpaved areas. The mortar shall be smoothly finished and have a slight slope to shed water away from the frame.

The exterior surfaces of all manhole components shall be given two (2) coats of bituminous waterproofing material acceptable to the Engineer. The material shall be applied by brush or spray in accordance with the manufacturer's recommendations. Sufficient time shall be allowed between coats so that application of the second coat shall not affect the first coat. At least one (1) coat shall be applied after the manhole has been constructed in the field, paying particular attention to the joints.

Manhole drops shall be constructed as shown on the plans and in the details in conformance with the applicable sections of these specifications.

Where called for on the plans, directed by the Engineer, or necessary for the new construction, existing manholes and pipe shall be modified as required. Modified joints and inverts in sanitary manholes shall conform with the pertinent sections of these specifications.

Manholes to be abandoned shall have the frame and cover removed and properly disposed of off-site. All pipes in the manhole shall be plugged with concrete. The Contractor may substitute bricks with permission of the Engineer. The existing manhole shall be removed to a level a minimum of two (2) feet below the surface. The remaining manhole structure shall be filled with sand and compacted. The remaining void shall be backfilled with granular fill to the subgrade elevation of the surface restoration treatment. The portions of the manhole removed shall not be used for any other Work performed on this project.

Manholes to be removed shall have all components of the manhole (i.e. frames and covers, cones, risers, base, etc.) removed and properly disposed of off-site. None of these components shall be utilized for any other work performed on this Project. The void left by the removal of the manhole shall be backfilled with granular fill and compacted.

When directed by the engineer, frames and covers for new manholes located within limits of road reconstruction shall be temporarily set at the binder course elevation and raised to the final course elevation immediately prior to paving.

The Contractor shall furnish, put in place and maintain such excavation support systems (i.e. trench boxes, steel plates, steel sheeting, etc.) as may be necessary to support the sides of the excavation and to prevent any movement of earth other than that intended to be accomplished by the excavation. Trench support systems shall be designed to support earth pressures, hydrostatic pressures, equipment and construction loads, and other surcharge loads, to allow safe and expeditious construction with minimal movement or settlement of ground, to prevent damage to, or movement or settlement of, adjacent buildings, structures, or utilities. Such systems shall be installed as may be necessary for the protection of the Work and for the safety of personnel, and shall comply with the safety precautions as outlined in the Associated General Contractors of America, "Manual of Accident Prevention in Construction," the "Occupational Safety and Health Act" of 1970 (OSHA) of latest revision and OSHA Reference: U.S. Dept. Of Labor O.S.H.A. Safety and Health Standards (29 CFR 1926/1910) revised March 5, 1990, Subpart P-Excavations, Trenching & Shoring Selection of Protective Systems, 1926-652 Appendix F.

TESTING

Vacuum testing shall be performed on selected manholes at the direction of the Engineer after backfilling. If said testing indicates any problems, additional testing may be ordered by the Engineer. The Contractor shall have the option of pre-testing prior to backfilling to help facilitate repairs. However, this does not relieve the Contractor from testing after backfilling.

All lift holes shall be plugged with an approved non-shrink grout. All pipes entering the manhole shall be plugged, taking care to securely brace the plug from being drawn into the manhole.

The test head shall be placed at the inside of the top of the cone section and the seal inflated in accordance with the manufacturer's recommendations. A vacuum of ten (10) inches of mercury shall be drawn and the vacuum pump shut off. With the valves closed, the time shall be measured for the vacuum to drop nine (9) inches. The manhole will pass if the time is greater than sixty (60) seconds for 48" diameter and ninety (90) seconds for 72" diameter manholes.

If the manhole fails the initial test, necessary repairs shall be made with a non-shrink grout while the vacuum is still being drawn. Retesting shall proceed until a satisfactory test is obtained.

SANITARY SEWER BYPASS SYSTEM

DESCRIPTION

"Sanitary Sewer Bypass System" shall consist of the furnishing of all equipment, labor, supervision, incidentals and material necessary for temporarily bypassing sanitary sewer flows around manholes, structures and piping by pumping as required for construction; to permit cleaning, testing, sealing; and to obtain other information necessary. This Work includes maintaining continuous and reliable wastewater service in all sewer pipes including individual service connections during construction.

Construction that may require a temporary sewer bypass systems includes, but is not limited to, wastewater pump station improvements; connections of new sewers to existing sewers; repair or replacement of existing sewers and structures; trenchless rehabilitation of existing sewers; and pipeline inspection.

Contact the Town for licensing requirements for any person involved in the installation of a sanitary sewer and/or appurtenances.

MATERIALS

To prevent the accidental spillage of wastewater flows, all discharge systems must be constructed of high density polyethylene (HDPE) pipe with fused joints or Quick Disconnect discharge pipe with positive restrained joints, and leak-proof connections. Discharge hose will only be allowed by specific permission from the Engineer.

HDPE bypass piping shall conform to the following requirements:

1. All HDPE pipes shall meet the requirements of ASTM F714. SDR rating of the pipe shall be sufficient to withstand the pressure and leakage test outlined herein.
2. HDPE Pipe shall be furnished in standard laying lengths not exceeding 50 feet.
3. Joining system: The HDPE pipe shall be joined with butt, heat fusion joints. All joints shall be made in strict compliance with the manufacturer's recommendations and ASTM 2657. Where required, flange connections, mechanical joint connections and butt connections using bolted mechanical couplers shall be provided from a pipe stub with a polyethylene and steel stiffener. Flanged connections shall be provided from a pipe stub and a steel back-up flange. Back flanges shall be primed and painted in corrosion protected paint. Quick disconnect couplings will not be permitted on HDPE bypass piping.
4. HDPE fittings shall be fully pressure rated to match the pipe SDR pressure rating. All fittings shall be molded or fabricated by the same manufacturer as the pipe. HDPE fittings shall be joined using butt, heat fusion and/or electro-fusion. Adhesives and solvent cements shall not be permitted.

The Contractor that fuses the HDPE pipe must have a minimum of five (5) years of experience fusing HDPE pipe of the same diameter required for the project.

PVC pipe with glued joints, aluminum “irrigation pipe”, steel pipe or PVC pipe with Dresser couplings will not be accepted.

All joints must be 100% restrained and all discharge pipes must have a minimum working pressure of 50 psi.

CONSTRUCTION DETAILS

Contractor shall supply pumps, pipes, power, fuel and all items required to bypass flow of sewage around the sewer system where Work is to be performed. It is the intent of these Specifications to require the Contractor to establish adequate bypass pumping as required regardless of the flow condition.

Contractor shall insert a plug or block the flow in pipes downstream of the bypass structure and connect pumps, hoses and any other equipment necessary to bypass flow around the existing sewer system as required for construction. Contractor shall make every effort to ensure the length of time the bypass system is operational is kept to a minimum.

During the bypass pumping operation, the Contractor shall undertake the necessary precautions to protect the existing sanitary sewer system from damage that might result from sewer surcharging. Discharge piping to gravity sewer systems shall be designed in such a manner as to prevent sewage discharge from contacting manhole walls or benches and full discharge shall go into downstream pipe with as minimal turbulence as possible. It may be necessary to remove the manhole cone to provide sufficient space for the bypass piping. If this is required, the Contractor shall be responsible for any damage to existing manhole components

Contractor shall undertake the necessary precautions to insure that flow control operations do not cause flooding or damage to public or private property. The Contractor is cautioned to monitor the upstream sewers for excessive surcharging which could cause flooding or damage. Monitoring methods include but are not limited to visually observing the flow in manholes upstream of the point of plugging.

The Contractor shall perform leakage and pressure tests of the bypass pumping discharge piping using clean water prior to the actual operation. The pressure and leakage test shall be conducted at one-and-a-half times the maximum pressure the system will experience based on the approved Bypass Pumping Plan for a period of two hours. No leakage is permitted during this test. The Engineer will be given 24 hours notice prior to testing. In addition, the Contractor shall demonstrate that the pumping system is in good working order and is sufficiently sized to successfully handle flows by performing a test run for a period of 24 hours prior to beginning construction activities in the bypassed areas of the sanitary sewer system.

Contractor shall provide primary bypass pumps that are critically silenced when used in residential settings or areas where excessive noise levels would create a disturbance as determined by the Engineer.

Contractor shall provide a redundant bypass pump, intake and discharge conduit, and other equipment necessary to provide continuous bypass flow and prevent the backup of sewage within sanitary sewer mains and laterals at all times. Redundant bypass pumping does not have to be critically silenced.

Sanitary sewer flows shall only be bypassed around construction activities when authorized by the Engineer. Bypass pumping will only be allowed when adequate flow control cannot be obtained by plugging or blocking as determined by the Engineer.

The bypass system shall be of sufficient capacity to handle existing flows plus additional flow that may occur during a rainstorm.

The design, installation, operation and maintenance of all temporary pumping systems shall be the responsibility of the Contractor. The Contractor shall either sufficiently demonstrate ability, or employ the services of a subcontractor who can sufficiently demonstrate ability, to the Engineer that he specializes in the design and operation of temporary bypass pumping systems.

The Contractor responsible for the bypass system shall provide at least three (3) references for projects of similar size and complexity in wastewater applications performed within the past five (5) years. The bypass system shall meet the requirements of all codes and regulatory agencies having jurisdiction. The Contractor shall provide only competent personnel skilled in this type of work.

The Contractor shall provide on-site manual oversight of all bypass pumping operations 24 hours per day, 7 days per week when the bypass pumping system is in operation or provide a reliable SCADA system for continuous remote monitoring of the bypass system that is approved by the Engineer. The person responsible for monitoring shall be properly trained, experienced, and mechanically qualified such that they can quickly and effectively address any potential emergency and non-emergency situations associated with the pumps and bypass pumping system that must remain in operation for an extended period.

Contractor shall construct, maintain and repair all temporary sewer bypass systems and shall be responsible for preventing system backup and providing appropriate conditions for proper installation, rehabilitation, testing and inspection of sewers during construction. The Contractor shall immediately notify the Engineer if a sanitary sewer overflow (SSO) occurs and take the necessary action to clean up and disinfect the spillage to the satisfaction of the Engineer and/or other governmental agency. Any required repairs to bypass systems shall be immediately completed to prevent any overflows or backups within the sanitary sewer system.

The Contractor shall immediately remove and dispose of all offensive matter spilled during the bypass pumping and is solely responsible for all associated costs. The Contractor shall also be responsible for paying any fines imposed as a result of spills or overflows that occur as a result of the bypass pumping operations.

The Contractor shall submit to the Engineer a sewer bypass schedule required to complete the Work. At a minimum, the schedule will include the proposed sequencing and coordination of wastewater pump station improvements, connections of new sewers to existing sewers, repair or replacement of existing sewers and structures, trenchless rehabilitation of existing sewers, pipeline inspection, and the handling of wastewater flow during all aspects of construction. The Engineer shall approve such schedule prior to implementation.

The Contractor shall prepare a specific, detailed description of the proposed pumping system (Bypass Pumping Plan.) The Bypass Pumping Plan shall be submitted and approved by the Engineer prior to the mobilization of any of the equipment included in the Bypass Pumping Plan. The Bypass Pumping Plan shall outline all provisions and precautions to be taken by the Contractor regarding handling of existing wastewater flows. This Bypass Pumping Plan must be specific and complete, including such items as schedules, locations, elevations, capacities of equipment, materials, and all other incidental items necessary and/or required to ensure proper protection of the facilities, including protection of bypass pumping locations from damage in compliance with the requirements and permit conditions specified herein. No construction shall begin until all provisions and requirements have been reviewed and accepted by the Engineer.

The plan shall include, but is not limited to, the following details:

1. Staging areas for pumps.
2. Sewer plugging method, types of plugs and proposed plug locations that will not cause adverse impacts upstream.
3. Size and location of manholes or access points for suction and discharge hose or piping.
4. Size of pipeline or conveyance system to be bypassed.
5. Number, size, material, location and method of installing suction piping.
6. Number, size, material, location and method of installing discharge piping.
7. Bypass pump sizes, capacities, and number of each size pump to be provided on-site including all primary, secondary, and spare pumping units.
8. Calculations of static lift, friction losses, and flow velocity. Pump curves showing pump operating range shall be submitted.
9. Downstream discharge plan.
10. Method of protecting discharge manholes or structures from damage.

11. Thrust and restraint block sizes and locations. Provide the details necessary to demonstrate the integrity of all suction and discharge piping including piping and fittings associated with all primary and secondary pumping units.
12. Section views showing suction and discharge pipe depth, embedment, select fill and special backfill.
13. Standby power generator size and location.
14. Method of noise control for each pump and any additional equipment that is included in the Bypass Pumping Plan.
15. Any temporary pipe supports and anchoring requirements.
16. Access plans to all bypass pumping locations indicated on the drawings.
17. Calculations for selection of bypass pumping pipe size.
18. Schedule for installation of and maintenance of bypass pumping pipes.
19. Plan indicating location of bypass pumping pipe locations.
20. Emergency plan for adverse weather and flooding for various phases of the Work.
21. Contractors plan for providing continuous monitoring of the bypass pumping operation as well as the monitoring person's qualifications and detailed information for the proposed monitoring system.

Sewage flows from private, commercial, and industrial users shall be handled by the Contractor during the Work without interruption.

The Contractor shall be required to repair, at his own expense, any damage to public or private property caused by his operations.

Should damage of any kind occur to the existing sanitary sewer system, the Contractor shall, at his own expense, make repairs to the satisfaction of the Engineer.

The Contractor shall not be permitted to overflow, bypass, pump or by any other means convey sewage to any land, street, storm drain, wetland, waterbody or watercourse.

The Contractor shall cease bypass pumping operations and return flows to the new and/or existing sewer when directed by the Engineer. During bypassing, no wastewater shall be leaked, dumped, or spilled in or onto any area outside the existing wastewater system. When bypass operations are complete, all bypass piping shall be flushed with fresh water and drained into the wastewater system prior to disassembly.

The Contractor shall establish adequate bypass pumping adherent to the conditions above and anticipate severe weather conditions and increases in peak flows during rain events.

Contact the Town for available flow and capacity data for Contractor's use in sizing equipment.

Contractor shall identify all areas requiring sewer bypass for completion of the work and notify the Engineer. Approximate sanitary flows within other areas of the sewer system that require bypass for the completion of work will be provided by the Engineer for development of the Bypass Pumping Plan.

The Contractor shall keep records of all bypass pumping performed. The records shall identify the name of the project; Contractor's name; pump intake location, discharge location, pumping equipment used, pipe size and length of sewer system that was bypassed; dates and beginning and ending times; and any special remarks concerning the operation. Four (4) copies of each record shall be submitted daily to the Engineer upon completion of the bypass pumping operation.

EROSION AND SEDIMENTATION CONTROLS

DESCRIPTION

"Silt Fence" includes the furnishing, placing, maintaining and removal of manufactured geotextile silt fence where shown on the Plans or where directed by the Engineer.

"Hay Bales" includes the furnishing, placing, maintaining and removal of hay bales where shown on the Plans or where directed by the Engineer.

"Silt Sack" includes the furnishing, placing, maintaining and removal of manufactured geotextile silt sacks specifically made to protect catch basins where shown on the Plans or where directed by the Engineer.

"Construction Entrance" includes the furnishing and installation of a temporary crushed stone pad on a geotextile surface located so as to prevent dirt and mud from tracking onto existing pavement. The exact location(s) of "Construction Entrance" shall be determined by the Engineer.

"Turbidity Curtain" includes the furnishing, placing, maintaining and removal of manufactured geosynthetic material where shown on the Plans and as directed by the Engineer.

MATERIALS

Geotextile shall conform to Section M.08.01.19 of Form 818.

Silt Sack shall be Hi-Flow Siltsack® Type A (for Type "C-L" catch basin tops) and Type B with curb deflector (for Type "C" catch basin tops or other structure with curb inlets) as manufactured by ACF Environmental, Inc., Richmond, VA (800-448-3636) or approved equal. Silt sack shall be provided with internal overflows and meet the following criteria:

Properties	Test Method	Units
Grab Tensile Strength	ASTM D-4632	265 lbs
Gran Tensile Elongation	ASTM D-4632	20%
Puncture	ASTM D-4833	135 lbs
Mullen Burst	ASTM D-3786	420 psi
Trapezoid Tear	ASTM D-4533	45 lbs
UV Resistance	ASTM D-4355	90%
Apparent Opening Size	ASTM D-4751	#20 U.S. Sieve
Flow Rate	ASTM D-4491	200 gal/min/sq ft
Permittivity	ASTM D-4491	1.5/sec

Crushed stone for Construction Entrances shall conform to “Grading A” of Section M.02.06 of Form 818.

Turbidity curtain shall be manufactured by ACF Environmental, Richmond, VA (800-448-3636) or approved equal.

RESPONSIBILITY

It is the Contractor’s sole responsibility to provide and continually inspect and maintain all erosion and sedimentation control measures on the site. Failure to do so may result in enforcement actions by the Town of Manchester or State of Connecticut. The erosion and sedimentation control measures shown on the Plans or in these Specifications are intended as a guideline to show the minimal control measures required based on the intended construction. Additional control measures may be necessary depending upon the Contractor’s operations and scheduling of the project.

CONSTRUCTION DETAILS

Geotextile sedimentation control systems may consist of either a prefabricated geotextile fence or a geotextile fence assembled by the Contractor in the field. Geotextile sedimentation control systems shall be installed so that the bottom six (6) inches of the fabric is buried by either trenching or by laying the six (6) inch section horizontally on the ground and burying by ramping the soil up to the control fence. All geotextile fences shall be a least 42 inches in exposed height as installed, with not less than a two (2) degree and not more than a 20 degree inclination toward the potential silt source. Hardwood posts shall have a minimum cross-section size of at least 1.5 inches by 1.5 inches and a minimum length of 30 inches. Steel posts shall be at least 0.5 pound per linear foot with a minimum length of 48 inches. Spacing between posts shall not exceed ten (10) feet, and all posts shall be driven a minimum of 12 inches into the ground. When joints between sections of geotextile sedimentation control systems are necessary, geotextile shall be spliced together only at a support post, with a minimum six (6) inch overlap, and securely sealed.

The installations shall be maintained or replaced until they are no longer necessary for the purpose intended or are ordered removed by the Engineer. Cleanout of accumulated sediment shall be accomplished when one-half of the original height of the sedimentation control system, as installed, becomes filled with sediment or as ordered by the Engineer.

The geotextile fence systems will be completely removed from the project at the completion of the project, unless specifically authorized by the Engineer to be left in place.

Unless a specific type of sedimentation control system is indicated on the plans or directed by the Engineer, the type of system will be at the Contractor’s option.

Silt sacks shall be installed in accordance with manufacturer’s instructions and shall be emptied and legally disposed of when they have collected 6” to 12” of sediment and when directed by the Engineer. Silt sacks shall be inspected every 1 to 2 weeks and after every major rainfall event.

Turbidity curtains shall be installed in accordance with manufacturer’s instructions.

Erosion and sedimentation control measures shall be installed and accepted by the Engineer prior to any excavation, grubbing or other operation that disturbs existing ground.

RIPRAP

DESCRIPTION

"Riprap" of the type specified includes the furnishing and installation of angular shaped crushed stone slope protection on a prepared base at the locations shown on the Plans or as directed by the Engineer in accordance with these Specifications.

MATERIALS

A. Stone: Stone shall consist of sound, tough, durable and angular rock, free from decomposed stones or other defects impairing its durability. The size of a stone as hereinafter specified shall be its least dimension. Broken concrete or rounded stones are not acceptable. The type of material to be used shall be as noted on the plans, in the special provisions or as may be ordered by the Engineer.

Grading for the various types of riprap shall conform to the requirements of Section M.12.02 of Form 816.

B. Geotextile shall conform to Section M.08.01.26 of Form 816 and shall be submitted to the Engineer for approval.

C. Granular Fill shall meet the requirements of "Granular Fill" elsewhere in these Specifications.

CONSTRUCTION DETAILS

The contractor shall excavate and key into the existing slope as shown in the plans. Bedding material shall be placed on the prepared area and compacted to the depth, lines and grades indicated on the plan. The riprap shall be placed to its full course thickness in one operation in such a manner as to produce a reasonably well-graded mass of rock without causing displacement of the underlying material. The finished surface shall be free from pockets of small stones and clusters of large stones. Placing this material by methods likely to cause segregation of the various sizes of stone will not be permitted. Rearranging of individual stones by mechanical or hand methods will be required to the extent necessary to obtain a reasonably well-graded distribution of the specified stone sizes. The completed course shall be of the specified thickness and to the lines and grades as shown on the plans or as ordered by the Engineer.

RESTORATION OF LAWN AND WETLAND AREAS AND EROSION CONTROL BLANKET

DESCRIPTION

"Restoration of Lawn Areas" includes all work required to establish turf, including the furnishing and installation of screened topsoil and of a specified slurry mixture of seed, fiber, fertilizer and stabilizer emulsion with hydro-mulch equipment, where shown on the Plans or where directed by the Engineer.

"Restoration of Wetland Areas" includes all work required to establish vegetation, including the furnishing and installation of screened topsoil, and of a specified slurry mixture of seed, fiber, fertilizer and stabilizer emulsion with hydro-mulch equipment, within the wetlands areas identified on the Plan or where directed by the Engineer.

"Erosion Control Blanket" includes the furnishing and installation of a manufactured straw/fiber blanket at the locations shown on the Plans or where directed by the Engineer.

MATERIALS

Fertilizer: Fertilizer shall conform to the requirements of Section M.13.03 of Form 818 or an approved equal. Soil testing and analysis may be performed by the Contractor at the Contractor's expense to determine fertilizer rate. Submit Manufacturer's product specifications and guaranteed purity analysis for fertilizer. Apply at a minimum rate of 25 lbs/ 1,000 SF or as per recommended by results of soil testing.

Mulch: Cellulose fiber mulch shall conform to the requirements of Section M.13.05.3 of Form 818. Apply at a minimum rate of 40 lbs/ 1,000 SF.

Tackifier: Organic tackifier shall be applied at rate of 70 lbs./acre

Topsoil: The term topsoil used herein shall mean a soil meeting the soil textural classes established by the United States Department of Agriculture Classification System based upon the proportion of sand, silt, and clay size particles after passing a two (2) millimeter (mm) sieve and subjected to a particle size analysis. The topsoil shall not contain less than 6% nor more than 20% organic matter as determined by loss-on-ignition of oven dried samples dried at 105 degrees centigrade.

The following textural classes shall be acceptable:

Loamy sand, including coarse, loamy fine, and loamy very fine sand
Sandy loam, including coarse, fine and very fine sandy loam
Loam
Silt loam, with not more than sixty (60) percent silt

The topsoil to be furnished by the Contractor shall be loose, friable, reasonably free of admixtures of subsoil, free from refuse, stumps, roots, brush, weeds, rocks, and stones ½ inch and over in all dimensions. The topsoil shall also be free from any material that will prevent the formation of a suitable seedbed or prevent seed germination and plant growth.

Seed: Shall meet the requirements of Section M.13.04 of Form 818 and be fresh and clean and new crop seed composed of an evenly graded mixture by proportion and testing minimum percentages of purity and germination indicated, or as approved by the Engineer.

The grass seed mixture, for lawns with <=3:1 slope with mowing required, shall have no noxious weeds in mix and shall conform to the following CTDOT mixture:

Species	Proportion by Weight (Pounds)	Minimum Purity (Percent)	Minimum Germination (Percent)
VELVET BENTGRASS (ARGOSTIS CANINA) Certified Variety	25	96	85
RED FESCUE (FESTUCA RUBRA L. SSP. RUBRA) Certified Variety	35	97	80
PARTRIDGE PEA (CHAMAECRISTA FASCICULATA) Certified Variety	10	95	90
INDIAN GRASS (SORGHASTRUM NUTANS) Certified Variety	15	95	90
CANADA WILDRYE (ELYMUS CANADENSIS) Certified Variety	5	95	90
KENTUCKY BLUE GRASS (POA PRATENSIS) Certified Variety	10	95	90

Under no circumstances shall annual Ryegrass, Italian Rye, or any other seed be added to the seed mixture.

The seed mixture for channel embankments and lawns >3:1 slope with mowing not required shall have no noxious weeds in mix and shall generally conform to the following requirements:

	Proportion by Weight (Percent)	Minimum Germination (Percent)
Creeping Red Fescue	54.0	85
Redtop	5.0	85
Crown Vetch	40.0	90
Other Ingredients	1.0	-

The seed mixture for wetlands areas shall be submitted to the Engineer for review and approval.

The seed mixture for wildflower mix shall be submitted to the Engineer for review and approval.

"Temporary" grass seed shall be annual ryegrass, or an approved equal. The temporary grass shall be used for topsoil and similar material stockpiles that are not to be used within 30 days or used for other applications as directed by the Engineer or submitted to the Engineer for review and approval.

Erosion control blanket: shall be a machine produced mat consisting of 100% coconut fiber. The blanket shall be of consistent thickness with the coconut fiber evenly distributed over the entire area of the mat. The blanket shall be covered on the top side with heavyweight photodegradable polypropylene netting having ultraviolet additives to delay breakdown and an approximate 5/8 inch x 5/8 inch mesh, and on the bottom side with a lightweight photodegradable polypropylene netting with an approximate ½ inch x ½ inch mesh. The blanket shall be sewn together on 1 ½ inch centers with degradable thread.

Coconut fiber erosion control blanket shall be C125 as manufactured by North American Green, or approved equal. The C125 erosion control blanket shall have the following properties:

Material content	
Coconut Fiber	100%
Netting	Both sides, heavyweight UV stabilized (3 lb/1000 sq ft approx wt)
Thread	100% Black Polypropylene

Physical Specifications	
Width	6.67 feet
Length	108 feet
Weight	44 lbs +/- 10%
Area	80 sq yds
Stitch spacing	1.5 inches

Wire staples are to be produced from 11 gauge .118 to .120 bright basic industrial quality 1008/1010 wire, minimum cast, light oil protection. The staples shall be produced in a 6" x 1" x 6" U-shaped configuration.

CONSTRUCTION DETAILS

Construction methods shall be those established as agronomically acceptable and feasible and which are approved by the Engineer.

The existing ground shall be graded to a reasonably true surface.

Topsoil shall be spread and shaped to meet existing elevation, after settlement and compaction has occurred, and have a minimum depth of four (4) inches with all stone larger than ½" removed.

In wetland areas, 8" of native topsoil/organic matter shall be stripped, stockpiled and reused for wetlands plantings.

It shall be the Contractor's responsibility to restore to the line, grade and surface all eroded areas with approved material and to keep topsoiled areas in acceptable condition until the completion of the construction work.

Examine work area before proceeding with any work and notify the Engineer in writing on conditions which may prevent the proper execution of this work. Failure to report unsuitable conditions will require the contractor to rectify unacceptable work at no additional cost to the Town.

Allow the planting area soil surface to dry out for one day only prior to the hydroseeding application. Exercise care not to allow the soil surface to be overly saturated with water prior to the hydroseeding installation. At the same time the soil surface should not become too dry during this period. There should be some residual moisture within the first 1/4 inch of the soil surface.

Notify the Engineer at least 48 hours prior to starting the hydroseeding operation. The Engineer shall be present during the hydroseeding operation and has final determination if conditions are acceptable for hydroseed application.

Application rates for hydroseed shall be as defined by the manufacturer.

Apply the hydroseed in the form of a slurry consisting of organic soil amendments, commercial fertilizer, and any other chemicals that are called out. When hydraulically sprayed onto the soil, the mulch shall form a blotter-like material. Direct the spray operation so that this procedure will drill and mix the slurry components into the soil, the slurry spray will also penetrate the soil surface, thus ensuring maximum impregnation and coverage. The impregnation and mixing of the components will help in retaining moisture while stabilizing soil surface from superficial erosion.

Do not leave the hydroseeding slurry components in the hydroseeding machine for more than two (2) hours because of possible seed destruction. If slurry components are left idle for more than two hours in the machine, add 50% more of the originally specified seed mix to any slurry mixture which has not been applied within the two hours after mixing. Add 75% more of the original seed mix to any slurry mixture which has not been applied eight (8) hours after mixing. All mixtures more than eight (8) hours old, must be disposed, offsite, at the contractor's expense.

Spray the area with a uniform visible coat, using the dark color of the cellulose fiber as a visual guide. The slurry shall be applied in a downward drilling motion via a fan stream nozzle. Insure that all of the slurry components enter and mix with the soil. Insure the uniformity of the hydroseed application. Exercise special care to prevent any of the slurry from being sprayed onto any hardscape areas including concrete walks, fences, walls, buildings, etc. Remove all slurry sprayed onto these surfaces at the contractor's expense.

Contractor shall save all seed and fertilizer tags and fiber mulch bags for the Engineer to verify compliance with the drawings and specifications.

The Contractor shall maintain the area until sufficient seed growth has occurred to stabilize the soil. This includes the restoration of all eroded areas, and the placing and maintaining of erosion control measures as required to prevent further erosion.

Normal seeding season shall be:

For Grass:
Spring seeding - March 15 to June 30
Fall seeding - August 15 through October 31

For Wildflower:
Spring seeding - March 1 to May 15
Fall seeding - November 15 to December 15

Seeding at other times will be allowed only with permission of the Engineer.

The Contractor may be required to top dress and reseed certain areas to achieve sufficient, uniform turf establishment.

MAINTENANCE

Upon completion of hydroseeding operations, maintain all hydroseeded areas for a period of 90 calendar days as follows:

1. Germination stage irrigation: Approximately 24 hours after hydroseeding the planting areas, initiate the watering sequence. Leave the water on long enough to moisten the soil thoroughly to the depth of the slurry mulch taking care not to super saturate or wash away the slurry and seed. Perform frequent, light irrigation until the seed has germinated. Repair all seed washings and erosion.

2. Establishment stage irrigation: After germination, reduce each watering. The specific watering program shall be approved by the Engineer.

Fertilize all hydroseeded areas with an approved commercial fertilizer approximately thirty (30) calendar days from the start of the maintenance period.

ACCEPTANCE

Final approval and acceptance will be given in writing by the Engineer following a final acceptance inspection. The Engineer reserves the option to extend the maintenance period to achieve complete germination of all turf or other plant materials with a uniform height, color and density throughout all hydroseeded areas. Final acceptance may be given at the end of the 90 calendar day maintenance period if an acceptable germination of turf and adequate plant establishment has been obtained, as determined by the Engineer.

GUARANTEE AND REPLACEMENT

Provide a guarantee for a period of one (1) year after final acceptance, that the installed grass areas be at least the quality and condition as at the time of acceptance. Rehydroseed unacceptable areas during the guarantee period. The guarantee shall not include damage or loss of turf due to acts of God, acts of vandalism or negligence on the part of the Town.

LANDSCAPING

DESCRIPTION

The Work of this Section consists of all labor, materials and equipment required to provide all trees, shrubs, groundcover and perennials, in place, as shown on the Plans, specified herein or as directed by the Engineer, and as necessary for a complete and proper installation.

QUALITY ASSURANCE

A. Industry Reference Standards:

1. American National Standards Institute (ANSI) Publications: ANSI Z60.1-1990 American Standard for Nursery Stock.

2. American Joint Committee on Horticultural Nomenclature (AJCHN) Publication: Second Edition, Standardized Plant Names, 1942.

3. State of Connecticut Department of Agriculture

   a. Connecticut Commercial Fertilizer Law: Chapter 427A (P.A. 73-278) of Connecticut General Statutes, Revisions and Subsequent Amendments.

   b. Connecticut Agriculture and Seed Law: Chapter 424 of Connecticut General Statutes, Revised to 1979, as amended.

B. Inspection of Plant Materials:

1. Plant materials may be inspected by the Engineer at his discretion at the growing site and tagged for size and quality and approved for delivery. Such inspection does not preclude the right of rejection at the project site.

2. Any plant tagged by the Engineer shall not have the tag removed until the plant has been accepted at the site.

3. At least and one shrub of each variety and from each source shall be labeled with a securely attached waterproof tag bearing legible designation of botanical and common name.

4. Any tree type material should have the north orientation marked at the nursery. The mark shall not be removed until the plant has been installed in the same orientation at the site.

C. Installer's Qualifications: Engaged firm must be able to provide evidence to indicate successful documented experience in the installation of work specified herein.

SUBMITTALS

A. Manufacturer's Product Data: Submit material specifications, including Material Safety Data Sheets (MSDS) and installation instructions where applicable, attesting that the following materials meet the requirements specified:

1. Fertilizer
2. Peat
3. Anti-desiccant
4. Compost

B. Certificates:

1. Nursery certification for all plant materials indicating names of plants in accordance with the American Joint Committee on Horticultural Nomenclature.
2. Nursery certification for plants indicating conformance with ANSI Z60.1 for quality and size.
3. Certificates of Inspection required by governing agencies.

MATERIALS

A. Plants:

1. Provide plants conforming to the varieties and numbers specified in the indicated plant list on the Drawings. Provide nursery stock in accordance with ANSI Z60.1 except as otherwise stated or indicated.

2. Provide well-branched and well-formed, sound, vigorous, healthy planting stock free from disease, sun-scale, windburn, abrasion and harmful insects or insect eggs and having healthy, normal and unbroken root balls.

   a. Provide symmetrically developed deciduous trees and shrubs of uniform habit of growth, with straight boles or stems and free from objectionable disfigurements.

   b. Provide evergreen trees and shrubs with well-developed symmetrical tops with typical spread of branches for each particular species or variety.

   c. Provide groundcovers, vines and perennials having the number and length of runners and clump sizes indicated and of the proper age for the grades of plants indicated. Provide well-established vines, groundcovers and perennial plants in removable containers, integral containers or formed homogeneous soil sections.

   d. Provide plants grown under climatic conditions similar to those in the locality of the project.

   e. Spray plants budding into leaf or having soft growth with an anti-desiccant before digging.

   f. Plants of the same specified size shall be of uniform size and character of growth.

3. The minimum acceptable sizes of all plants, measured before pruning and with branches in normal position, shall conform to the measurements indicated on the Drawings. Measurements shall be the average width or height or caliper of the plant for the species as specified in ANSI Z60.1 and shall not be the extreme outside measurement.

   Plants larger in size than specified may be used with the acceptance of the Engineer with no change in the Contact Price. If larger plants are used, increase the ball of earth or spread of roots in accordance with ANSI Z60.1.

4. The use of equipment such as "tree spades" will be permitted provided that the plant balls are sized in accordance with ANSI Z60.1 and that the plant tops are protected from damage.

5. Provide the following root containment as required on the plant list.

   a. Provide Balled and Burlapped (BB) and/or Balled and Potted (BP) plants having ball sizes and ratios conforming to ANSI Z60.1. Ball plants with firm, natural balls of soil. Wrap BB plants firmly with burlap, strong cloth or plastic and tie securely. Ball and wrap BP plants in the same manner as BB plants and fasten BP plants securely to strong platforms as approved by the Engineer.

   b. Provide container-grown plants with sufficient root growth to hold the earth intact when removed from containers. Root-bound plants will not be accepted.

6. Substitutions may be made only when a plant is not obtainable and the Engineer authorizes a change order in writing for use of the nearest equivalent obtainable size or variety of plant having the same essential characteristics with an equitable adjustment of the contract price.

B. Topsoil shall be in accordance with the requirements of "Restoration of Lawn Areas" elsewhere in these Specifications.

C. Peat: Provide a domestic or imported product consisting of partially decomposed vegetable matter of natural fresh water occurrence. It shall be brown, clean and low in content of mineral and woody mineral, mildly acidic, shredded and granulated to pass a ½ inch mesh screen, and free from weedy grasses, sedges or rushes.

D. Planting Soil Mixture:

1. The planting soil mixture shall be composed of 4 parts topsoil and 2 part peat.

E. Mulch:

1. Provide 100 percent double shredded bark mulch free from wood chips and other foreign matter.
2. Size: ½" – 3", finely shredded.
3. Color: Uniformly brown.

F. Anti-desiccants:

1. Anti-desiccants for retarding excessive loss of plant moisture and inhibiting wilt must be sprayable, water insoluble vinyl-vinledine complex which will produce a moisture retarding barrier not removable by rain or snow. Film must form at temperatures commonly encountered out-of-doors during planting season. The anti-desiccant film thus formed is required to have MVT (moisture vapor transmission rate of the resultant film) of not more than 10 grams per 24 hours at 70 percent humidity. Furnish evidence that the material can be used safely on both deciduous and evergreen material.

2. Apply anti-desiccants in accordance with the manufacturer's instructions.

CONSTRUCTION DETAILS

A. Planting Season: Accomplish planting within the following dates:

Spring Planting: March 15 to June 15

Fall Planting: August 15 to November 15

B. Planting Conditions: Plant, subject to the Engineer, only when the ground is not frozen or snow covered and when planting operations do not interfere with other construction operations. If special conditions exist that may warrant a variance in the above planting dates or conditions, submit a written request to the Engineer stating conditions and proposed variance(s).

C. Layout: Stake out plant material locations on the project site before any plant pits or beds are dug. Actual field locations of all materials will be subject to acceptance by the Engineer. Adjustments may be made due to field conditions, with approval from the Engineer.

D. Excavation for Planting:

1. Check grades and elevations prior to excavating for plant pits and beds to ensure that the area conforms to the lines and grades shown on the Drawings and verify the location of any underground utilities. Damage to utility lines shall be repaired at no cost to the Owner. Contractor shall notify "Call Before You Dig" (800-922-4455) at least 48 hours prior to start of excavation.

   a. If lawns have been established prior to planting excavations, cover the existing adjacent turf, before excavations are made, in a manner that will protect existing turf areas. Restore any turf areas damaged by planting operations to their original condition and to the satisfaction of the Engineer.

   b. If planting is to occur in existing turf areas, remove the turf to a depth that will insure the removal of the entire root system.

   c. Barricade any existing trees, shrubbery and beds that are to be preserved in a manner that will effectively protect them during planting operations. If damage does occur, repair to pre-existing condition, if possible. If this is not possible, the damaged plant material shall be replaced in kind, size and quantity at no additional cost to the owner.

2. Remove rocks and other underground obstructions to a depth necessary to permit proper planting according tot he Drawings and Specifications. If underground utilities, construction or solid rock ledges are encountered, other locations may be selected by the Engineer.

E. Setting Plants:

1. Handle and move balled and burlapped plants, balled and platformed plants and container-grown plants only by the ball or container.

2. Set plants on a hand compacted layer of planting soil and hold in position until soil has been firmly placed around the roots or ball.

3. Remove any loose soil brought into the root ball against the stem or trunk during excavation or cultivation in the nursery. This will expose the root flare and the true top of the root ball for establishing the setting height. Set plants in relation to surrounding grade so that they are slightly higher than the depth at which they were grown in the nursery, collecting field or container.

4. Perennials and groundcover plants may be planted after the mulch is in place. Take care to avoid contaminating the plant crown with soil or mulch.

5. No balled and burlapped or balled and platformed plants shall be planted if the ball is cracked or broken either before or during the process of planting. Damaged plants are automatically rejected and are to be immediately removed form the site.

F. Backfilling:

1. For balled and platformed and container stock, carefully remove all coverings and containers.

2. For balled and burlapped stock, carefully remove all coverings and binding material. The Contractor must request approval from the Engineer if the Contractor can demonstrate a portion thereof is infeasible to remove.

3. Backfill planted stock with planting soil mixture to approximately half the depth of the ball and then tamp and water.

4. Tamp and water the remainder of planting soil mixture while backfilling.

5. Form earth saucers or water basins around isolated plants.

G. Mulching:

1. Provide mulch material at a minimum depth of 4” within the limits shown on the plans.

2. Provide mulching within 48 hours after planting.

3. Keep mulch at a minimum of 12” from the outside diameter of woody perennials’ trunk/stem and out of plant crowns and off buildings, sidewalks, light standards and other structures.

PLANT MAINTENANCE

A. General:

1. Plant maintenance consists of two distinct parts:

a. Maintenance during installation.
b. Maintenance during the guarantee period.

2. Final acceptance of all work and materials under this Section may occur only at the end of the plant maintenance periods herein specified.

B. Maintenance:

1. Period Required: The Contractor shall maintain the plants until the completion of the Project and as necessary during the guarantee period.

a. Water plants as necessary to maintain the required amount of moisture within each plants root zone. Do not apply water so quickly that it cannot be absorbed by the mulch and plants.

b. Prune, spray and perform all other operations necessary to maintain plants in a healthy, attractive growing condition.

c. Do not allow grass and weeds in plant beds to reach a height of 3 inches before being completely removed, including root growth.

d. For trees that are not plumb, correct by digging up the root ball and repositioning the plant. Under no circumstances shall the stem or trunk be used as a lever to pull upon or correct a lean.

e. Install stakes and/or guys as needed as determined by the Owner.

f. Repair eroded plant saucers to retain moisture.

g. Inspect plants at least once per week during the installation period and perform needed maintenance promptly.

h. Remove dead plants immediately at the Contractor’s expense. New plants shall be installed prior to asking for acceptance to begin guarantee.

i. Once planted, remove the name identification tags and any markings.

GUARANTEE:

A. Period Required:

1. Plants are to be guaranteed one year from the date of “Final Acceptance” of the Project.

2. Any plants that have not survived the guarantee period shall be replaced at the expense of the Contractor.

CONDUIT

DESCRIPTION

"Conduit" shall consist of furnishing and installing conduit of the size and type specified, complete and in place, at the locations shown on the plans or as directed by the Engineer.

MATERIALS

Rigid metal conduit shall conform to the requirements of Section M.15.09.1 of Form 816.

Polyvinyl chloride (PVC) conduit shall conform to the requirements of Section M.15.09.3 of Form 816.

Underground pipe warning (marking) tape shall be plastic and metallic-coated to permit detection by a magnetic sensing device. The tape shall be not less than 3 inches in width and shall have the words "CAUTION - BURIED CONDUIT BELOW" repeated along the full length of the tape in letters not less than 1" high permanently fused into the tape. Pipe marking tape shall be "Terra-Tape" detectable pipe marking tape as manufactured by Reef Industries, Inc., Houston, Texas or approved equal.

CONSTRUCTION DETAILS

Conduit shall be installed at the locations shown on the plans. All conduit shall be installed in a neat and workmanlike manner in accordance with recognized trade practices. Trenching and backfilling shall be in accordance with the details shown on the plans and in accordance with Section 10.01 of Form 816. All conduit shall be installed in accordance with the current National Electric Code. Conduits shall be capped at each end with a commercial pipe cap. Upon completion of the work, all conduits shall be cleaned and free from obstructions. Marking tape shall be installed above the conduit. Where conduit is shown to be installed under existing roadway or driveways, the trench shall be excavated and backfilled with suitable material and the surface restored to its original condition.

CONCRETE HANDHOLE

DESCRIPTION

This item shall consist of furnishing and installing a concrete handhole of the type specified, complete and in place, at the locations shown on the plan or as directed by the Engineer.

MATERIALS

Concrete Handholes shall conform to the requirements of Section 10.10.02 of Form 816.

CONSTRUCTION DETAILS

Concrete Handholes shall conform to the requirements of Section 10.10.03 of Form 816.

LOOP DETECTOR

DESCRIPTION

This item shall consist of furnishing and installing loop vehicle detectors in conformance with the plans, specifications or as directed by the Engineer.

MATERIALS

Materials shall conform to the requirements of Section M.16.12 of Form 816.

CONSTRUCTION DETAILS

Work shall conform to the requirements of Section 11.11.03 of Form 816.

PEDESTALS

DESCRIPTION

This item shall consist of furnishing and installing a pedestal of the size and type specified, complete and in place, at the locations shown on the plan or as directed by the Engineer.

MATERIALS

Pedestals shall conform to the requirements of Section M.16.03 of Form 816.

CONSTRUCTION DETAILS

Pedestals shall conform to the requirements of Section 11.02.03 of Form 816.

TRAFFIC CONTROL SIGNS

DESCRIPTION

"Sign Face – Sheet Aluminum" includes the furnishing and installation of permanent sign face sheet aluminum signs of the type specified on new breakaway type metal sign posts at the locations indicated on the plans.

"Install Sign (Town Furnished)" shall consist of installing new ground mounted signs on new breakaway type metal sign posts at the locations shown on the Plans or where directed by the Engineer.

"Install Sign Overhead Mounted (Town Furnished)" shall consist of installing overhead signs on mast arms or span wires at the locations shown on the Plans or as directed by the Engineer.

"Reset Sign" includes the resetting of existing signs on new breakaway type metal sign posts furnished by the Contractor at the locations shown on the Plans or where directed by the Engineer.

MATERIALS

Reflective sheeting shall conform to the requirements of Section M.18.09.01, Type I, II or III of Form 816.

Silk screening shall conform to the requirements specified by the reflective sheeting manufacturer.

Metal sign posts shall conform to the requirements of Section M.18.14 of Form 816.

CONSTRUCTION DETAILS

Placement and dimensions of copy, border and mounting holes shall conform to details of the CTDOT typical details.

Reflective sheeting shall be applied in such a manner that the finished sign shall be wrinkle and bubble free.

Cutout, copy and border shall conform to the manufacturer's requirements.

Signs shall be mounted on metal sign posts. Metal sign posts shall be driven or the holes augered and the backfill thoroughly tamped after the posts have been set level and plumb.
When signs are to be placed in new concrete sidewalk, the Contractor shall provide a PVC sleeve, at the locations approved by the Engineer, to accommodate the resetting of signs.

TRAFFIC CONTROL FOUNDATION

DESCRIPTION

This item shall consist of furnishing and installing a traffic control foundation of the type specified, complete and in place, at the locations shown on the plan or as directed by the Engineer.

MATERIALS

Traffic control foundations shall conform to the requirements of Section 10.02.02 of Form 816.

CONSTRUCTION DETAILS

Traffic control foundations shall conform to the requirements of Section 10.02.03 of Form 816.

PAVEMENT MARKINGS

DESCRIPTION

"Epoxy Resin Pavement Markings" shall consist of furnishing and installing reflectorized white and yellow epoxy resin pavement markings of the width and color specified at the locations indicated on the plan. Epoxy resin pavement markings include center lines, lane lines and shoulder lines.

"Epoxy Resin Pavement Markings, Symbols and Legends" shall consist of furnishing and installing reflectorized markings, symbols or legends of the dimensions and color specified at the locations indicated on the plan. Epoxy resin pavement markings, symbols and legends include crosswalks, stop bars and lane arrows.

"Painted Pavement Markings" shall consist of furnishing and installing white and yellow painted pavement markings of the width and color specified at the locations indicated on the plan. Painted pavement markings include center lines, lane lines and shoulder lines.

"Handicap Parking Symbol" shall consist of furnishing and installing white painted handicap parking symbols on pavement surfaces at locations specified on the plans.

"Remove Pavement Markings" shall consist of the eradication of existing pavement markings at the locations indicated on the plan.

MATERIALS

Materials for epoxy resin pavement markings shall conform to the requirements of Section M.07.22 of Form 818.

Materials for painted pavement markings shall conform to the requirements of Section M.07.20 of Form 818.

Glass beads shall conform to the requirements of Section M.07.30 of Form 818.

CONSTRUCTION DETAILS

Pavement markings shall be removed from the pavement by any method that does not materially damage the surface or texture of the pavement. Any damage to the pavement surface caused by pavement marking removal shall be repaired by the Contractor at his expense by methods acceptable to the Engineer.

Equipment used to apply pavement markings shall include an applicator truck of adequate size and power to apply an epoxy resin material in a continuous pattern and portable glass bead applicators, one for each size bead, designed to provide uniform and complete coverage of the epoxy binder by a controlled free fall method. Pressurized glass bead application shall not be used.

For markings applied over existing pavement, the existing pavement shall be thoroughly power washed and dried prior to application of new markings.

Glass beads shall be immediately applied after application of the epoxy resin to provide an immediate no-track system.

The Contractor shall be responsible for all horizontal control and layout of the work.

The material shall be in “no-track” condition within fifteen minutes. Adequate protection shall be given to newly painted markings to assure the “no-track” condition.

When stencils are used, care must be used when removing the stencils so that the epoxy resin does not drip on the road and that the applied markings have edges which are clean, straight and neat.

Epoxy resin pavement markings shall be warranted not to fade, lift, shrink, tear, rollback, distort, or chip for one year under normal vehicular traffic and maintenance activities.

For crosswalks, only glass beads conforming to the requirements of Grading “A” (smaller beads) shall be applied at a rate of 25 lbs/gallon of epoxy material.

GRANITE STONE MONUMENT

DESCRIPTION

"Granite Stone Monument" includes the furnishing and installation of granite monuments, complete and in place, at the locations shown on the Plans or as directed by the Engineer.

"Reset Granite Stone Monument" includes the removal, relocation and installation of existing granite monuments, complete and in place, at the locations shown on the Plans or as directed by the Engineer.

MATERIALS

Granite stone monument shall be 6" x 6" x 3'-9" (±3") surveyors bound sawn or dressed top with a 1/2" Dia. x 1" Deep hole and split sides.

Granular Fill shall conform to the requirements of "Granular Fill" elsewhere in these Specifications.

CONSTRUCTION DETAILS

Excavation shall be to the depth of the monument. Prior to the setting of the monument, all loose soil or stones shall be removed from the bottom of the excavation, and the subgrade tampered to compaction. Granular fill shall be used as a backfill material and compacted in 6" layers.

Monuments shall be accurately installed to the locations specified.

MAINTENANCE AND PROTECTION OF TRAFFIC

DESCRIPTION

"Maintenance and Protection of Traffic" includes the furnishing, installation, maintenance, adjusting, cleaning, storing and removal when no longer required of all temporary signs (sheet aluminum or plywood), sign supports, cones, drums, barricades or other approved traffic control devices necessary to maintain and protect traffic within the project area in accordance with the Plans, Specifications, the latest edition of the Manual of Uniform Traffic Control Devices (MUTCD), and the Town of Manchester Traffic Control Ordinance, or as directed by the Engineer.

It also includes furnishing certified, uniformed flagpersons capable of safely directing traffic around the work area during all lane closures where uniformed police officers are not required or when directed by the Engineer and other pertinent work necessary to comply with this specification, including but not limited to, warning of local agencies of proposed traffic change, snow removal if Contractor's operations interfere with the normal snow removal operation, either by public agencies or private entities, when required or as directed by the Engineer.

"Uniformed Police Officers" includes providing uniformed Manchester police officers for traffic control **only on arterial streets required by the Town of Manchester Traffic Control Ordinance.**

"Construction Area Signs" includes the furnishing of sheet aluminum or plywood construction signs and supports required on the project in accordance with the Plans, the Manual of Uniform Traffic Control Devices (MUTCD) or as directed by the Engineer.

SUBMITTALS

Unless a Traffic Detour Plan is provided elsewhere in these specifications, all temporary road closures and detours proposed by the Contractor must be approved by the Engineer prior to implementation. In these instances, the Contractor shall submit a plan of the proposed detour, complete with sign patterns, and estimated duration of detour to the Engineer for approval at least seven (7) days prior to execution. Detours will only be considered for infrequent, short-term operations.

MATERIALS

Traffic Drums

The traffic drums shall be manufactured plastic or rubber designed in accordance with the latest edition of the MUTCD. The device shall be stabilized with sandbags or other approved means. The traffic drum shall have, at a minimum, two 4" wide retroreflective orange stripes and two 6" wide retroreflective white stripes. The stripes shall be placed horizontally and alternated with the orange stripe on top. The sections of the traffic drum not covered with retroreflective sheeting shall be orange. Either Type IV or Type VIII Retroreflective Sheeting, in accordance with Section M.18.09 of Form 818 shall be used

Traffic Cones

Traffic Cones shall be constructed of materials to a thickness to withstand impact without damage to cones or to vehicles. The traffic cones shall be 42" tall and of sufficient mass or have bases to which ballast may be added to assure that they will not be blown over or displaced by wind from passing vehicles. Traffic cones shall be reflectorized utilizing Type VI retro reflective sheeting in accordance with Sub article M.18.09 of Form 818.

Barricades

Barricades shall conform to the requirements of Section 9.79.02 of Form 818.

Construction Area Signs

Construction Area signs shall be sheet aluminum or plywood with necessary supports. Signs faces shall be of retro reflective sheeting, Type VIII or IX and conform to section 12.20 of Form 818. When the signs are no longer required on the project, they shall remain the property of the Contractor.

Opposing Traffic Lane Dividers

Opposing Traffic Lane Dividers shall conform to the requirements of Section 6F.76 of the MUTCD utilizing Type III Reflective sheeting

Any other traffic control devices shall meet the minimum material requirements of Form 818 and the latest edition of the Manual of Uniform Traffic Control Devices (MUTCD).

RESTRICTIONS

During working hours, the Contractor shall maintain at least one lane of traffic a minimum 10' in width on a gravel or paved surface with uniformed flagpersons directing traffic throughout the project area. At the end of each work day, the Contractor shall open the roadway to travel in both directions on a gravel or paved surface at least 20' in width with all applicable signs, cones, drums, barricades and lane dividers required by the Engineer.

The Contractor shall schedule operations such that travel by the general public on gravel surfaces is limited to two (2) weeks.

Temporary transverse drop-offs between pavement and milled pavement or between pavement and gravel shall have a maximum 10:1 slope. Temporary longitudinal drop-offs between pavement and milled pavement or between pavement and gravel shall have a maximum 3:1 slope.

REQUIREMENTS

The Contractor shall maintain and protect traffic in the project area in accordance with the requirements and regulations of the Town of Manchester, and these Specifications. Unless otherwise specified, the Contractor must maintain pedestrian and vehicular traffic to permit access to businesses, factories, residences, and intersecting streets.

1. Advanced Warning: It shall be the sole responsibility of the Contractor to forewarn the Town's Local Regulatory Agencies (including but not limited to the Public Works Highway Division, Police and Fire Departments and Board of Education) at least 72 hours in advance of changes in traffic patterns due to reduction of pavement widths or closing of streets.

2. Access: The Contractor shall arrange his/her operations to properties along the street including temporary bridges to driveways, and provide access to fire hydrants, manholes, gate boxes, or other utilities. Whenever any trench obstructs traffic in or to any public way, private driveway, or property entrance, the Contractor shall take such steps as required to maintain necessary traffic and access including temporary bridging if required. The Contractor shall confine his/her occupancy of public or traveled ways to the smallest space compatible with the efficient and safe performance of the work.

   The Contractor shall observe and obey all local and state laws, ordinances, regulations and permits in relation to the obstruction of streets and highways, keeping passageways open and protecting traffic where there may be danger from blasting or other construction activities.

   If the Contractor's operations interfere with the removal or sanding of snow or ice by the public authorities or adjoining land owners, in an ordinary manner with regular highway equipment, the Contractor shall be required to perform such services for the public authorities or adjoining owners without charge. If the Contractor fails to do so, he shall reimburse the said authorities or adjoining owners or the Town for any additional cost to them for doing such work occasioned by conditions arising from the Contractor's operations, occupancy, or trench surfaces, together with any damage to the equipment of said parties by those conditions, or claims of any parties for damage or injury or loss by reason of failure to remove snow or ice or to sand icy spots under these conditions.

3. Maintenance: The Contractor shall maintain all traffic control devices on the project. Traffic control devices shall be cleaned periodically to maintain retroreflectivity. Any damaged traffic control devices shall be immediately removed and replaced. It is the Contractors responsibility to move, adjust or relocate traffic control devices as his operations change.

4. Non-Performance: Should the Contractor or his/her employees neglect to maintain traffic control devices as required in these Specifications, the Engineer may shut the work down. If the Contractor fails to take corrective action, the Engineer may immediately and without notice, furnish, install and maintain traffic control devices. The cost thereof shall be borne by the Contractor and may be deducted from any amount due or to become due to the Contractor under this contract.

   The Contractor will be held responsible for any damages that the Town, Engineer, Governmental units, or their heirs or assigns may have to pay as a consequence of the Contractor's failure to protect the public from injury, and the same may be deducted from any payments that are due or may become due to the Contractor under this contract.

5. Uniformed Flagperson: The Contractor shall be responsible for providing certified and adequately equipped personnel for directing traffic around the work area during all lane closures where uniformed police officers are not required and where directed by the Engineer to provide adequate protection of the traveling public. Flagpersons must be certified by the American Traffic Safety Services Association (ATSSA) or the National Safety Council (NSC).

6. Uniformed Police Officers: On designated arterial streets within the Town, the Town of Manchester Traffic Control Ordinance requires the use of Town of Manchester uniformed

police officers to be used to supplement the Contractor's traffic control operations. It is the Contractor's responsibility to schedule, coordinate and make payment in a timely manner for the use of uniformed police officers with the Police Department. The Town of Manchester Police Department requires payment for services within fourteen (14) days of work. A portion of the cost to provide uniformed police officers on the streets defined in the Traffic Control Ordinance will be measured separately for payment as specified herein.

TRAFFIC CONTROL PATTERNS

Traffic control patterns shall be used when a work operation requires that all or part of any vehicle or work area protrudes onto any part of a travel lane or shoulder. For each situation, the installation of traffic control devices shall be based on the following:

Speed and volume of traffic
Duration of operation
Exposure to hazards

Traffic control patterns shall be uniform, neat and orderly so as to command respect from the motorist.

In the case of a horizontal or vertical sight restriction in advance of the work area, the traffic control pattern shall be extended to provide adequate sight distance for approaching traffic.

If a lane reduction taper is required to shift traffic, the entire length of the taper should be installed on a tangent section of roadway so that the entire taper area can be seen by the motorist.

Any existing signs that are in conflict with the traffic control patterns shall be removed, covered, or turned so that they are not readable by oncoming traffic.

When installing a traffic control pattern, a "buffer area" must be provided which shall be free of equipment, workers, materials and parked vehicles.

When required by the Engineer, the Contractor shall install temporary marking tape to designate traffic lanes until such time permanent pavement markings included in the Contract are installed.

Although each situation must be dealt with individually, conformity with the typical traffic control pattern contained herein is required. In a situation not adequately covered by the typical traffic control plans, the Contractor must contact the Engineer for assistance prior to setting up a traffic control patterns.

ALLOWABLE ADJUSTMENT OF SIGNS AND DEVICES SHOWN ON THE TRAFFIC CONTROL PLANS

The traffic control patterns contained herein show the location and spacing of signs and devices under ideal conditions. Signs and devices should be installed as shown on these patterns whenever possible.

The proper application of the traffic control patterns and installation of traffic control devices depends on actual field conditions.

Adjustments to the traffic control patterns/plans shall be made only at the direction of the Engineer to improve the visibility of the signs and devices and to better control traffic operations. Adjustments to the traffic control plans shall be based on safety of work forces and motorists, abutting property requirements, driveways, side roads, and the vertical and horizontal curvature of the roadway.

The Engineer may require that the traffic control pattern be located significantly in advance of the work area to provide better sight line to the signing and safer traffic operations through the work zone.

Table I indicates the minimum taper length required for a lane closure based on the posted speed limit of the roadway. These taper lengths shall only be used when the recommended taper lengths shown on the traffic control patterns cannot be achieved.

TABLE I – MINIMUM TAPER LENGTHS

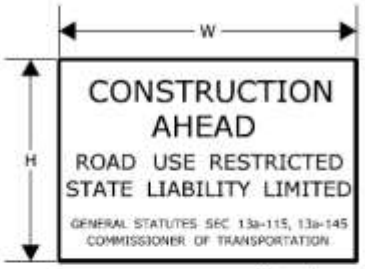
POSTED SPEED LIMIT MILES PER HOUR	MINIMUM TAPER LENGTH IN FEET FOR A SINGLE LANE CLOSURE
30 OR LESS	180
35	250
40	320
45	540
50	600
55	660
65	780

The following DOT coded signs are anticipated to be used during the project. Where applicable, “STATE” shall be revised to “TOWN” and “COMMISSIONER OF TRANSPORTATION” shall be revised to “DIRECTOR OF PUBLIC WORKS”:

80-1613 16M
80-9701R Detour (right arrow)
80-9701L Detour (left arrow)
80-9612 End Road Work
80-9602 Road Work Ahead

Series 16 signs shall be post mounted at the beginning and end of the project area as applicable.

SERIES 16 SIGNS



		W H
16-E	80-1605	84" x 60"
16-H	80-1608	60" x 42"
16-M	80-1613	30" x 24"

		W H
16-S	80-1619	48" x 30"

THE 16-S SIGN SHALL BE USED ON ALL PROJECTS THAT REQUIRE SIDEWALK RECONSTRUCTION OR RESTRICT PEDESTRIAN TRAVEL ON AN EXISTING SIDEWALK.

SERIES 16 SIGNS SHALL BE INSTALLED IN ADVANCE OF THE TRAFFIC CONTROL PATTERNS TO ALLOW MOTORISTS THE OPPORTUNITY TO AVOID A WORK ZONE. SERIES 16 SIGNS SHALL BE INSTALLED ON ANY MAJOR INTERSECTING ROADWAYS THAT APPROACH THE WORK ZONE. ON LIMITED-ACCESS HIGHWAYS, THESE SIGNS SHALL BE LOCATED IN ADVANCE OF THE NEAREST UPSTREAM EXIT RAMP AND ON ANY ENTRANCE RAMPS PRIOR TO OR WITHIN THE WORK ZONE LIMITS.

THE LOCATION OF SERIES 16 SIGNS CAN BE FOUND ELSEWHERE IN THE PLANS OR INSTALLED AS DIRECTED BY THE ENGINEER.

SIGNS 16-E AND 16-H SHALL BE POST-MOUNTED.

SIGN 16-E SHALL BE USED ON ALL EXPRESSWAYS.

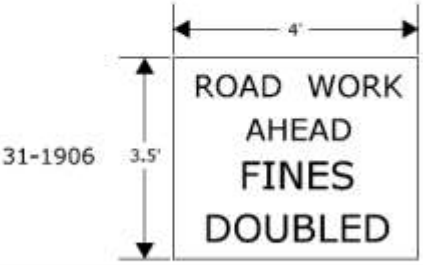
SIGN 16-H SHALL BE USED ON ALL RAMPS, OTHER STATE ROADWAYS, AND MAJOR TOWN/CITY ROADWAYS.

SIGN 16-M SHALL BE USED ON OTHER TOWN ROADWAYS.

REGULATORY SIGN "ROAD WORK AHEAD, FINES DOUBLED"

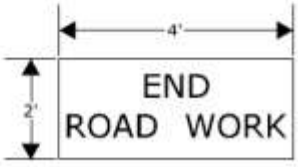
THE REGULATORY SIGN "ROAD WORK AHEAD FINES DOUBLED" SHALL BE INSTALLED FOR ALL WORK ZONES THAT OCCUR ON ANY STATE HIGHWAY IN CONNECTICUT WHERE THERE ARE WORKERS ON THE HIGHWAY OR WHEN THERE IS OTHER THAN EXISTING TRAFFIC OPERATIONS.

THE "ROAD WORK AHEAD FINES DOUBLED" REGULATORY SIGN SHALL BE PLACED AFTER THE SERIES 16 SIGN AND IN ADVANCE OF THE "ROAD WORK AHEAD" SIGN.



"END ROAD WORK" SIGN

THE LAST SIGN IN THE PATTERN MUST BE THE "END ROAD WORK" SIGN.



SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN
REQUIRED SIGNS

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED Charles S. Harlow 2012.06.05 11:35:43-04'00'
PRINCIPAL ENGINEER

NOTES FOR TRAFFIC CONTROL PLANS

1. IF A TRAFFIC STOPPAGE OCCURS IN ADVANCE OF SIGN (A), THEN AN ADDITIONAL SIGN (A) SHALL BE INSTALLED IN ADVANCE OF THE STOPPAGE.

2. SIGNS (AA), (A), AND (D) SHOULD BE OMITTED WHEN THESE SIGNS HAVE ALREADY BEEN INSTALLED TO DESIGNATE A LARGER WORK ZONE THAN THE WORK ZONE THAT IS ENCOMPASSED ON THIS PLAN.

3. SEE TABLE 1 FOR ADJUSTMENT OF TAPERS IF NECESSARY.

4. IF THIS PLAN REMAINS IN CONTINUOUS OPERATION FOR MORE THAN 36 HOURS, THEN TRAFFIC DRUMS SHALL BE USED IN PLACE OF TRAFFIC CONES.

5. ANY LEGAL SPEED LIMIT SIGNS WITHIN THE LIMITS OF A ROADWAY / LANE CLOSURE AREA SHALL BE COVERED WITH AN OPAQUE MATERIAL WHILE THE CLOSURE IS IN EFFECT, AND UNCOVERED WHEN THE ROADWAY / LANE CLOSURE IS RE-OPENED TO ALL LANES OF TRAFFIC.

6. IF THIS PLAN REMAINS IN CONTINUOUS OPERATION FOR MORE THAN 36 HOURS, THEN ANY EXISTING CONFLICTING PAVEMENT MARKINGS SHALL BE ERADICATED OR COVERED, AND TEMPORARY PAVEMENT MARKINGS THAT DELINEATE THE PROPER TRAVELPATHS SHALL BE INSTALLED.

7. DISTANCES BETWEEN SIGNS IN THE ADVANCE WARNING AREA MAY BE REDUCED TO 100' ON LOW-SPEED URBAN ROADS (SPEED LIMIT < 40 MPH).

8. IF THIS PLAN IS TO REMAIN IN OPERATION DURING THE HOURS OF DARKNESS, INSTALL BARRICADE WARNING LIGHTS - HIGH INTENSITY ON ALL POST-MOUNTED DIAMOND SIGNS IN THE ADVANCE WARNING AREA.

9. A CHANGEABLE MESSAGE SIGN SHALL BE INSTALLED ONE HALF TO ONE MILE IN ADVANCE OF THE LANE CLOSURE TAPER.

10 SIGN (P) SHALL BE MOUNTED A MINIMUM OF 7 FEET FROM THE PAVEMENT SURFACE TO THE BOTTOM OF THE SIGN.

TABLE 1 - MINIMUM TAPER LENGTHS

POSTED SPEED LIMIT (MILES PER HOUR)	MINIMUM TAPER LENGTH FOR A SINGLE LANE CLOSURE
30 OR LESS	180' (55m)
35	250' (75m)
40	320' (100m)
45	540' (165m)
50	600' (180m)
55	660' (200m)
65	780' (240m)

METRIC CONVERSION CHART (1" = 25mm)

ENGLISH	METRIC	ENGLISH	METRIC	ENGLISH	METRIC
12"	300mm	42"	1050mm	72"	1800mm
18"	450mm	48"	1200mm	78"	1950mm
24"	600mm	54"	1350mm	84"	2100mm
30"	750mm	60"	1500mm	90"	2250mm
36"	900mm	66"	1650mm	96"	2400mm

SCALE: NONE

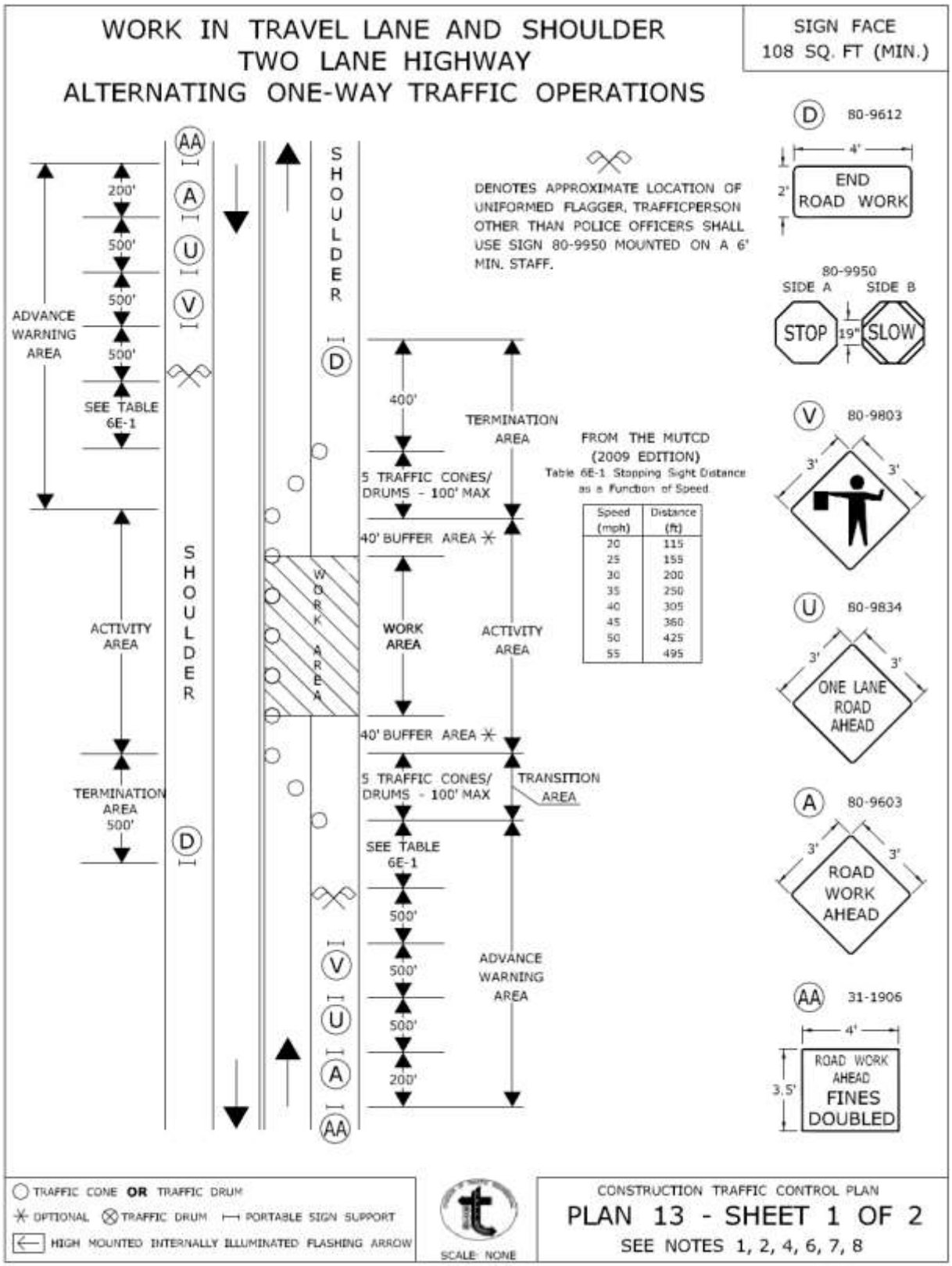
CONSTRUCTION TRAFFIC CONTROL PLAN

NOTES

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED _____ PRINCIPAL ENGINEER

Charles S. Harlow 2012.06.05 15:50:35-04'00'


WORK IN TRAVEL LANE AND SHOULDER
TWO LANE HIGHWAY
ALTERNATING ONE-WAY TRAFFIC OPERATIONS
SIGN FACE
108 SQ. FT (MIN.)
DENOTES APPROXIMATE LOCATION OF UNIFORMED FLAGGER. TRAFFICPERSON OTHER THAN POLICE OFFICERS SHALL USE SIGN 80-9950 MOUNTED ON A 6' MIN. STAFF.
ADVANCE WARNING AREA
200'
500'
500'
500'
SEE TABLE 6E-1
ACTIVITY AREA
TERMINATION AREA 500'
SHOULDER
SHOULDER
WORK AREA
400'
TERMINATION AREA
5 TRAFFIC CONES/ DRUMS - 100' MAX
40' BUFFER AREA
WORK AREA
ACTIVITY AREA
40' BUFFER AREA
5 TRAFFIC CONES/ DRUMS - 100' MAX
TRANSITION AREA
SEE TABLE 6E-1
500'
500'
500'
200'
ADVANCE WARNING AREA
FROM THE MUTCD (2009 EDITION)
Table 6E-1 Stopping Sight Distance as a Function of Speed
Speed (mph) | Distance (ft)
20 | 115
25 | 155
30 | 200
35 | 250
40 | 305
45 | 360
50 | 425
55 | 495
D 80-9612
4'
2'
END ROAD WORK
80-9950
SIDE A
SIDE B
STOP
19"
SLOW
V 80-9803
3'
3'
U 80-9834
3'
3'
ONE LANE ROAD AHEAD
A 80-9603
3'
3'
ROAD WORK AHEAD
AA 31-1906
4'
3.5'
ROAD WORK AHEAD
FINES DOUBLED
TRAFFIC CONE OR TRAFFIC DRUM
OPTIONAL
TRAFFIC DRUM
PORTABLE SIGN SUPPORT
HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW
SCALE: NONE
CONSTRUCTION TRAFFIC CONTROL PLAN
PLAN 13 - SHEET 1 OF 2
SEE NOTES 1, 2, 4, 6, 7, 8
CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION
APPROVED
Charles S. Harlow
2012.06.05 15:55:23-04'00'
PRINCIPAL ENGINEER

WORK IN TRAVEL LANE AND SHOULDER
TWO LANE HIGHWAY
ALTERNATING ONE-WAY TRAFFIC OPERATIONS

SIGN FACE
108 SQ. FT (MIN.)

HAND SIGNAL METHODS TO BE USED BY UNIFORMED FLAGGERS

THE FOLLOWING METHODS FROM SECTION 6E.07, FLAGGER PROCEDURES, IN THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES," SHALL BE USED BY UNIFORMED FLAGGERS WHEN DIRECTING TRAFFIC THROUGH A WORK AREA. THE STOP/SLOW SIGN PADDLE (SIGN NO. 80-9950) SHOWN ON THE TRAFFIC STANDARD SHEET TR-1220 01 ENTITLED, "SIGNS FOR CONSTRUCTION AND PERMIT OPERATIONS" SHALL BE USED.

A. TO STOP TRAFFIC

TO STOP ROAD USERS, THE FLAGGER SHALL FACE ROAD USERS AND AIM THE STOP PADDLE FACE TOWARD ROAD USERS IN A STATIONARY POSITION WITH THE ARM EXTENDED HORIZONTALLY AWAY FROM THE BODY. THE FREE ARM SHALL BE HELD WITH THE PALM OF THE HAND ABOVE SHOULDER LEVEL TOWARD APPROACHING TRAFFIC.

B. TO DIRECT TRAFFIC TO PROCEED

TO DIRECT STOPPED ROAD USERS TO PROCEED, THE FLAGGER SHALL FACE ROAD USERS WITH THE SLOW PADDLE FACE AIMED TOWARD ROAD USERS IN A STATIONARY POSITION WITH THE ARM EXTENDED HORIZONTALLY AWAY FROM THE BODY. THE FLAGGER SHALL MOTION WITH THE FREE HAND FOR ROAD USERS TO PROCEED.

C. TO ALERT OR SLOW TRAFFIC

TO ALERT OR SLOW TRAFFIC, THE FLAGGER SHALL FACE ROAD USERS WITH THE SLOW PADDLE FACE AIMED TOWARD ROAD USERS IN A STATIONARY POSITION WITH THE ARM EXTENDED HORIZONTALLY AWAY FROM THE BODY. TO FURTHER ALERT OR SLOW TRAFFIC, THE FLAGGER HOLDING THE SLOW PADDLE FACE TOWARD ROAD USERS MAY MOTION UP AND DOWN WITH THE FREE HAND, PALM DOWN.

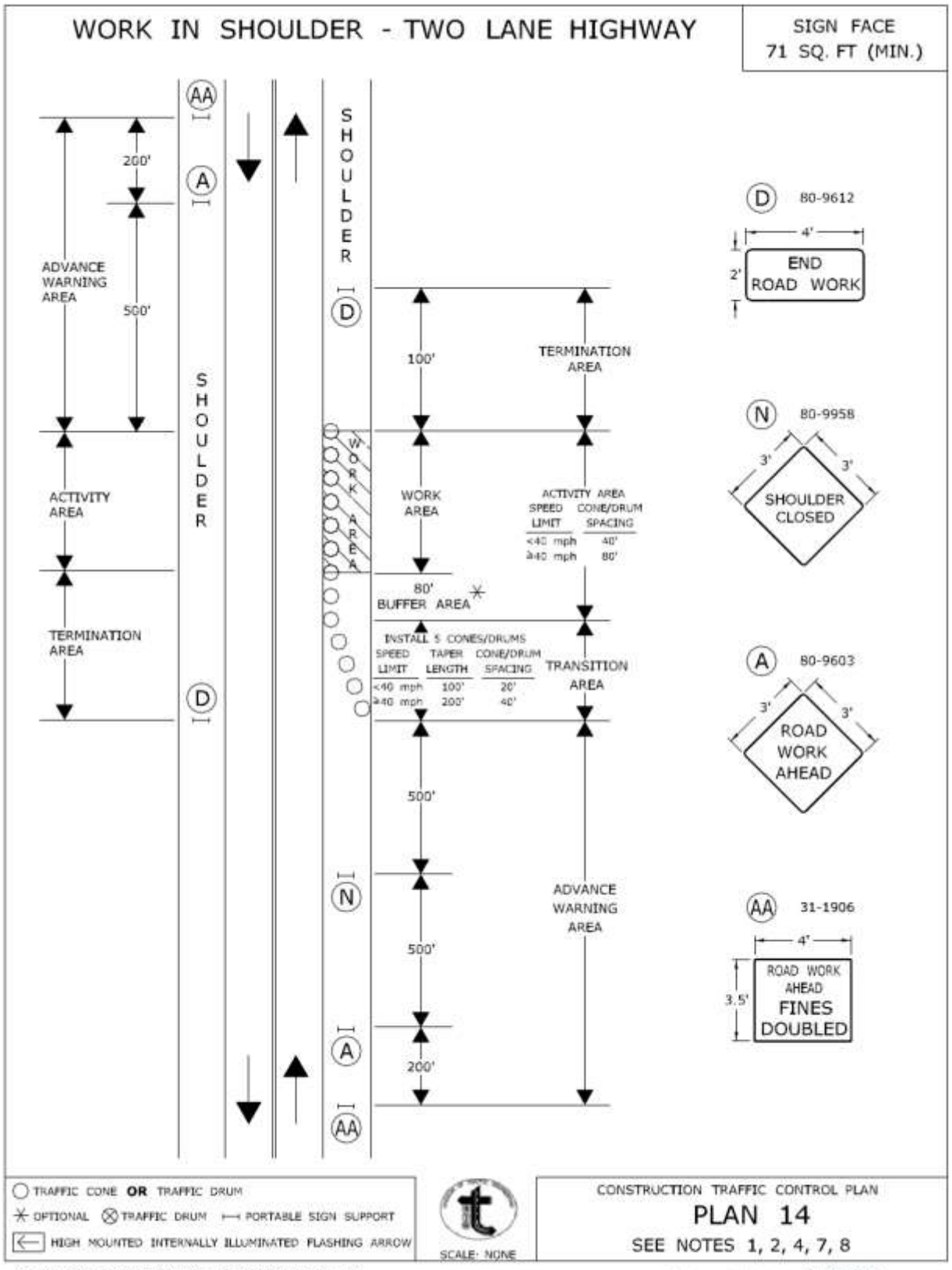
○ TRAFFIC CONE **OR** TRAFFIC DRUM
✳ OPTIONAL ⊗ TRAFFIC DRUM ⊢ PORTABLE SIGN SUPPORT
⇦ HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW

SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN
PLAN 13 - SHEET 2 OF 2
SEE NOTES 1, 2, 4, 6, 7, 8

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED _____ Charles S. Harlow 2012.06.05 15:55:45-04'00'
PRINCIPAL ENGINEER



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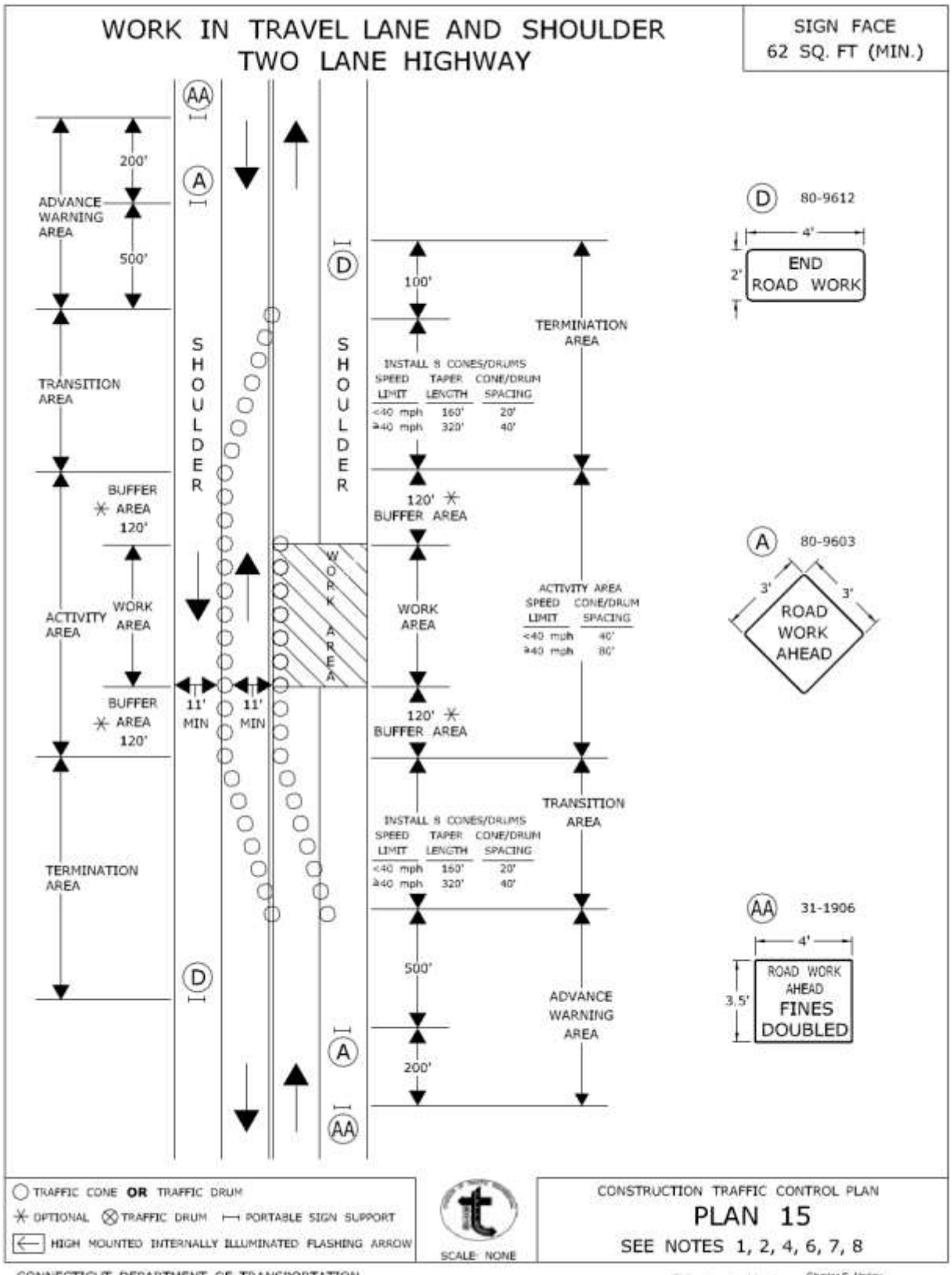
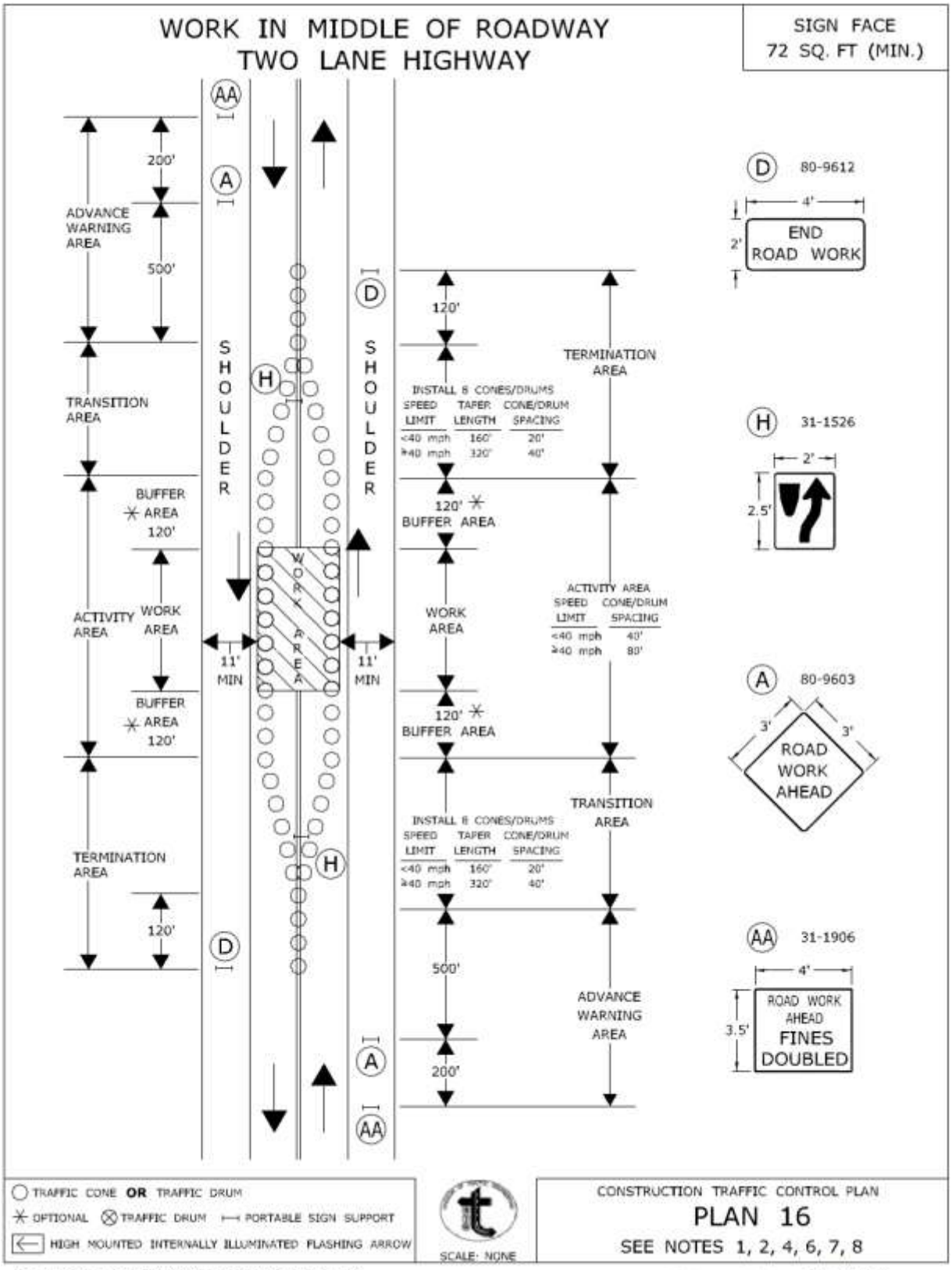
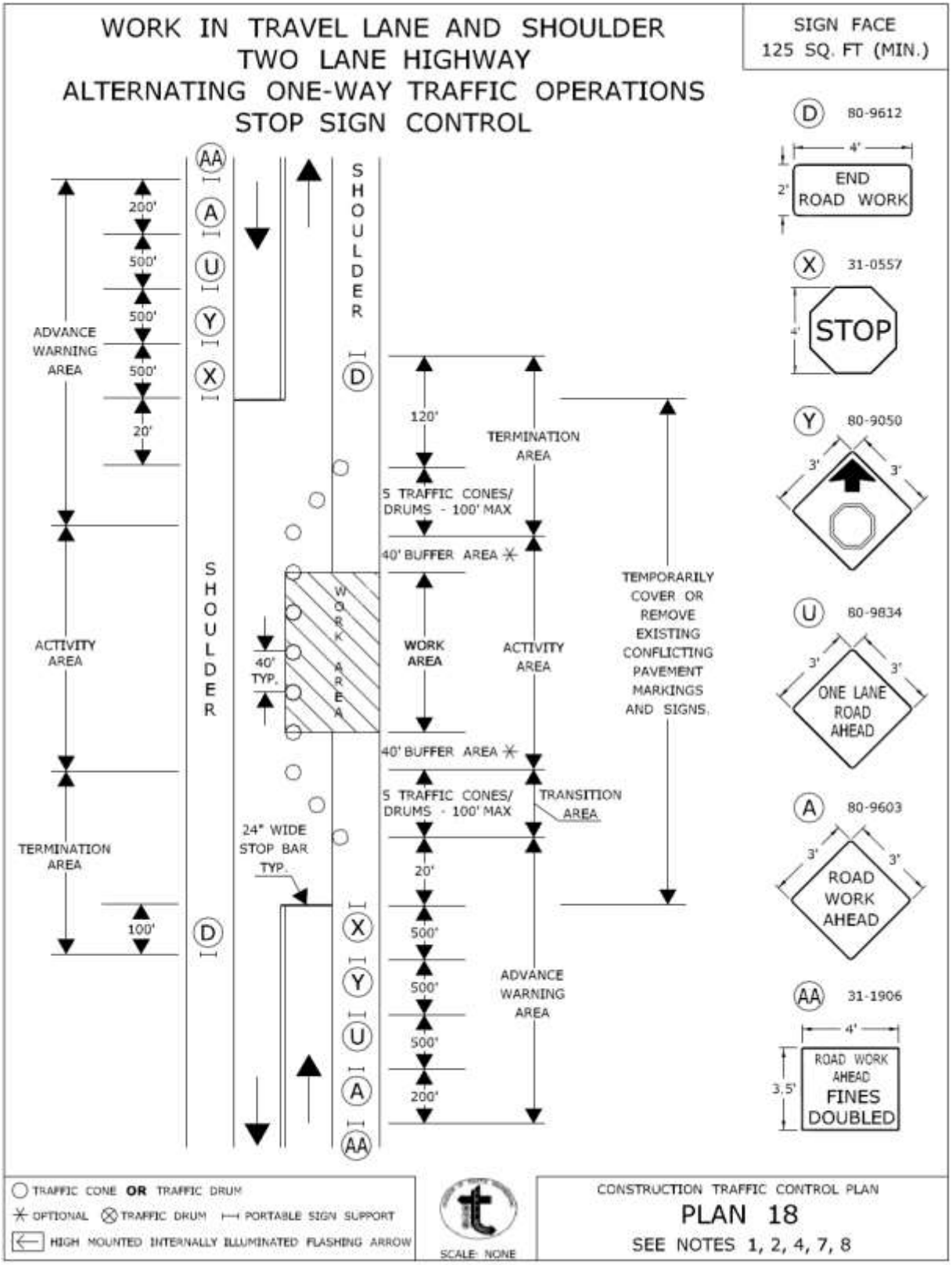
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED Charles S. Harlow 2012.06.05 15:56:09-04'00'
PRINCIPAL ENGINEER


WORK IN TRAVEL LANE AND SHOULDER
TWO LANE HIGHWAY
SIGN FACE
62 SQ. FT (MIN.)
ADVANCE WARNING AREA
200'
500'
TRANSITION AREA
BUFFER AREA 120'
ACTIVITY AREA
WORK AREA
BUFFER AREA 120'
TERMINATION AREA
SHOULDER
SHOULDER
WORK AREA
11' MIN
11' MIN
100'
INSTALL 8 CONES/DRUMS
SPEED LIMIT | TAPER LENGTH | CONE/DRUM SPACING
<40 mph | 160' | 20'
≥40 mph | 320' | 40'
120' BUFFER AREA
WORK AREA
120' BUFFER AREA
INSTALL 8 CONES/DRUMS
SPEED LIMIT | TAPER LENGTH | CONE/DRUM SPACING
<40 mph | 160' | 20'
≥40 mph | 320' | 40'
500'
200'
TERMINATION AREA
ACTIVITY AREA
SPEED LIMIT | CONE/DRUM SPACING
<40 mph | 40'
≥40 mph | 80'
TRANSITION AREA
ADVANCE WARNING AREA
D 80-9612
4'
2'
END ROAD WORK
A 80-9603
3'
3'
ROAD WORK AHEAD
AA 31-1906
4'
3.5'
ROAD WORK AHEAD
FINES DOUBLED
TRAFFIC CONE OR TRAFFIC DRUM
OPTIONAL
TRAFFIC DRUM
PORTABLE SIGN SUPPORT
HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW
SCALE: NONE
CONSTRUCTION TRAFFIC CONTROL PLAN
PLAN 15
SEE NOTES 1, 2, 4, 6, 7, 8
CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION
APPROVED
Charles S. Harlow
2012.06.05 15:58:29-04'00'
PRINCIPAL ENGINEER


WORK IN MIDDLE OF ROADWAY
TWO LANE HIGHWAY
SIGN FACE
72 SQ. FT (MIN.)
ADVANCE WARNING AREA
200'
500'
TRANSITION AREA
BUFFER AREA 120'
ACTIVITY AREA
WORK AREA
BUFFER AREA 120'
TERMINATION AREA
120'
SHOULDER
SHOULDER
WORK AREA
11' MIN
11' MIN
120'
INSTALL 6 CONES/DRUMS
SPEED LIMIT | TAPER LENGTH | CONE/DRUM SPACING
<40 mph | 160' | 20'
≥40 mph | 320' | 40'
TERMINATION AREA
120' BUFFER AREA
WORK AREA
ACTIVITY AREA
SPEED LIMIT | CONE/DRUM SPACING
<40 mph | 40'
≥40 mph | 80'
120' BUFFER AREA
INSTALL 6 CONES/DRUMS
SPEED LIMIT | TAPER LENGTH | CONE/DRUM SPACING
<40 mph | 160' | 20'
≥40 mph | 320' | 40'
TRANSITION AREA
500'
200'
ADVANCE WARNING AREA
D 80-9612
4'
2'
END ROAD WORK
H 31-1526
2'
2.5'
A 80-9603
3'
3'
ROAD WORK AHEAD
AA 31-1906
4'
3.5'
ROAD WORK AHEAD
FINES DOUBLED
TRAFFIC CONE OR TRAFFIC DRUM
OPTIONAL
TRAFFIC DRUM
PORTABLE SIGN SUPPORT
HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW
SCALE: NONE
CONSTRUCTION TRAFFIC CONTROL PLAN
PLAN 16
SEE NOTES 1, 2, 4, 6, 7, 8
CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION
APPROVED
PRINCIPAL ENGINEER
Charles S. Harlow
2012.06.05 15:56:51-04'00'



CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED Charles S. Harlow 2012.08.06 15:57:37-04'00'
PRINCIPAL ENGINEER

9.01 GENERAL

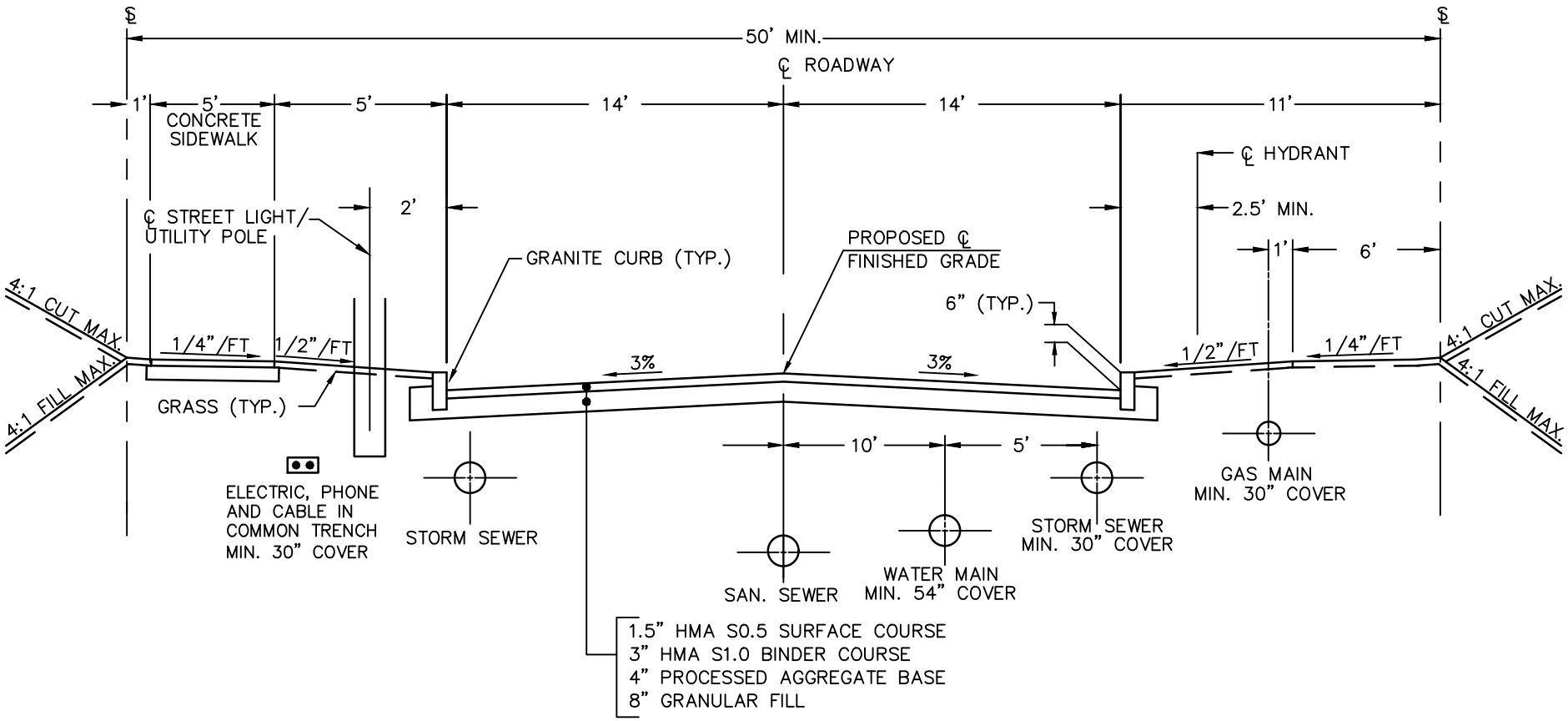
All improvements that impact public infrastructure and facilities within the Town right-of-way shall conform to the following standard construction details, unless otherwise approved by the Engineer. The Engineer reserves the right to modify these standard construction details at any time as deemed necessary to meet the needs of existing and proposed public infrastructure and facilities and to protect private property.

9.02 STANDARD CONSTRUCTION DETAILS

Plate No.	Detail Title
1.1	Typical Roadway Section – Local Road
1.2	Typical Roadway Section – Collector Road
1.3	Typical Roadway Section – Arterial Road
1.4	Temporary Pavement Repair
1.5	Permanent Pavement Repair
2.1	Temporary Cul-de-Sac
2.2	Permanent Cul-de-Sac
3.1	Concrete Sidewalk
3.2	Reinforced Concrete Sidewalk
3.3	Bituminous Concrete Trail / Bike Path
4.1	Concrete Sidewalk and Curb Monolithic
5.1	*Reserved – See CTDOT Highway Guide Sheets for Concrete Sidewalk Ramps*
6.1	Curb Types
6.2	Transition Curbs
7.1	Concrete Driveway Apron without Shelf
7.2	Concrete Driveway Apron with Shelf
7.3	Bituminous Concrete Driveway Apron without Sidewalk
7.4	Bituminous Concrete Driveway Apron with Sidewalk
8.1	Monumentation and Property Markers
9.1	Typical Sign Installation
9.2	Typical Streetlight Installation
10.1	Type “C” and “C-L” Catch Basin
10.2	Type “C” and “C-L” Double Grate Type I Catch Basin
10.3	Type “C” and “C-L” Double Grate Type II Catch Basin

Plate No.	Detail Title
10.4	Convert Catch Basin to Manhole
10.5	Reset Catch Basin Top
10.6	Catch Basin Notes
11.1	Precast Concrete Type “C” Catch Basin Top for Granite Curb
11.2	Precast Concrete Type “C” Catch Basin Top for Concrete Curb
11.3	Precast Concrete Type “C” Catch Basin Top for Bituminous Concrete Lip Curb
11.4	Precast Concrete Type “C-L” Catch Basin Top
11.5	Precast Concrete Type “C” Double Grate Type I Catch Basin Top for Granite Curb
11.6	Precast Concrete Type “C” Double Grate Type I Catch Basin Top for Concrete Curb and Bituminous Concrete Lip Curb
11.7	Precast Concrete Type “C” Double Grate Type II Catch Basin Top for Granite and Concrete Curb and Bituminous Concrete Lip Curb
11.8	Precast Concrete Type “C-L” Double Grate Type I Catch Basin Top
11.9	Precast Concrete Type “C-L” Double Grate Type II Catch Basin Top
12.1	Catch Basin Steel Frame and Grate
13.1	Catch Basin Trap Hood
14.1	Drainage Manhole
14.2	*Removed (Drainage Doghouse Manhole)*
15.1	Precast Concrete Drywell
16.1	Stormwater Treatment System Schematic for Public Systems
16.2	Stormwater Treatment System Notes
16.3	Detention Basin
17.1	Storm Sewer Trench
17.2	Underdrain
18.1	Concrete Endwall
18.2	Concrete Wingwall for Pipes 30” Diameter and Less
18.3	Concrete Wingwall for Pipes Larger than 30” Diameter
19.1	Water Main Trench
19.2	Water Service Connection
19.3	Water Service Curb Stop in Paved Areas and Sidewalk
19.4	Water Gate Valve
19.5	Concrete Thrust Block

Plate No.	Detail Title
20.1	Hydrant
20.2	Water Main Blowoff
20.3	Air Release Valve Manhole
21.1	Sanitary Sewer Manhole (48” Diameter)
21.2	Sanitary Sewer Manhole (72” Diameter)
21.3	Sanitary Sewer Drop Manhole (48” Diameter)
21.4	Sanitary Sewer Manhole (48” Diameter Flat Top)
21.5	Sanitary Sewer Manhole Frame and Cover
21.6	Sanitary Sewer Manhole Joint
22.1	Sanitary Sewer Trench
22.2	Sanitary Lateral Stub
22.3	Sanitary Lateral Connection
22.4	Sanitary Lateral Reconnection
22.5	Sanitary Lateral Connection to RCP
22.6	Precast Concrete Chimney
22.7	Sanitary Sewer Cleanout
23.1	GreaseTrap
23.2	Oil/Water Separator
24.1	Typical Utility Supports
25.1	Silt Fence
25.2	Hay Bales
25.3	Silt Sack
25.4	Construction Entrance
26.1	*Reserved – See CTDOT Traffic Engineering Special Provisions for Traffic Control Plans and Typical Materials*
27.1	Tree Planting
27.2	Tree Staking



NOTES:

1. ALL UNDERGROUND UTILITIES, INCLUDING SERVICES, SHALL BE INSTALLED BEFORE BASE MATERIALS AND HMA ARE PLACED.
2. THE GAS MAIN SHALL BE PRIMARILY INSTALLED IN THE GRASS SHELF ON THE OPPOSITE SIDE OF WHERE THE CONCRETE SIDEWALK IS TO BE INSTALLED (GENERALLY SOUTH AND WEST SIDES).
3. IF ADDITIONAL LANE(S) ARE REQUIRED, PROVIDE SUFFICIENT RIGHT-OF-WAY TO MAINTAIN 11' FROM CURB TO STREETLINE.

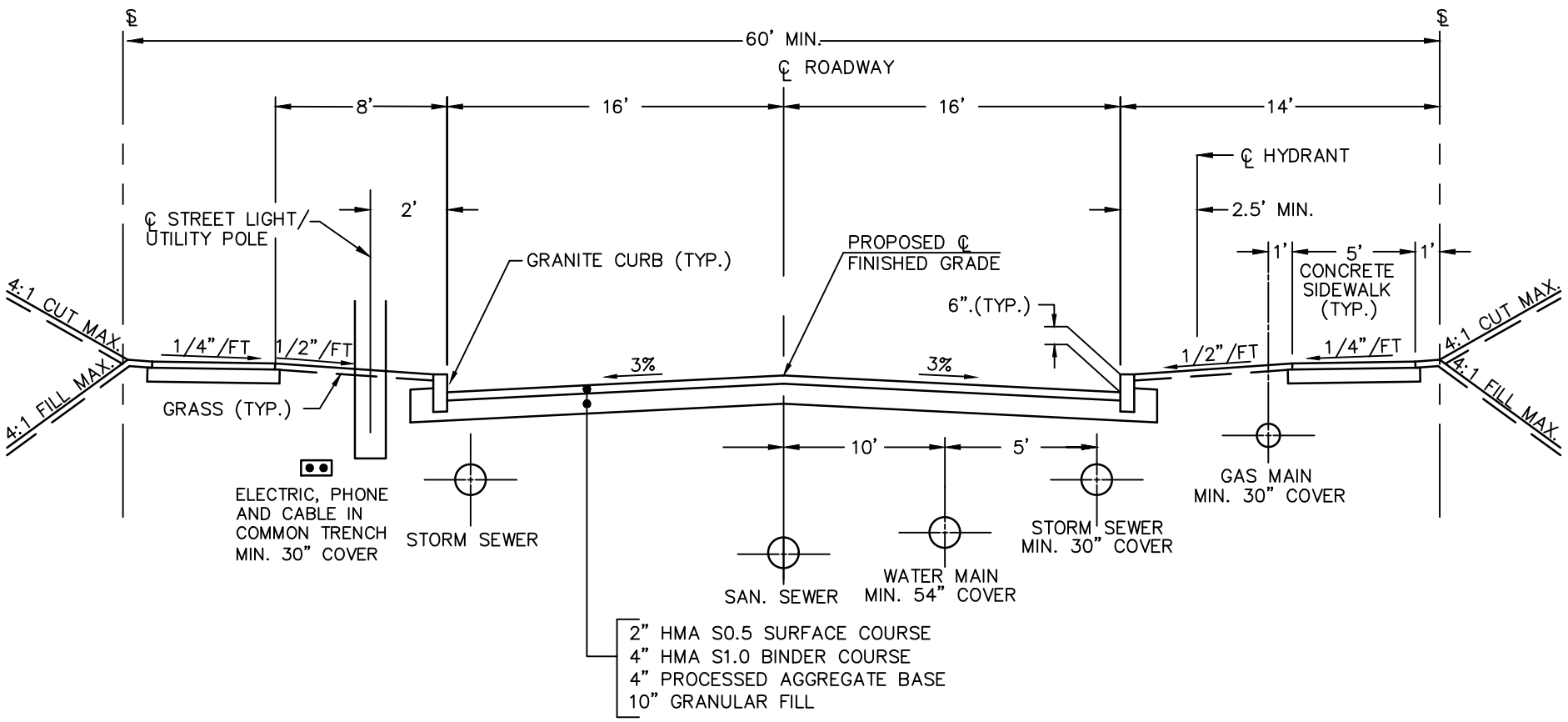
REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED
DRAWN BY: DG		CHECKED BY: JL	
DATE: OCT 2020		FILENAME: PLATE1.DWG	

TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

TYPICAL ROADWAY SECTION LOCAL ROAD

NO SCALE

PLATE 1.1



NOTES:

1. ALL UNDERGROUND UTILITIES, INCLUDING SERVICES, SHALL BE INSTALLED BEFORE BASE MATERIALS AND HMA ARE PLACED.
2. THE GAS MAIN SHALL BE PRIMARILY INSTALLED IN THE GRASS SHELF ON THE OPPOSITE SIDE OF WHERE THE CONCRETE SIDEWALK IS TO BE INSTALLED (GENERALLY SOUTH AND WEST SIDES).
3. IF ADDITIONAL LANE(S) ARE REQUIRED, PROVIDE SUFFICIENT RIGHT-OF-WAY TO MAINTAIN 14' FROM CURB TO STREETLINE.

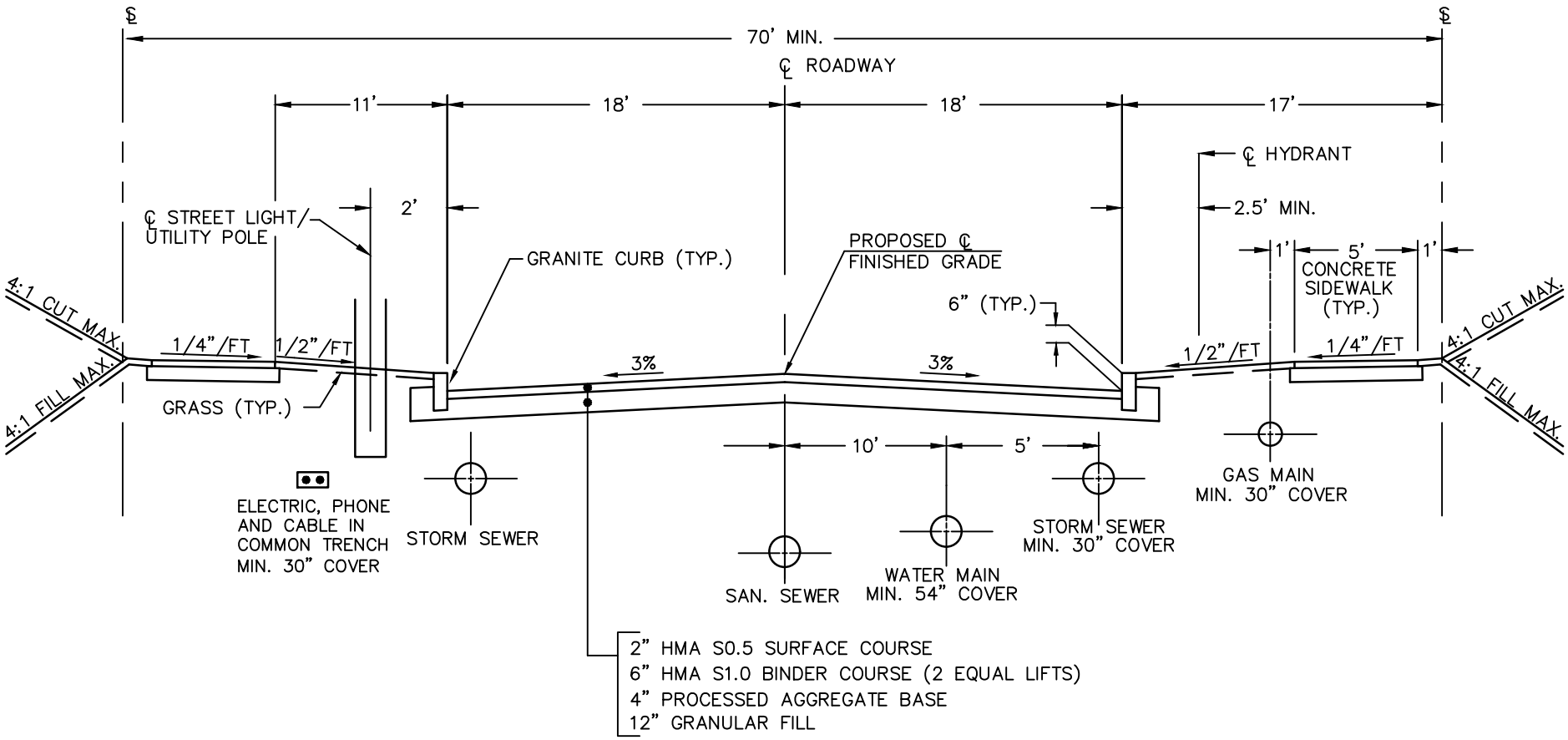
REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED
DRAWN BY: DG		CHECKED BY: JL	
DATE: OCT 2020		FILENAME: PLATE1.DWG	

TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

TYPICAL ROADWAY SECTION
COLLECTOR ROAD

NO SCALE

PLATE 1.2



NOTES:

1. ALL UNDERGROUND UTILITIES, INCLUDING SERVICES, SHALL BE INSTALLED BEFORE BASE MATERIALS AND HMA ARE PLACED.
2. THE GAS MAIN SHALL BE PRIMARILY INSTALLED IN THE GRASS SHELF ON THE OPPOSITE SIDE OF WHERE THE CONCRETE SIDEWALK IS TO BE INSTALLED (GENERALLY SOUTH AND WEST SIDES).
3. IF ADDITIONAL LANE(S) ARE REQUIRED, PROVIDE SUFFICIENT RIGHT-OF-WAY TO MAINTAIN 17' FROM CURB TO STREETLINE.

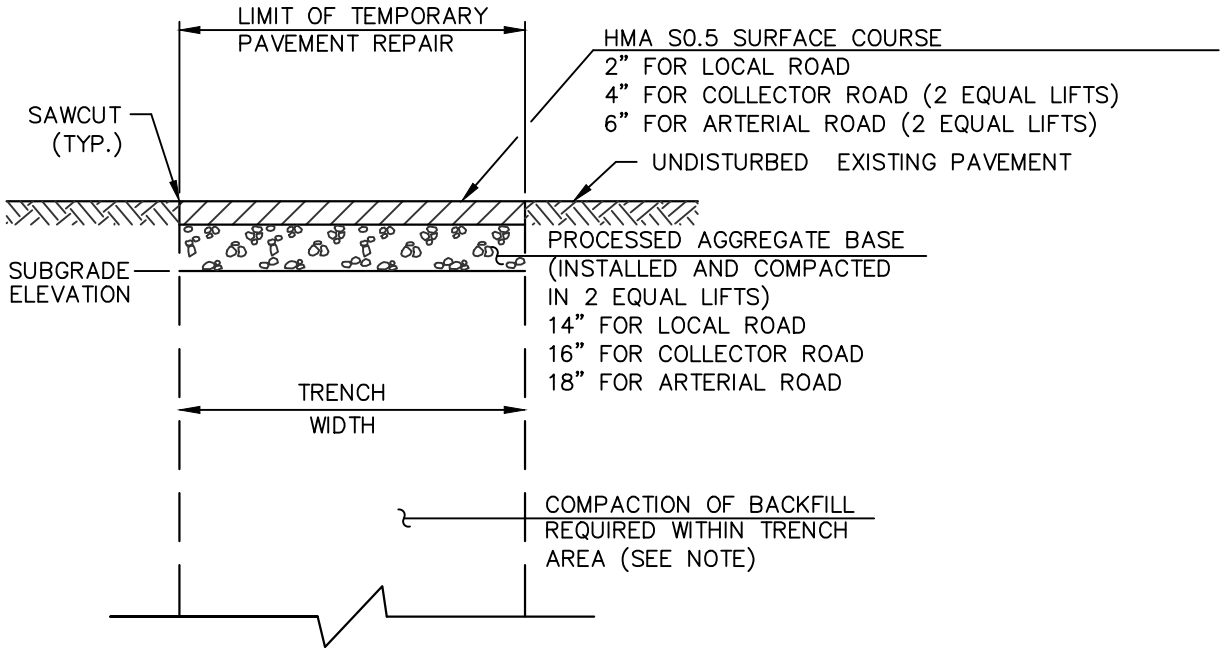
REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED
DRAWN BY: DG		CHECKED BY: JL	
DATE: OCT 2020		FILENAME: PLATE1.DWG	

TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

TYPICAL ROADWAY SECTION
ARTERIAL ROAD

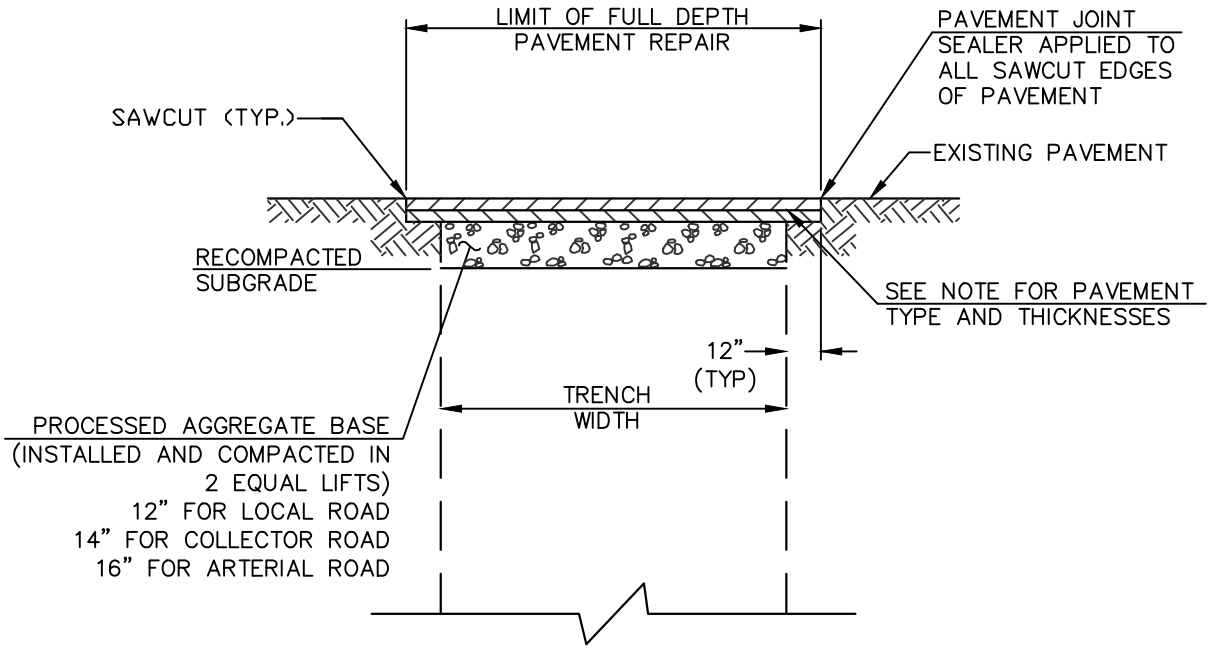
NO SCALE

PLATE 1.3



NOTE:
WHEN REQUESTED BY THE TOWN, THE CONTRACTOR SHALL VERIFY AND SUBMIT TEST RESULTS CONFIRMING THAT COMPACTION OF THE TOTAL TRENCH AREA MEETS TOWN STANDARDS FOR 95% COMPACTED DENSITY.

REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				TEMPORARY PAVEMENT REPAIR
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE1.DWG		NO SCALE — PLATE 1.4



NOTE:
MATCH EXISTING PAVEMENT THICKNESS OR USE MINIMUM PAVEMENT THICKNESS SHOWN BELOW (WHICHEVER IS GREATER):

LOCAL ROAD:	1.5" HMA S0.5 SURFACE COURSE 3" HMA S1.0 BINDER COURSE
COLLECTOR ROAD:	2" HMA S0.5 SURFACE COURSE 4" HMA S1.0 BINDER COURSE
ARTERIAL ROAD:	2" HMA S0.5 SURFACE COURSE 6" HMA S1.0 BINDER COURSE (2 EQUAL LIFTS)

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED

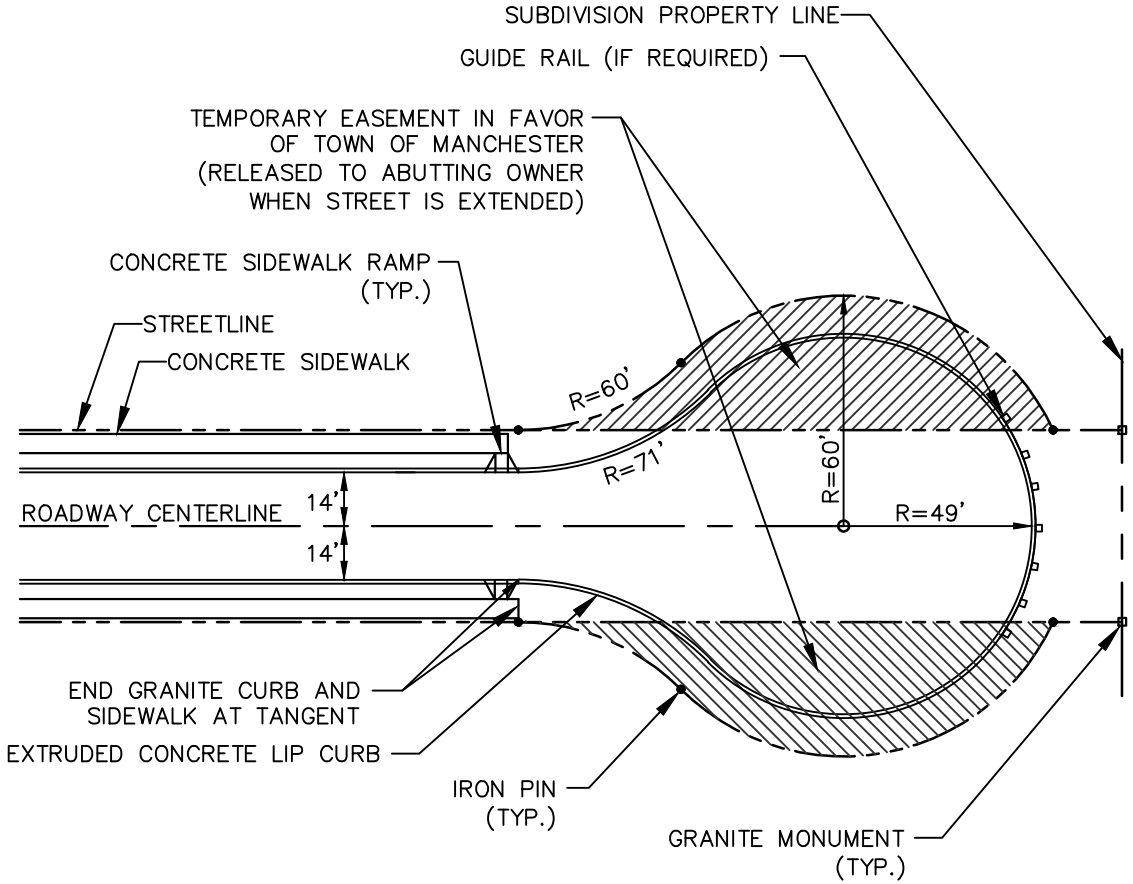
DRAWN BY: DG	CHECKED BY: JL
DATE: OCT 2020	FILENAME: PLATE1.DWG

TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

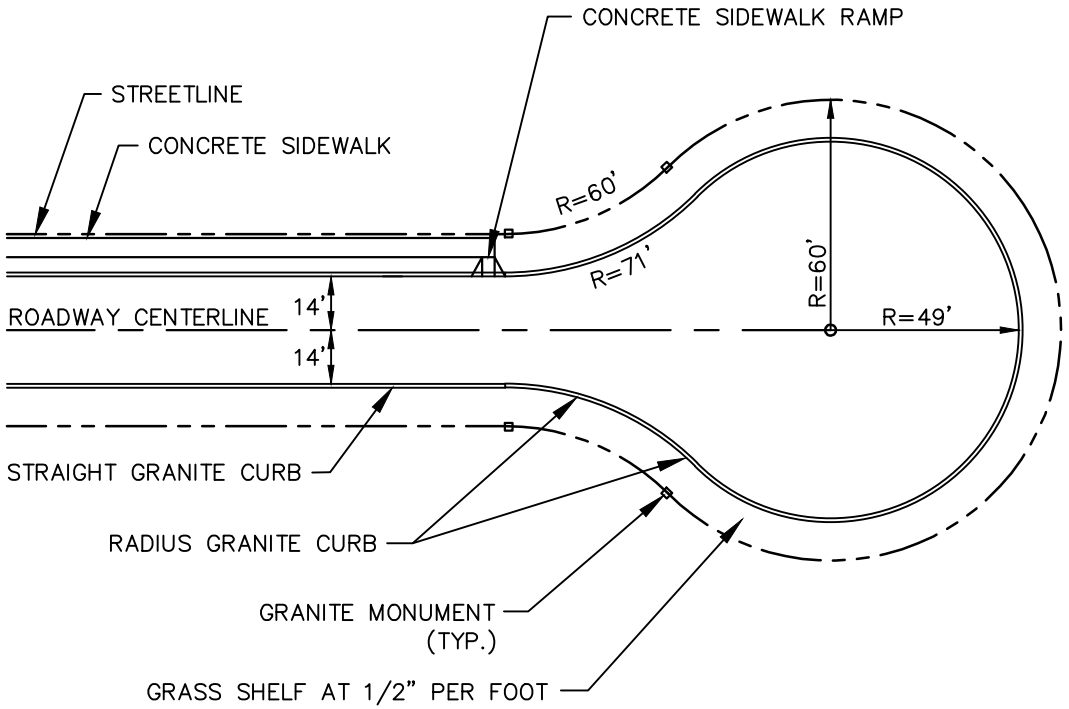
PERMANENT PAVEMENT REPAIR

NO SCALE

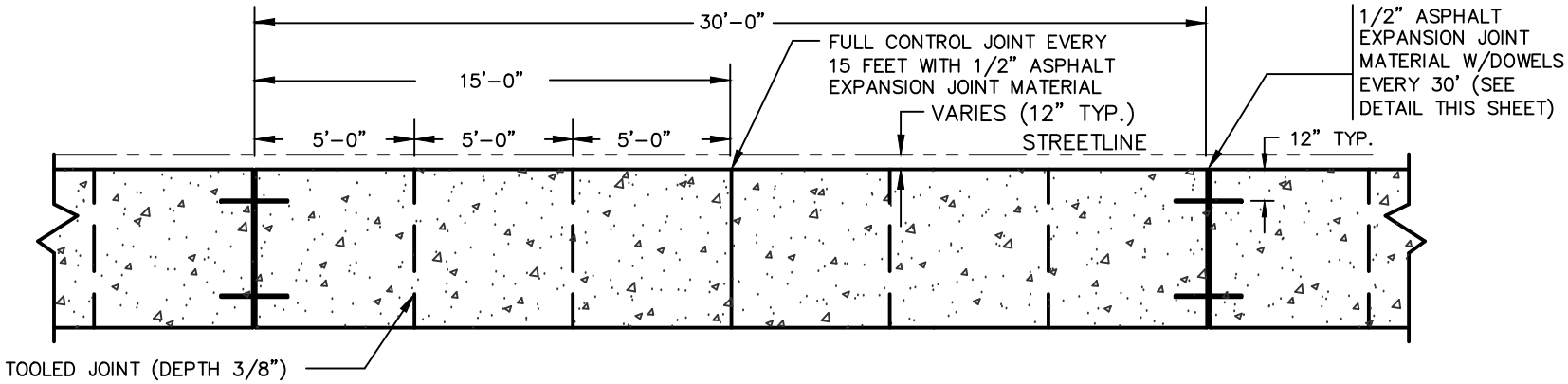
PLATE 1.5



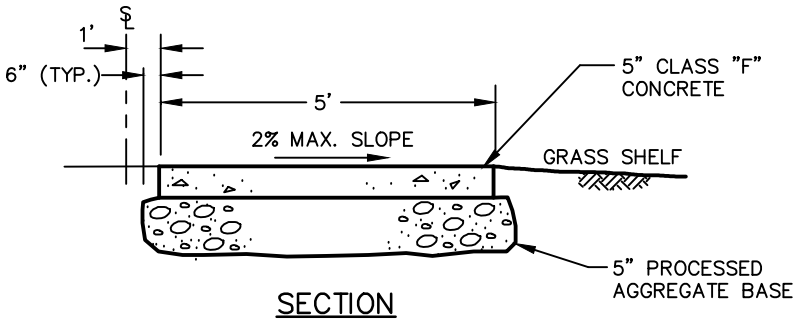
REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				TEMPORARY CUL–DE–SAC
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE2.DWG		NO SCALE — PLATE 2.1



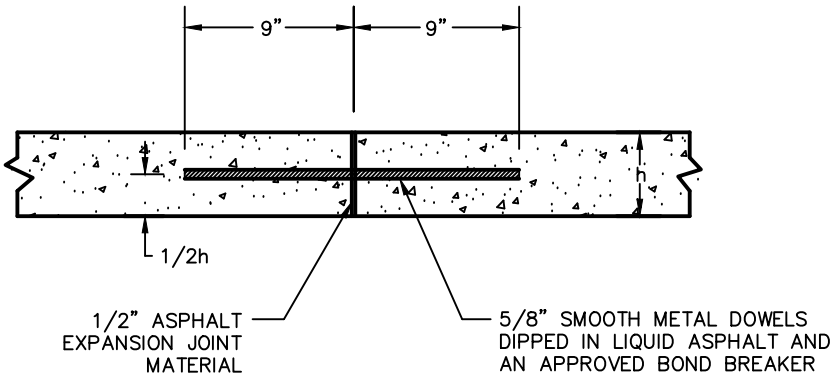
REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				PERMANENT CUL–DE–SAC
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE2.DWG		NO SCALE — PLATE 2.2



PLAN



SECTION

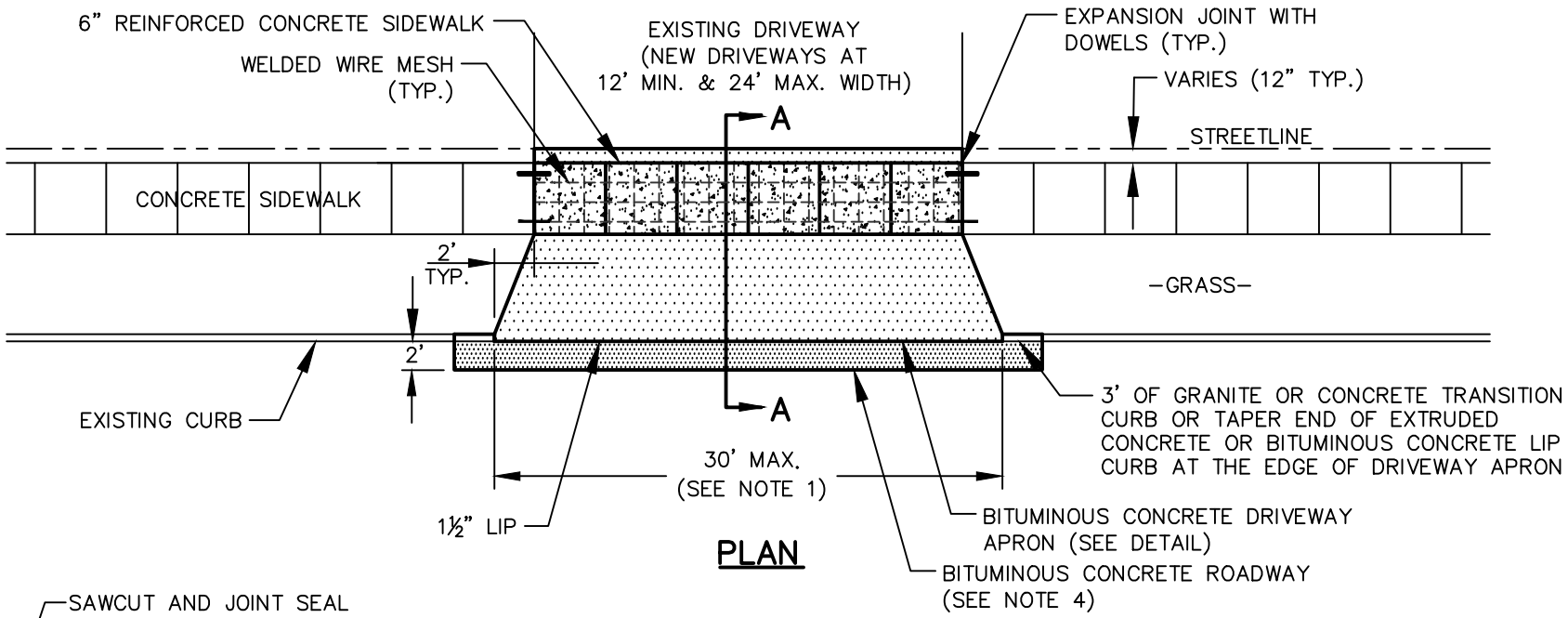


EXPANSION JOINT – DETAIL

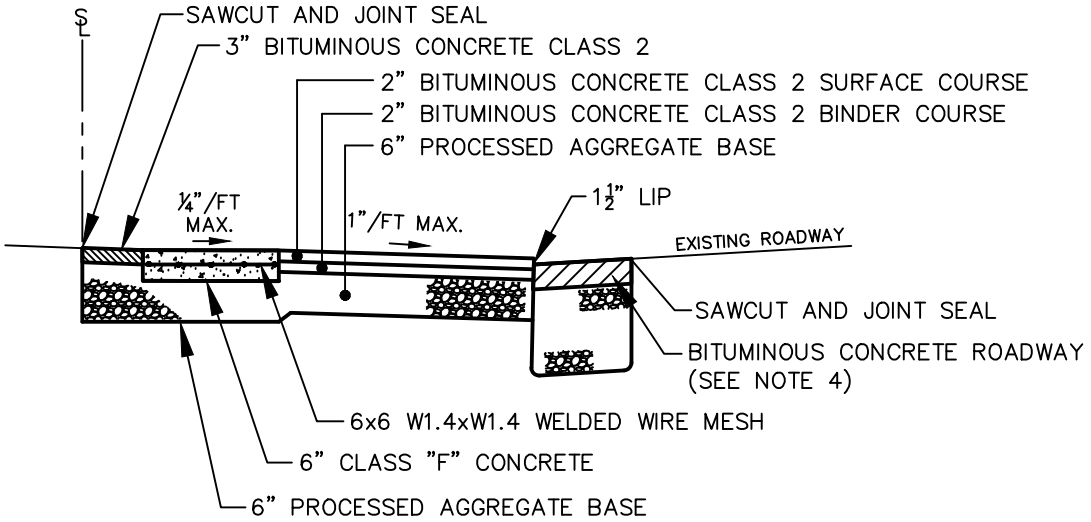
NOTES:

1. A MINIMUM 36" CLEAR WIDTH SHALL BE MAINTAINED BETWEEN THE EDGES OF THE SIDEWALK AND ANY OBSTRUCTIONS WITHIN THE SIDEWALK LIMITS.
2. AT THE END OF THE DAILY POUR OF CONCRETE, METAL DOWELS ARE TO BE INSERTED IN THE LAST SLAB FOR THE EXTENSION OF THE SIDEWALK.
3. INSTALL APPROVED BOND BREAKER BETWEEN GRANITE CURB AND SIDEWALK.

REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				CONCRETE SIDEWALK
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE3.DWG		NO SCALE — PLATE 3.1



PLAN

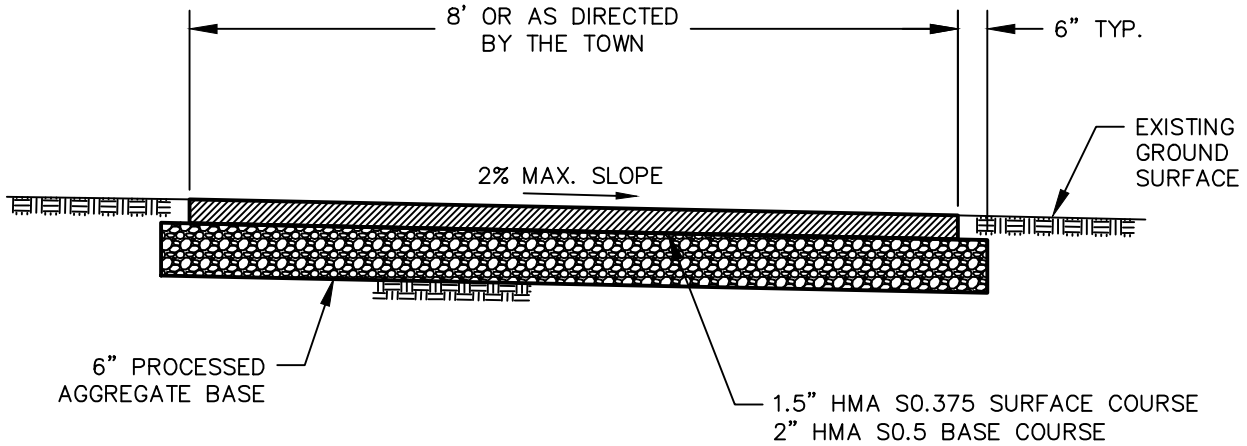


SECTION A–A

NOTES:

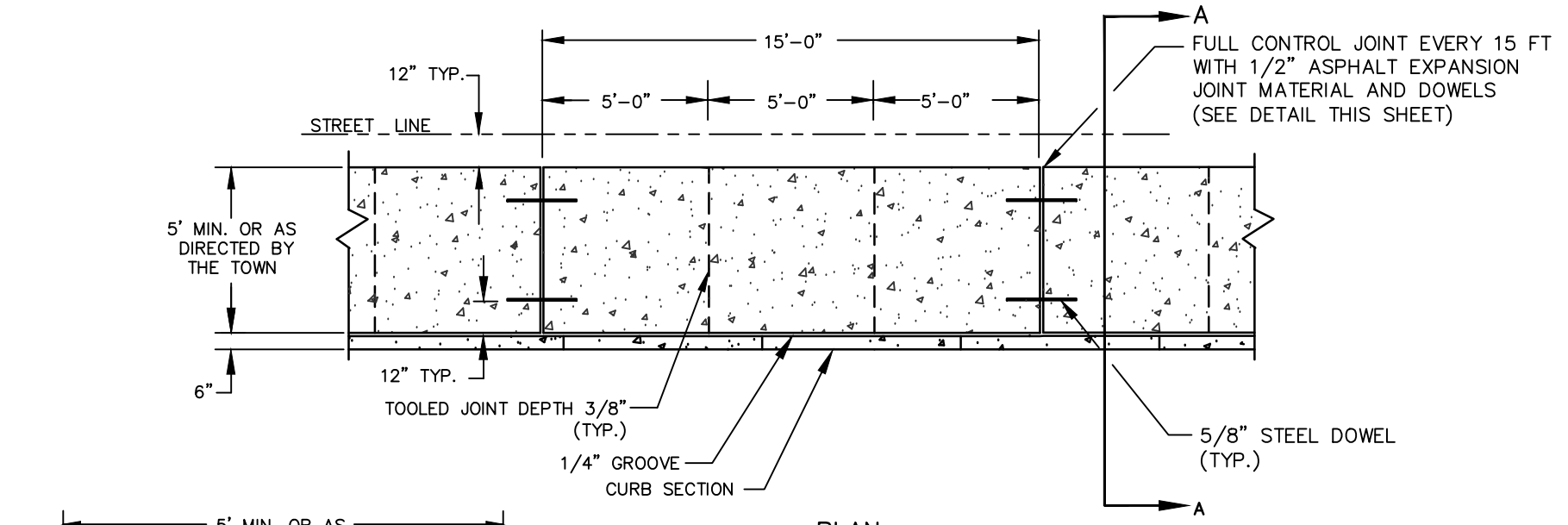
1. MAXIMUM WIDTH OF APRON IS 30' AT CURB LINE. THE TOWN MAY ALLOW WIDER APRON WIDTHS TO ACCOMMODATE EXISTING ACCESS CONDITIONS AND/OR REQUIRED VEHICLE TURNING MOVEMENTS
2. MINIMUM DISTANCE BETWEEN MULTIPLE DRIVEWAY OPENINGS SHALL BE 10'.
3. SEE RESPECTIVE DETAILS FOR CONCRETE SIDEWALK AND CURB.
4. PAVEMENT COURSES AND PROCESSED AGGREGATE BASE THICKNESS SHALL MATCH EXISTING OR BE INSTALLED AS DIRECTED BY THE ENGINEER. PROCESSED AGGREGATE BASE THICKNESS SHALL BE 12" MINIMUM.
5. CONCRETE DRIVEWAY APRON EXTENDING FROM BACK OF SIDEWALK TO ROAD GUTTER SHALL BE INSTALLED WHERE SHELF IS LESS THAN 3 FT WIDE. SEE APPROPRIATE DETAIL.

REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				REINFORCED CONCRETE SIDEWALK
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE3.DWG		NO SCALE — PLATE 3.2

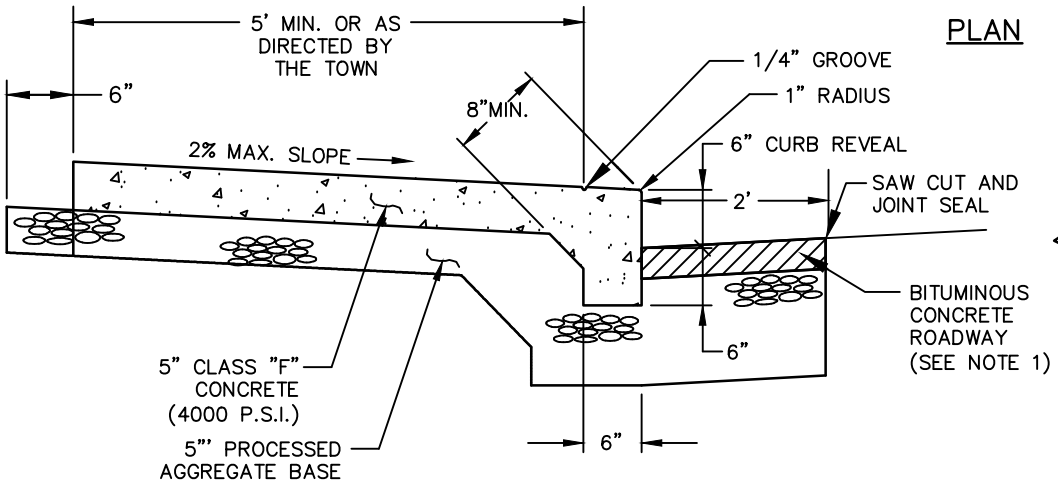


SECTION

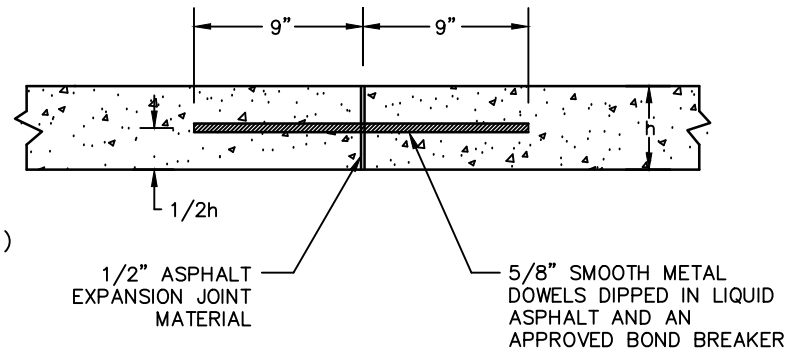
REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				BITUMINOUS CONCRETE TRAIL/BIKE LANE
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE3.DWG		NO SCALE — PLATE 3.3



PLAN



SECTION A–A

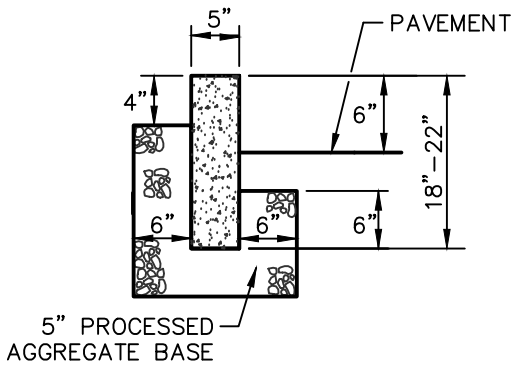


EXPANSION JOINT – DETAIL

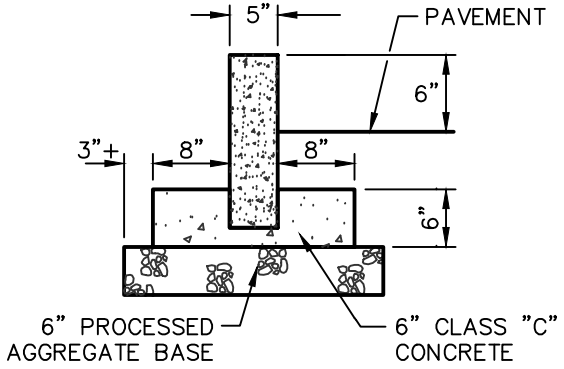
NOTES:

1. PAVEMENT COURSES AND PROCESSED AGGREGATE BASE THICKNESS SHALL MATCH EXISTING OR BE INSTALLED AS DIRECTED BY THE ENGINEER. PROCESSED AGGREGATE BASE THICKNESS SHALL BE 12" MINIMUM.
2. A MINIMUM 36" CLEAR WIDTH SHALL BE MAINTAINED BETWEEN THE EDGES OF THE SIDEWALK AND ANY OBSTRUCTIONS WITHIN THE SIDEWALK LIMITS.
3. AT THE END OF THE DAILY POUR OF CONCRETE, METAL DOWELS ARE TO BE INSERTED IN THE LAST SLAB FOR THE EXTENSION OF THE SIDEWALK.

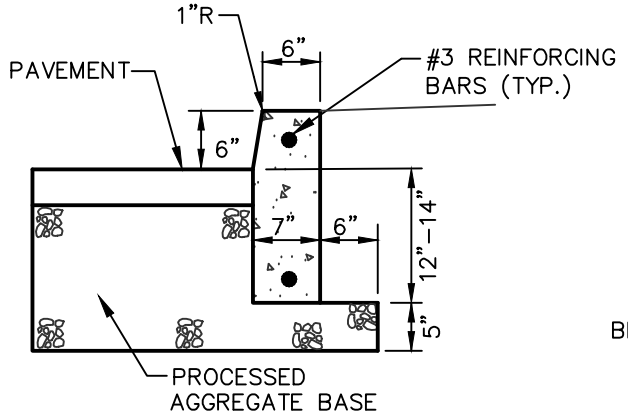
REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				CONCRETE SIDEWALK AND CURB MONOLITHIC
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE4.DWG		NO SCALE — PLATE 4.1



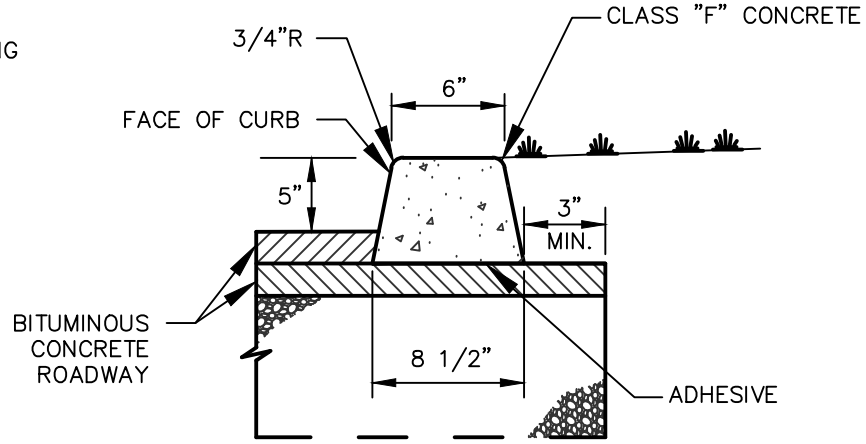
STRAIGHT GRANITE CURB
(SEE NOTES BELOW)



RADIUS GRANITE CURB
(SEE NOTES BELOW)



PRECAST CONCRETE CURB

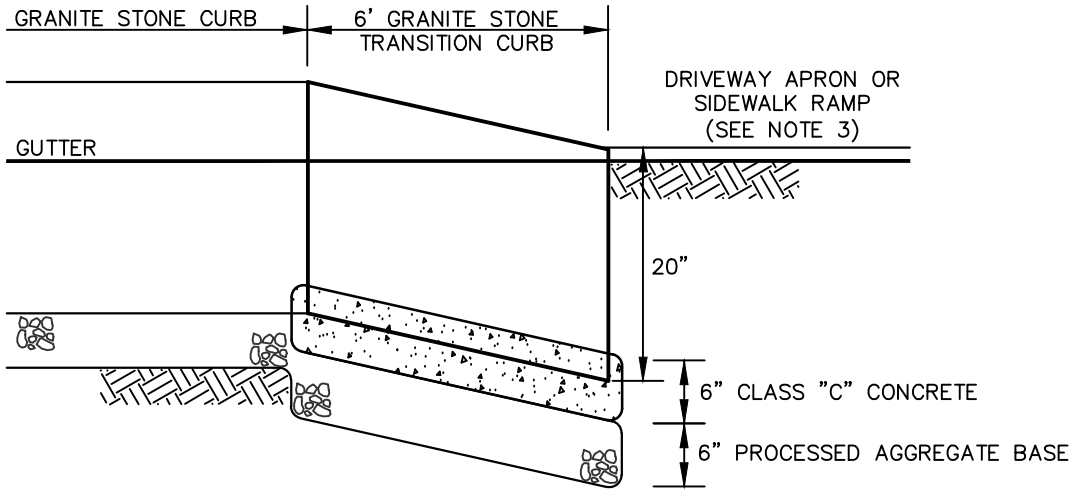


EXTRUDED CONCRETE CURB
(SEE NOTES BELOW)

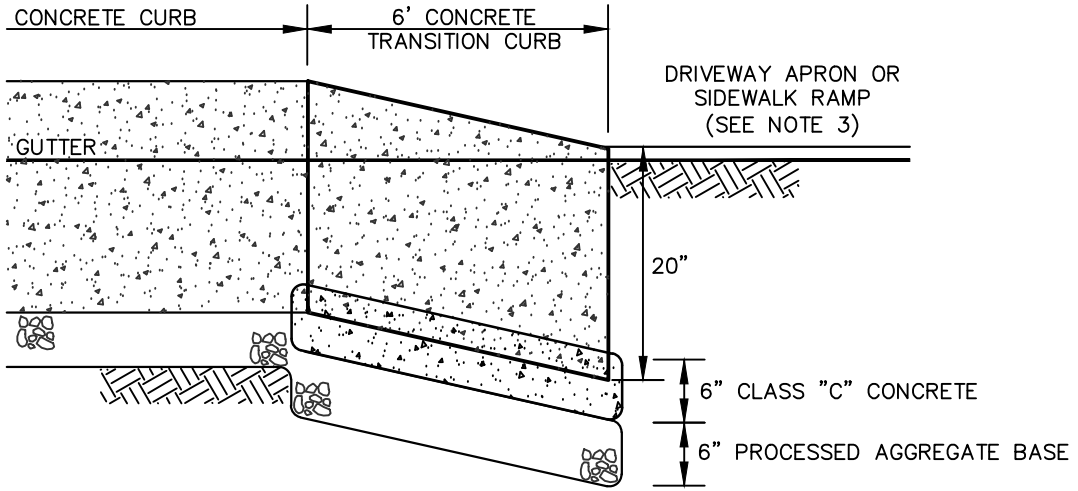
GRANITE CURB NOTES:

1. MINIMUM LENGTH OF GRANITE CURB IS 4'–0".
2. GRANITE CURB SHALL BE FINISH–SAWN TOP AND SPLIT FACE JOINTED.
3. ALL GRANITE CURB JOINTS SHALL BE SET IN 6" OF CLASS "C" CONCRETE AND MORTAR SHALL BE APPLIED ALONG THE HEIGHT AND WIDTH OF ALL ABUTTING CURB FACES.
4. GRANITE CURB WITH A RADIUS OF 100' OR LESS SHALL BE BUILT OF RADIUS GRANITE CURB AND SET IN 6" OF CONCRETE ALONG THE ENTIRE LENGTH.
5. STRAIGHT AND RADIUS GRANITE CURB SHALL BE USED FOR TRANSITION CURB AT DRIVEWAYS AND SIDEWALK RAMPS WHERE APPLICABLE.
6. THE JOINTS OF RESET GRANITE STONE CURB SHALL BE SET IN 6" OF CONCRETE.

REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				CURB TYPES
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE6.DWG		NO SCALE — PLATE 6.1



GRANITE STONE TRANSITION CURB



CONCRETE TRANSITION CURB

NOTES:
1. CONCRETE TRANSITION CURB SHALL BE POURED MONOLITHIC WITH A CONCRETE DRIVEWAY APRON OR CONCRETE SIDEWALK RAMP.
2. IN GENERAL, GRANITE CURB TRANSITIONS ARE TO BE INSTALLED WHEN THE ADJACENT CURB IS GRANITE AND CONCRETE CURB TRANSITIONS ARE TO BE INSTALLED WHEN THE ADJACENT CURB IS CONCRETE OR BITUMINOUS.
3. TOP CORNER OF CURB SHALL MATCH GUTTER ELEVATION FOR INSTALLATION OF CONCRETE SIDEWALK RAMPS.

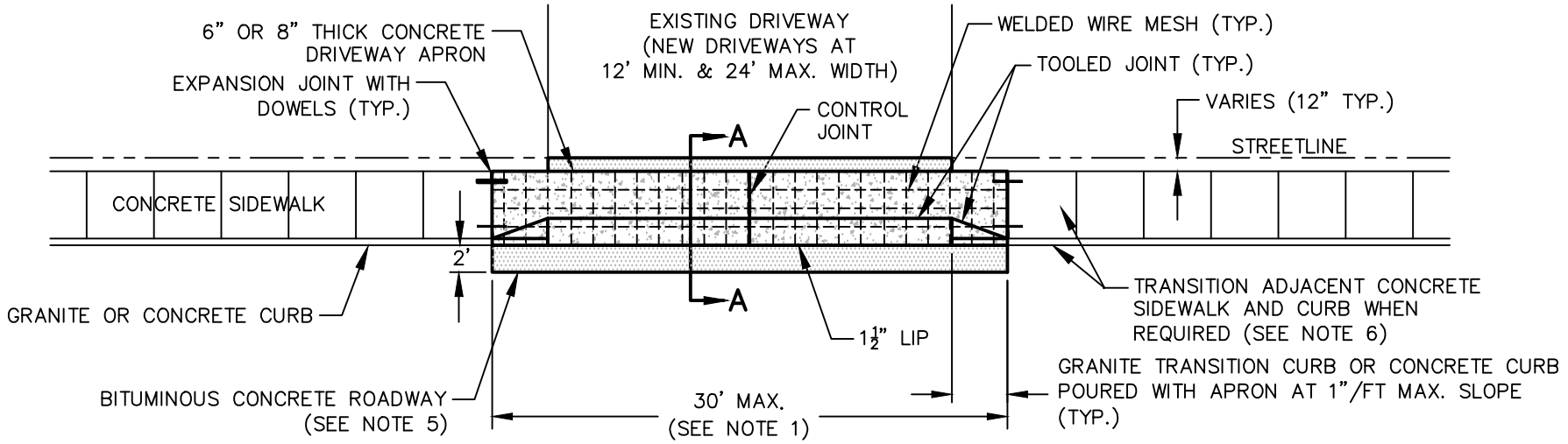
REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED
DRAWN BY: DG		CHECKED BY: JL	
DATE: OCT 2020		FILENAME: PLATE6.DWG	

TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

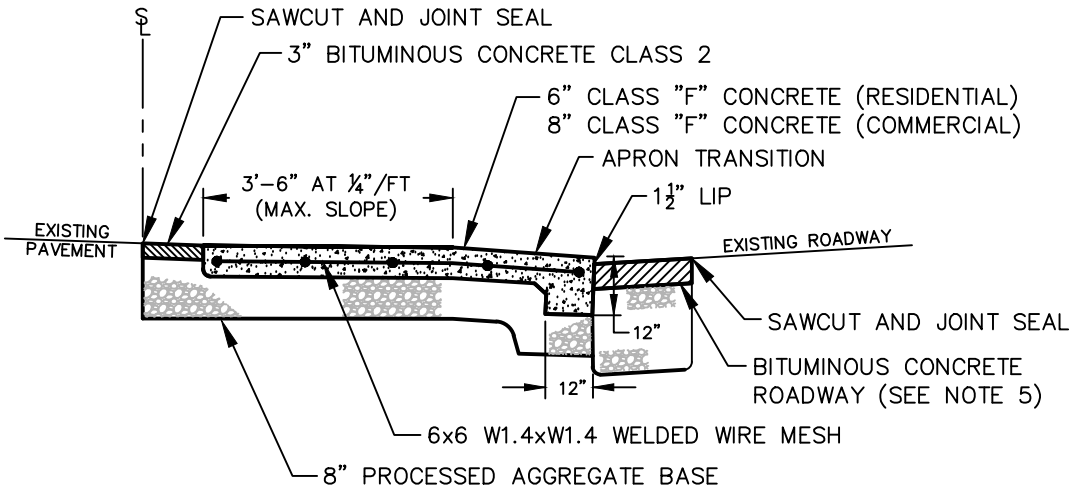
TRANSITION CURBS

NO SCALE

PLATE 6.2



PLAN



SECTION A–A

NOTES:

1. MAXIMUM WIDTH OF APRON IS 30' AT THE CURB LINE (INCLUDING CURB TRANSITIONS.) THE TOWN MAY ALLOW WIDER APRON WIDTHS TO ACCOMMODATE EXISTING ACCESS CONDITIONS AND/OR REQUIRED VEHICLE TURNING MOVEMENTS.
2. MINIMUM DISTANCE BETWEEN MULTIPLE DRIVEWAY OPENINGS SHALL BE 10'.
3. SEE RESPECTIVE DETAILS FOR CONCRETE SIDEWALK AND CURB.
4. RESIDENTIAL DRIVEWAY APRONS SHALL BE 6" THICK AND COMMERCIAL DRIVEWAY APRONS SHALL BE 8" THICK.
5. PAVEMENT COURSES AND PROCESSED AGGREGATE BASE THICKNESS SHALL MATCH EXISTING OR BE INSTALLED AS DIRECTED BY THE ENGINEER. PROCESSED AGGREGATE BASE THICKNESS SHALL BE 12" MINIMUM.
6. TOTAL HEIGHT OF LIP AND APRON TRANSITION SHALL BE 3" MAXIMUM ABOVE THE ROAD GUTTER. WHEN REQUIRED, REPLACE ADJACENT CONCRETE SIDEWALK SLABS AND RESET CURB AT 5% MAXIMUM SLOPE AS DIRECTED BY THE ENGINEER.

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED

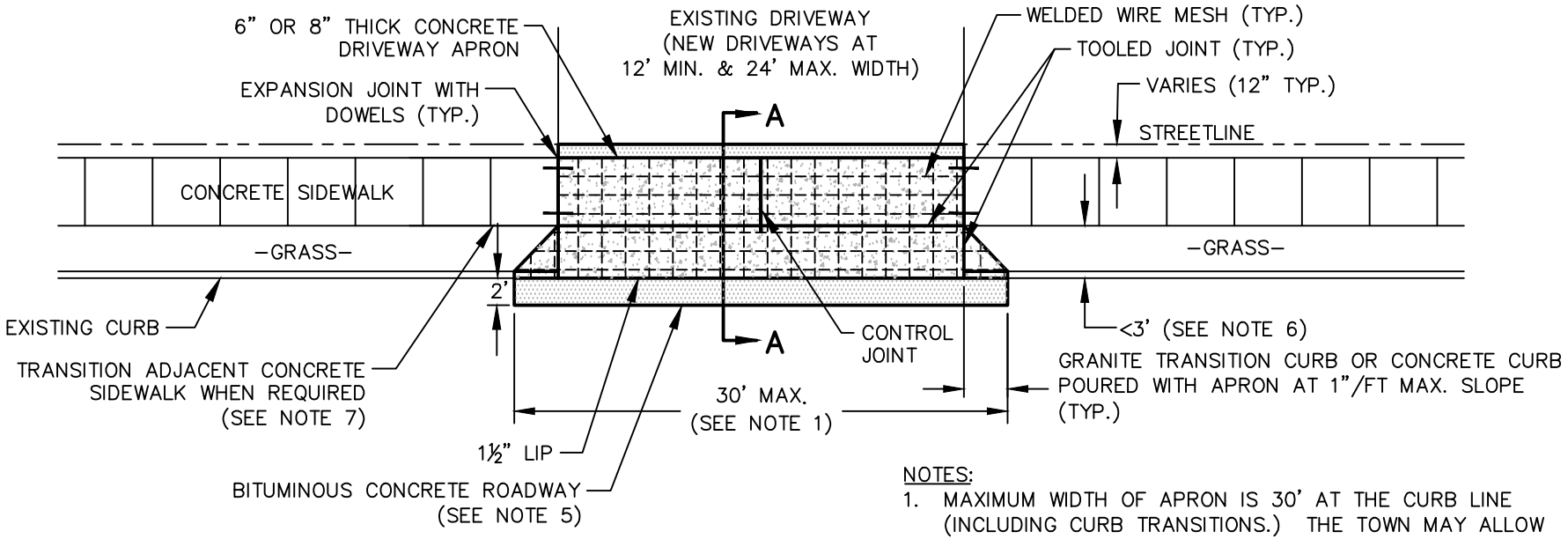
TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

DRAWN BY: DG	CHECKED BY: JL
DATE: OCT 2020	FILENAME: PLATE7.DWG

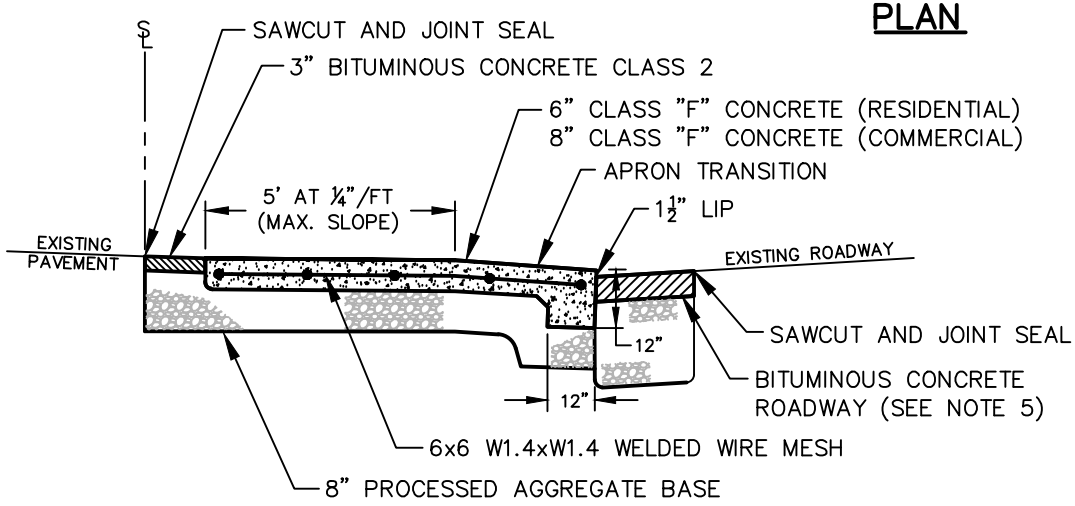
CONCRETE DRIVEWAY APRON WITHOUT SHELF

NO SCALE

PLATE 7.1



PLAN



SECTION A-A

NOTES:

1. MAXIMUM WIDTH OF APRON IS 30' AT THE CURB LINE (INCLUDING CURB TRANSITIONS.) THE TOWN MAY ALLOW WIDER APRON WIDTHS TO ACCOMMODATE EXISTING ACCESS CONDITIONS AND/OR REQUIRED VEHICLE TURNING MOVEMENTS.
2. MINIMUM DISTANCE BETWEEN MULTIPLE DRIVEWAY OPENINGS SHALL BE 10'.
3. SEE RESPECTIVE DETAILS FOR CONCRETE SIDEWALK AND CURB.
4. RESIDENTIAL DRIVEWAY APRONS SHALL BE 6" THICK AND COMMERCIAL DRIVEWAY APRONS SHALL BE 8" THICK.
5. PAVEMENT COURSES AND PROCESSED AGGREGATE BASE THICKNESS SHALL MATCH EXISTING OR BE INSTALLED AS DIRECTED BY THE ENGINEER. PROCESSED AGGREGATE BASE THICKNESS SHALL BE 12" MINIMUM.
6. A BITUMINOUS CONCRETE DRIVEWAY APRON SHALL BE INSTALLED WHERE SHELF WIDTH IS 3 FT OR GREATER. SEE APPROPRIATE DETAIL.
7. TOTAL HEIGHT OF LIP AND APRON TRANSITION SHALL BE 3" MAXIMUM ABOVE THE ROAD GUTTER. WHEN REQUIRED, REPLACE ADJACENT CONCRETE SIDEWALK SLABS AT 5% MAXIMUM SLOPE AS DIRECTED BY THE ENGINEER.

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED

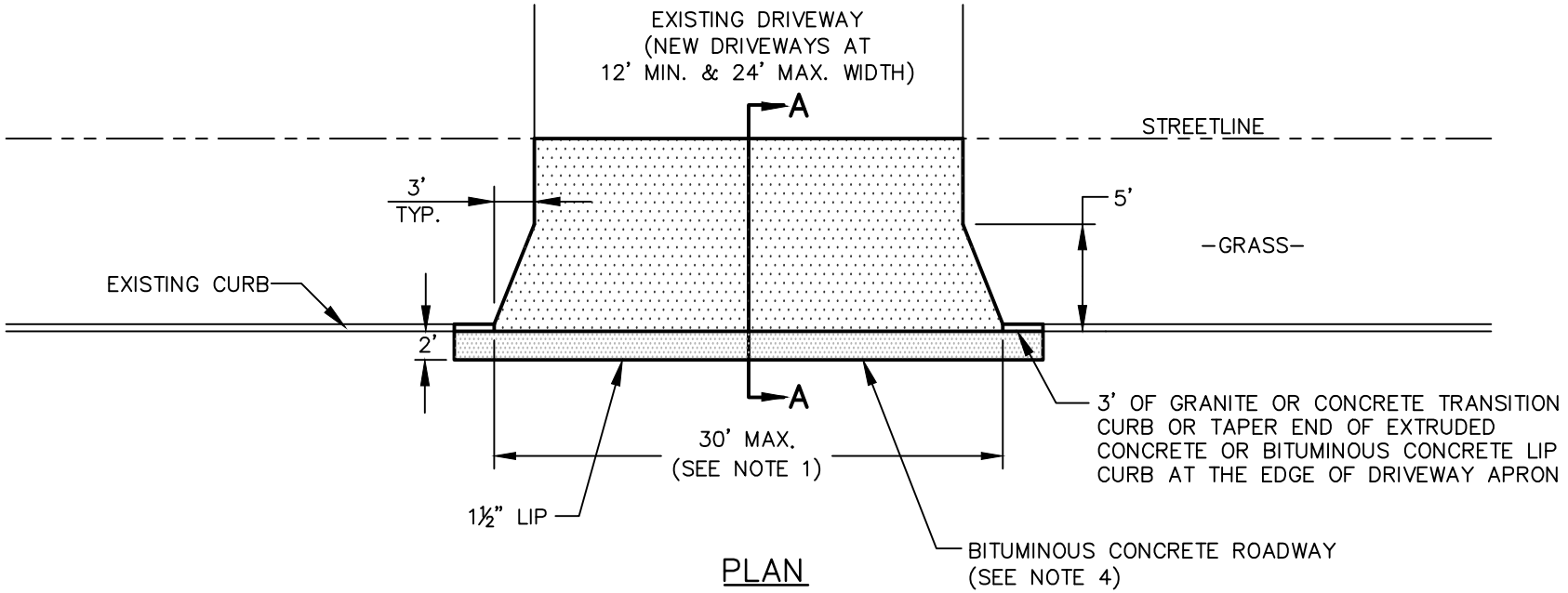
TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

DRAWN BY: DG	CHECKED BY: JL
DATE: OCT 2020	FILENAME: PLATE7.DWG

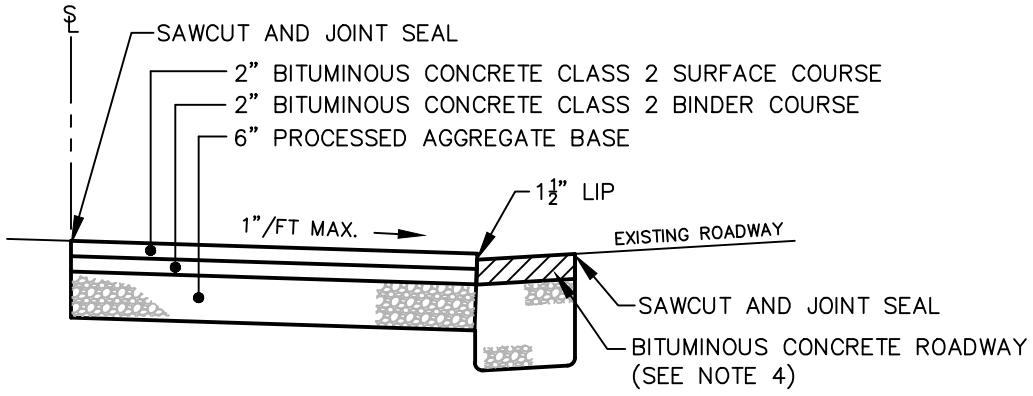
CONCRETE DRIVEWAY APRON WITH SHELF

NO SCALE

PLATE 7.2



PLAN

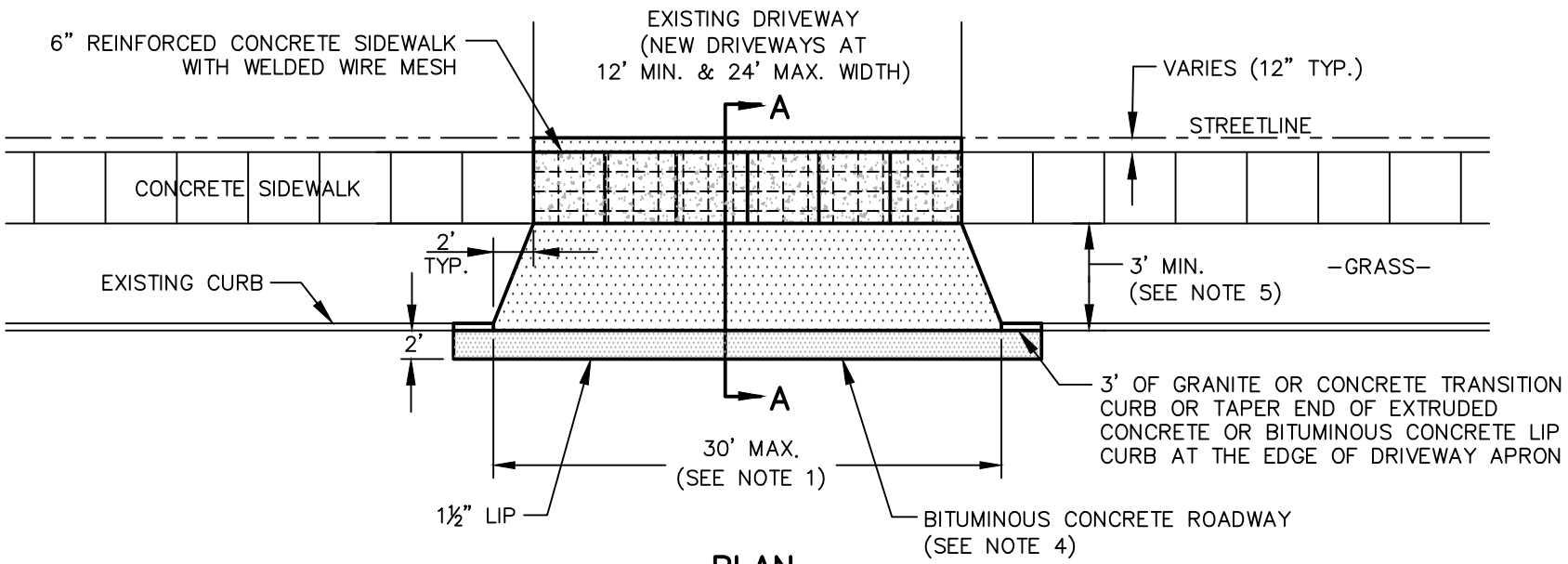


SECTION A–A

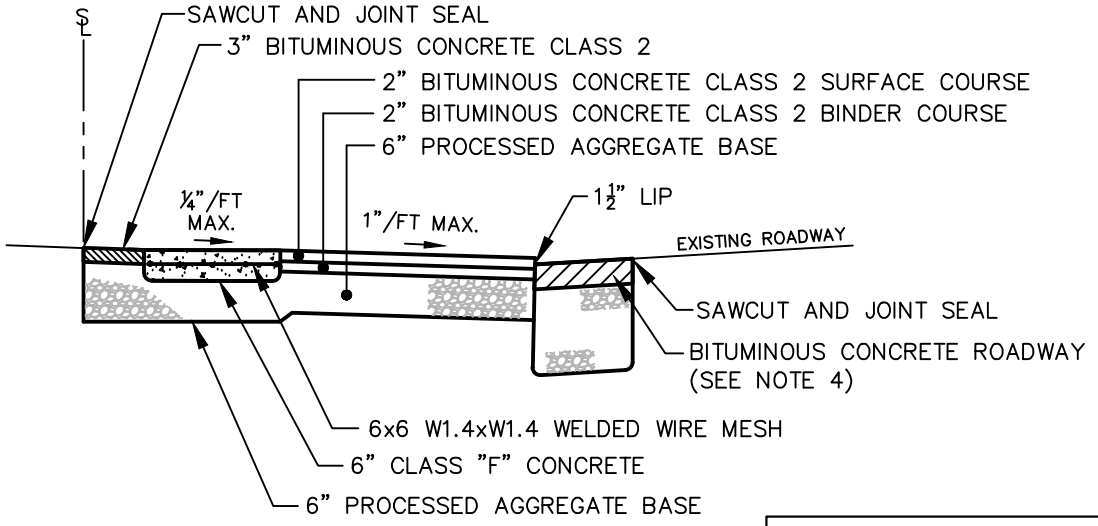
NOTES:

1. MAXIMUM WIDTH OF APRON IS 30' AT THE CURB LINE. THE TOWN MAY ALLOW WIDER APRON WIDTHS TO ACCOMMODATE EXISTING ACCESS CONDITIONS AND/OR REQUIRED VEHICLE TURNING MOVEMENTS.
2. MINIMUM DISTANCE BETWEEN MULTIPLE DRIVEWAY OPENINGS SHALL BE 10'.
3. SEE RESPECTIVE DETAIL FOR CURB.
4. PAVEMENT COURSES AND PROCESSED AGGREGATE BASE THICKNESS SHALL MATCH EXISTING OR BE INSTALLED AS DIRECTED BY THE ENGINEER. PROCESSED AGGREGATE BASE THICKNESS SHALL BE 12" MINIMUM.

REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				BITUMINOUS CONCRETE DRIVEWAY APRON WITHOUT SIDEWALK
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE7.DWG		NO SCALE — PLATE 7.3



PLAN



SECTION A-A

NOTES:

1. MAXIMUM WIDTH OF APRON IS 30' AT THE CURB LINE. THE TOWN MAY ALLOW WIDER APRON WIDTHS TO ACCOMMODATE EXISTING ACCESS CONDITIONS AND/OR REQUIRED VEHICLE TURNING MOVEMENTS
2. MINIMUM DISTANCE BETWEEN MULTIPLE DRIVEWAY OPENINGS SHALL BE 10'.
3. SEE RESPECTIVE DETAILS FOR CONCRETE SIDEWALK AND CURB.
4. PAVEMENT COURSES AND PROCESSED AGGREGATE BASE THICKNESS SHALL MATCH EXISTING OR BE INSTALLED AS DIRECTED BY THE ENGINEER. PROCESSED AGGREGATE BASE THICKNESS SHALL BE 12" MINIMUM.
5. A CONCRETE DRIVEWAY APRON EXTENDING FROM THE BACK OF SIDEWALK TO THE ROAD GUTTER SHALL BE INSTALLED WHERE SHELF WIDTH IS LESS THAN 3 FT. SEE APPROPRIATE DETAIL.

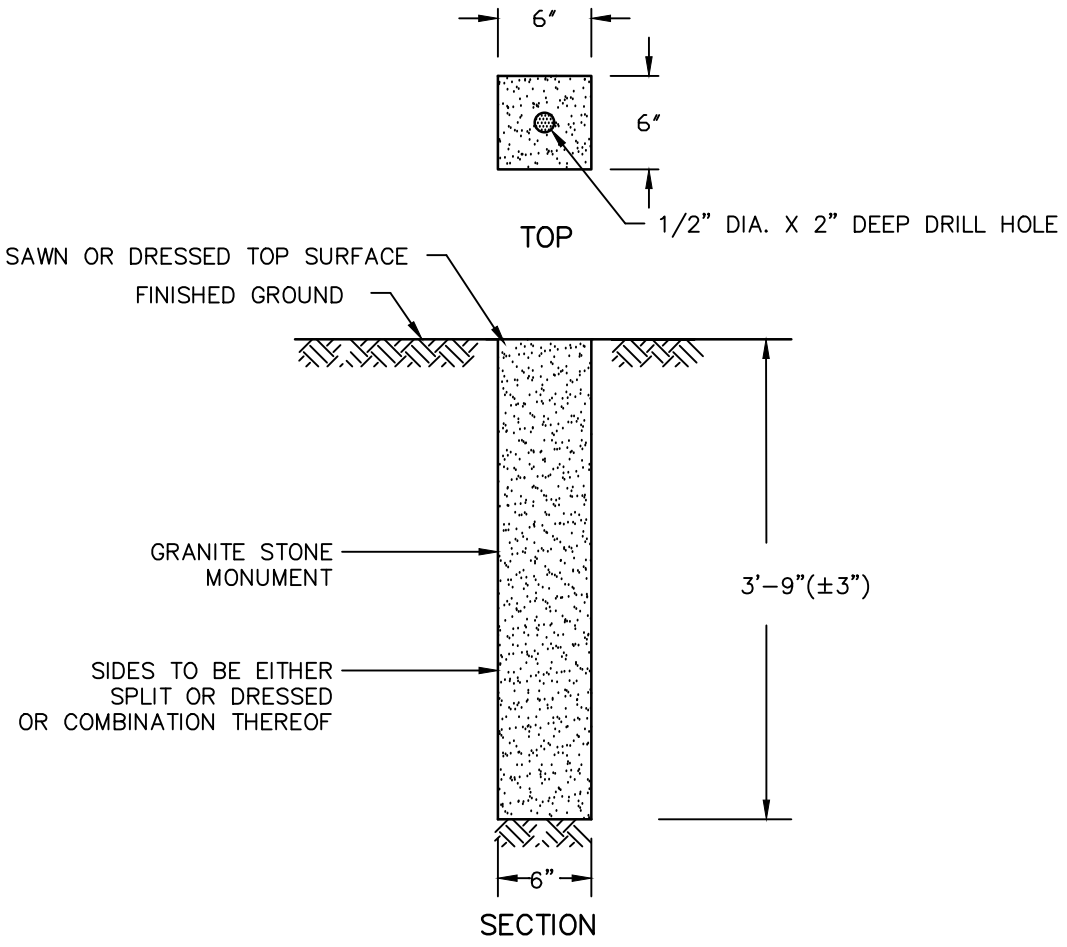
REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED
DRAWN BY: DG		CHECKED BY: JL	
DATE: OCT 2020		FILENAME: PLATE7.DWG	

TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

BITUMINOUS CONCRETE DRIVEWAY APRON WITH SIDEWALK

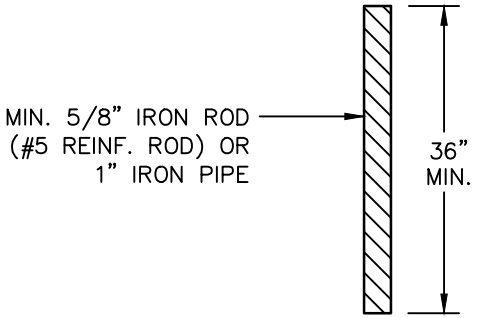
NO SCALE

PLATE 7.4



GRANITE MONUMENT

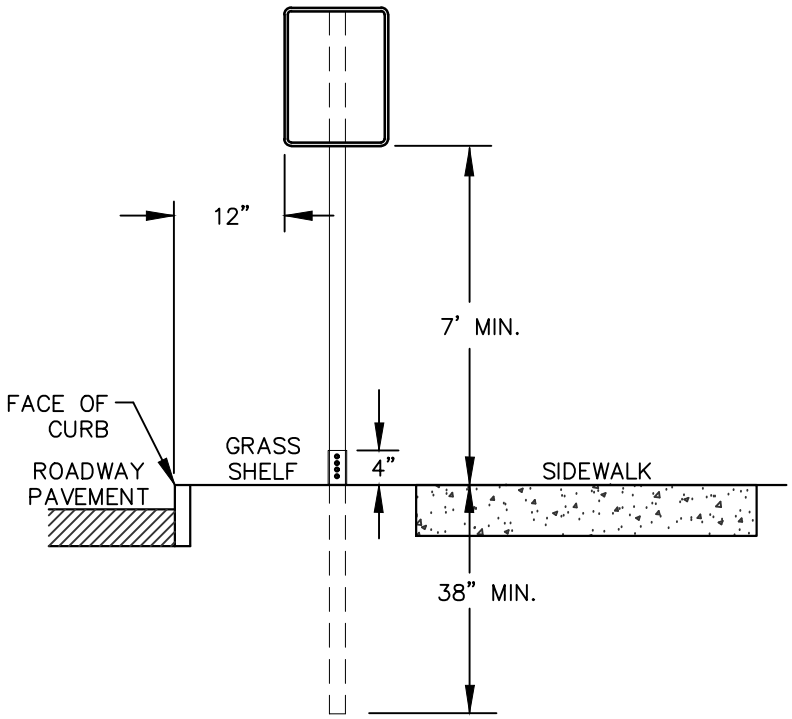
EACH IRON ROD OR IRON PIPE SHALL BE CAPPED WITH A SURVEY MARKER BEARING THE NAME AND CONNECTICUT LICENSE NUMBER OF THE PROFESSIONAL LAND SURVEYOR RESPONSIBLE FOR ITS PLACEMENT.



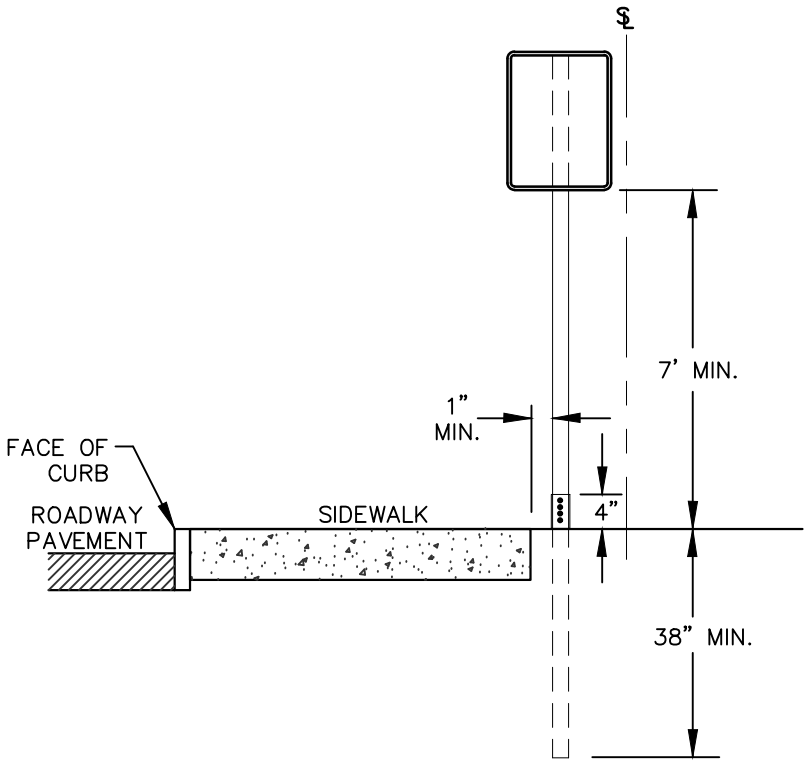
IRON ROD OR IRON PIPE

NOTE:
ALL SURVEY POINTS DESCRIBED ABOVE SHALL BE PLACED AT FINISHED GRADE.

REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				MONUMENTATION AND PROPERTY MARKERS
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE8.DWG		NO SCALE — PLATE 8.1



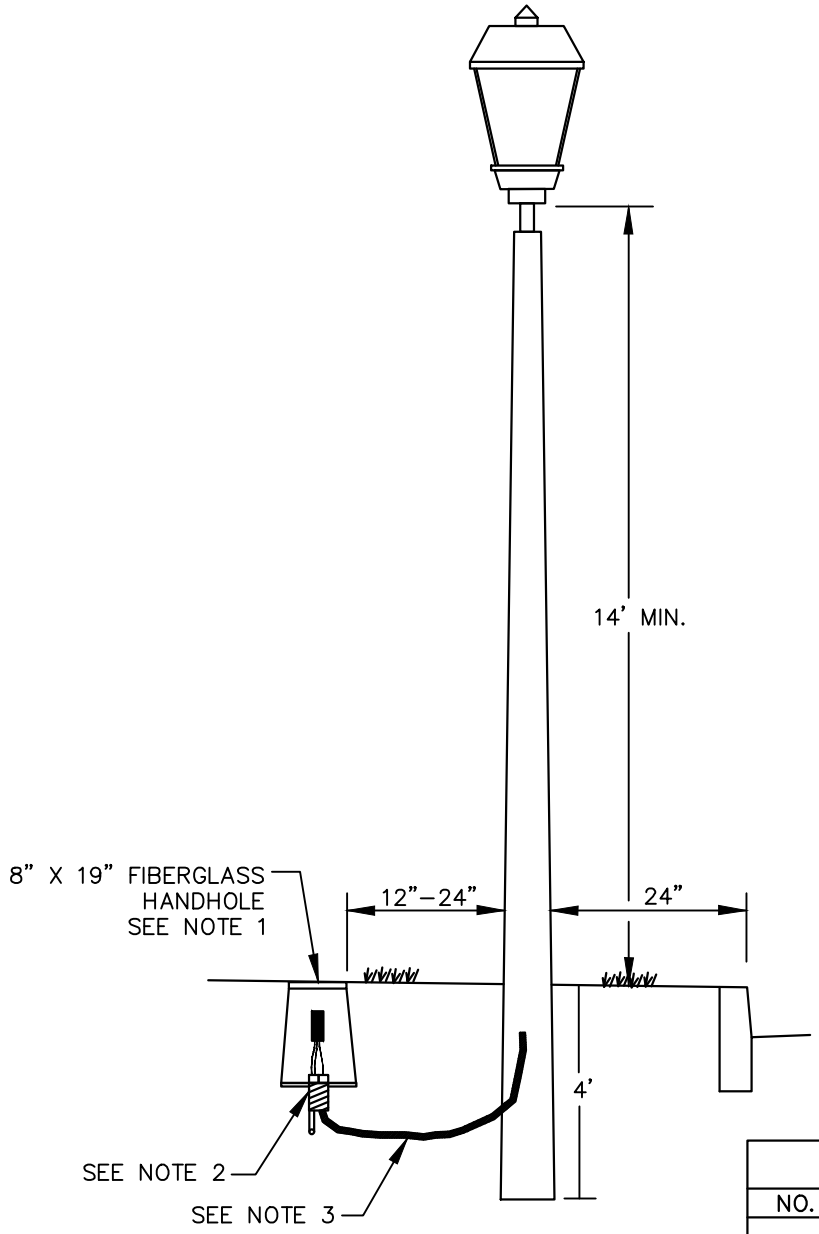
SECTION WITH SIDEWALK AND GRASS SHELF



SECTION WITH SIDEWALK AND NO GRASS SHELF

NOTES:
1. SUPPORTS SHALL BE METAL GALVANIZED STEEL POSTS WITH BREAKAWAY COUPLING SYSTEM.
2. WHERE POSTS CANNOT BE INSTALLED BEHIND SIDEWALK, THEY SHALL BE INSTALLED WITH THE EDGE OF THE SIGN 12" FROM FACE OF CURB.

REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				TYPICAL SIGN INSTALLATION
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE9.DWG		NO SCALE — PLATE 9.1



NOTES:

1. FIBERGLASS HANDHOLE (NORTHEAST UTILITIES PART SC 0174953) SHALL BE ON FIELD SIDE OF POLE FLUSH WITH GROUND.
2. SECURE 90 DEGREE BENDS AND END OF FLEXIBLE CONDUIT TOGETHER WITH DUCT TAPE. TOP OF CONDUITS SHALL EXTEND NO MORE THAN 6 INCHES UP INTO THE ENCLOSURE. INSTALL 1/4" PULL ROPE WITH TAGS IDENTIFYING CONDUIT DESTINATION.
3. INSTALL FLEXIBLE NON–METALLIC CONDUIT, 1–1/4" MAXIMUM O.D., AND EXTEND UP INTO POLE FOR STREETLIGHT CONDUCTORS. INSTALL 1/4" PULL ROPE FROM HANDHOLE TO TOP OF POLE.

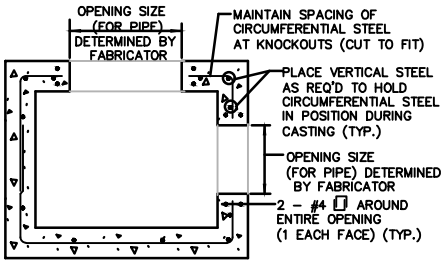
REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED
DRAWN BY: DG		CHECKED BY: JL	
DATE: OCT 2020		FILENAME: PLATE9.DWG	

TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

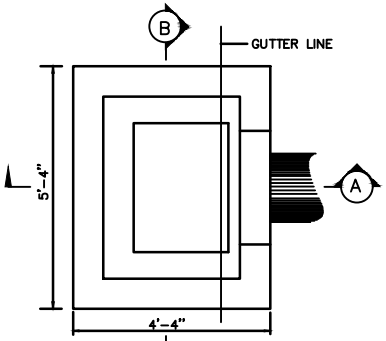
TYPICAL STREETLIGHT INSTALLATION

NO SCALE

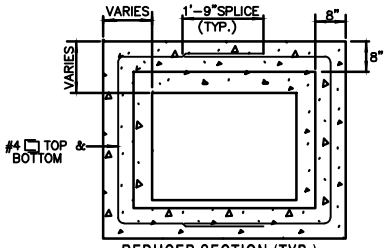
PLATE 9.2



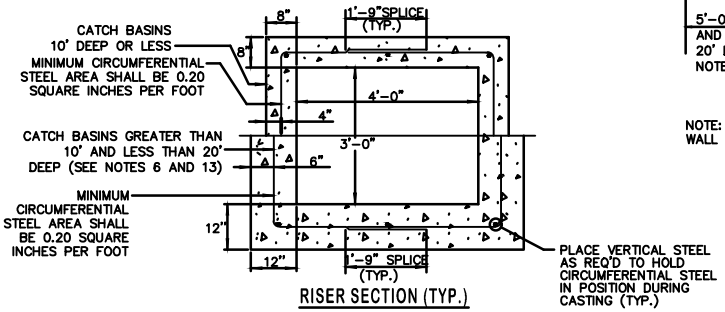
TYPICAL SECTION THRU
RISER WITH OPENING



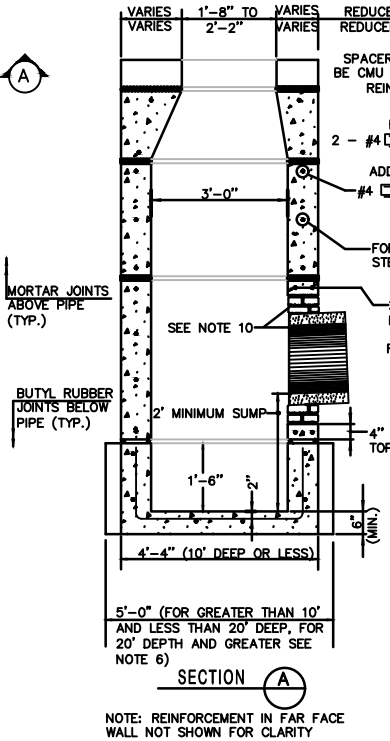
PLAN



REDUCER SECTION (TYP.)

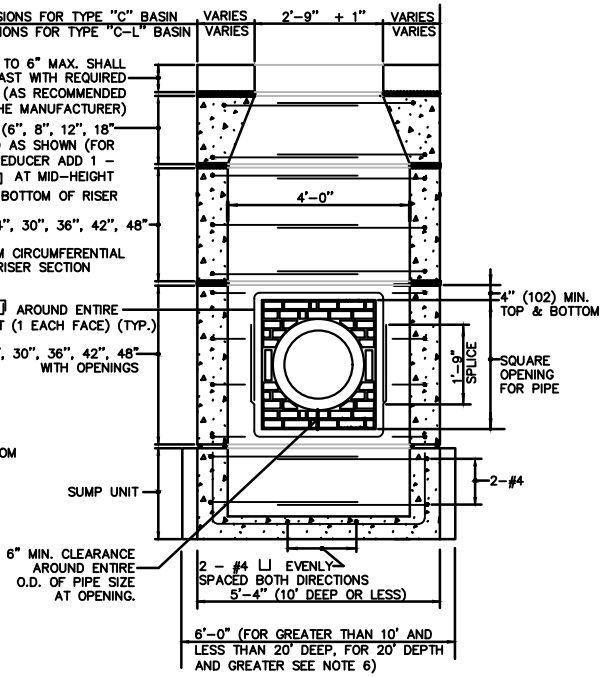


RISER SECTION (TYP.)

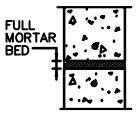


SECTION A

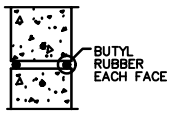
NOTE: REINFORCEMENT IN FAR FACE WALL NOT SHOWN FOR CLARITY



SECTION B

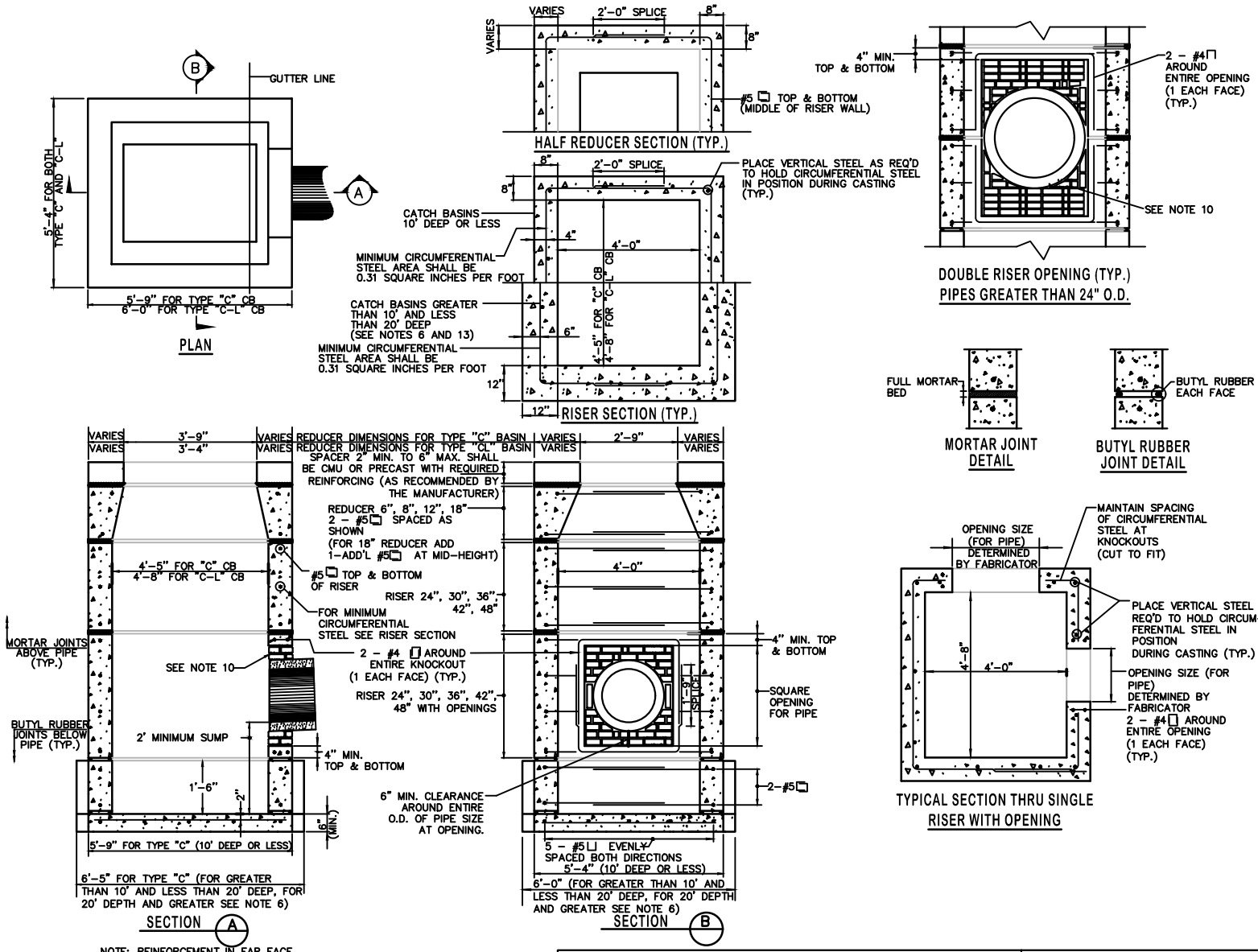


MORTAR JOINT
DETAIL



BUTYL RUBBER
JOINT DETAIL

REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				TYPE "C" AND "C-L" CATCH BASIN
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE10.DWG		NO SCALE — PLATE 10.1

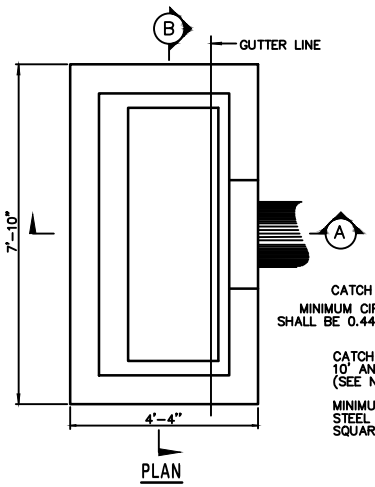


REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED

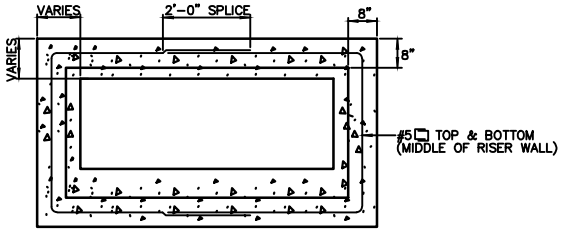
TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

TYPE "C" AND "C-L" DOUBLE GRATE TYPE I CATCH BASIN

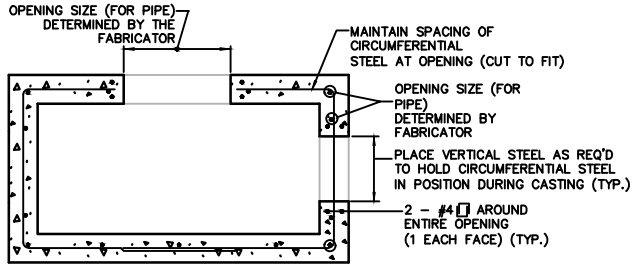
DRAWN BY: DG	CHECKED BY: JL	NO SCALE	PLATE 10.2
DATE: OCT 2020	FILENAME: PLATE10.DWG		



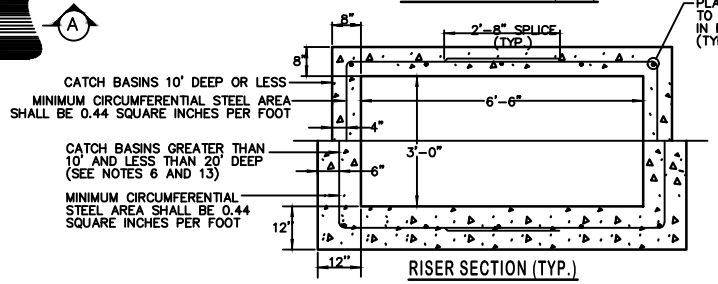
PLAN



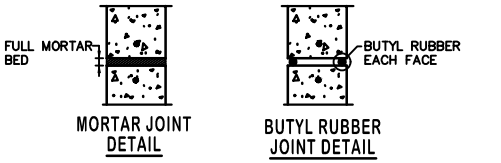
REDUCER SECTION (TYP.)



TYPICAL SECTION THRU SINGLE RISER
WITH OPENINGS

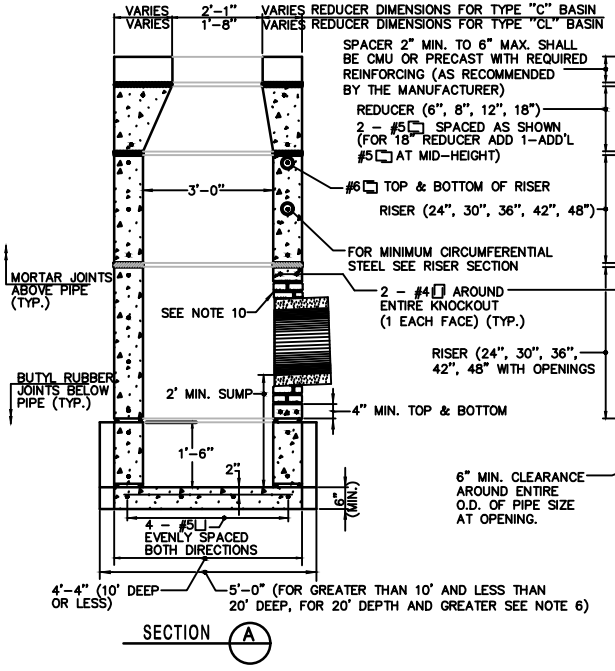


RISER SECTION (TYP.)



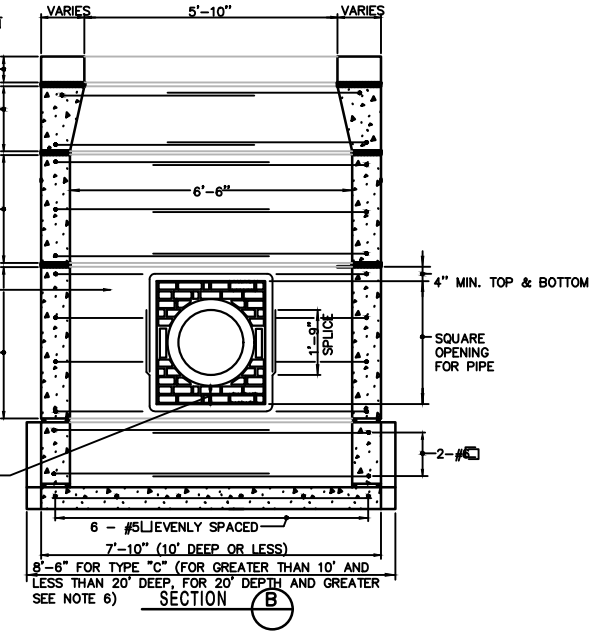
MORTAR JOINT
DETAIL

BUTYL RUBBER
JOINT DETAIL

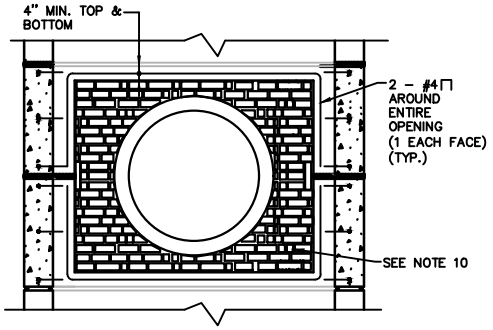


SECTION A

NOTE: REINFORCEMENT IN FAR FACE
WALL NOT SHOWN FOR CLARITY



SECTION B



DOUBLE RISER OPENING (TYP.)
PIPES GREATER THAN 24" O.D.

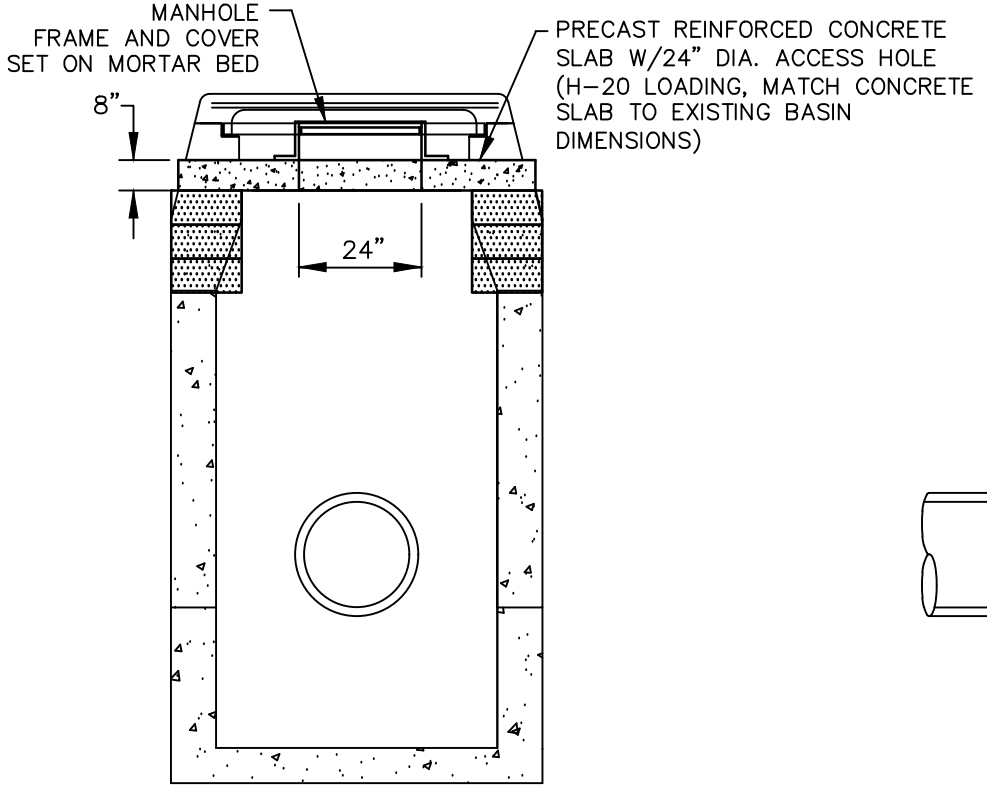
REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED
DRAWN BY: DG		CHECKED BY: JL	
DATE: OCT 2020		FILENAME: PLATE10.DWG	

TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

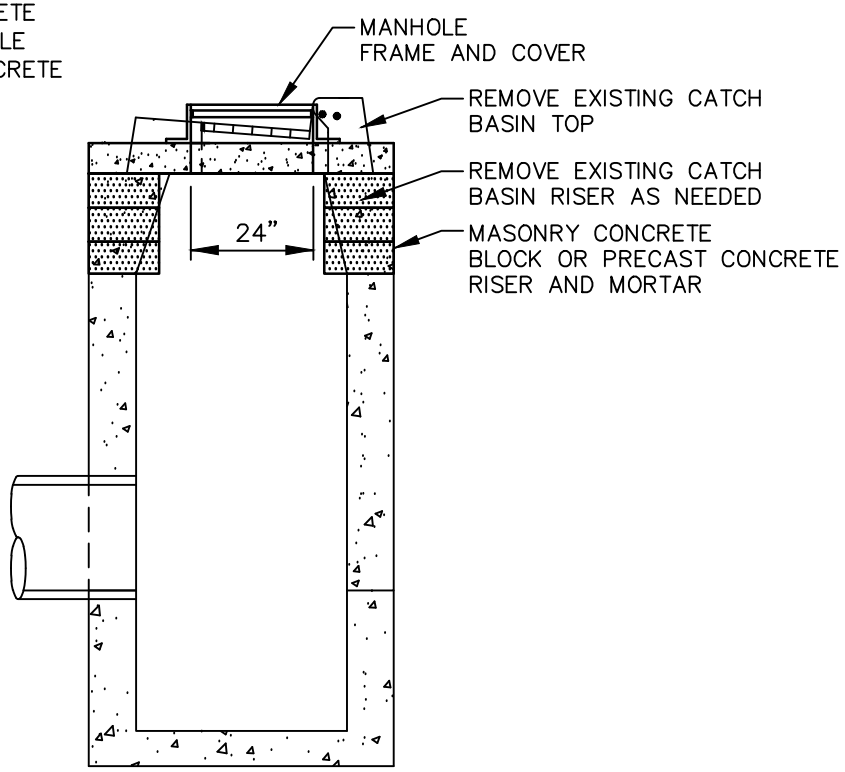
TYPE "C" AND "C-L" DOUBLE GRATE TYPE II CATCH BASIN

NO SCALE

PLATE 10.3



FRONT



SIDE

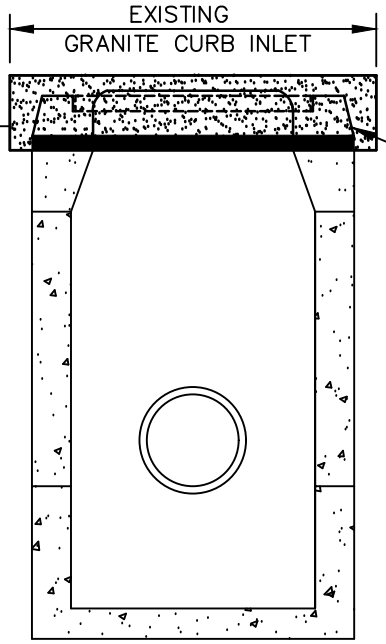
NOTES:
1. USE CONCRETE BLOCKS OR PRECAST RISER AND THE CONCRETE SLAB TO BRING THE MANHOLE COVER TO GRADE.
2. TYPE "C" CATCH BASIN TOP IS SHOWN; HOWEVER, DETAIL ALSO APPLIES TO TYPE "C-L" CATCH BASIN TOPS.

REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				CONVERT CATCH BASIN TO MANHOLE
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE10.DWG		NO SCALE

PLATE 10.4

GENERAL DESCRIPTION OF WORK:

1. SAWCUT AND REMOVE EXISTING BITUMINOUS CONCRETE PAVEMENT AND BASE MATERIAL UP TO THE TOP OF THE STRUCTURE.
2. REMOVE EXISTING CATCH BASIN TOP.
3. RECONSTRUCT STRUCTURE WALLS TO A 3' DEPTH UNLESS OTHERWISE DIRECTED BY THE TOWN.
4. PROVIDE AT LEAST ONE ROW OF CONCRETE BRICKS/BLOCKS OR PRECAST CONCRETE RISER (1 1/2" MIN. THICKNESS) TO ADJUST THE NEW CB TOP TO MATCH THE NEW PAVEMENT SURFACE.
5. NEW PAVEMENT COURSES AND PROCESSED AGGREGATE BASE THICKNESS SHALL MATCH EXISTING OR BE INSTALLED AS DIRECTED BY THE TOWN. PROCESSED AGGREGATE BASE THICKNESS SHALL BE 12" MINIMUM.



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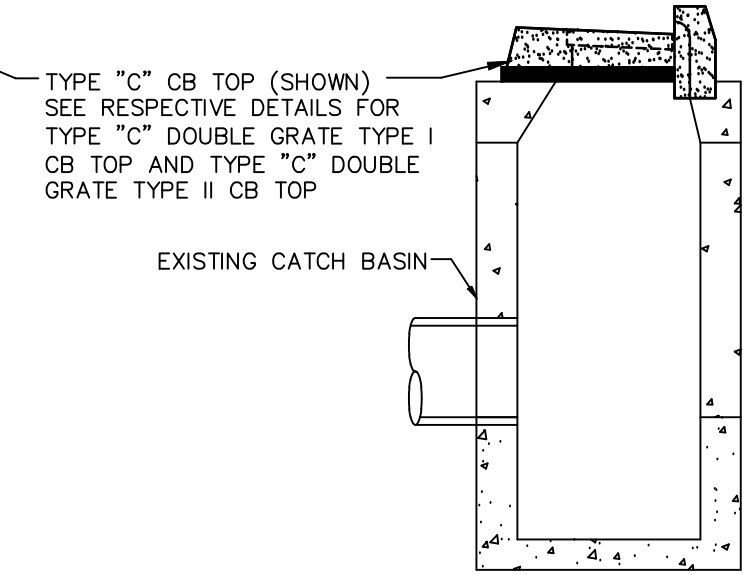


SIDE

NOTES:

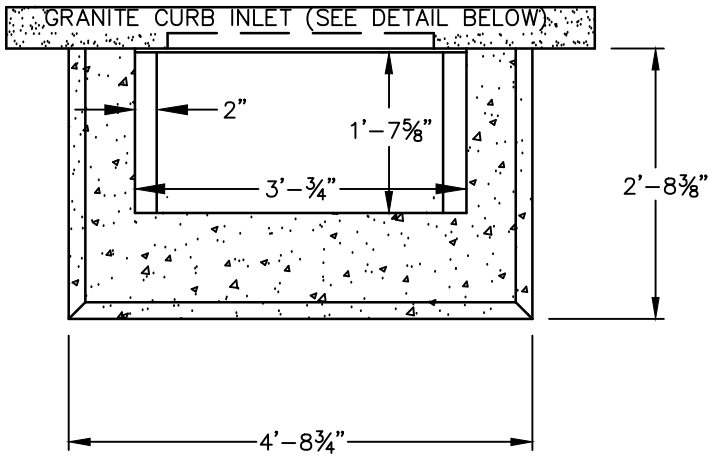
1. WHEN CONCRETE BLOCKS ARE USED, MAXIMUM CORBEL IS 2" PER COURSE OF BLOCK.
2. WALLS SHALL BE CONCRETE BLOCK OR PRECAST CONCRETE SECTIONS.
3. WALL THICKNESS TO BE 12" WHEN TOTAL HEIGHT OF STRUCTURE EXCEEDS 10' FROM TOP OF FRAME TO BOTTOM OF BASE.
4. THIS DETAIL IS FOR RESETTING OF CB ALL TOPS OF THE TYPE SPECIFIED ON THE PLANS (ONLY A TYPE "C" CB TOP HAS BEEN SHOWN).

REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				RESET CATCH BASIN TOP
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE10.DWG		NO SCALE — PLATE 10.5

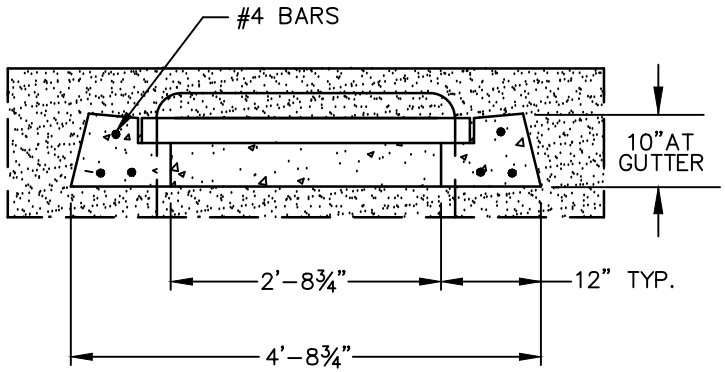
CATCH BASIN NOTES:

1. REINFORCEMENT SHALL CONFORM TO ASTM A615, GRADE 60.
2. CATCH BASIN DETAILS SHOW STANDARD REINFORCEMENT. WELDED WIRE FABRIC WITH AN AREA EQUAL TO OR GREATER THAN THE REINFORCING SHOWN MAY BE SUBSTITUTED.
3. ALL LAP SPLICES, DEVELOPMENT LENGTHS, BENDS FOR REINFORCEMENT, AND WELDED WIRE FABRIC SHALL CONFORM TO AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES.
4. ALL REINFORCEMENT SHALL HAVE A MINIMUM CLEAR COVER OF 2".
5. MINIMUM CONCRETE COMPRESSIVE STRENGTH Fc' = 4000 PSI SHALL BE OBTAINED PRIOR TO SHIPPING.
6. BASES AND RISERS AT A DEPTH OF 20' OR MORE SHALL BE DESIGNED BY THE CONTRACTOR AND WORKING DRAWINGS SHALL BE SUBMITTED TO THE TOWN FOR REVIEW.
7. SEE APPROPRIATE DETAIL FOR CATCH BASIN FRAMES AND GRATES.
8. RISERS MAY BE PREFABRICATED WITH PIPE OPENINGS IN ALL FOUR WALLS. ADEQUATE REINFORCING AROUND PIPE OPENINGS CONFORMING TO THESE PLANS SHALL BE PROVIDED. ANY RISERS USED WHERE A PIPE OPENING IS TO REMAIN IN PLACE, MUST BE FORMED UP WITH BRICK AS DIRECTED BY THE TOWN.
9. RISERS SHALL NEVER HAVE CORNER PIPE ENTRIES.
10. ALL OPENINGS SURROUNDING PIPES SHALL BE CLOSED USING CEMENT RUBBLE MASONRY CONFORMING TO THE LATEST STATE OF CONNECTICUT STANDARD SPECIFICATIONS MATERIAL SECTION M6.06. IF THE TOWN DETERMINES THAT THE CLOSURE OF ANY PIPE OPENING IS UNSATISFACTORY, THE CONTRACTOR SHALL IMMEDIATELY RECLOSE SAID OPENING. THE LOCATION OF PIPE OPENINGS SHALL NOT REDUCE THE WALL THICKNESS.
11. THE LATEST CONNECTICUT D.O.T. STANDARD SPECIFICATIONS AND SUPPLEMENTALS SHALL GOVERN.
12. WALL THICKNESS OF ALL CATCH BASINS OVER 10' DEEP SHALL BE INCREASED TO 12" THICK. INSIDE DIMENSION SHALL REMAIN THE SAME (THE 12" THICKNESS WILL START AFTER THE FIRST 10').
13. BUTYL RUBBER JOINT SEAL SHALL CONFORM TO AASHTO M-198 AND MORTAR SHALL CONFORM TO THE LATEST STATE OF CONNECTICUT STANDARD SPECIFICATIONS MATERIAL SECTION M11.04. ALL CATCH BASINS SHALL BE BUILT WITH SPACERS AS SHOWN IN THE DETAILS.
14. SHRINKAGE AND TEMPERATURE REINFORCEMENT SHALL BE PROVIDED IN THE TOPS OF SLABS. THE TOTAL AREA OF REINFORCEMENT PROVIDED SHALL BE AT LEAST 0.125 SQUARE INCHES PER FOOT IN EACH DIRECTION. THE MAXIMUM SPACING OF THIS REINFORCEMENT SHALL NOT EXCEED 18 INCHES.

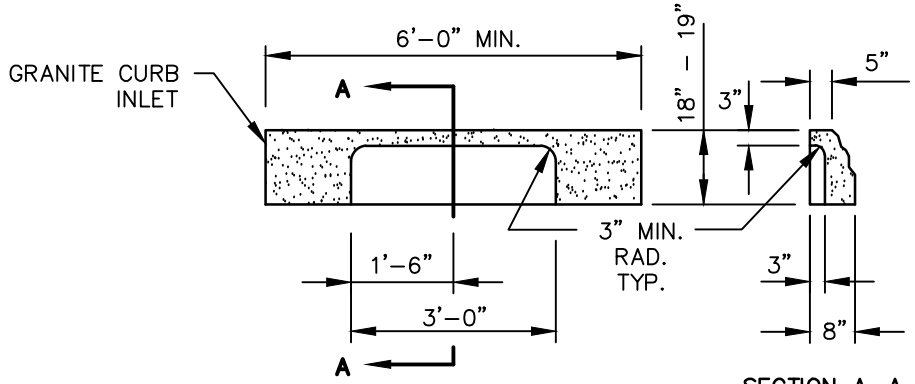
REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				CATCH BASIN NOTES
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE10.DWG		NO SCALE — PLATE 10.6



PLAN

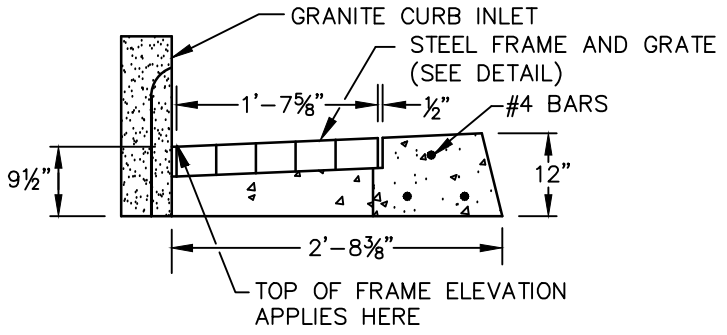


FRONT



SECTION A-A

GRANITE CURB INLET



SIDE

NOTE:
1. CATCH BASIN TOP DIMENSIONS PROVIDED ARE APPROXIMATE. ACTUAL DIMENSIONS ARE SUBJECT TO APPROVAL BY THE TOWN.

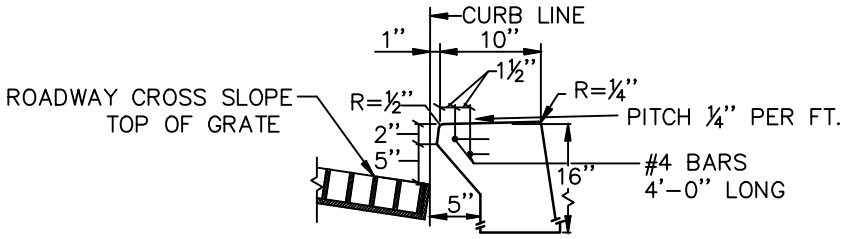
REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED
DRAWN BY: DG		CHECKED BY: JL	
DATE: OCT 2020		FILENAME: PLATE11.DWG	

TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

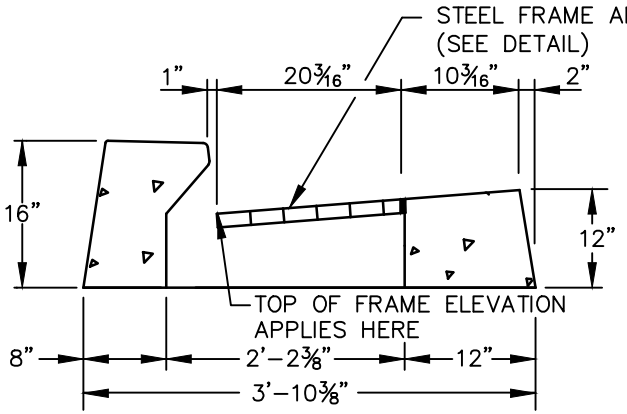
PRECAST CONCRETE TYPE "C" CATCH BASIN TOP FOR GRANITE CURB

NO SCALE

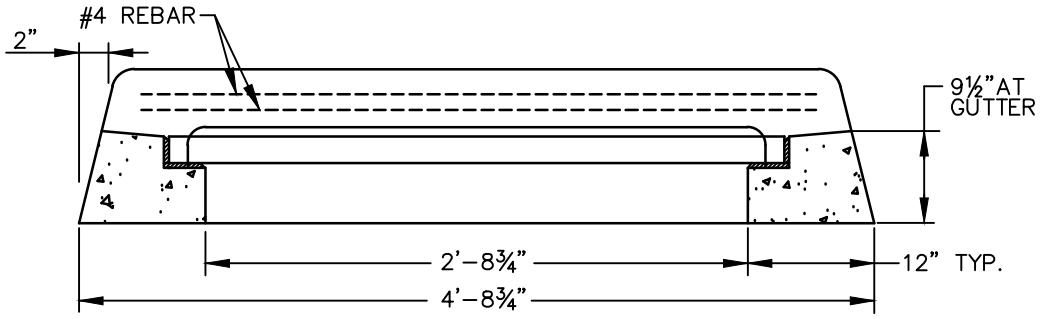
PLATE 11.1



INLET DETAIL



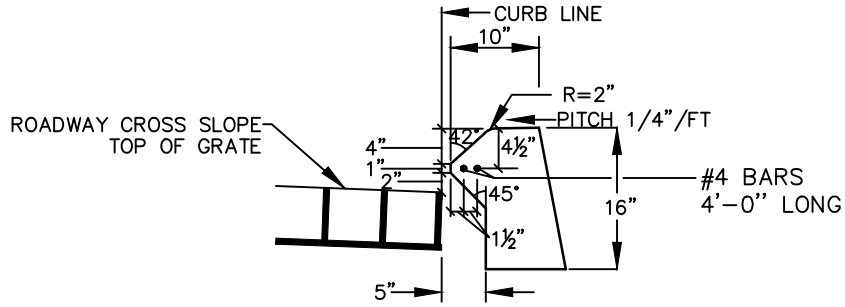
SIDE



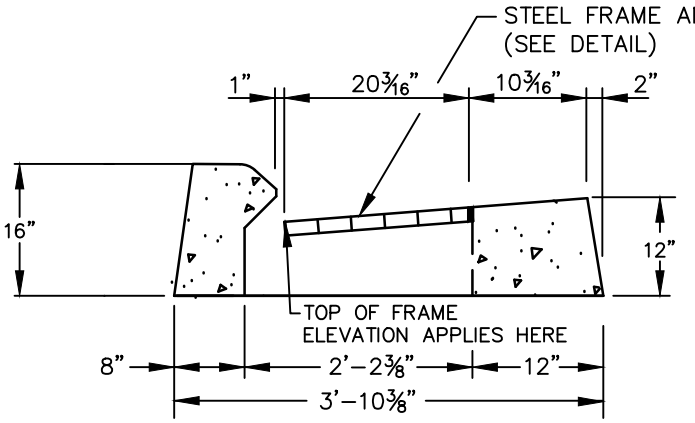
FRONT

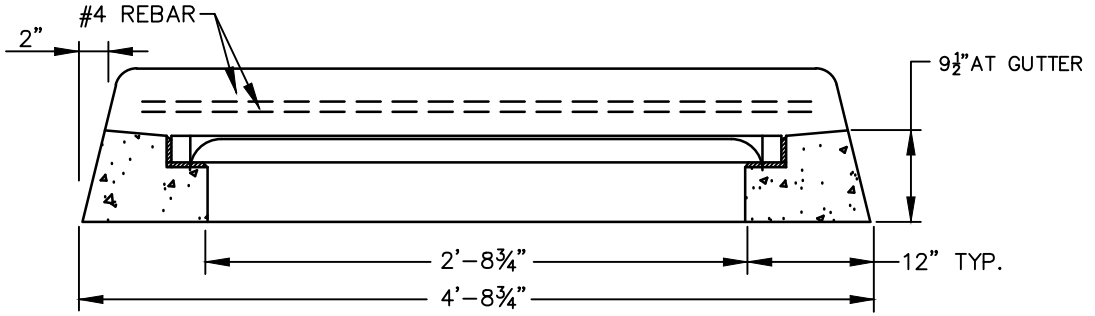
NOTES:
1. CONCRETE TOP SHALL BE CAST TO MATCH ADJACENT CONCRETE CURB.
2. CATCH BASIN TOP DIMENSIONS PROVIDED ARE APPROXIMATE. ACTUAL DIMENSIONS ARE SUBJECT TO APPROVAL BY THE TOWN.

REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				PRECAST CONCRETE TYPE "C" CATCH BASIN TOP FOR CONCRETE CURB
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE11.DWG		NO SCALE — PLATE 11.2



INLET DETAIL





FRONT

NOTES:
1. CONCRETE TOP SHALL BE CAST TO MATCH ADJACENT BITUMINOUS CONCRETE LIP CURB.
2. CATCH BASIN TOP DIMENSIONS PROVIDED ARE APPROXIMATE. ACTUAL DIMENSIONS ARE SUBJECT TO APPROVAL BY THE TOWN.

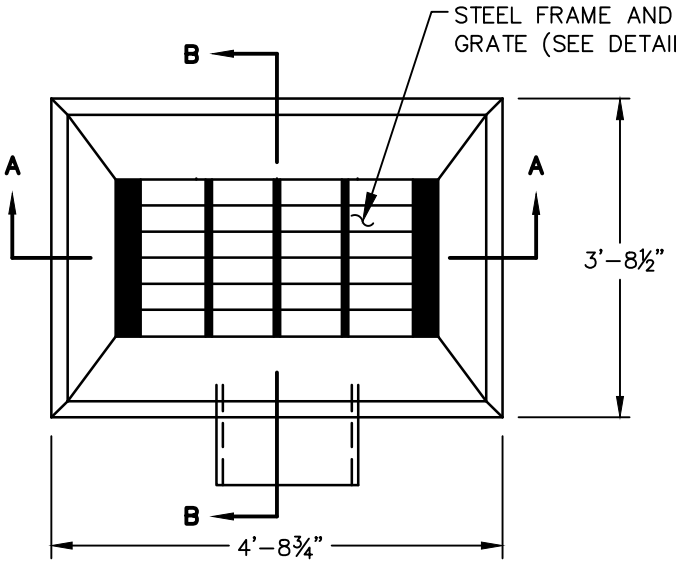
REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED
DRAWN BY: DG		CHECKED BY: JL	
DATE: OCT 2020		FILENAME: PLATE11.DWG	

TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

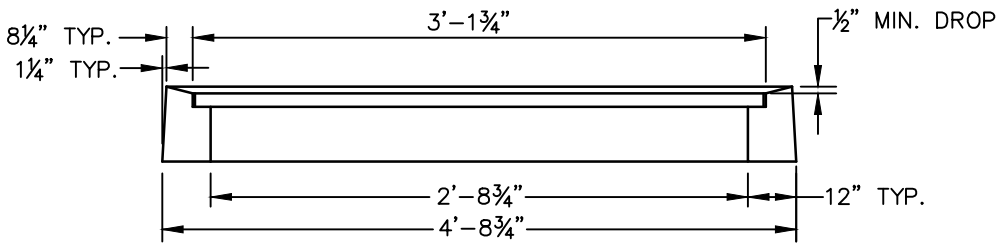
PRECAST CONCRETE TYPE "C" CATCH BASIN TOP FOR BITUMINOUS CONCRETE LIP CURB

NO SCALE

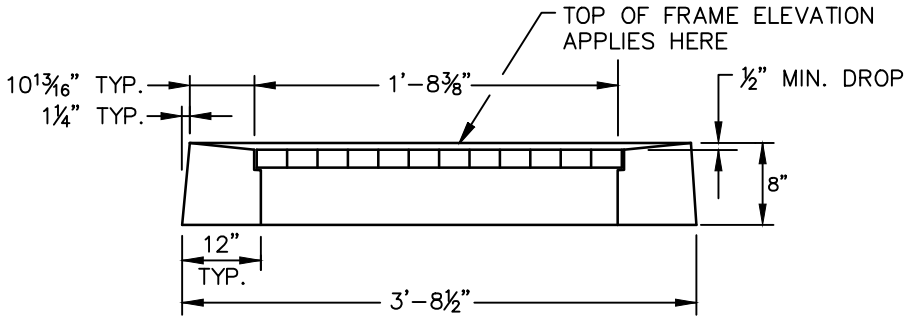
PLATE 11.3



PLAN



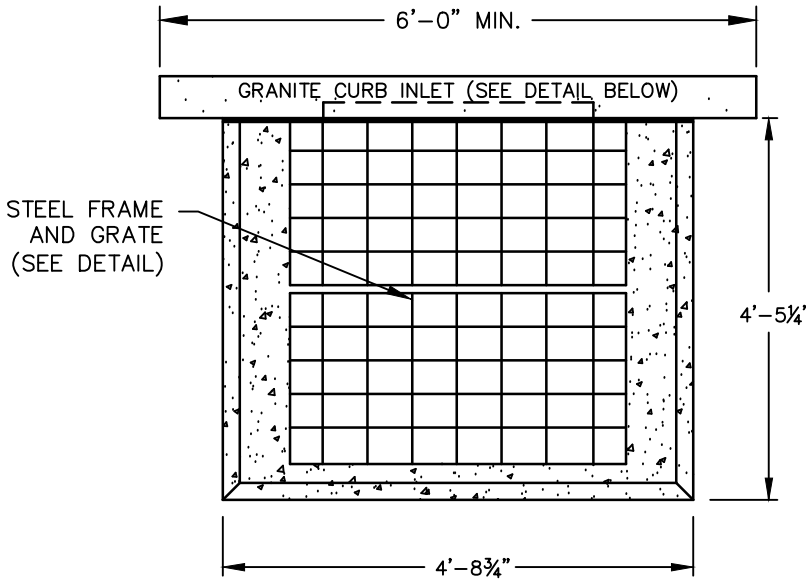
SECTION A–A



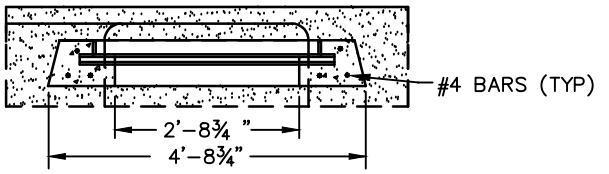
SECTION B–B

NOTE:
1. CATCH BASIN TOP DIMENSIONS PROVIDED ARE APPROXIMATE. ACTUAL DIMENSIONS ARE SUBJECT TO APPROVAL BY THE TOWN.

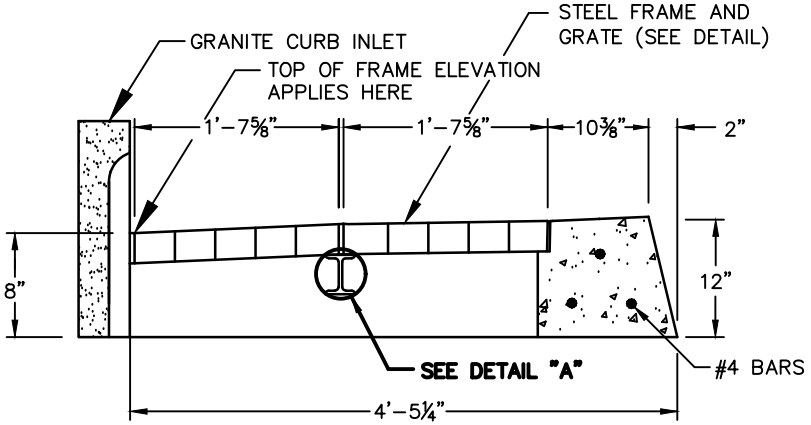
REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				PRECAST CONCRETE TYPE "C–L" CATCH BASIN TOP
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE11.DWG		NO SCALE — PLATE 11.4



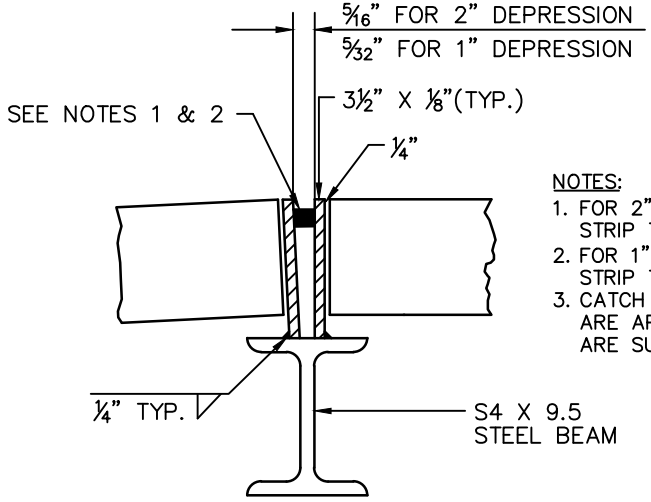
PLAN



FRONT

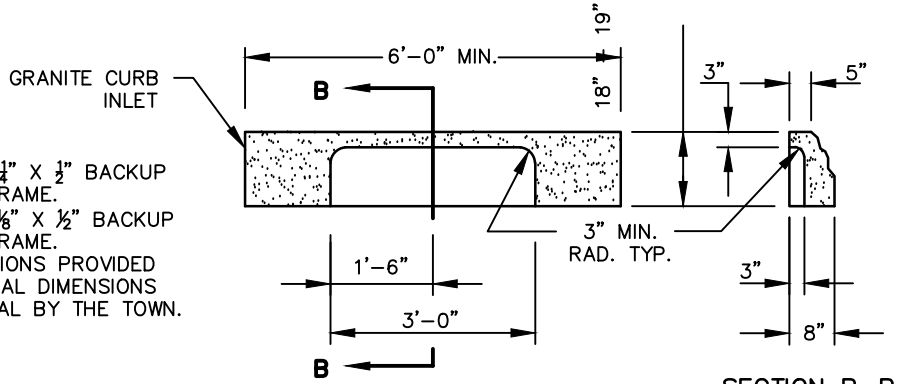


SIDE



DETAIL "A"

NOTES:
1. FOR 2" DEPRESSION USE ¼" X ½" BACKUP STRIP TACK WELDED TO FRAME.
2. FOR 1" DEPRESSION USE ⅛" X ½" BACKUP STRIP TACK WELDED TO FRAME.
3. CATCH BASIN TOP DIMENSIONS PROVIDED ARE APPROXIMATE. ACTUAL DIMENSIONS ARE SUBJECT TO APPROVAL BY THE TOWN.



SECTION B-B

GRANITE CURB INLET

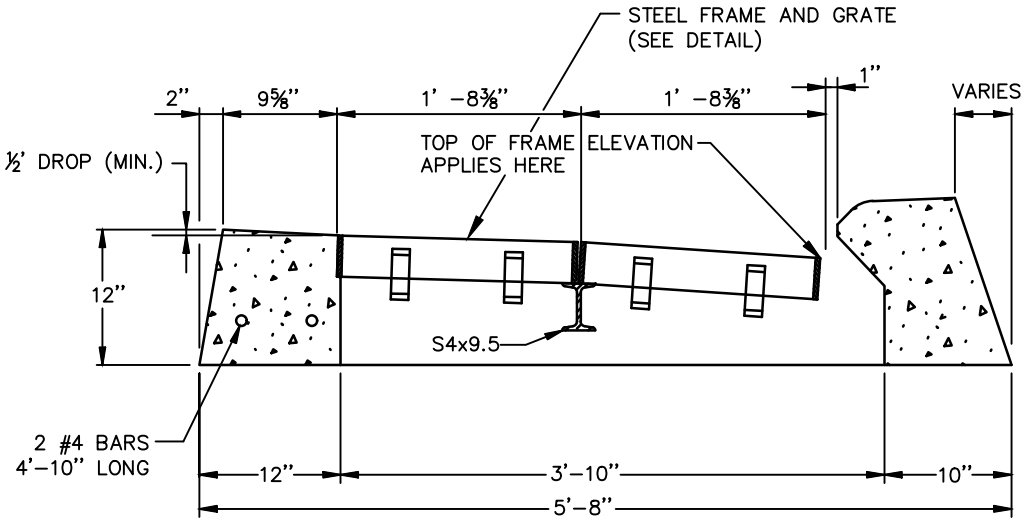
REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED
DRAWN BY: DG		CHECKED BY: JL	
DATE: OCT 2020		FILENAME: PLATE11.DWG	

TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

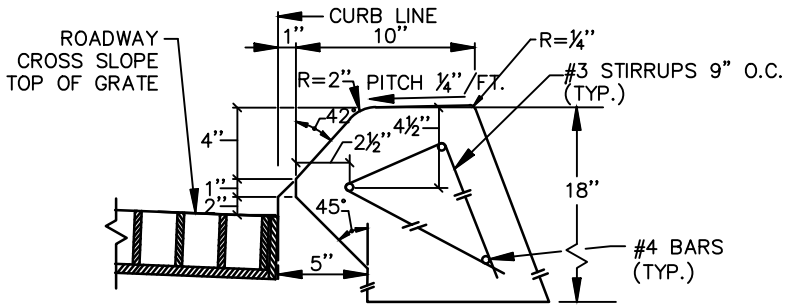
PRECAST CONCRETE TYPE "C" DOUBLE GRATE TYPE I CATCH BASIN TOP FOR GRANITE CURB

NO SCALE

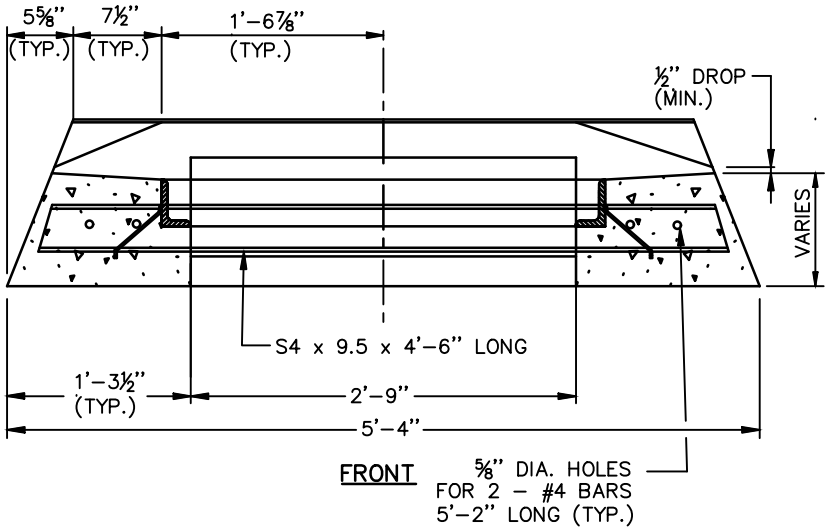
PLATE 11.5

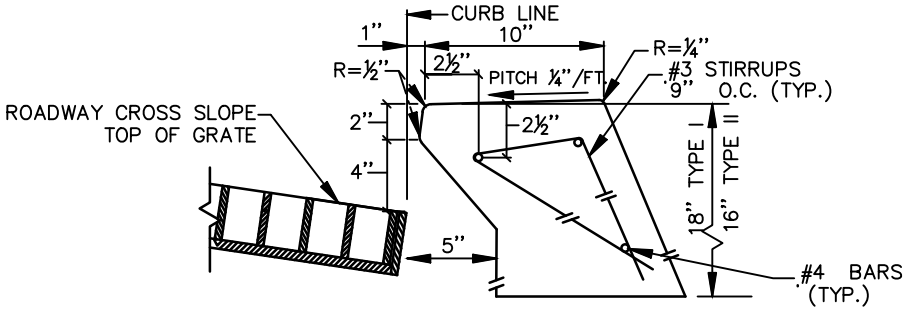


CROSS SECTION



INLET FOR 6" BITUMINOUS CONCRETE LIP CURBING





INLET FOR 6" CONCRETE CURBING

NOTE:
1. CATCH BASIN TOP DIMENSIONS PROVIDED ARE APPROXIMATE. ACTUAL DIMENSIONS ARE SUBJECT TO APPROVAL BY THE TOWN.

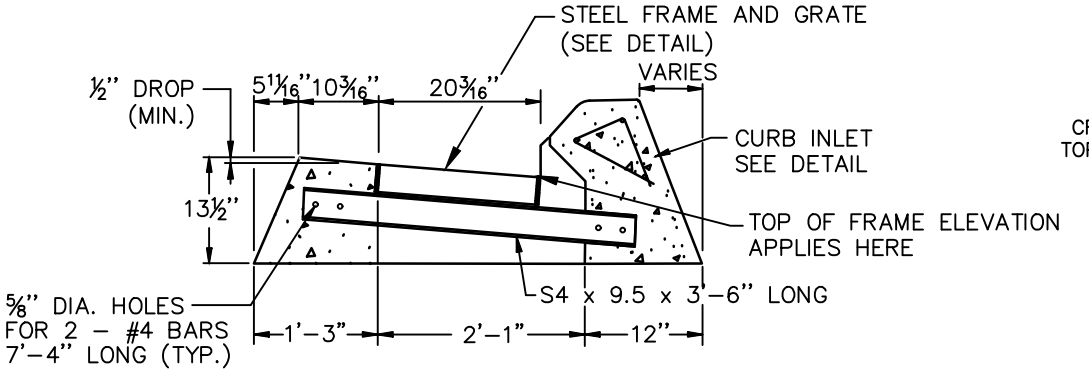
REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED
DRAWN BY: DG		CHECKED BY: JL	
DATE: OCT 2020		FILENAME: PLATE11.DWG	

TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

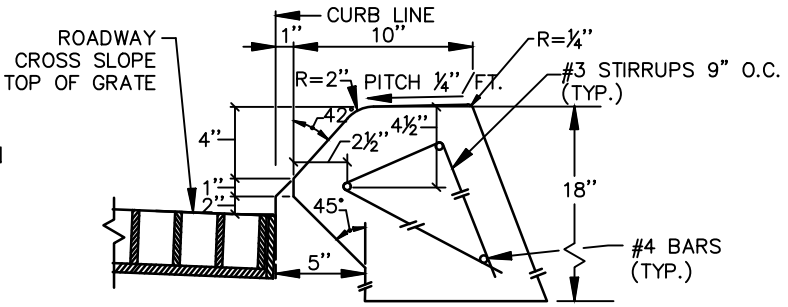
PRECAST CONCRETE TYPE "C" DOUBLE GRATE TYPE I CATCH BASIN TOP FOR CONCRETE CURB AND BITUMINOUS CONCRETE LIP CURB

NO SCALE

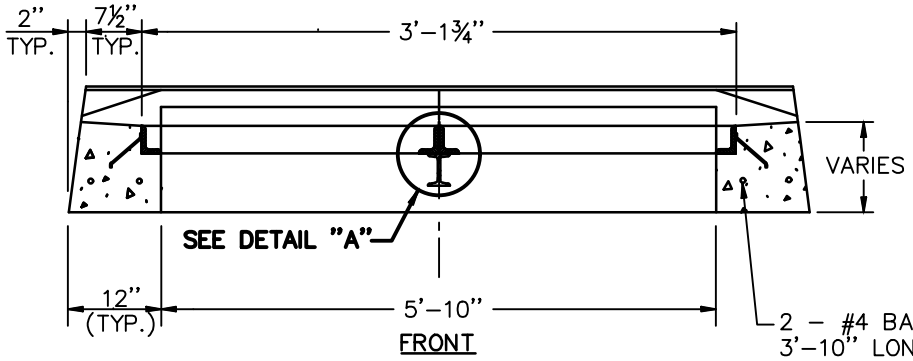
PLATE 11.6



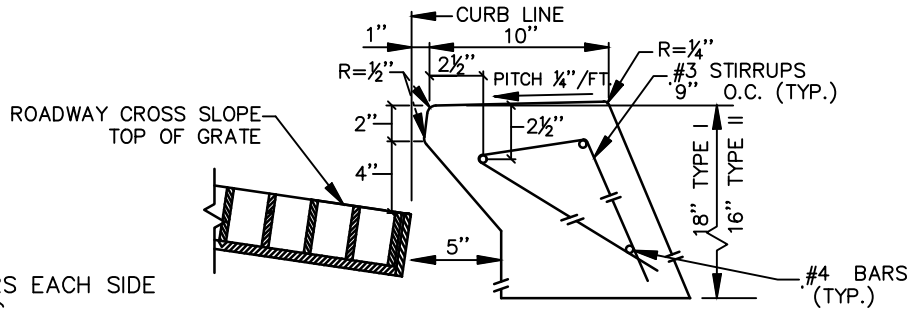
SIDE



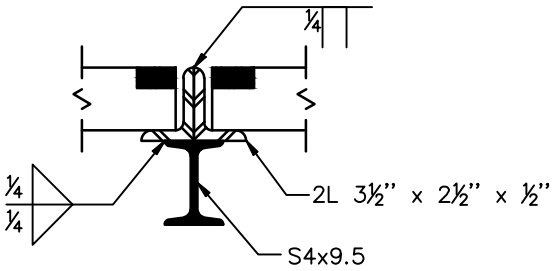
INLET FOR 6" BITUMINOUS CONCRETE LIP CURBING



FRONT



INLET FOR 6" GRANITE AND CONCRETE CURBING



DETAIL "A"

NOTE:
1. CATCH BASIN TOP DIMENSIONS PROVIDED ARE APPROXIMATE. ACTUAL DIMENSIONS ARE SUBJECT TO APPROVAL BY THE TOWN.

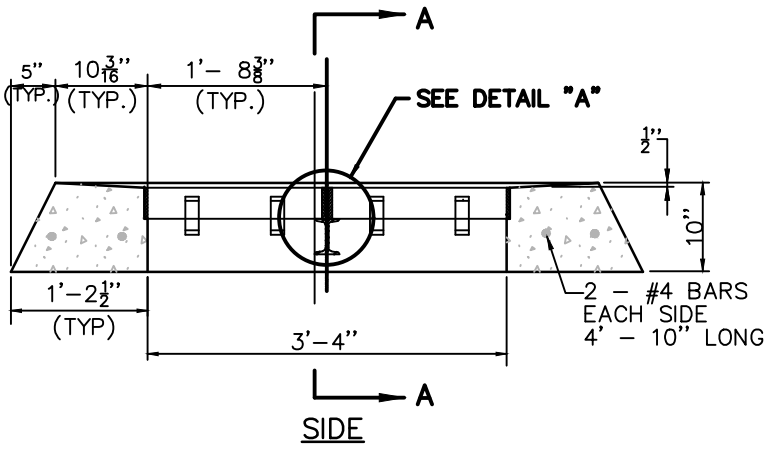
REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED

TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

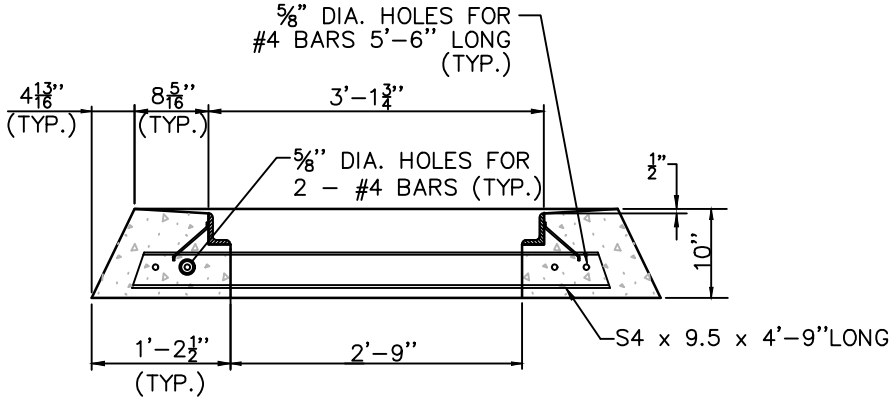
PRECAST CONCRETE TYPE "C" DOUBLE GRATE TYPE II CATCH BASIN TOP FOR GRANITE AND CONCRETE CURB AND BITUMINOUS CONCRETE LIP CURB

DRAWN BY: DG	CHECKED BY: JL	
DATE: OCT 2020	FILENAME: PLATE11.DWG	NO SCALE

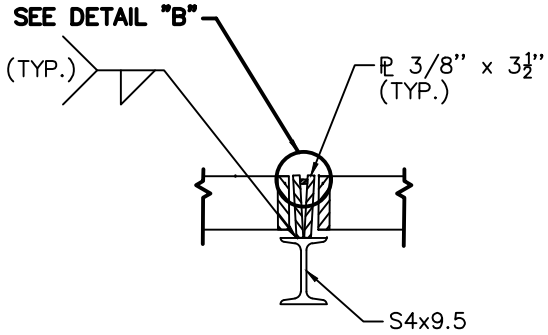
PLATE 11.7



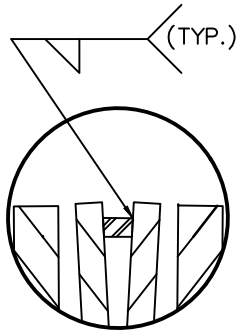
SIDE



SECTION A-A



DETAIL "A"



DETAIL "B"

NOTE:
1. CATCH BASIN TOP DIMENSIONS PROVIDED ARE APPROXIMATE. ACTUAL DIMENSIONS ARE SUBJECT TO APPROVAL BY THE TOWN.

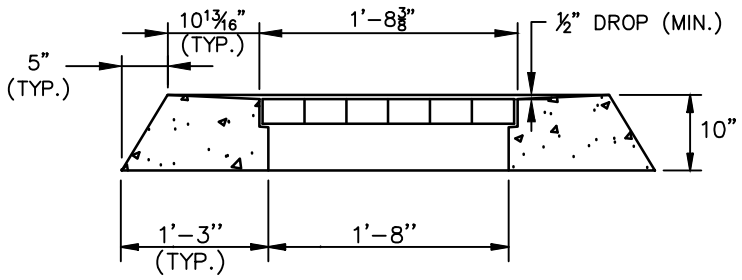
REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED
DRAWN BY: DG		CHECKED BY: JL	
DATE: OCT 2020		FILENAME: PLATE11.DWG	

TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

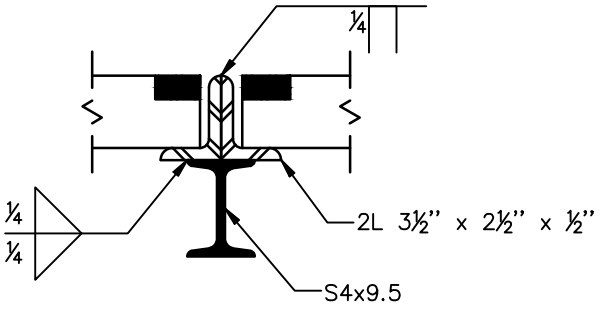
PRECAST CONCRETE TYPE "C-L"
DOUBLE GRATE TYPE I
CATCH BASIN TOP

NO SCALE

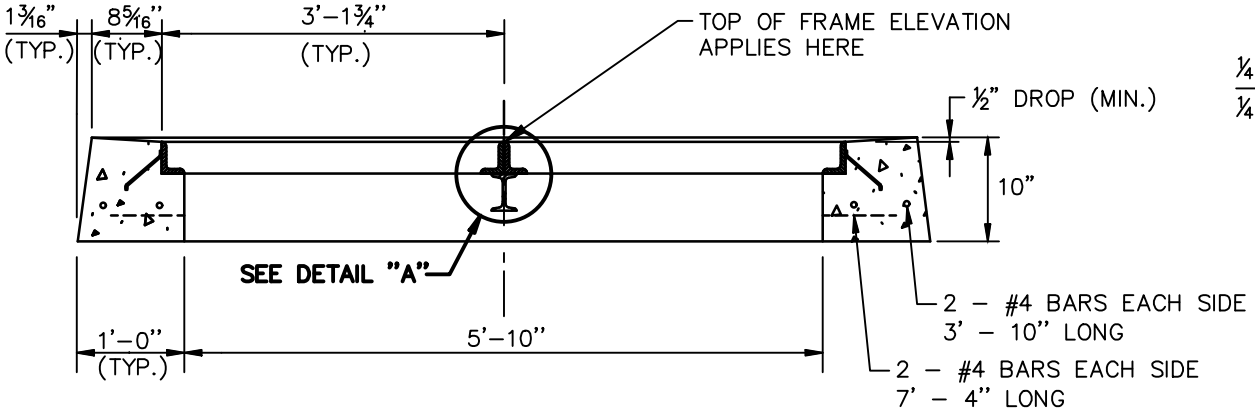
PLATE 11.8



SIDE



DETAIL "A"



FRONT

NOTE:
1. CATCH BASIN TOP DIMENSIONS PROVIDED ARE APPROXIMATE. ACTUAL DIMENSIONS ARE SUBJECT TO APPROVAL BY THE TOWN.

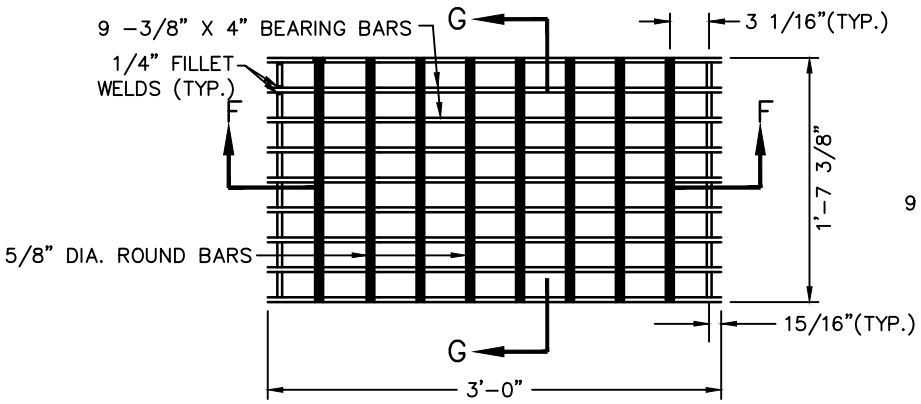
REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED
DRAWN BY: DG		CHECKED BY: JL	
DATE: OCT 2020		FILENAME: PLATE11.DWG	

TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

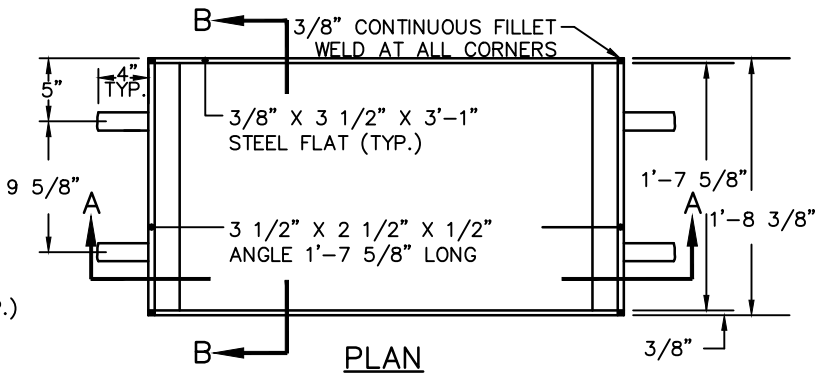
PRECAST CONCRETE TYPE "C-L" DOUBLE GRATE TYPE II CATCH BASIN TOP

NO SCALE

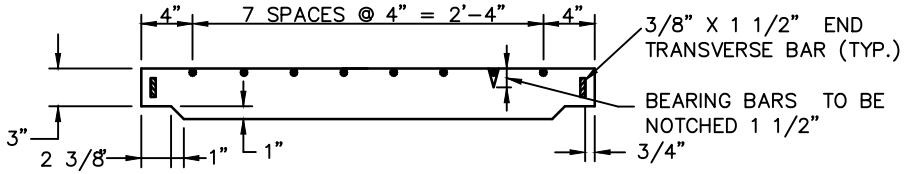
PLATE 11.9



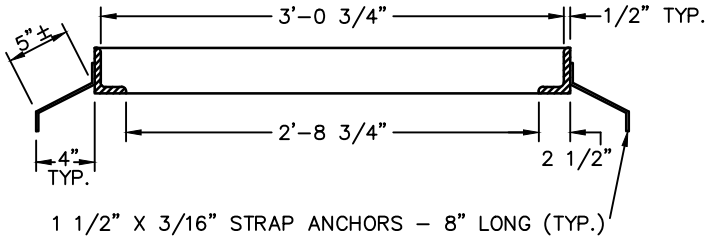
STEEL GRATE



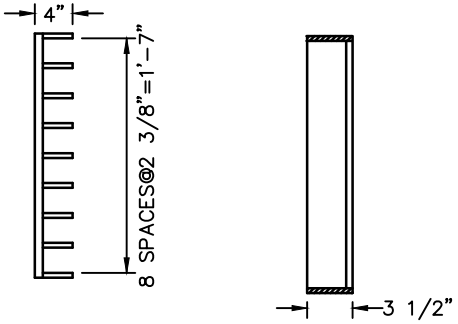
PLAN



SECTION F–F



SECTION A–A

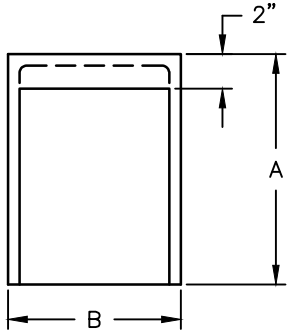


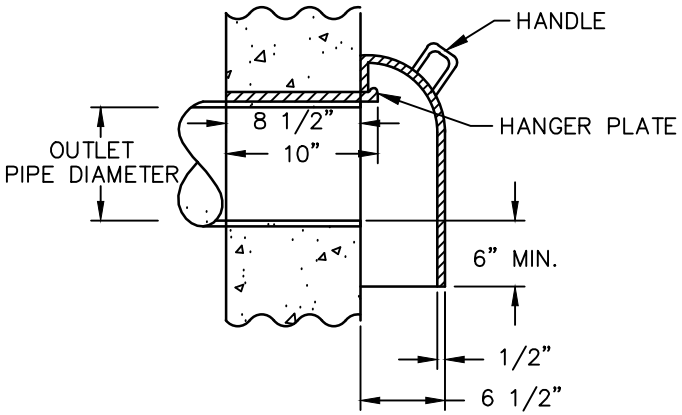
SECTION G–G SECTION B–B

NOTES:

1. ALL BARS SHALL BE WELDED AT ALL INTERSECTIONS.
2. FRAMES AND GRATES SHALL BE GALVANIZED IN ACCORDANCE WITH THE LATEST STATE OF CONNECTICUT SPECIFICATIONS MATERIAL SECTION M.06.03.

REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				CATCH BASIN STEEL FRAME AND GRATE
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE12.DWG		NO SCALE PLATE 12.1





A	B	PIPE SIZE	WT. LBS.	SETTING METHOD
16"	12"	TO 6"	70	2 HOOKS
18"	12"	8"	75	2 HOOKS
20"	12"	10"	85	2 HOOKS
22"	16"	12"	100	2 HOOKS
25"	17"	15"	135	2 HOOKS
28"	20"	18"	155	2 HOOKS

NOTE:

1. MANUFACTURER CATALOG NUMBER TO BE INDICATED ON SHOP DRAWINGS FOR CAST IRON TRAPS.

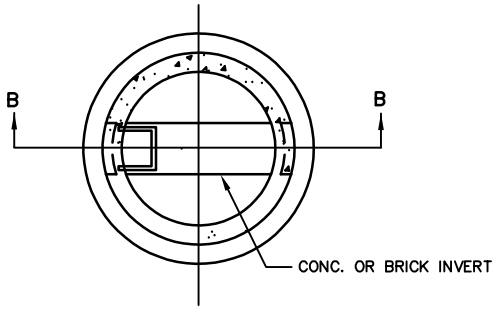
REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED
DRAWN BY: DG		CHECKED BY: JL	
DATE: OCT 2020		FILENAME: PLATE13.DWG	

TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

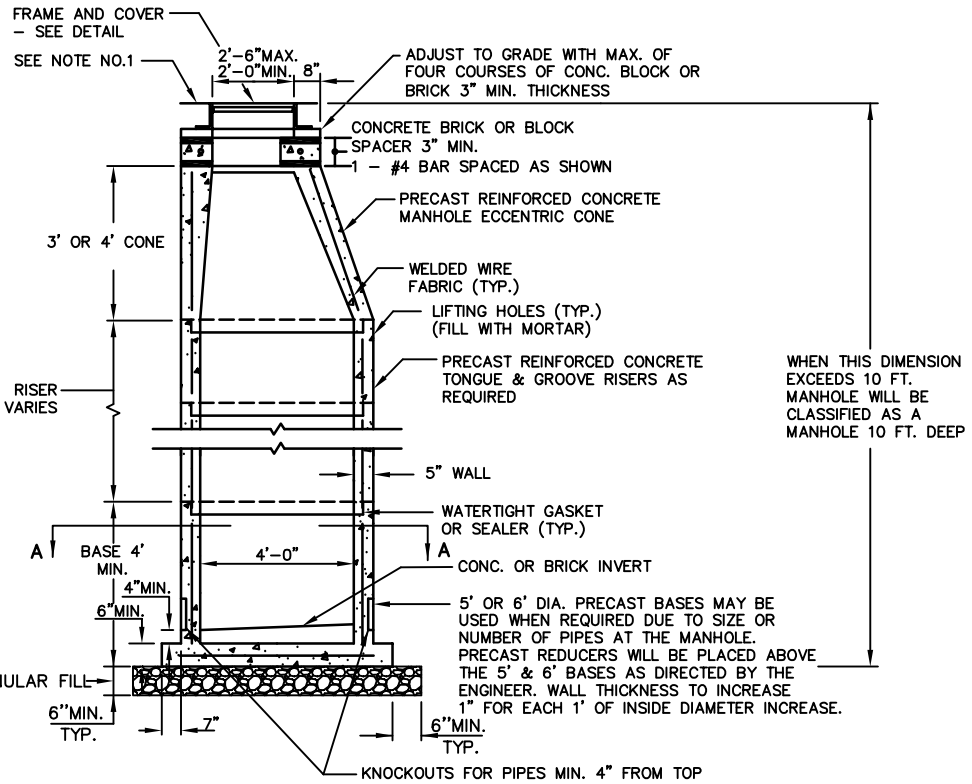
CATCH BASIN TRAP HOOD

NO SCALE

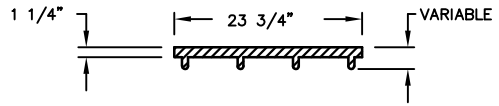
PLATE 13.1



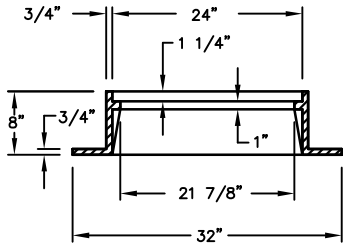
CROSS SECTION "A–A"



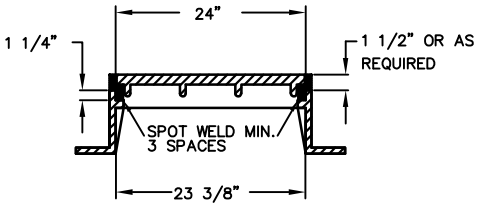
MANHOLE VERTICAL SECTION "B–B"



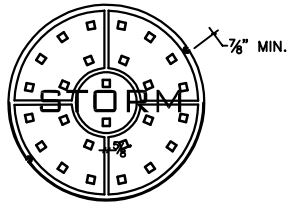
COVER – SECTION



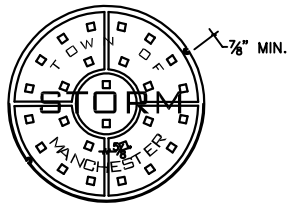
FRAME – SECTION



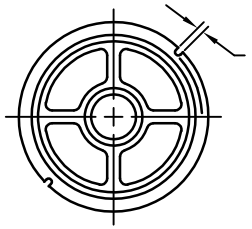
MANHOLE RISER RING



COVER–PLAN
FOR PRIVATELY–OWNED SYSTEMS



COVER–PLAN
FOR TOWN–OWNED SYSTEMS



COVER – BOTTOM VIEW

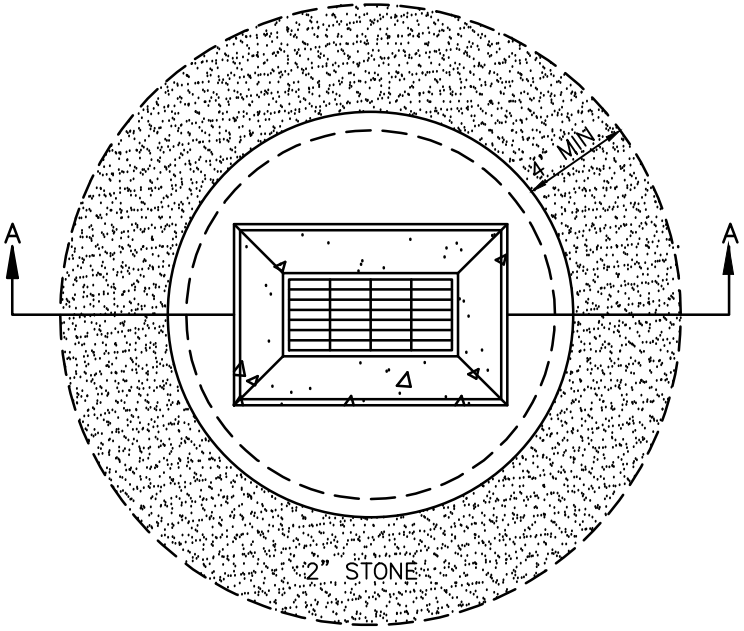
NOTES:
1. FRAME AND COVER DIMENSIONS SHOWN HEREON ARE APPROXIMATE. ACTUAL DIMENSIONS MUST BE SHOWN ON SHOP DRAWING SUBMITTALS AND APPROVED BY THE ENGINEER.
2. ALL MANHOLE FRAMES COVERS TO BE SET FLUSH WITH BINDER COURSE OF PAVEMENT. A MANHOLE RISER RING SHALL BE INSTALLED TO RAISE MANHOLE COVER TO FINISHED GRADE PRIOR TO THE COMPLETION OF THE FINAL SURFACE COURSE.

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED

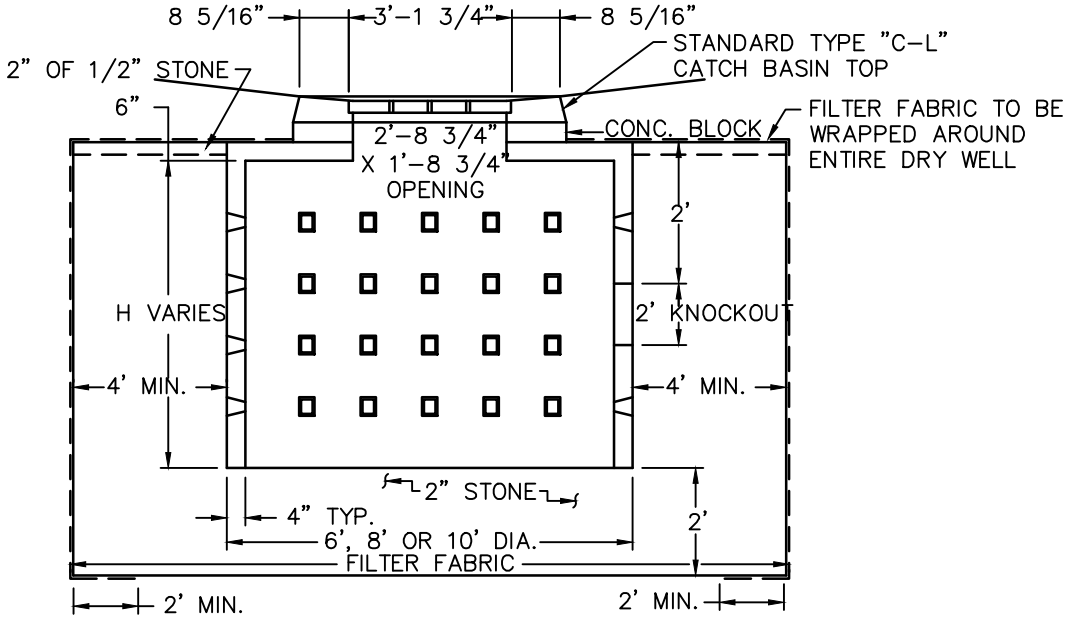
TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

DRAINAGE MANHOLE

DRAWN BY: DG	CHECKED BY: JL	NO SCALE	PLATE 14.1
DATE: OCT 2020	FILENAME: PLATE14.DWG		



PLAN



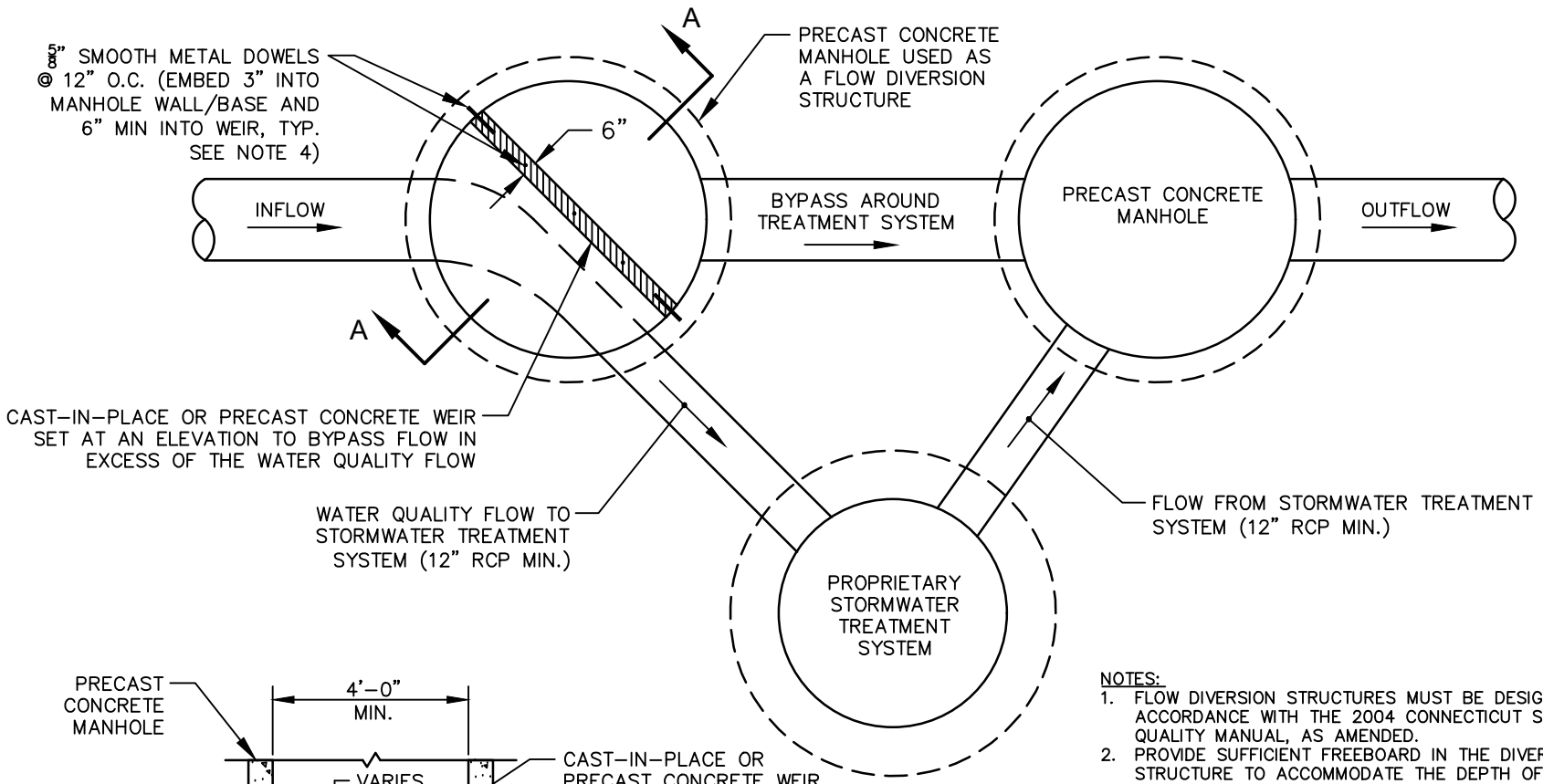
SECTION A – A

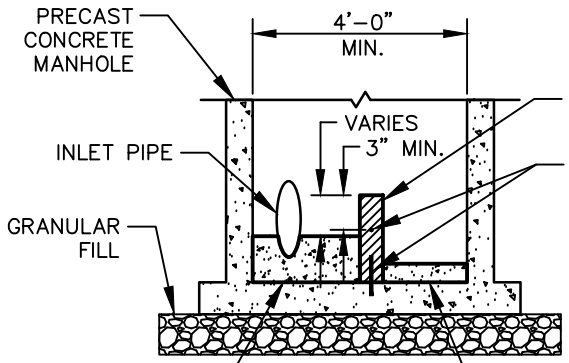
NOTES:

1. ALL DRYWELLS SHALL BE CONSTRUCTED WITH AN OVERFLOW SYSTEM CONNECTED TO A STORM DRAINAGE SYSTEM, WHICH MUST BE APPROVED BY THE TOWN. AT A MINIMUM, DRYWELLS SHALL BE SIZED TO CONTAIN RUNOFF FROM ITS ENTIRE CONTRIBUTING DRAINAGE AREA FOR A 25–YEAR DESIGN STORM EVENT.
2. SUBSURFACE TEST PITS AND PERCOLATION TESTS (OR PERMEABILITY TESTS) ARE TO BE COMPLETED BY THE DESIGN ENGINEER AT LOCATIONS OF THE PROPOSED DRY WELLS AND SUBMITTED TO THE TOWN FOR REVIEW. THE MINIMUM INFILTRATION RATE SHALL BE 0.3 INCHES/HR AND MAXIMUM RATE SHALL BE 5.0 INCHES/HR.
3. MINIMUM CONCRETE STRENGTH SHALL BE 5000 P.S.I. AT 28 DAYS.
4. STEEL REINFORCING SHALL BE ASTM–A–615–68 GRADE 60 WITH 1" MINIMUM COVER.
5. DRYWELLS SHALL BE DESIGNED FOR ASHTO–HS20–44 LOADING.
6. VOIDS IN STONE ASSUMED TO BE 30% OF TOTAL VOLUME OF STONE.

H	STORAGE CAPACITY CU. FT.	VOLUME DRY WELL CU. FT.
6' – 0"	645	253
8' – 0"	821	338
10' – 0"	995	422

REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				PRECAST CONCRETE DRYWELL
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE15.DWG		NO SCALE PLATE 15.1





SECTION A-A

NOTES:
1. FLOW DIVERSION STRUCTURES MUST BE DESIGNED IN ACCORDANCE WITH THE 2004 CONNECTICUT STORMWATER QUALITY MANUAL, AS AMENDED.
2. PROVIDE SUFFICIENT FREEBOARD IN THE DIVERSION STRUCTURE TO ACCOMMODATE THE DEPTH OF THE FLOW OVER THE WEIR FOR THE DESIGN STORM EVENT.
3. TOWN-OWNED TREATMENT SYSTEMS MUST BE EASILY ACCESSIBLE WITHIN AN EASEMENT OR THE RIGHT-OF-WAY AS CLOSE TO THE ROAD AS POSSIBLE. MAXIMUM DEPTH FROM THE TOP OF FRAME TO BOTTOM OF SUMP WITHIN THE STRUCTURE IS 12 FT (HOWEVER 10 FT IS PREFERRED).
4. SMOOTH METAL DOWELS SHALL BE DIPPED IN LIQUID ASPHALT AND AN APPROVED BOND BREAKER.
5. COVERS ON PROPRIETARY TREATMENT SYSTEMS MUST CLEARLY IDENTIFY THE SYSTEM AND COVERS ON MANHOLES MUST CLEARLY IDENTIFY THEM AS DRAINAGE STRUCTURES.

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED

TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

STORMWATER TREATMENT SYSTEM SCHEMATIC FOR PUBLIC SYSTEMS

DRAWN BY: DG	CHECKED BY: JL	
DATE: OCT 2020	FILENAME: PLATE16.DWG	NO SCALE

PLATE 16.1

STORMWATER TREATMENT SYSTEM NOTES:

1. PUBLIC TREATMENT SYSTEMS INSTALLED FOR DEVELOPMENT PROJECTS MUST BE LOCATED "OFF-LINE", WHEREAS, PRIVATELY-OWNED SYSTEMS MAY BE LOCATED "IN-LINE" OR "OFF-LINE". THE TOWN DOES NOT REQUIRE PRIVATELY-OWNED SYSTEMS TO BE COMPLETELY DESIGNED PRIOR TO PLAN APPROVALS REQUIRED BY THE MANCHESTER ZONING REGULATIONS.
2. IF TREATMENT SYSTEMS ARE LOCATED "IN-LINE", ADD THE FOLLOWING NOTE TO THE PLANS:
   THE STORMWATER TREATMENT SYSTEM MUST BE DESIGNED TO REMOVE A MINIMUM OF 80% OF THE TOTAL SUSPENDED SOLIDS FROM THE WATER QUALITY FLOW OF (*FILL IN*) CFS WITH INTERNAL BYPASS OF THE (*FILL IN*)-YR DESIGN STORM FLOW OF (*FILL IN*) CFS. THE SYSTEM MUST BE INSPECTED AND CLEANED QUARTERLY. SHOP DRAWINGS OF THE PROPOSED SYSTEM MUST FIRST BE APPROVED BY THE DESIGN ENGINEER THEN SUBMITTED TO THE TOWN FOR REVIEW PRIOR TO FABRICATION. SHOP DRAWING SUBMITTALS MUST INCLUDE:
   - "TREATED" FLOW FOR THE SPECIFIED SYSTEM AND MODEL, WHICH MUST EQUAL OR EXCEED THE WATER QUALITY FLOW
   - "CONVEYED" FLOW FOR THE SPECIFIED SYSTEM AND MODEL, WHICH MUST EQUAL OR EXCEED THE DESIGN STORM FLOW
   - CALCULATIONS OR DOCUMENTATION VERIFYING THAT 80% (MIN.) OF THE AVERAGE ANNUAL TOTAL SUSPENDED SOLIDS WILL BE REMOVED FROM THE WATER QUALITY FLOW
   - CALCULATIONS OF THE HYDRAULIC GRADE LINE ELEVATIONS FOR THE DESIGN STORM EVENT IN THE FIRST STRUCTURE LOCATED UPSTREAM OF THE SYSTEM AND ANY OTHER CRITICAL LOCATIONS
   - ORIENTATION OF THE SYSTEM IN PLAN VIEW WITH RESPECT TO THE APPROVED SITE PLAN (IF DIFFERENT THAN SHOWN ON THE APPROVED PLANS)
   - PROPOSED SIZE AND ELEVATION OF CRITICAL WEIR, ORIFICE, PIPE INVERT ELEVATIONS, AND OTHER DESIGN ELEMENTS THAT CORRESPOND TO THE HYDRAULIC CHARACTERISTICS OF THE SYSTEM
3. IF TREATMENT SYSTEMS ARE LOCATED "OFF-LINE", ADD THE FOLLOWING NOTE TO THE PLANS:
   THE STORMWATER TREATMENT SYSTEM MUST BE DESIGNED TO REMOVE A MINIMUM OF 80% OF THE TOTAL SUSPENDED SOLIDS FROM THE WATER QUALITY FLOW OF (*FILL IN*) CFS WITH EXTERNAL BYPASS OF THE (*FILL IN*)-YR DESIGN STORM FLOW OF (*FILL IN*) CFS AROUND THE SYSTEM. THE SYSTEM MUST BE INSPECTED AND CLEANED QUARTERLY. SHOP DRAWINGS OF THE PROPOSED DIVERSION MANHOLE AND TREATMENT SYSTEM MUST FIRST BE APPROVED BY THE DESIGN ENGINEER THEN SUBMITTED TO THE TOWN FOR REVIEW PRIOR TO FABRICATION. SHOP DRAWING SUBMITTALS MUST INCLUDE:
   - "TREATED" FLOW FOR THE SPECIFIED SYSTEM AND MODEL, WHICH MUST EQUAL OR EXCEED THE WATER QUALITY FLOW
   - CALCULATIONS OR DOCUMENTATION VERIFYING THAT 80% (MIN.) OF THE AVERAGE ANNUAL TOTAL SUSPENDED SOLIDS WILL BE REMOVED FROM THE WATER QUALITY FLOW
   - DETAILED HYDRAULIC CALCULATIONS FOR DESIGN OF THE DIVERSION STRUCTURE (BYPASS WEIR ELEVATION) WHICH INCLUDE HYDRAULIC GRADE LINE ELEVATIONS FOR THE DESIGN STORM EVENT IN THE FIRST STRUCTURE LOCATED UPSTREAM OF THE SYSTEM AND ANY OTHER CRITICAL LOCATIONS
   - ORIENTATION OF THE SYSTEM IN PLAN VIEW WITH RESPECT TO THE APPROVED PLANS (IF DIFFERENT THAN SHOWN ON THE APPROVED PLANS)
   - PROPOSED SIZE AND ELEVATION OF CRITICAL WEIR, ORIFICE, PIPE INVERT ELEVATIONS, AND OTHER DESIGN ELEMENTS THAT CORRESPOND TO THE HYDRAULIC CHARACTERISTICS OF THE SYSTEM
4. NOTE THAT ALTERNATE DIVERSION STRUCTURES AND BYPASS SYSTEMS (OTHER THAN A MANHOLE WITH A WEIR) MAY BE USED FOR PRIVATELY-OWNED TREATMENT SYSTEMS.
5. THE TOWN MAY REQUIRE ADDITIONAL CALCULATIONS AND DOCUMENTATION BASED ON SPECIFIC SITE CONDITIONS FOR EACH PROJECT.
6. REVISIONS TO APPROVED STORMWATER TREATMENT SYSTEMS REQUIRE RESUBMISSION OF ALL DOCUMENTATION OUTLINED HEREIN.

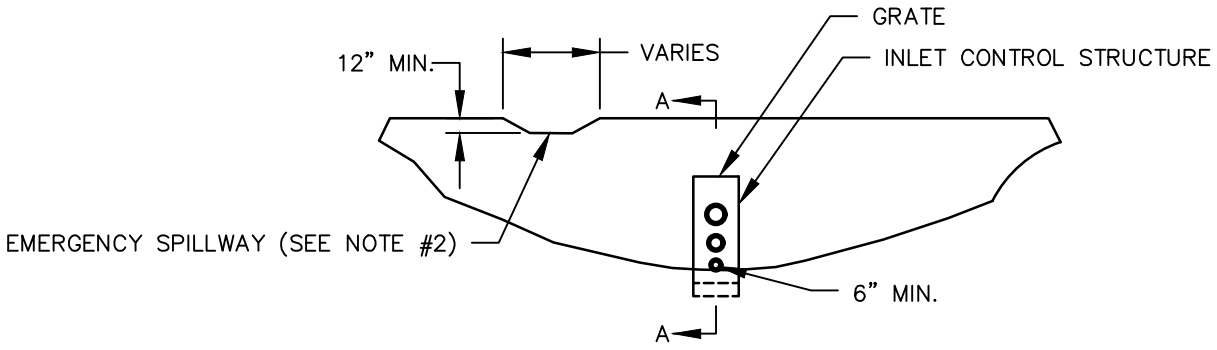
REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED
DRAWN BY: DG		CHECKED BY: JL	
DATE: OCT 2020		FILENAME: PLATE16.DWG	

TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

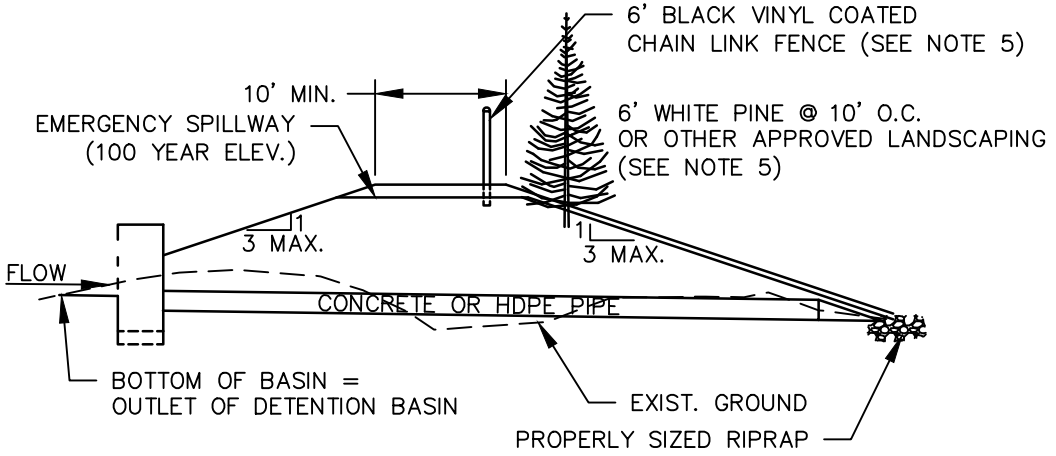
STORMWATER TREATMENT SYSTEM NOTES

NO SCALE

PLATE 16.2



FRONT ELEVATION

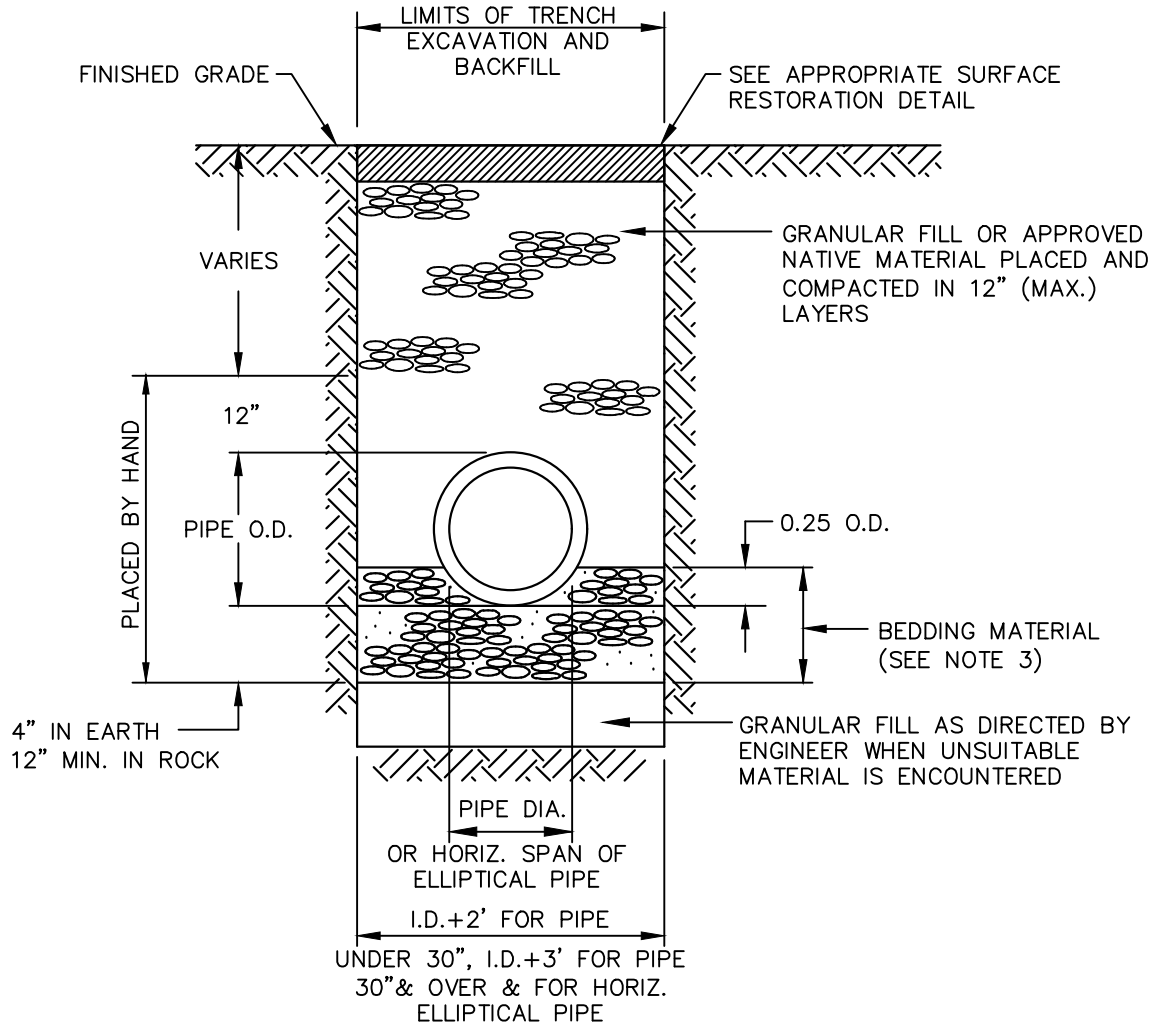


SECTION A-A

NOTES:

1. TO FACILITATE COMPLETE DRAINING AND TO AVOID SILTATION, THE BOTTOM OF ALL DETENTION BASINS SHALL BE CONSTRUCTED WITH A 2' WIDE DITCH HAVING A SLOPE NOT LESS THAN ONE PERCENT.
2. THE EMERGENCY SPILLWAY SHALL BE STABILIZED WITH CONCRETE, CONCRETE BLOCK PAVERS OR RIPRAP TO PREVENT SLOPE EROSION.
3. CONCRETE ANTI-SEEP COLLARS SHALL BE INSTALLED ALONG THE PIPE. ANTI-SEEP COLLARS ARE NOT REQUIRED FOR EXCAVATED DETENTION BASINS. COLLAR SPACING TO BE DETERMINED BY THE DESIGN ENGINEER (DESIGN OF WHICH IS TO BE INCLUDED WITH THE TYPICAL CROSS SECTION).
4. SLOPES SHALL BE LANDSCAPED AND PLANTED WITH A MIXTURE OF WILD FLOWER SEEDS AND ANNUAL RYE GRASS WHERE REQUESTED BY THE TOWN.
5. CHAIN LINK FENCE AND ASSOCIATED PLANTINGS ARE ONLY REQUIRED FOR DETENTION BASINS THAT ARE TO BE OWNED AND MAINTAINED BY THE TOWN.
6. THE INLET CONTROL STRUCTURE SHALL INCLUDE AN GALVANIZED TRASH RACK DESIGNED IN ACCORDANCE WITH THE 2002 CONNECTICUT GUIDELINES FOR SOIL EROSION AND SEDIMENT CONTROL, AS AMENDED.

REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				DETENTION BASIN
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE16.DWG		NO SCALE — PLATE 16.3

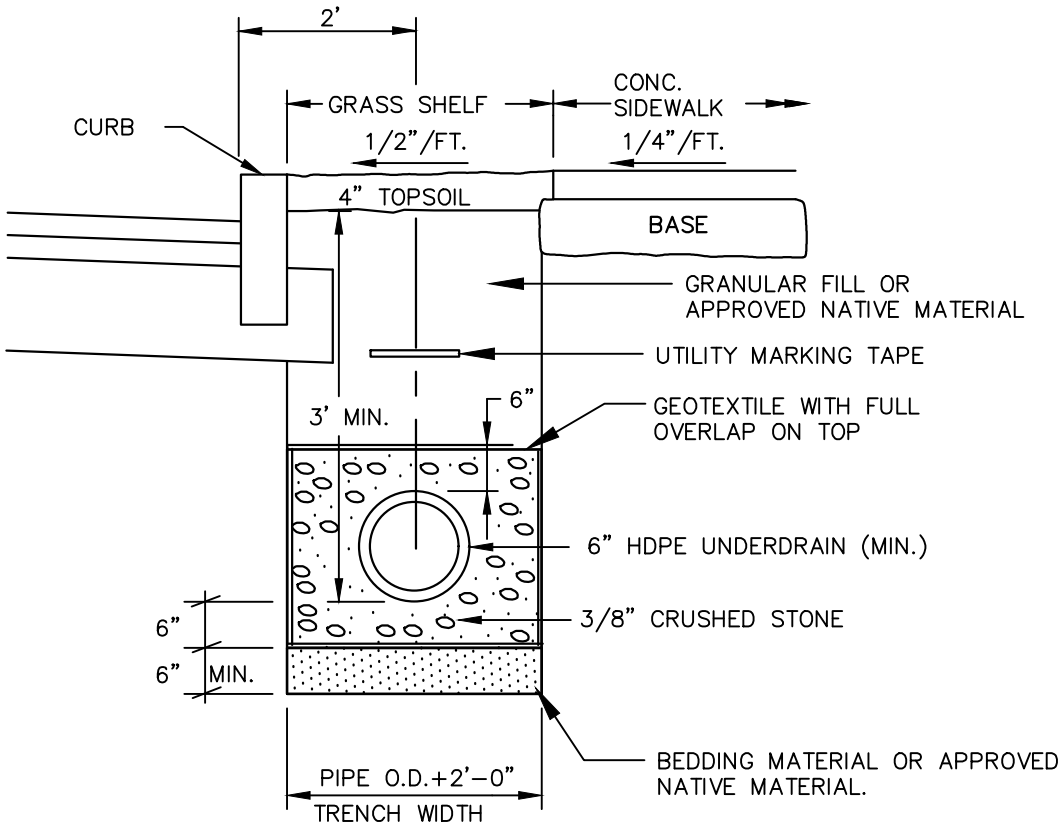


NOTES:

1. ALL CONCRETE PIPE TO BE MINIMUM CLASS IV WITH 2 FT OF COVER UNLESS OTHERWISE APPROVED BY THE TOWN.
2. INSTALL WATERTIGHT RUBBER GASKETS IN ALL PIPE JOINTS.
3. BEDDING MATERIAL SHALL BE INSTALLED A MINIMUM OF 12" ABOVE THE TOP OF ALL PLASTIC PIPES AND PIPES 48" IN DIAMETER AND LARGER.

REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				STORM SEWER TRENCH
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE17.DWG		NO SCALE

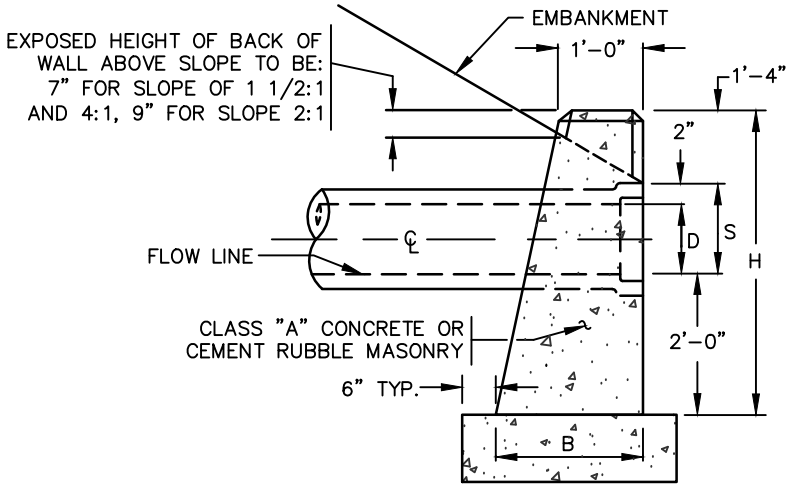
PLATE 17.1



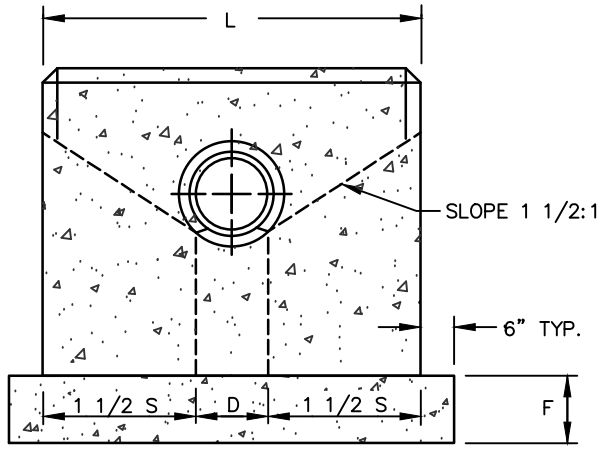
NOTES:

1. SLOTTED PIPE PERFORATIONS ARE TO BE PROVIDED AND PLACED UP OR DOWN AS SPECIFIED BY THE TOWN.
2. ALL UNDERDRAINS ARE TO OUTLET DIRECTLY INTO A CATCH BASIN. THE TOP OF THE UNDERDRAIN PIPE IS TO MATCH THE TOP OF THE OUTLET PIPE.

REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				UNDERDRAIN
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE17.DWG		NO SCALE — PLATE 17.2



WALL AT FOOT OF SLOPE



FRONT ELEVATION

DIMENSIONS AND QUANTITIES FOR ONE ENDWALL BASED ON S=D+2"							
D	S	H*	L	BATTER	B	F	VOL.
INS.	FT.& INS.	FT.& INS.	FT.& INS.	INS./FT.	FT.& INS.	FT.& INS.	CU.YD.
15"	1'-5"	4'-9"	5'-6"	2 1/2"	1'-11 7/8"	1'-6"	1.45
18"	1'-8"	5'-0"	6'-6"	2 1/2"	2'-0 1/2"	1'-6"	1.83
24"	2'-2"	5'-6"	8'-6"	2 1/2"	2'-1 3/4"	2'-0"	2.72
30"	2'-8"	6'-0"	10'-6"	2 1/2"	2'-3"	2'-0"	3.79
36"	3'-2"'	6'-6"	12'-6"	3"	2'-7 1/2"	2'-0"	5.45
42"	3'-8"	7'-0"	14'-6"	3"	2'-9"	2'-6"	6.40**
48"	4'-2"	7'-6"	16'-6"	3"	2'-10 1/2"	2'-6"	8.00**

* MINIMUM DIMENSION PROVIDED, ACTUAL HEIGHT WILL BE BASED ON FIELD CONDITIONS

** CONCRETE VOLUME DOES NOT INCLUDE PIPE VOLUME BASED ON "D" PLUS WALL THICKNESS AT CENTERLINE OF PIPE

NOTES:

1. ALL CONSTRUCTION DIMENSIONS ARE NOMINAL.
2. ALL EDGES OF EXPOSED SURFACES SHALL BE CHAMFERED ABOUT 1".
3. WHEN ONE WINGWALL IS TO BE USED FOR TWO PIPES, THE DIMENSIONS OF THAT WINGWALL SHALL CONFORM TO THAT REQUIRED FOR THE LARGER PIPE, EXCEPT THE DIMENSION "L" SHALL BE INCREASED BY THE OUTSIDE DIAMETER OF THE SMALLER PIPE PLUS ONE FOOT.
4. REINFORCEMENT TO BE PLACED FOR 48" PIPE AND LARGER AND WITH 3" COVER MINIMUM.
5. THESE ENDWALLS WILL BE USED ONLY AT LOCATIONS WHERE THEY WILL NOT BE A HAZARD TO VEHICLES THAT RUN OFF THE ROAD IN NO CASE WILL THE LOCATION OF THESE ENDWALLS BE LESS THAN 30' FROM THE EDGE OF THE TRAVELED WAY.
6. VINYL COATED CHAIN LINK FENCE IS REQUIRED AT TOP OF WALL WHEN H>48".
7. DIMENSIONS OF RIPRAP AT OUTLET IS DEPENDENT ON THE DISCHARGE FLOW AND PIPE SIZE. REFER TO CTDOT STANDARDS FOR SIZING REQUIREMENTS..

H = TOTAL HEIGHT OF ENDWALL
B = BASE
D = INSIDE DIAMETER OF PIPE
S = HEIGHT OF SLOPE ABOVE FLOW LINE AT FACE OF WALL = D+2" (MIN.)
L = LENGTH OF WALL=3S=D
F = HEIGHT OF FOOTING

REVISIONS			
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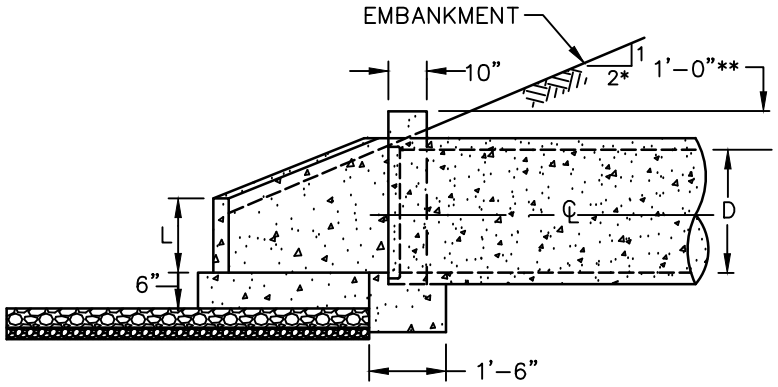
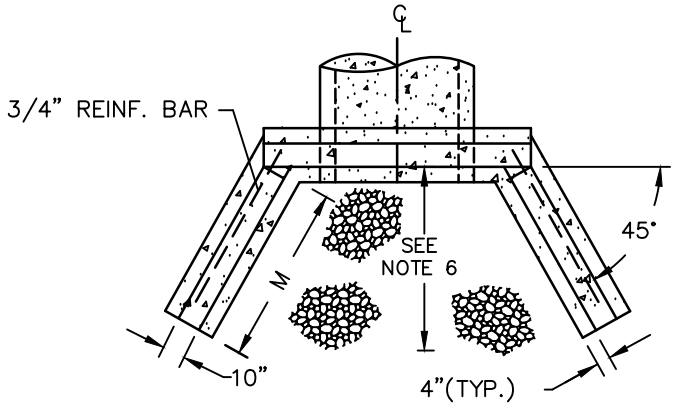
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

CONCRETE ENDWALL

DRAWN BY: DG	CHECKED BY: JL		
DATE: OCT 2020	FILENAME: PLATE18.DWG	NO SCALE	PLATE 18.1



SIDE ELEVATION

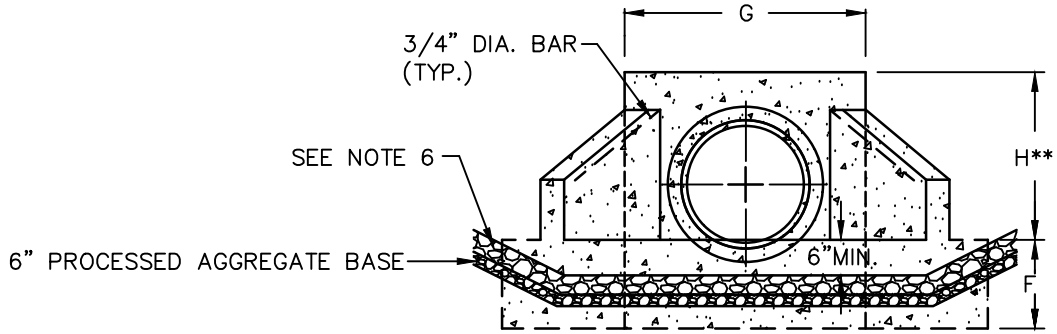


PLAN

DIMENSIONS AND QUANTITIES						
D	H**	G	L	M	F	VOL.
INS.	FT.& INS.	FT.& INS.	FT.& INS.	FT.& INS.	FT.& INS.	CU YD
15"*	2'–3"	3'–7"	1'–0"	3'–3"	1'–6"	0.7
18"*	2'–6"	3'–10"	1'–2"	3'–6"	1'–6"	0.8
24"*	3'–0"	4'–4"	1'–5"	4'–0"	2'–0"	1.2
30"	3'–6"	4'–10"	1'–9"	4'–6"	2'–0"	1.5

* FOR EMBANKMENT SLOPES 4:1 OR LESS, PRECAST FLARED END SECTION MAY BE INSTALLED IN PLACE OF CONCRETE WINGWALLS FOR ALL PIPES 24" IN DIA. OR LESS WITH THE APPROVAL OF THE TOWN.

** MINIMUM DIMENSION PROVIDED, ACTUAL HEIGHT WILL BE BASED ON FIELD CONDITIONS



FRONT ELEVATION

NOTES:
1. ALL CONSTRUCTION DIMENSIONS ARE NOMINAL.
2. ALL EDGES OF EXPOSED SURFACES SHALL HAVE 1" CHAMFERS.
3. WHEN ONE WINGWALL IS TO BE USED FOR TWO PIPES, THE DIMENSIONS OF THAT WINGWALL SHALL CONFORM TO THAT REQUIRED FOR THE LARGER PIPE, EXCEPT THE DIMENSION "L" SHALL BE INCREASED BY THE OUTSIDE DIAMETER OF THE SMALLER PIPE PLUS ONE FOOT.
4. THESE ENDWALLS WILL BE USED ONLY AT LOCATIONS WHERE THEY WILL NOT BE A HAZARD TO VEHICLES THAT RUN OFF THE ROAD. IN NO CASE WILL THE LOCATION OF THESE ENDWALLS BE LESS THAN 30' FROM THE EDGE OF THE TRAVELED WAY.
5. VINYL COATED CHAIN LINK FENCE IS REQUIRED AT TOP OF WALL WHEN H>48".
6. DIMENSIONS OF RIPRAP AT OUTLET IS DEPENDENT ON THE DISCHARGE FLOW AND PIPE SIZE. REFER TO CTDOT STANDARDS FOR SIZING REQUIREMENTS.

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED

DRAWN BY: DG	CHECKED BY: JL
DATE: OCT 2020	FILENAME: PLATE18.DWG

TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

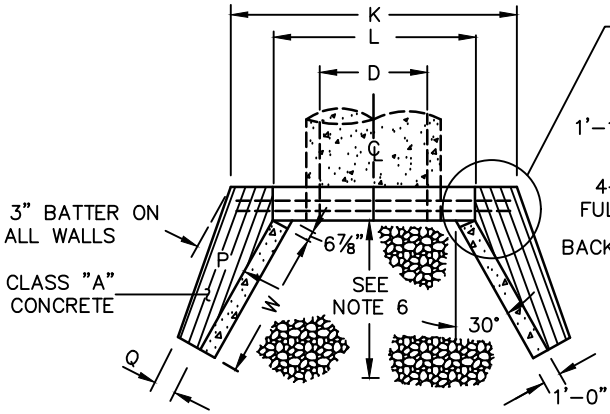
CONCRETE WINGWALL FOR PIPES 30" DIAMETER AND LESS

NO SCALE

PLATE 18.2

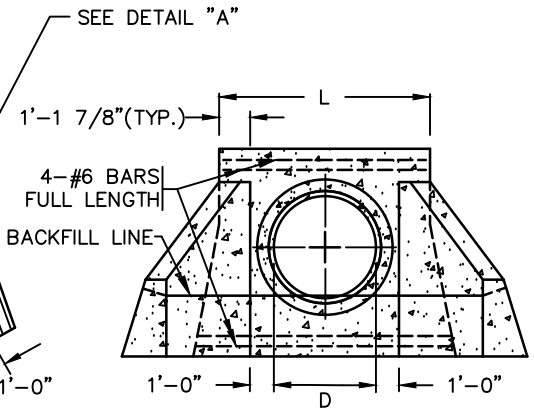
DIMENSIONS AND QUANTITIES											
D	B	C	G	H*	K	L	P	Q	R	W	VOL.
INS.	FT.& IN.	FT.& IN.	FT.& IN.	FT.& IN.	FT.& IN.	FT.& IN.	FT.& IN.	FT.& IN.	FT.& IN.	FT.& IN.	CU.YD.
36"	1'–6"	2'–0"	3'–3"	6'–8"	9'–1 1/2"	7'–3 3/4"	1'–4 7/8"	0'–9 3/4"	3'–4 7/8"	5'–5 3/4"	5.9
42"	1'–6"	2'–0"	3'–3"	7'–2"	9'–10 1/2"	7'–9 3/4"	1'–6 3/8"	0'–9 3/4"	3'–10 1/2"	6'–7 3/4"	6.7
48"	1'–7"	2'–6"	3'–9"	8'–2"	10'–10"	8'–3 3/4"	1'–9 3/8"	0'–11 1/4"	4'–9"	7'–9 1/2"	9.1
60"	1'–7"	2'–6"	3'–9"	9'–2"	12'–4 1/2"	9'–3 3/4"	2'–0 3/8"	0'–11 1/4"	5'–9"	10'–1 1/4"	12.4
72"	1'–7"	2'–6"	3'–9"	10'–2"	13'–10 3/4"	10'–3 3/4"	2'–3 3/8"	0'–11 1/4"	6'–9"	12'–5"	16.3

* MINIMUM DIMENSION PROVIDED, ACTUAL HEIGHT WILL BE BASED ON FIELD CONDITIONS.

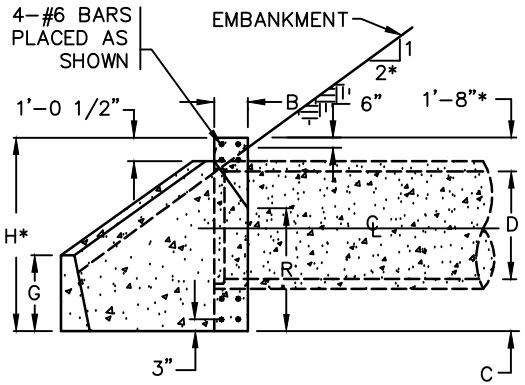


NOTE: ENDWALL SYMMETRICAL ABOVE CENTERLINE OF PIPE

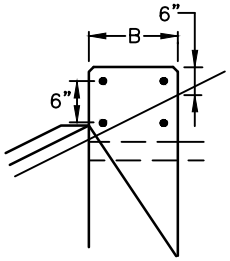
PLAN



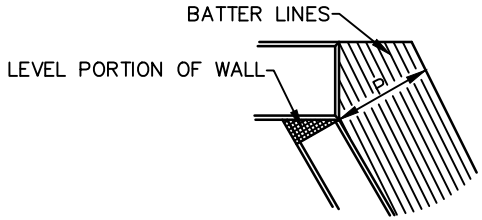
FRONT ELEVATION



SIDE ELEVATION



DETAIL OF BAR SPACING



DETAIL "A"

NOTES:
1. ALL CONSTRUCTION DIMENSIONS ARE NOMINAL.
2. ALL EDGES OF EXPOSED SURFACES SHALL HAVE 1" CHAMFERS.
3. WHEN ONE WINGWALL IS TO BE USED FOR TWO PIPES, THE DIMENSIONS OF THAT WINGWALL SHALL CONFORM TO THAT REQUIRED FOR THE LARGER PIPE, EXCEPT THE DIMENSION "L" SHALL BE INCREASED BY THE OUTSIDE DIAMETER OF THE SMALLER PIPE PLUS ONE FOOT.
4. REINFORCEMENT TO BE PLACED FOR 48" PIPE AND LARGER AND WITH 3" COVER MINIMUM.
5. THESE ENDWALLS WILL BE USED ONLY AT LOCATIONS WHERE THEY WILL NOT BE A HAZARD TO VEHICLES THAT RUN OFF THE ROAD. IN NO CASE WILL THE LOCATION OF THESE ENDWALLS BE LESS THAN 30' FROM THE EDGE OF THE TRAVELED WAY.
6. VINYL COATED CHAIN LINK FENCE IS REQUIRED AT TOP OF WALL WHEN H>48".
7. DIMENSIONS OF RIPRAP AT OUTLET IS DEPENDENT ON THE DISCHARGE FLOW AND PIPE SIZE. REFER TO CTDOT STANDARDS FOR SIZING REQUIREMENTS.

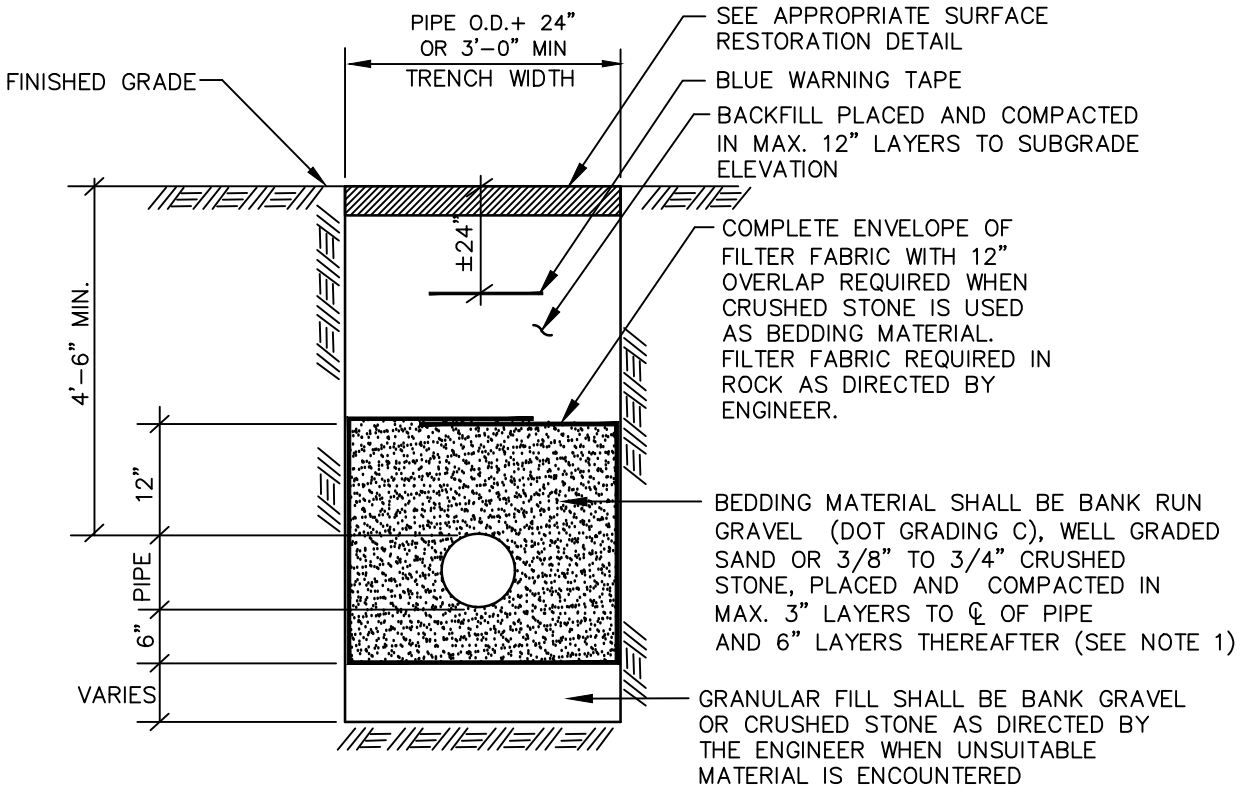
REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED
DRAWN BY: DG		CHECKED BY: JL	
DATE: OCT 2020		FILENAME: PLATE18.DWG	

TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

CONCRETE WINGWALL FOR PIPES LARGER THAN 30" DIAMETER

NO SCALE

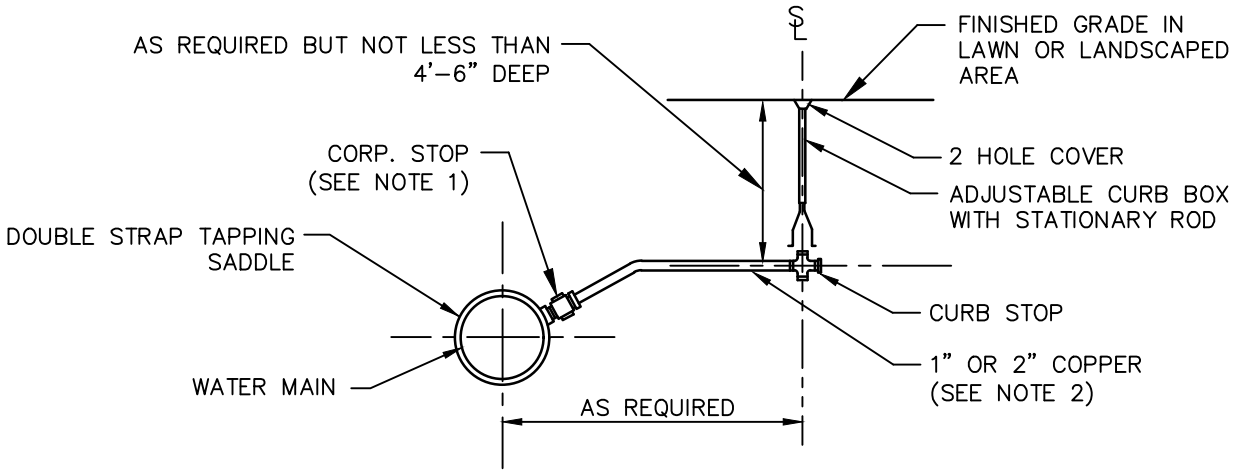
PLATE 18.3



NOTES:

1. CRUSHED STONE SHALL ONLY BE USED IN HIGH GROUNDWATER CONDITIONS AS DIRECTED BY THE ENGINEER.
2. ALL WATER MAIN WITH LESS THAN 4'–6" OF COVER SHALL BE INSULATED UNLESS APPROVED OTHERWISE BY THE ENGINEER. SEE TYPICAL TRENCH DETAIL (INSULATED WATER) FOR ADDITIONAL INFORMATION.

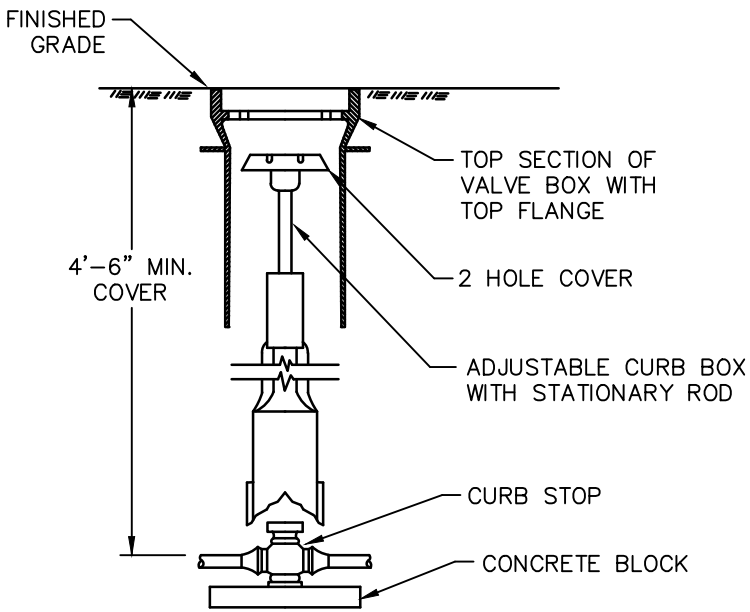
REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				WATER MAIN TRENCH
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE19.DWG		NO SCALE — PLATE 19.1



NOTES:

1. THE TOP OF THE CORPORATION AND THE FIRST THREE (3) FEET OF COPPER TUBING SHALL BE INSTALLED NO HIGHER THAN THE TOP OF THE WATER MAIN.
2. NO INTERMEDIATE SIZES (i.e. 3/4", 1 1/2", 1 3/4") ARE ALLOWED FOR COPPER SERVICES. ANY SERVICE REQUIREMENT GREATER THAN 2" COPPER SHALL BE CLDIP (4" MIN.) WITH THE SHUT–OFF LOCATED AT THE MAIN. COPPER TUBING SHALL BE CONTINUOUS WITH NO COUPLINGS BETWEEN THE CORPORATION STOP AND THE CURB STOP.
3. TOP SECTION OF VALVE BOX WITH FLANGE SHALL BE SET AT FINISHED GRADE OVER CURB STOP COVER WHEN LOCATED WITHIN PAVED AREAS AND SIDEWALK.

REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				WATER SERVICE CONNECTION
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE19.DWG		NO SCALE — PLATE 19.2



REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED

TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

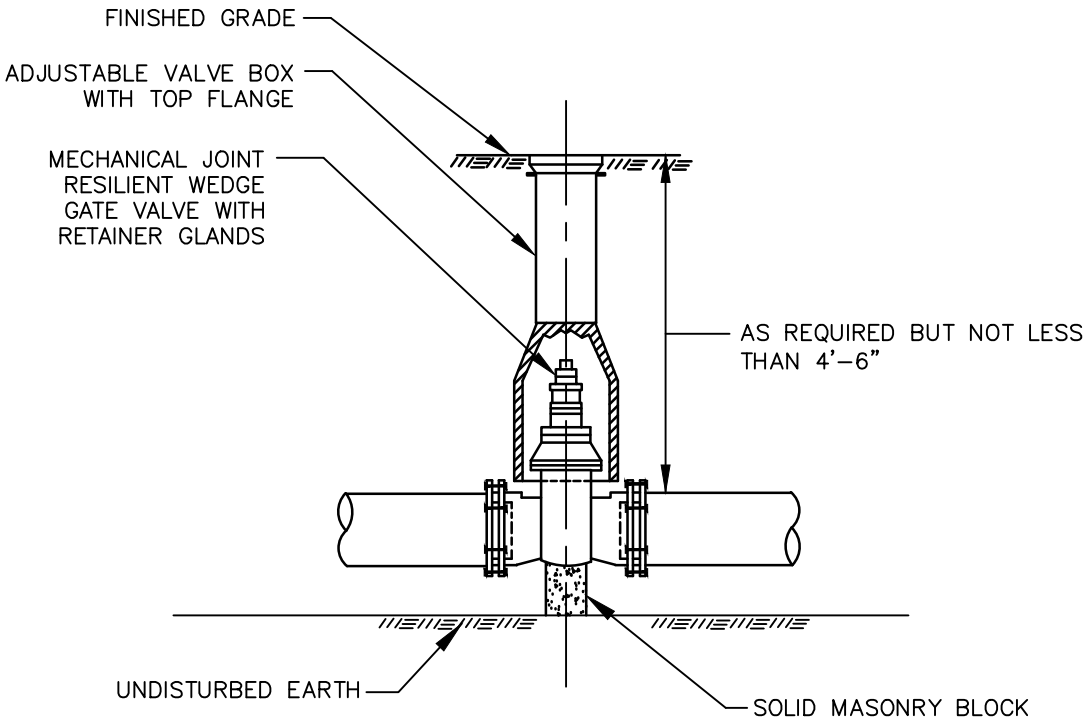
DRAWN BY: DG | CHECKED BY: JL

DATE: OCT 2020 | FILENAME: PLATE19.DWG

WATER SERVICE CURB STOP IN PAVED AREAS AND SIDEWALK

NO SCALE

PLATE 19.3



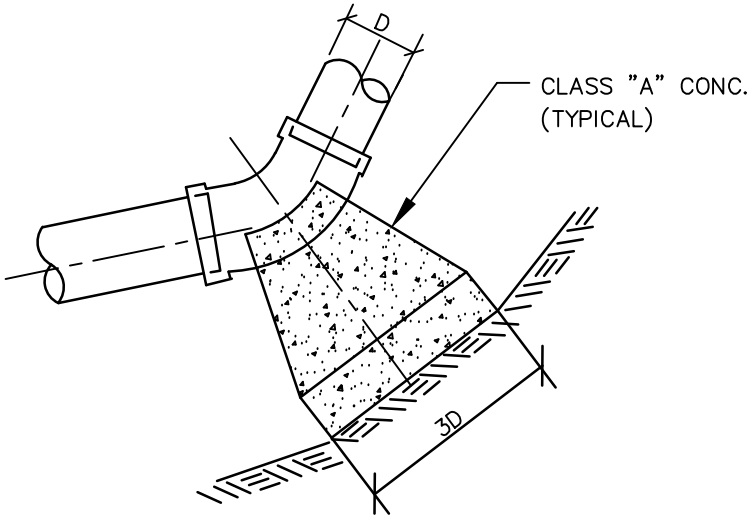
REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED
DRAWN BY: DG		CHECKED BY: JL	
DATE: OCT 2020		FILENAME: PLATE19.DWG	

TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

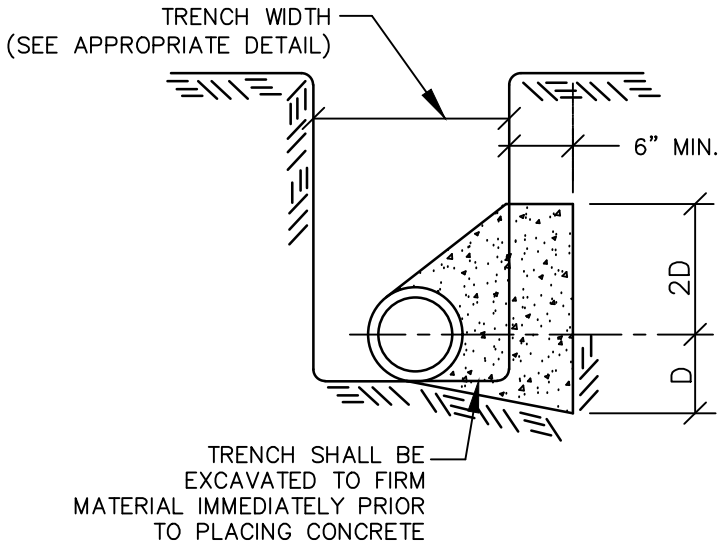
WATER GATE VALVE

NO SCALE

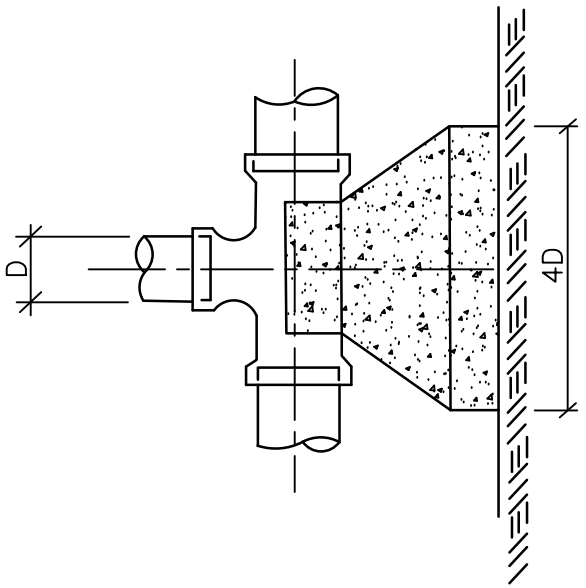
PLATE 19.4



PLAN – 1/8 OR 1/16 BEND

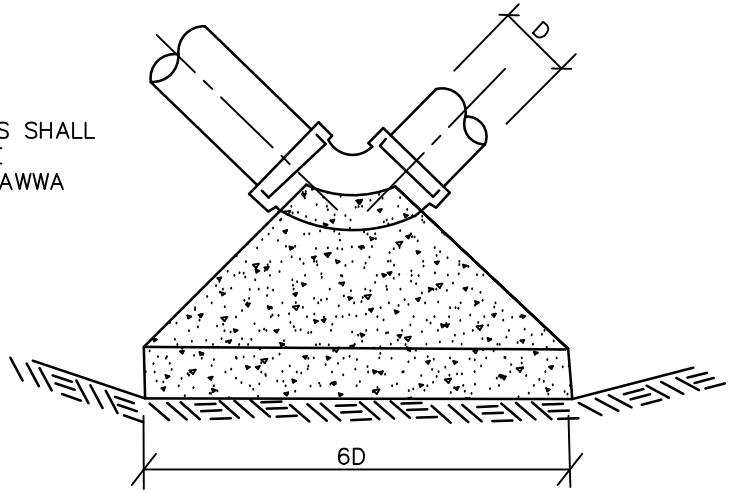


SECTION



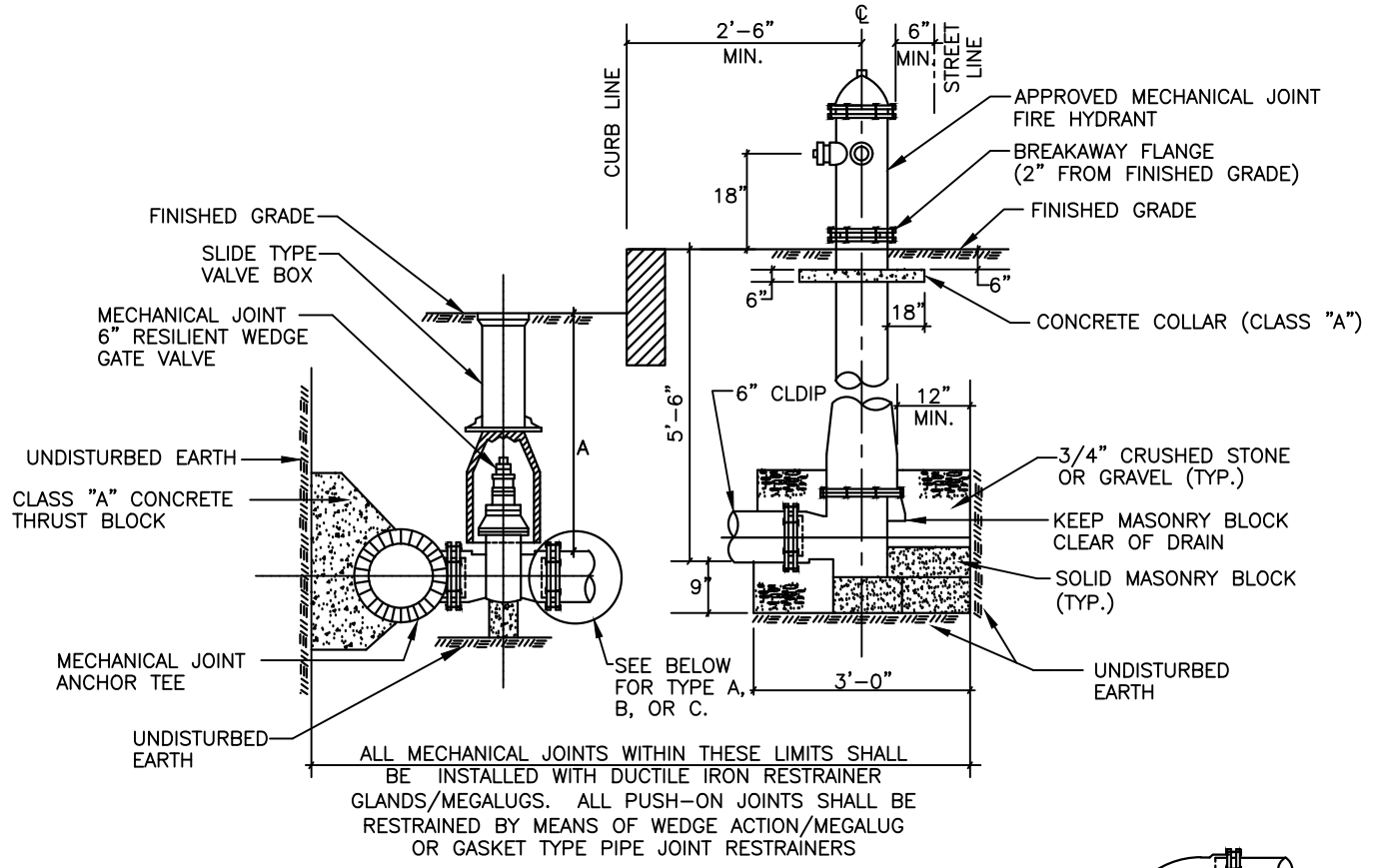
PLAN – TEE

NOTE:
ALL JOINTS AT THRUST BLOCKS SHALL BE WRAPPED IN POLYETHYLENE ENCASEMENT CONFORMING TO AWWA C105 OF LATEST REVISION.



PLAN – 1/4 BEND

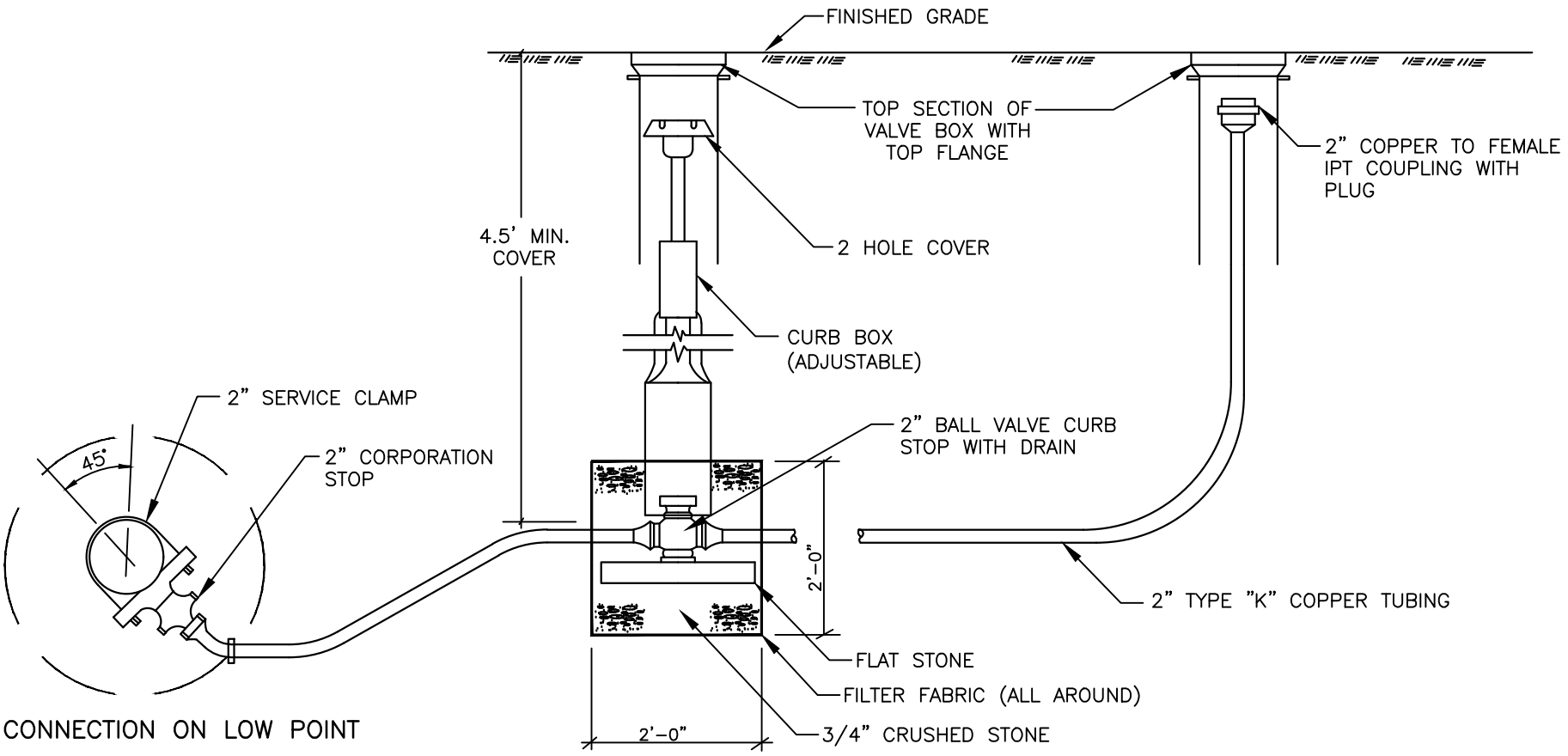
REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				CONCRETE THRUST BLOCK
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE19.DWG		NO SCALE PLATE 19.5



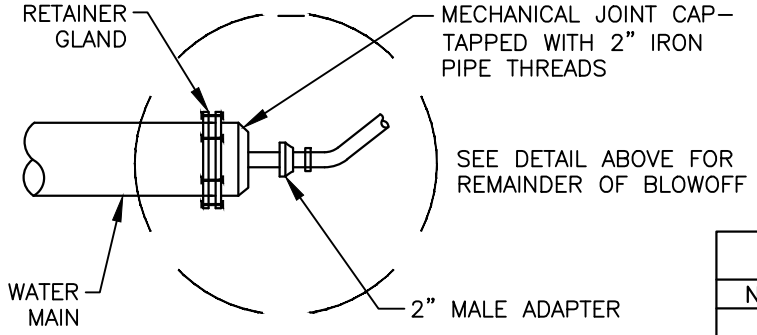
NOTE:

1. TYPE "A" HYDRANT HAS NO OFFSETS OR BENDS BETWEEN THE AUXILIARY VALVE AND THE HYDRANT
2. THE REQUIRED TYPE SHALL BE DETERMINED IN THE FIELD BY THE TOWN.

REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				HYDRANT
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE20.DWG		NO SCALE — PLATE 20.1



CONNECTION ON LOW POINT

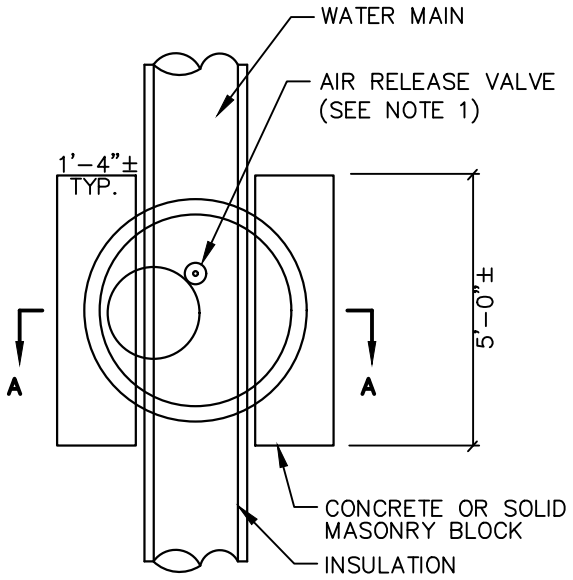


CONNECTION AT END OF MAIN

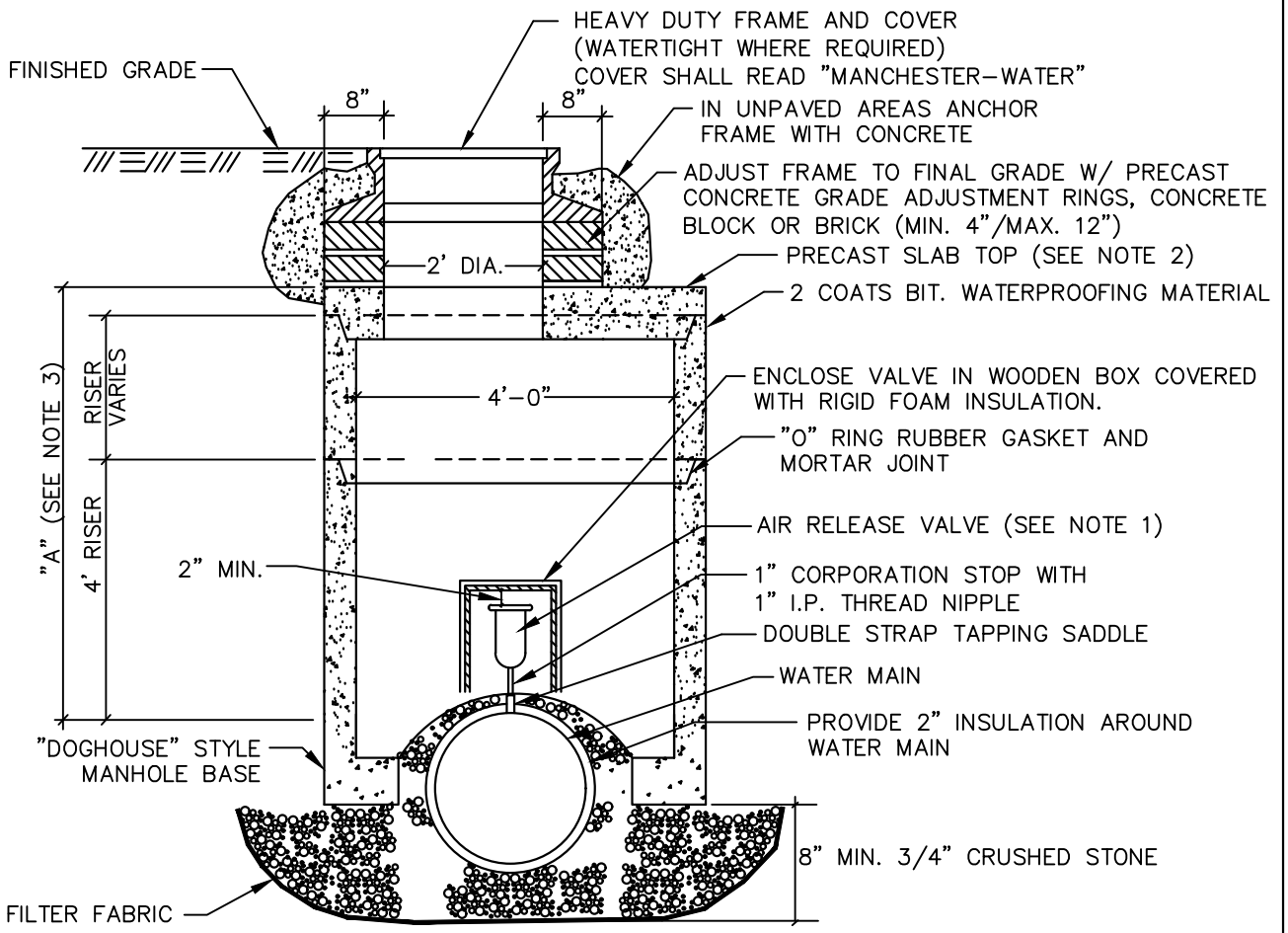
NOTES:

1. CURB BOX AND BLOWOFF DISCHARGE SHALL BE INSTALLED IN ROADWAY AND SHALL HAVE MINIMUM SEPARATING DISTANCE OF 5 FEET UNLESS DIRECTED OTHERWISE BY THE TOWN.
2. FILTER FABRIC – MIRAFI 140, DUPONT TYPAR OR EQUAL. FILTER FABRIC TO BE OVERLAPPED 12".
3. TWO (2) INCH RIGID COPPER OR BRASS PIPE MAY BE SUBSTITUTED FOR COPPER TUBING FROM THE CURB STOP TO GROUND LEVEL WITH PRIOR APPROVAL FROM THE TOWN.

REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				WATER MAIN BLOWOFF
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE20.DWG		NO SCALE — PLATE 20.2



PLAN



SECTION A-A

NOTES:

1. AIR RELEASE VALVE SHALL BE GOLDEN ANDERSON FIGURE NO. 910 (1" INLET, 3/8" OUTLET, 1/16" ORIFICE).
2. FLAT TOP MANHOLE TO BE USED WHERE "A" IS LESS THAN 6 FEET. USE CONCENTRIC FLAT TOP WHEN "A" IS LESS THAN 3 FEET. IF "A" IS GREATER THAN 3 FEET USE ECCENTRIC FLAT TOP.
3. PIPE BEDDING AND VALVE CONNECTION MUST BE OF SUFFICIENT DEPTH AND LENGTH TO RESPECTIVELY ASSURE THAT THE TOP OF BEDDING AND AIR RELEASE VALVE ARE ABOVE HIGH GROUNDWATER LEVEL. INSULATE AS DIRECTED BY THE TOWN.

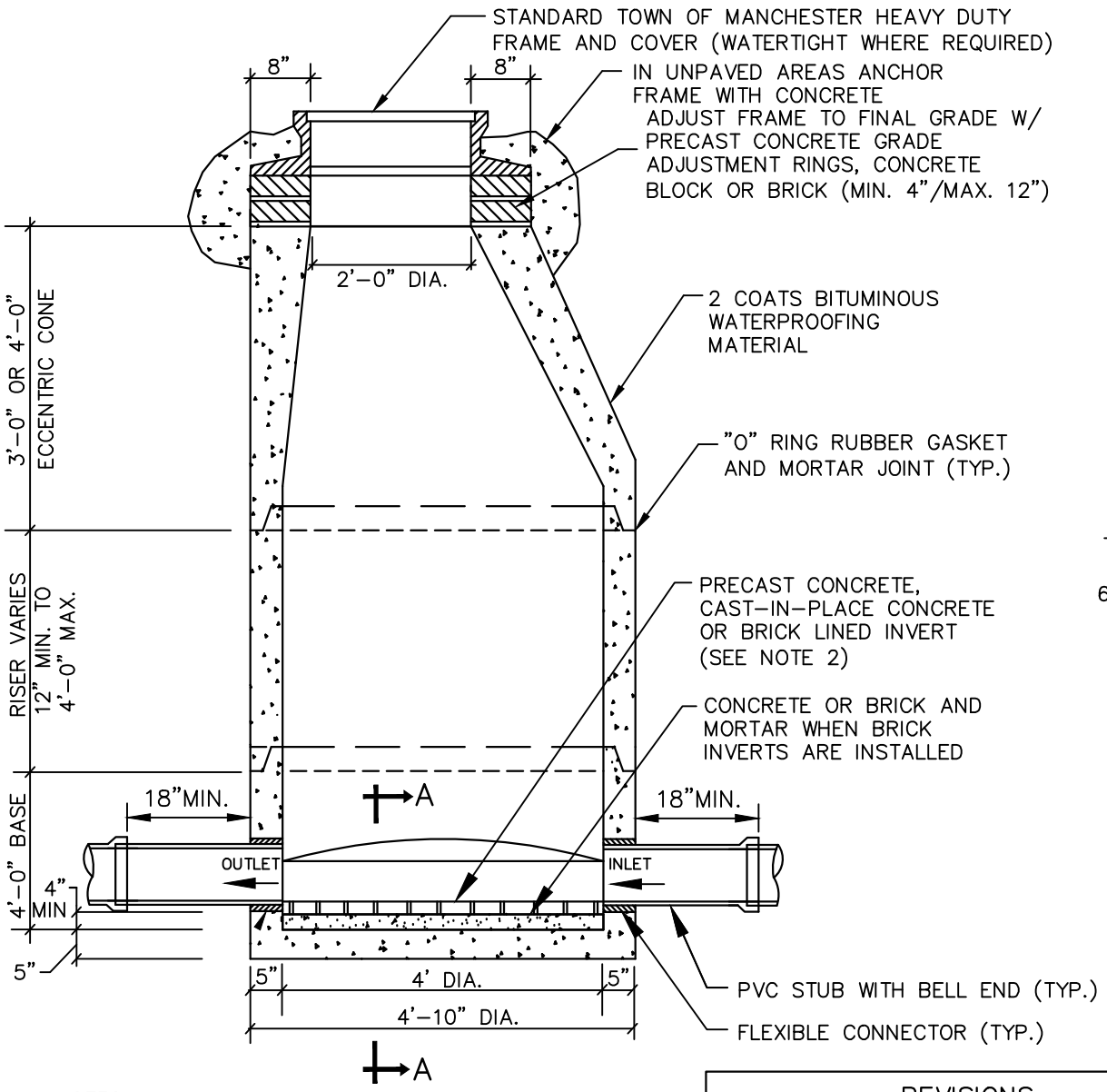
REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED
DRAWN BY: DG		CHECKED BY: JL	
DATE: OCT 2020		FILENAME: PLATE20.DWG	

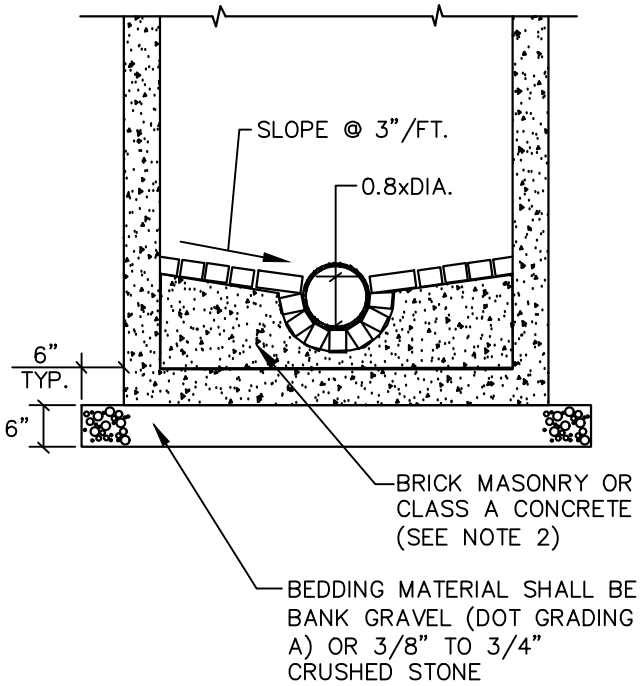
TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

AIR RELEASE VALVE MANHOLE

NO SCALE

PLATE 20.3





SECTION A-A

NOTES:

1. MAXIMUM PIPE SIZE TO BE USED IN 4' DIA. MANHOLE IS 24".
2. BRICK INVERT CONSTRUCTION IS SHOWN; HOWEVER, PRECAST OR CAST-IN-PLACE CONCRETE INVERTS SHALL BE INSTALLED UNLESS DIRECTED OTHERWISE BY THE TOWN.

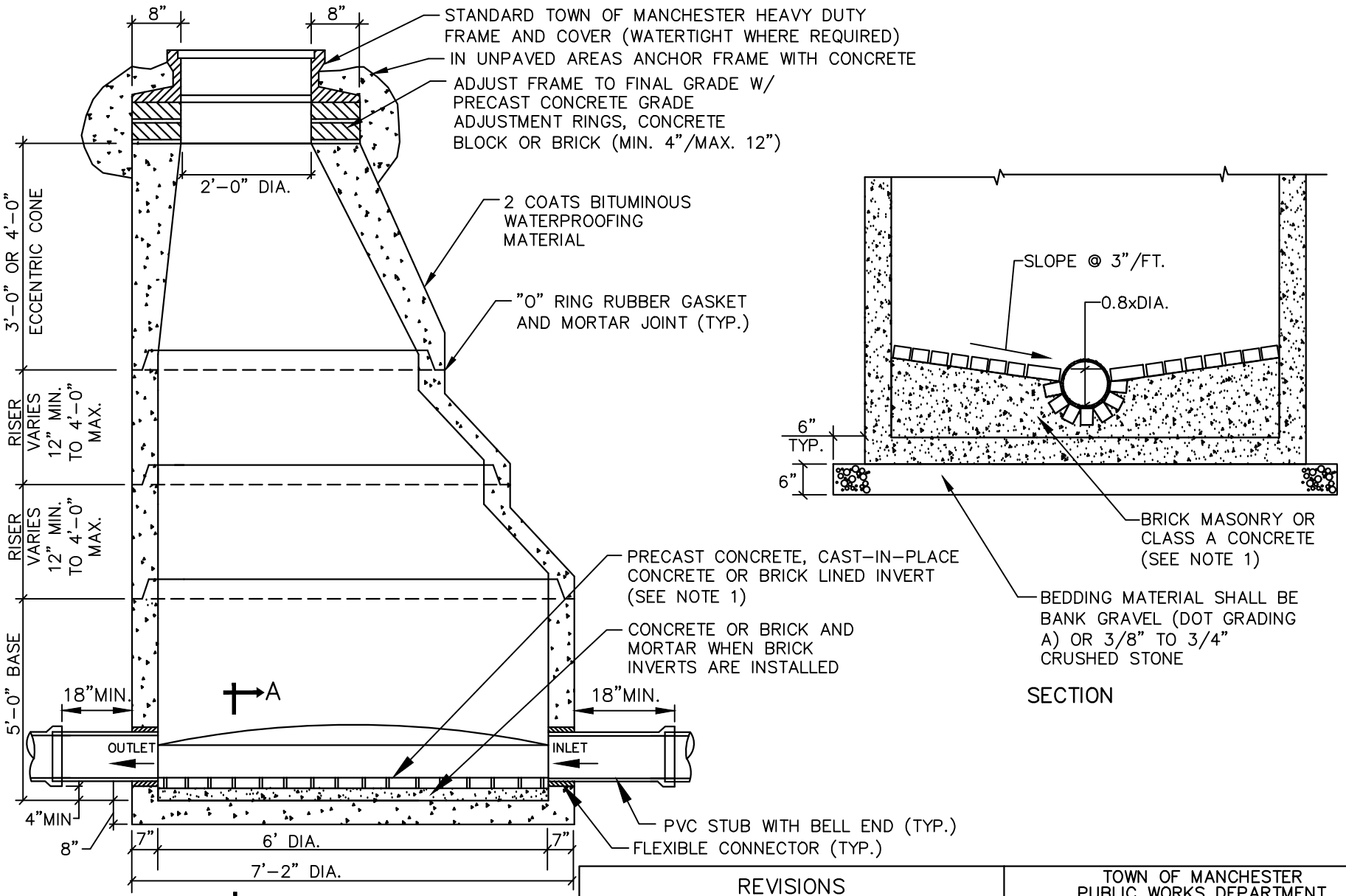
REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED
DRAWN BY: DG		CHECKED BY: JL	
DATE: OCT 2020		FILENAME: PLATE21.DWG	

TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

SANITARY SEWER MANHOLE (48" DIAMETER)

NO SCALE

PLATE 21.1



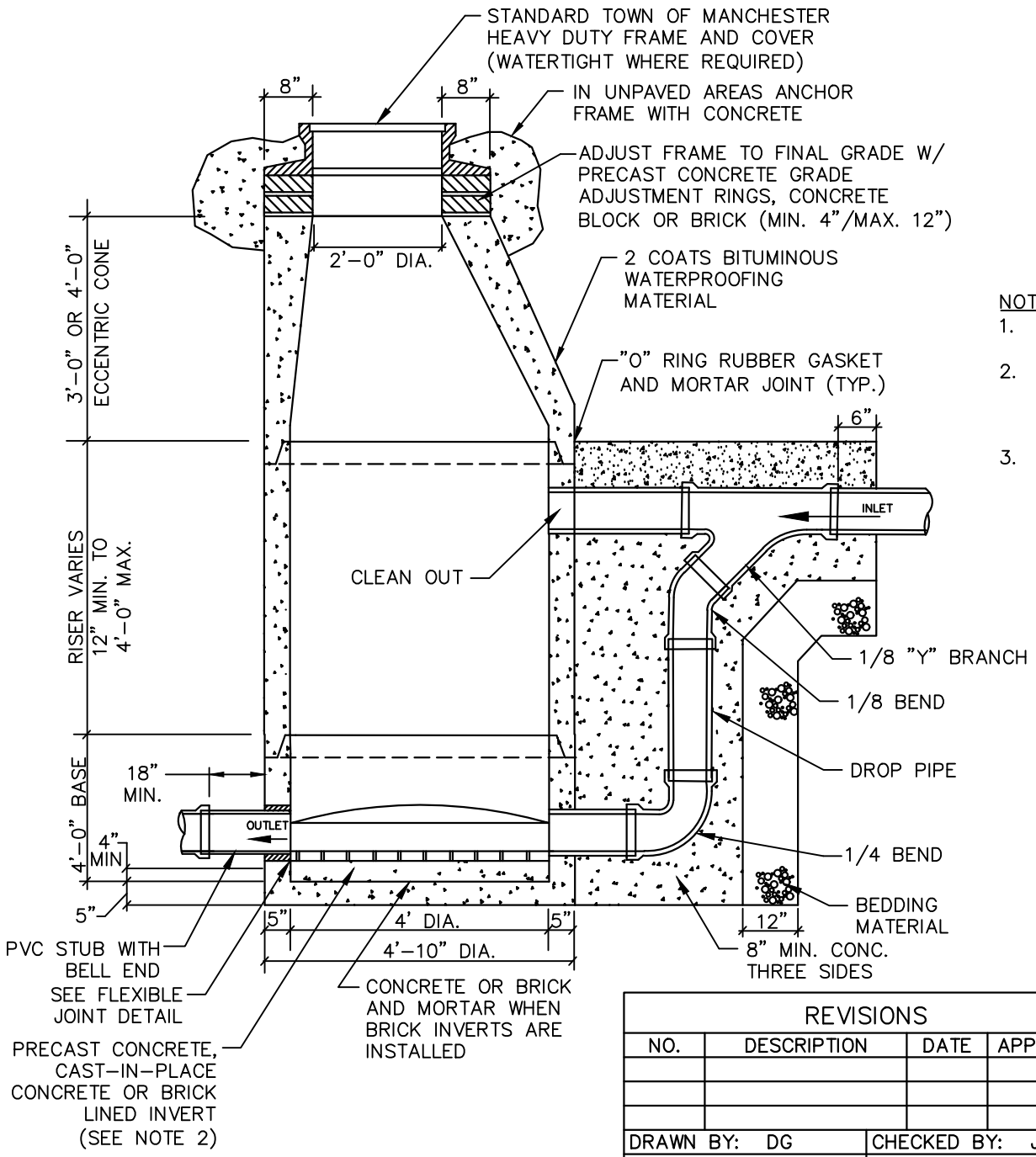
NOTE:
1. BRICK INVERT CONSTRUCTION IS SHOWN; HOWEVER, PRECAST OR CAST-IN-PLACE CONCRETE INVERTS SHALL BE INSTALLED UNLESS DIRECTED OTHERWISE BY THE TOWN.

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED

TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

SANITARY SEWER MANHOLE (72" DIAMETER)

DRAWN BY: DG	CHECKED BY: JL	NO SCALE	PLATE 21.2
DATE: OCT 2020	FILENAME: PLATE21.DWG		



NOTES:

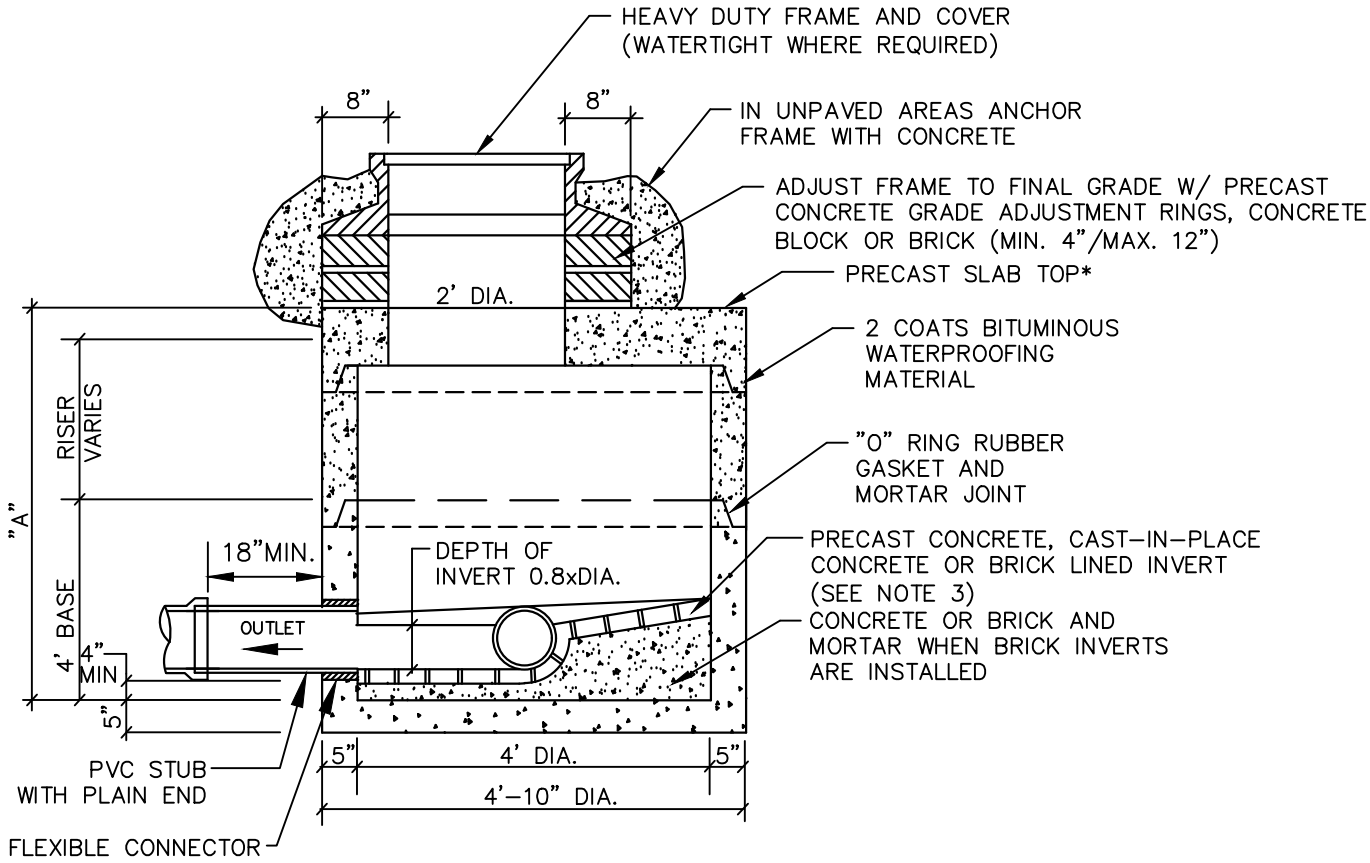
1. MAXIMUM PIPE SIZE TO BE USED IN 4' DIA. MANHOLE IS 24".
2. BRICK INVERT CONSTRUCTION IS SHOWN; HOWEVER, PRECAST OR CAST-IN-PLACE CONCRETE INVERTS SHALL BE INSTALLED UNLESS DIRECTED OTHERWISE BY THE TOWN.
3. PROVIDE BEDDING MATERIAL IN ACCORDANCE WITH THE 48" SANITARY MANHOLE DETAIL.

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED

TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

SANITARY SEWER DROP MANHOLE (48" DIAMETER)

DRAWN BY: DG	CHECKED BY: JL	NO SCALE	PLATE 21.3
DATE: OCT 2020	FILENAME: PLATE21.DWG		



NOTES:

1. FLAT TOP MANHOLE TO BE USED WHERE "A" IS LESS THAN 6'. USE CONCENTRIC FLAT-TOP WHEN "A" IS LESS THAN 3 FEET AND ECCENTRIC FLAT-TOP IF GREATER THAN 3'.
2. MAXIMUM PIPE SIZE TO BE USED IN 4' DIA. MANHOLE IS 24".
3. BRICK INVERT CONSTRUCTION IS SHOWN; HOWEVER, PRECAST OR CAST-IN-PLACE CONCRETE INVERTS SHALL BE INSTALLED UNLESS DIRECTED OTHERWISE BY THE TOWN.
4. PROVIDE BEDDING MATERIAL IN ACCORDANCE WITH THE 48" SANITARY MANHOLE DETAIL.

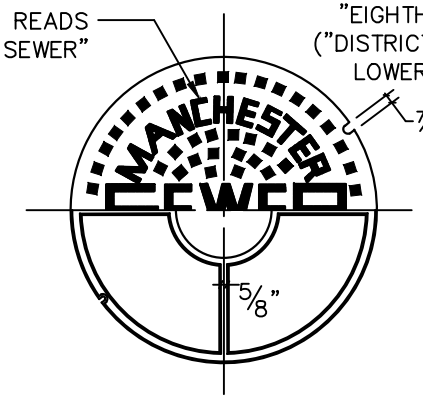
REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED
DRAWN BY: DG		CHECKED BY: JL	
DATE: OCT 2020		FILENAME: PLATE21.DWG	

TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

SANITARY SEWER MANHOLE (48" DIAMETER FLAT TOP)

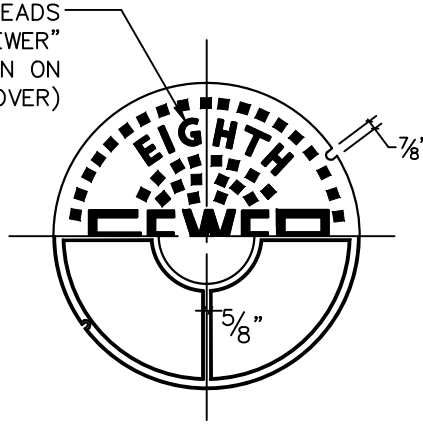
NO SCALE

PLATE 21.4



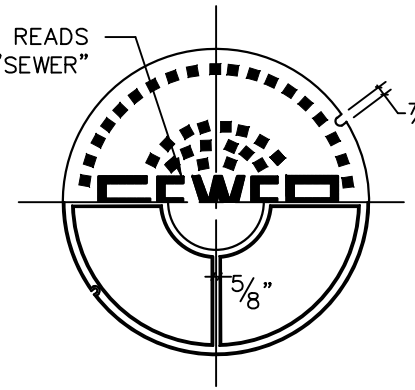
COVER–PLAN

FOR SYSTEMS OWNED BY THE
TOWN OF MANCHESTER



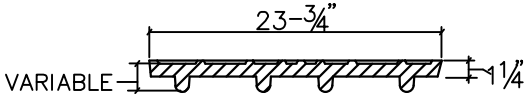
COVER–PLAN

FOR SYSTEMS OWNED BY THE
8TH UTILITIES DISTRICT

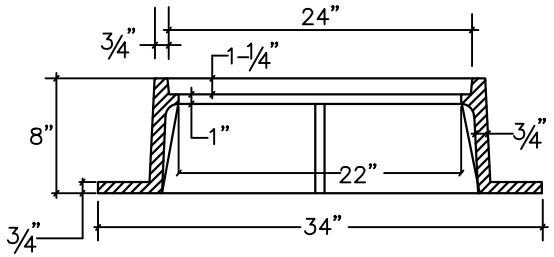


COVER–PLAN

FOR PRIVATELY–OWNED SYSTEMS



COVER–SECTION

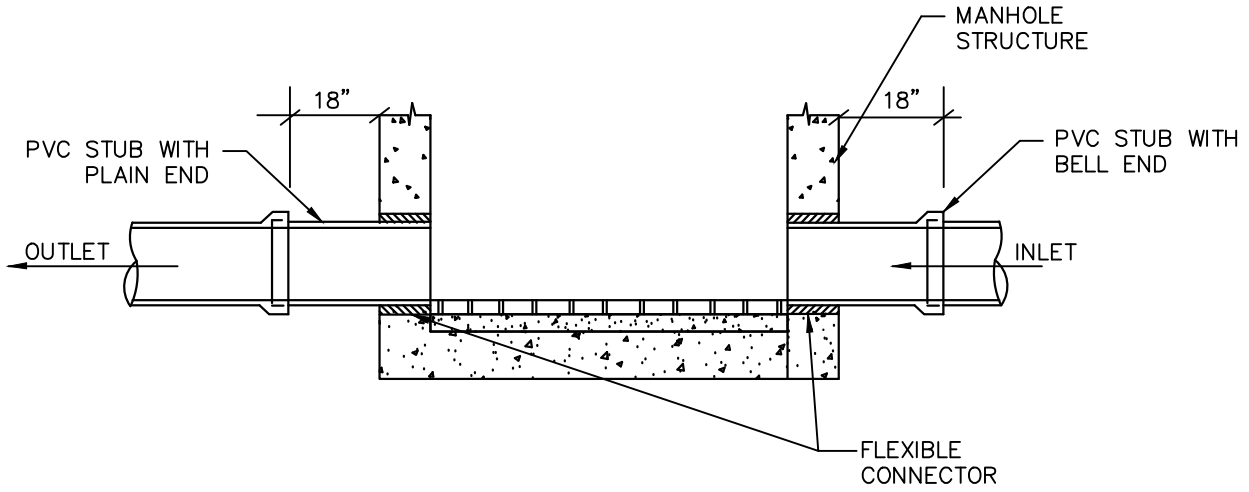


FRAME–SECTION

NOTES:

1. MANHOLE FRAMES AND COVERS OWNED BY THE TOWN SHALL BE THE MODEL AND MANUFACTURER LISTED IN THE TECHNICAL SPECIFICATIONS. FRAMES AND COVERS OWNED BY THE EIGHTH UTILITIES DISTRICT SHALL BE APPROVED BY THE DISTRICT.
2. BOLTS FOR BOLTED COVERS SHALL BE ½" STAINLESS STEEL.

REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				SANITARY MANHOLE FRAME AND COVER
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE21.DWG		NO SCALE — PLATE 21.5



REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED

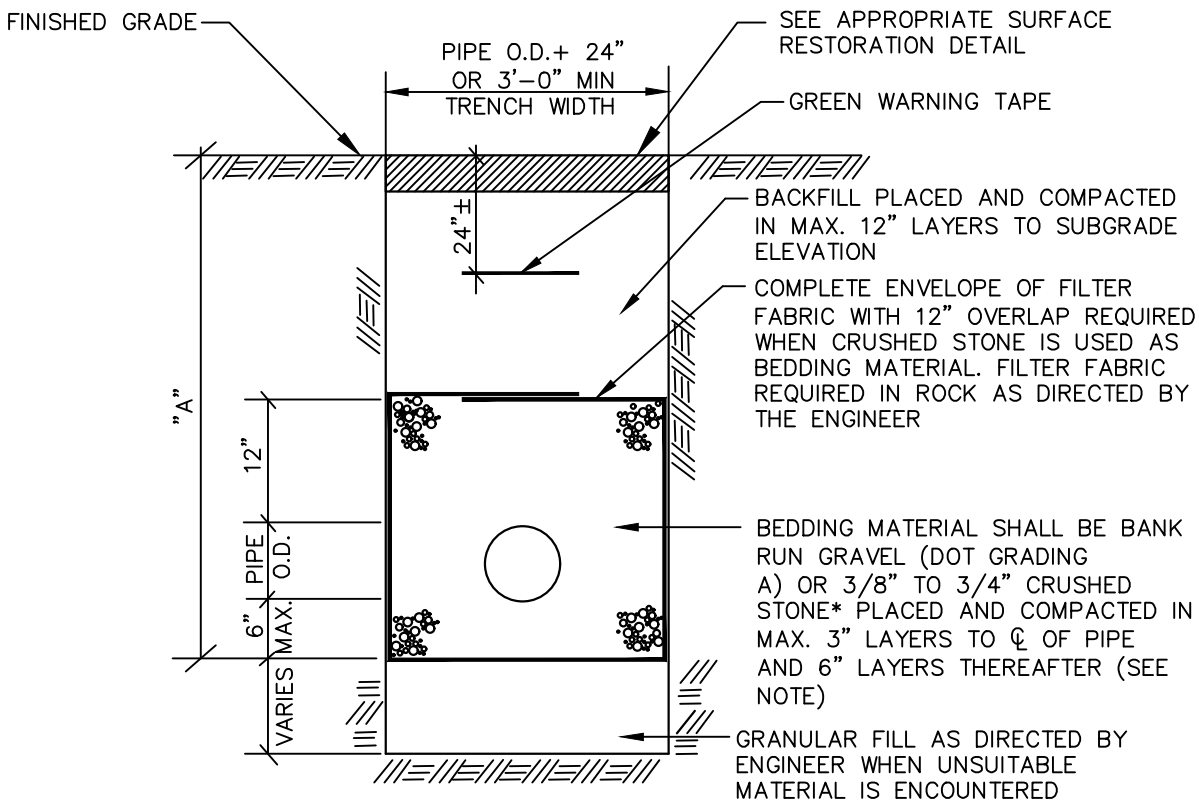
TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

DRAWN BY: DG	CHECKED BY: JL
DATE: OCT 2020	FILENAME: PLATE21.DWG

SANITARY SEWER MANHOLE JOINT

NO SCALE

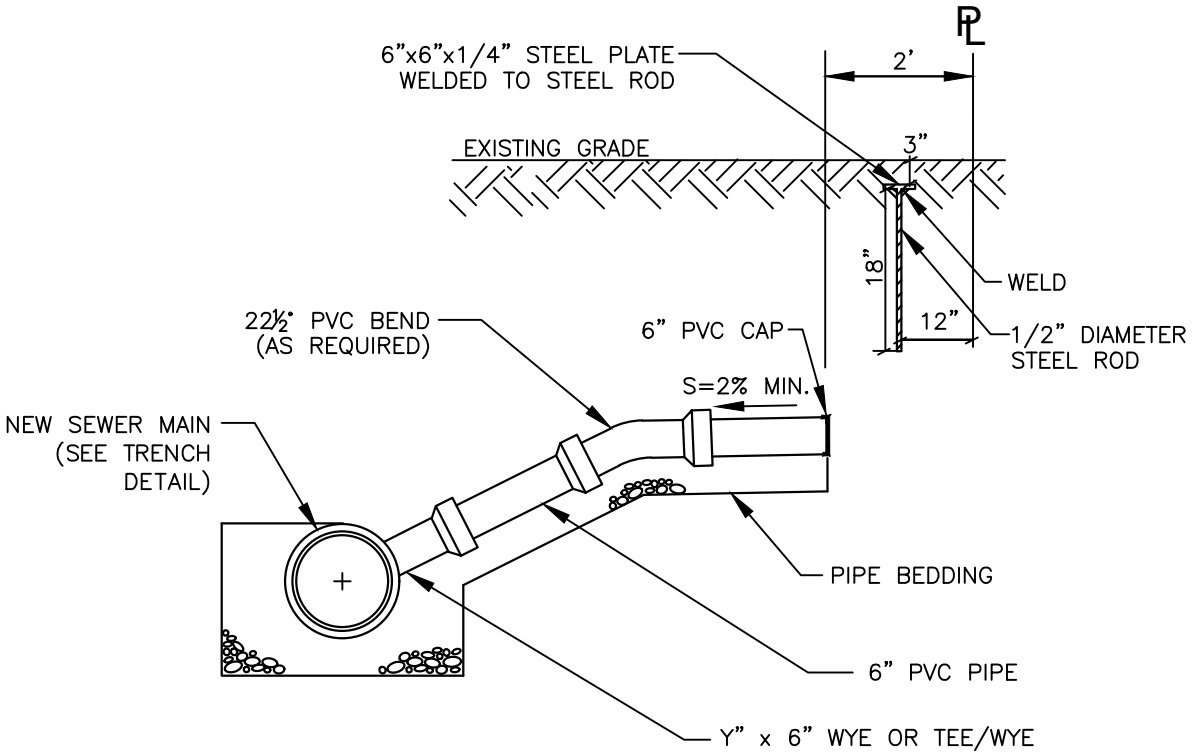
PLATE 21.6



NOTE:
CRUSHED STONE SHALL BE USED WHENEVER "A" IS GREATER THAN 15' AND PVC PIPE IS USED.

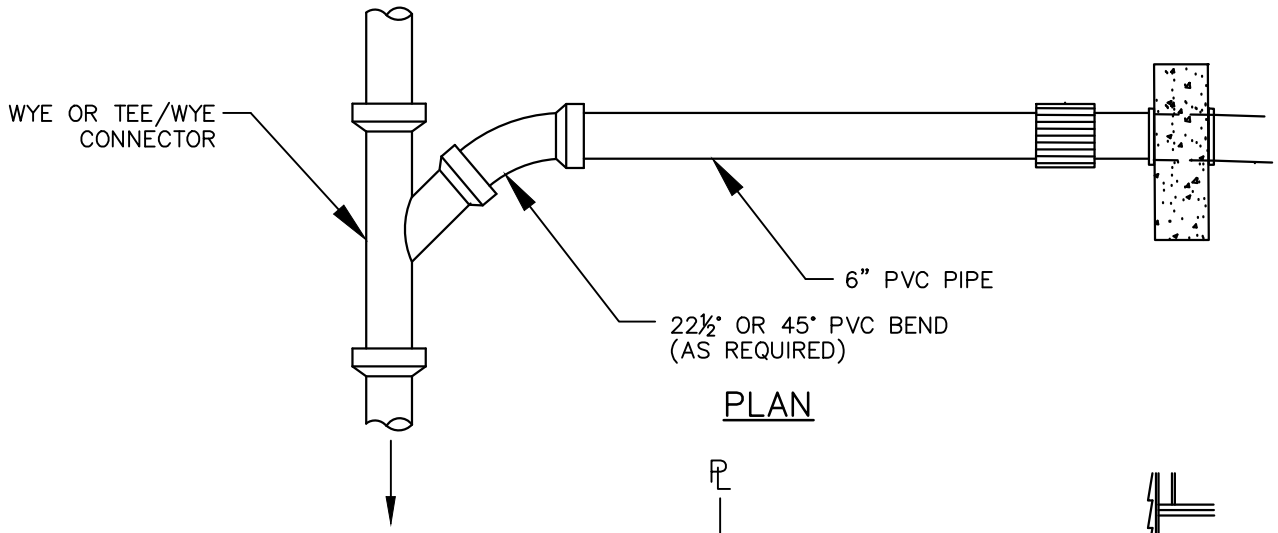
REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				SANITARY SEWER TRENCH
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE22.DWG		NO SCALE

PLATE 22.1

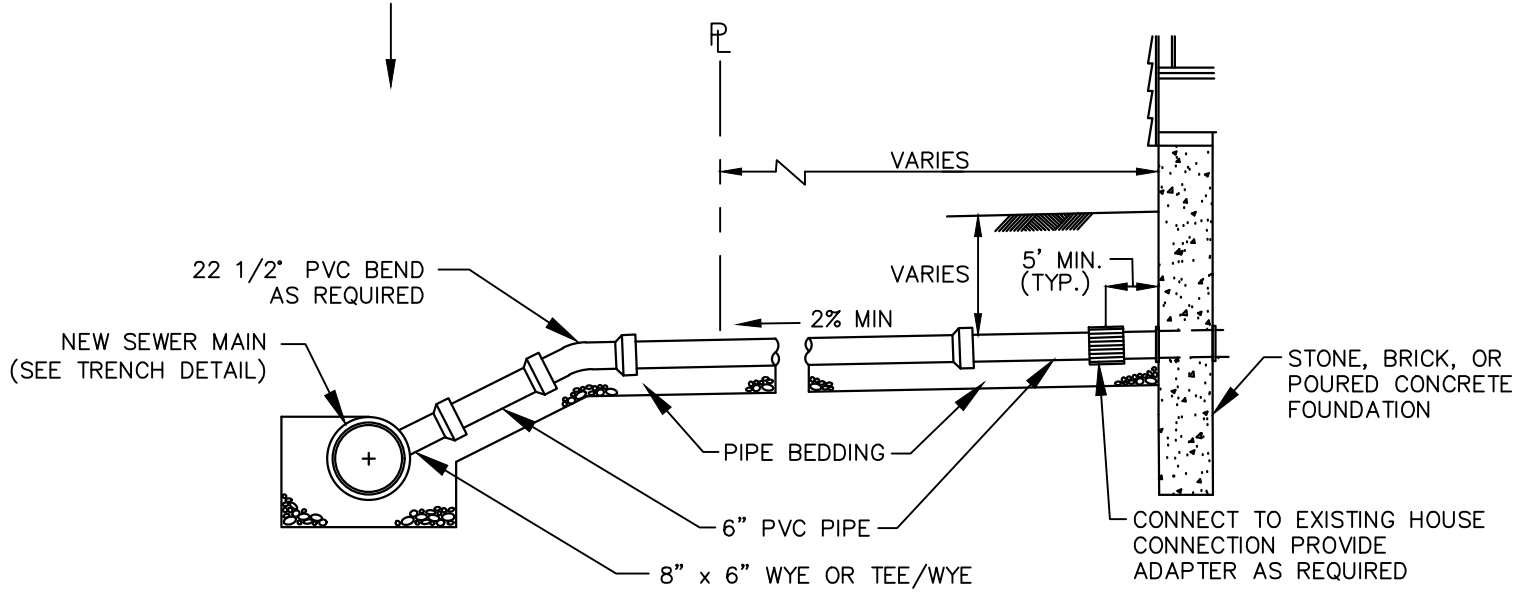


NOTE:
EXACT LOCATION AND ELEVATION OF SERVICE CONNECTIONS TO BE DETERMINED AND SET IN THE FIELD DURING CONSTRUCTION.

REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				SANITARY LATERAL STUB
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE22.DWG		NO SCALE — PLATE 22.2



PLAN



ELEVATION

NOTE:
EXACT LOCATION AND ELEVATION OF SERVICE CONNECTIONS TO BE DETERMINED IN THE FIELD DURING CONSTRUCTION.

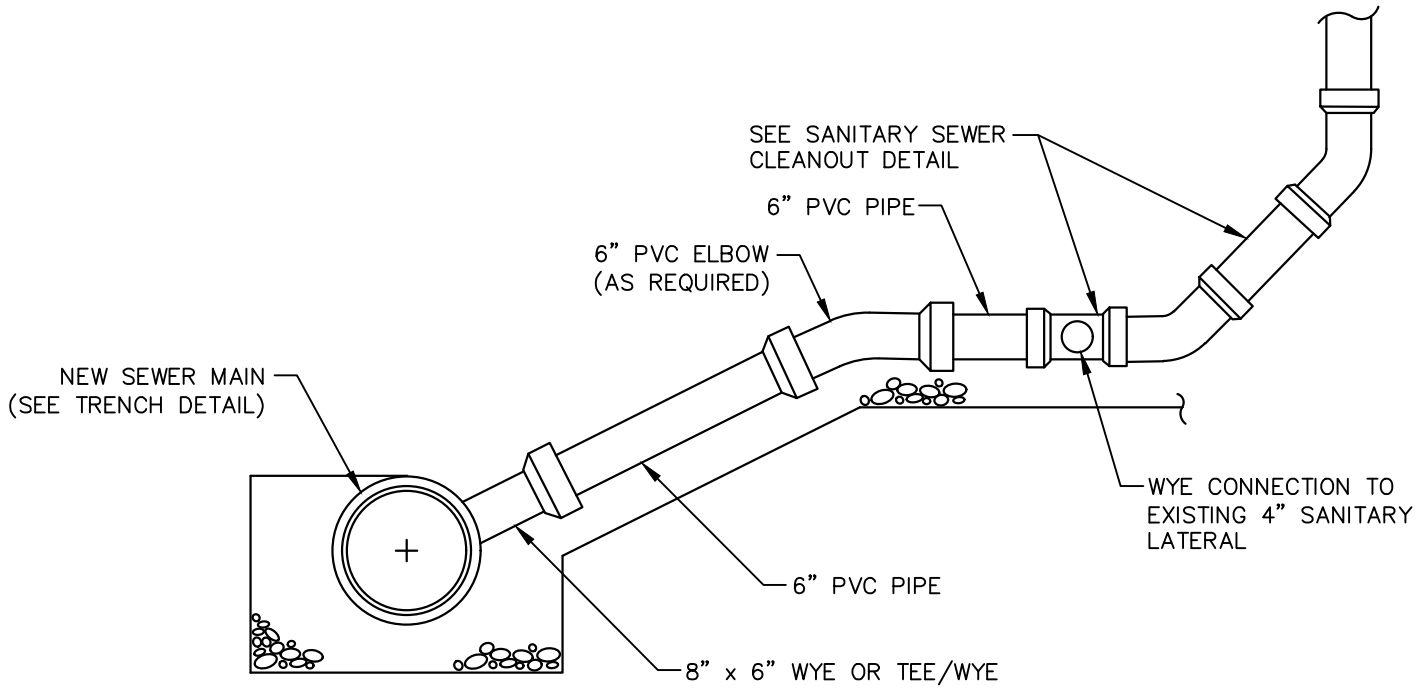
REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED
DRAWN BY: DG		CHECKED BY: JL	
DATE: OCT 2020		FILENAME: PLATE22.DWG	

TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

SANITARY LATERAL CONNECTION

NO SCALE

PLATE 22.3



NOTE:
CLEANOUTS SHALL BE INSTALLED AT ALL CUMULATIVE CHANGES OF LATERAL DIRECTION EXCEEDING 45°, AT A SPACING OF NO MORE THAN ONE HUNDRED FEET (100') AND WHERE DIRECTED BY THE TOWN.

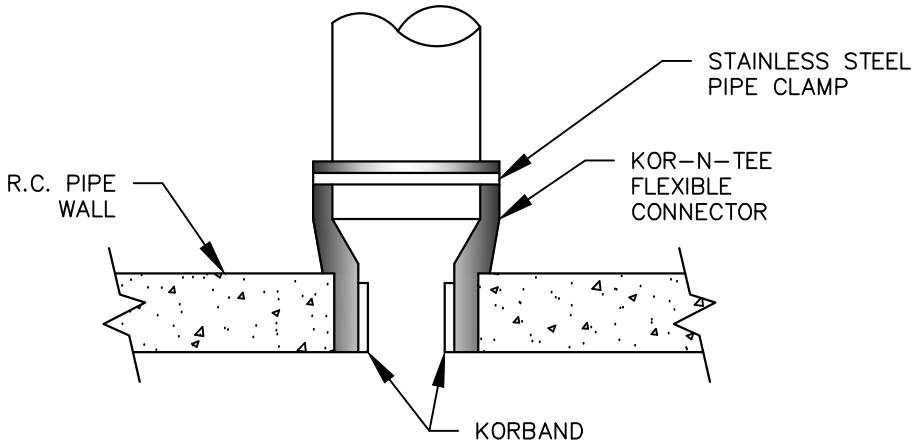
REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED
DRAWN BY: DG		CHECKED BY: JL	
DATE: OCT 2020		FILENAME: PLATE22.DWG	

TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

SANITARY LATERAL RECONNECTION

NO SCALE

PLATE 22.4



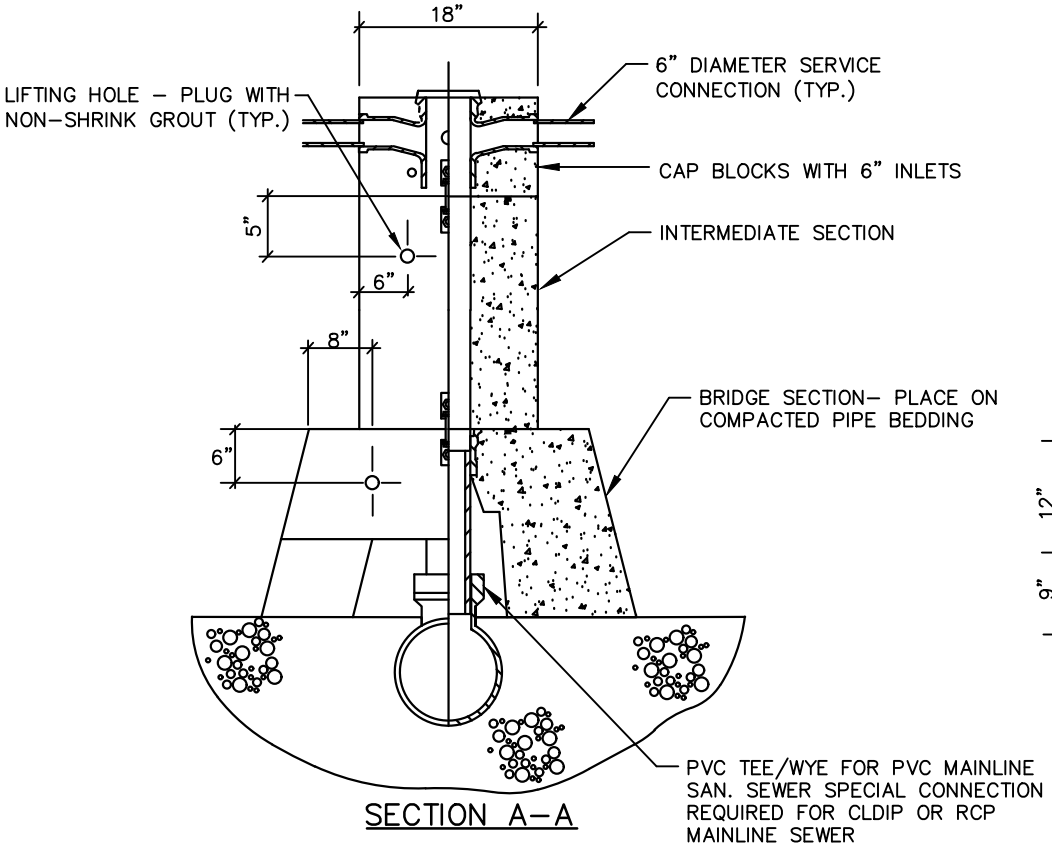
NOTE:
THE OPENING FOR THE KOR–N–TEE CONNECTOR MUST BE CORED USING EQUIPMENT AND PRACTICES RECOMMENDED BY THE MANUFACTURER.

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED

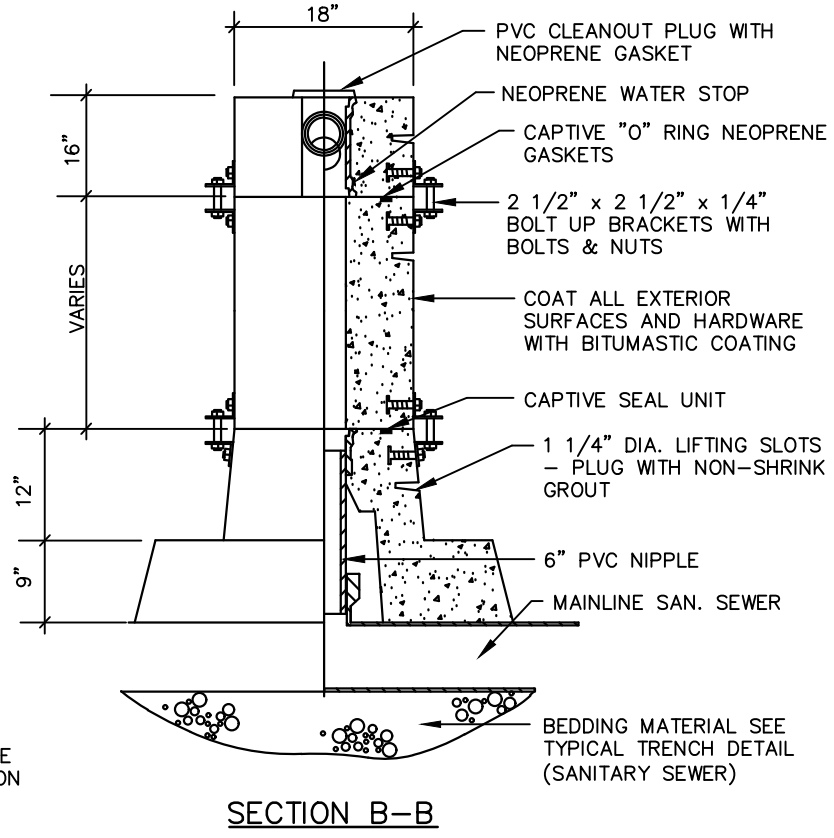
TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

SANITARY LATERAL CONNECTION TO RCP

DRAWN BY: DG	CHECKED BY: JL	NO SCALE	PLATE 22.5
DATE: OCT 2020	FILENAME: PLATE22.DWG		

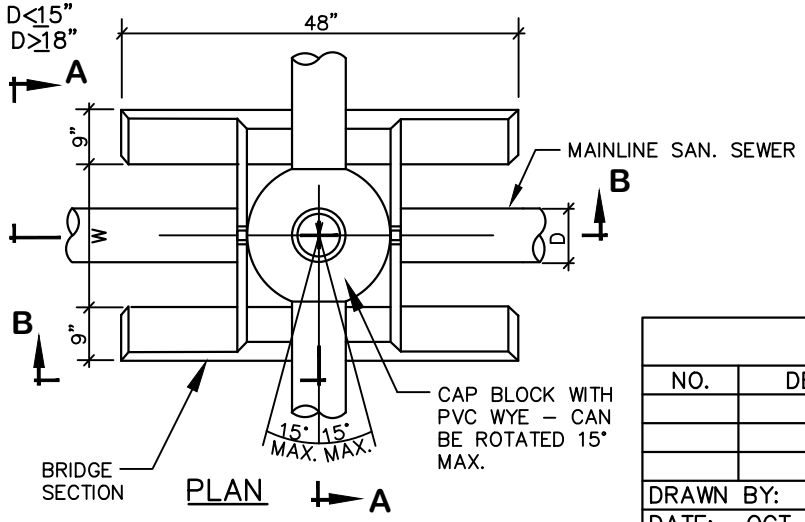


SECTION A–A



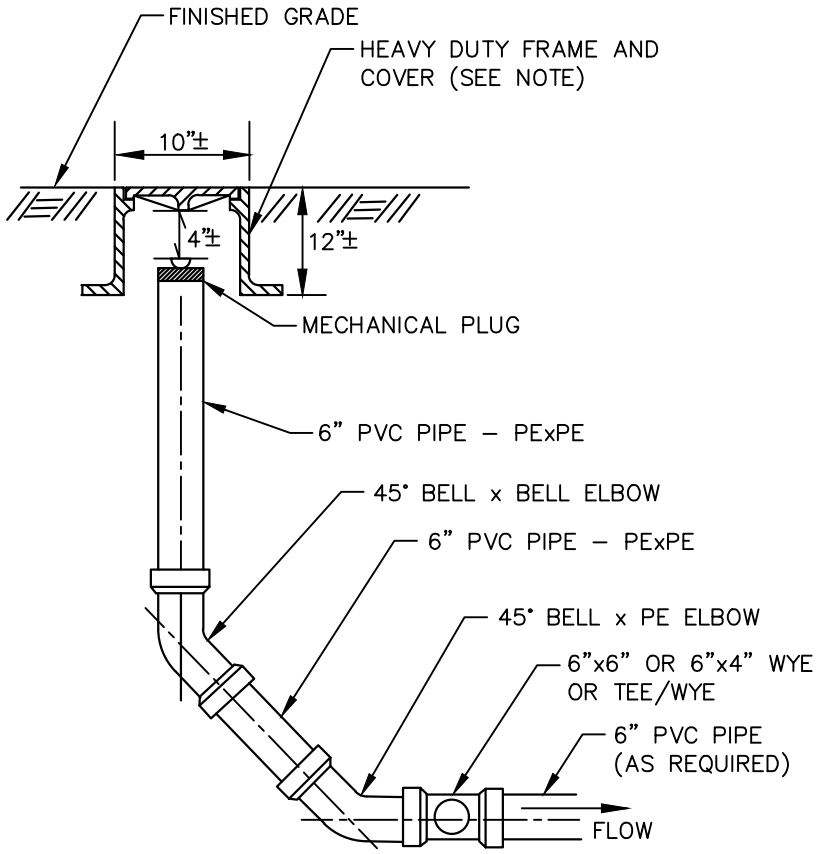
SECTION B–B

W=18" IF D≤15"
W=30" IF D≥18"



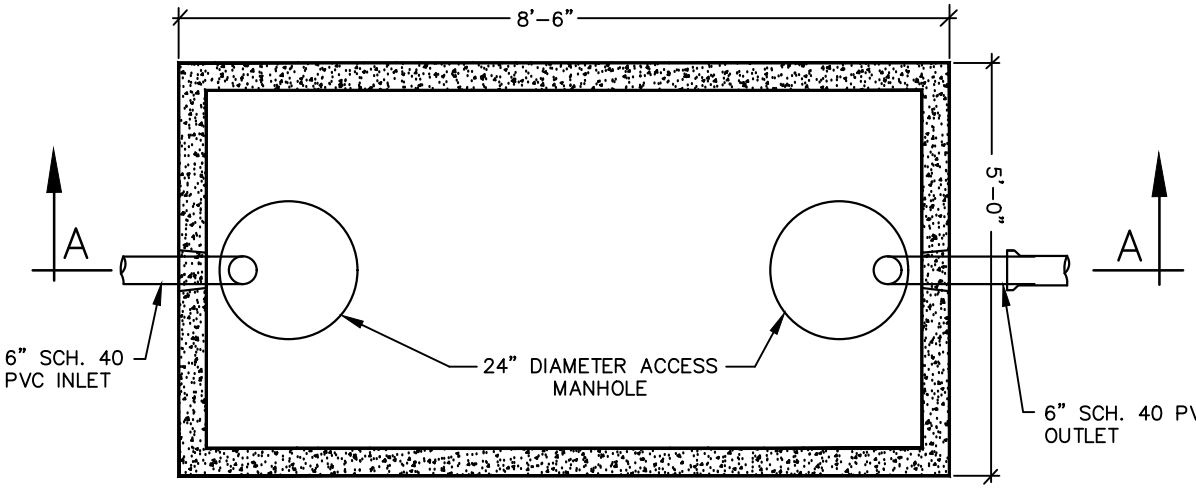
PLAN

REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				PRECAST CONCRETE CHIMNEY
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE22.DWG		NO SCALE PLATE 22.6

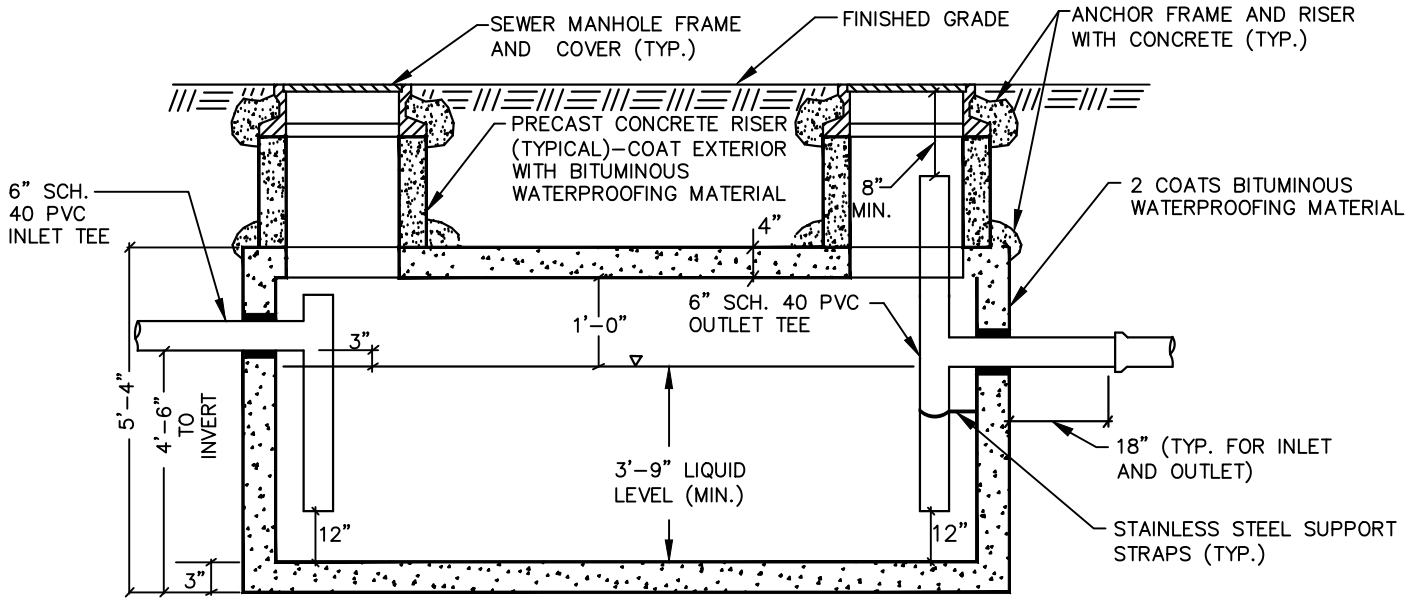


NOTE:
FRAMES AND COVERS LOCATED WITHIN PAVED AREAS MUST BE RATED FOR H20 LOADING.

REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
DRAWN BY: DG		CHECKED BY: JL		SANITARY SEWER CLEANOUT
DATE: OCT 2020		FILENAME: PLATE22.DWG		NO SCALE PLATE 22.7



PLAN VIEW

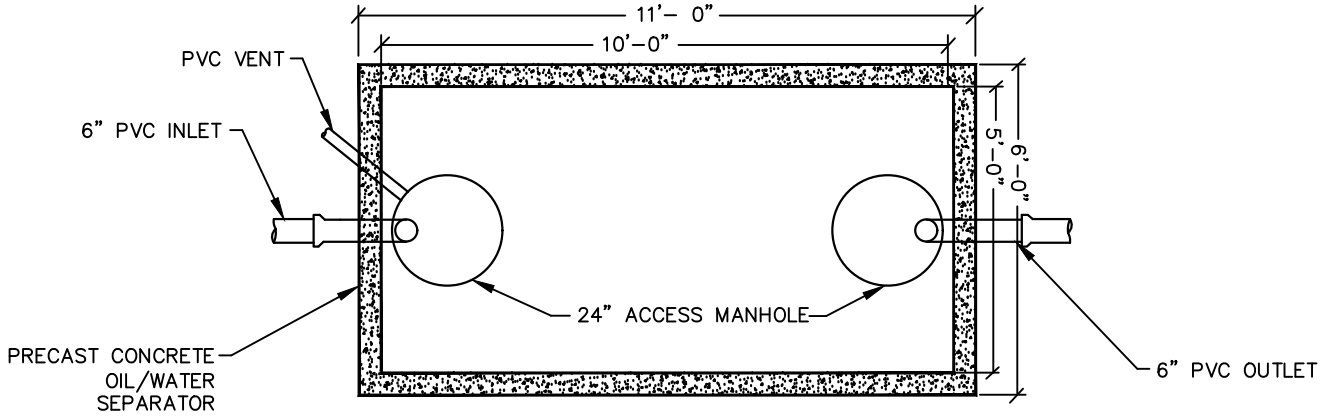


SECTION A-A

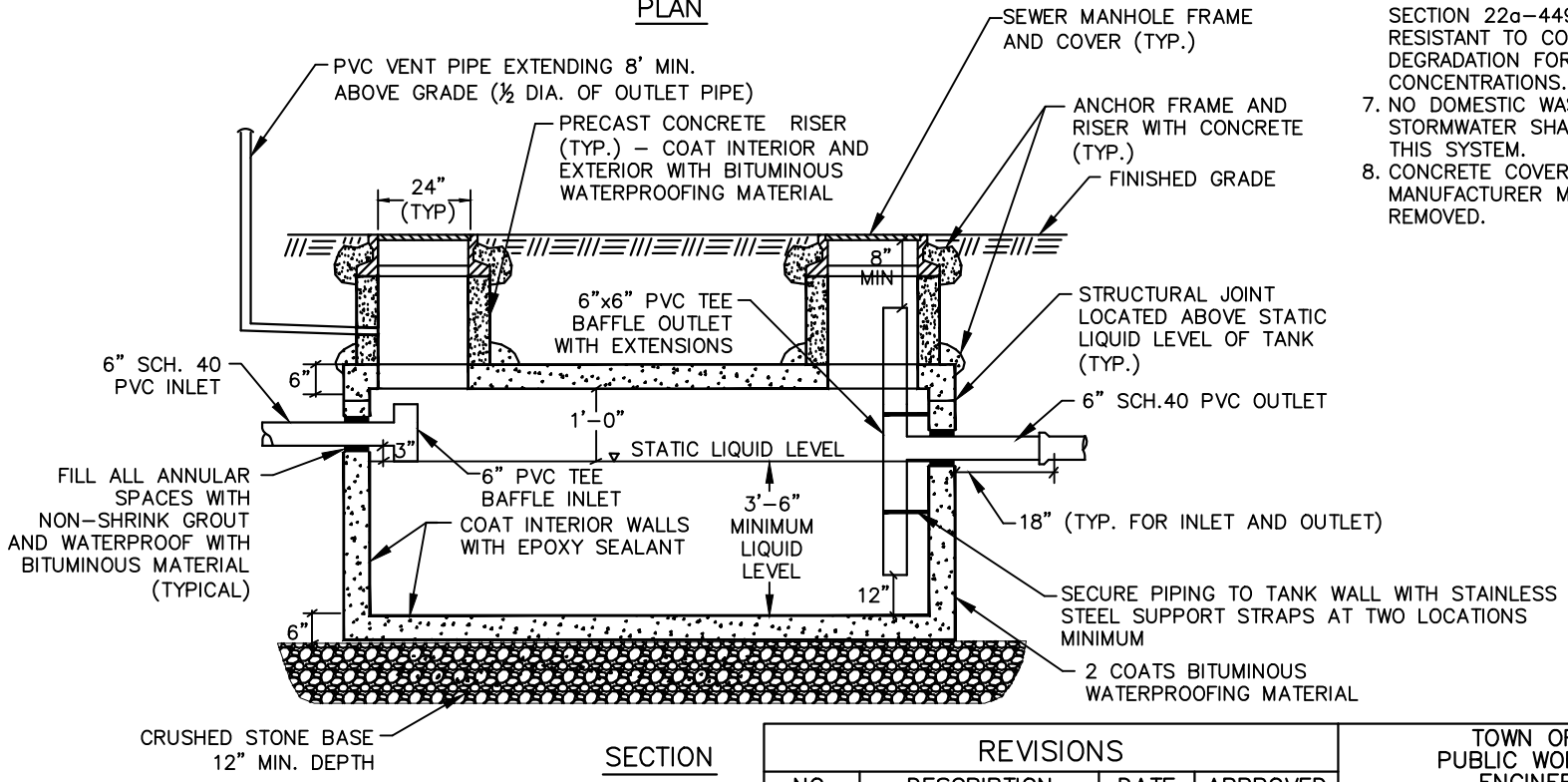
NOTES:
1. GREASE TRAPS SHALL HAVE A MINIMUM 1,000 GALLON CAPACITY (AS SHOWN ABOVE).
2. CONCRETE SHALL HAVE A MINIMUM STRENGTH OF 4,000 P.S.I. AT 28 DAYS.
3. REINFORCEMENT SHALL BE ASTM A615 (REBAR) GRADE 60 REINFORCEMENT AND ASTM A185 (WWF) WITH FY=60,000 PSI.
4. CONSTRUCTION JOINTS SHALL BE SEALED WITH 1" DIA. BUTYL RUBBER OR EQUAL.
5. DESIGN LOADING FOR STRUCTURE SHALL MEET AASHTO HS20-44.

REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				GREASE TRAP
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE23.DWG		NO SCALE

PLATE 23.1



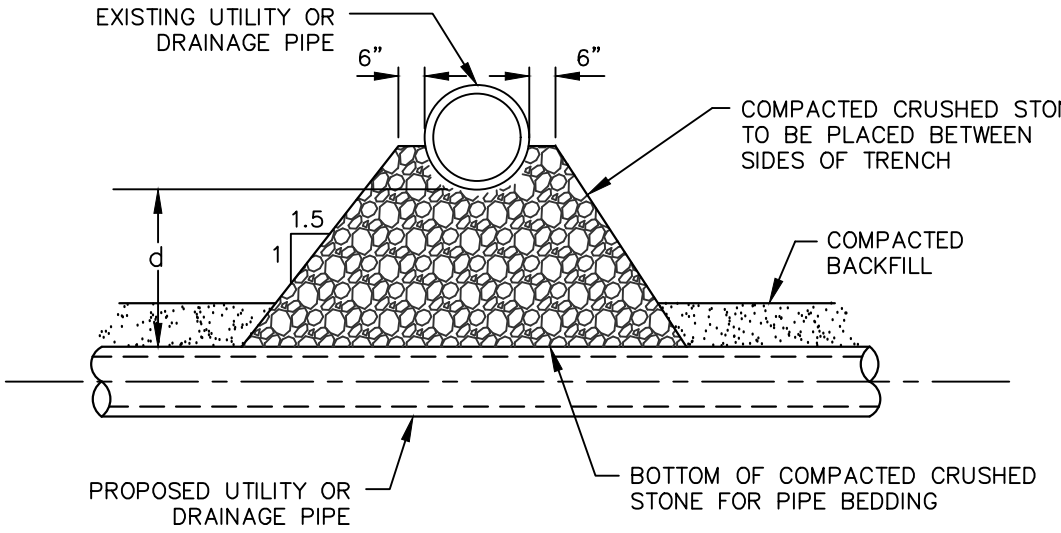
PLAN



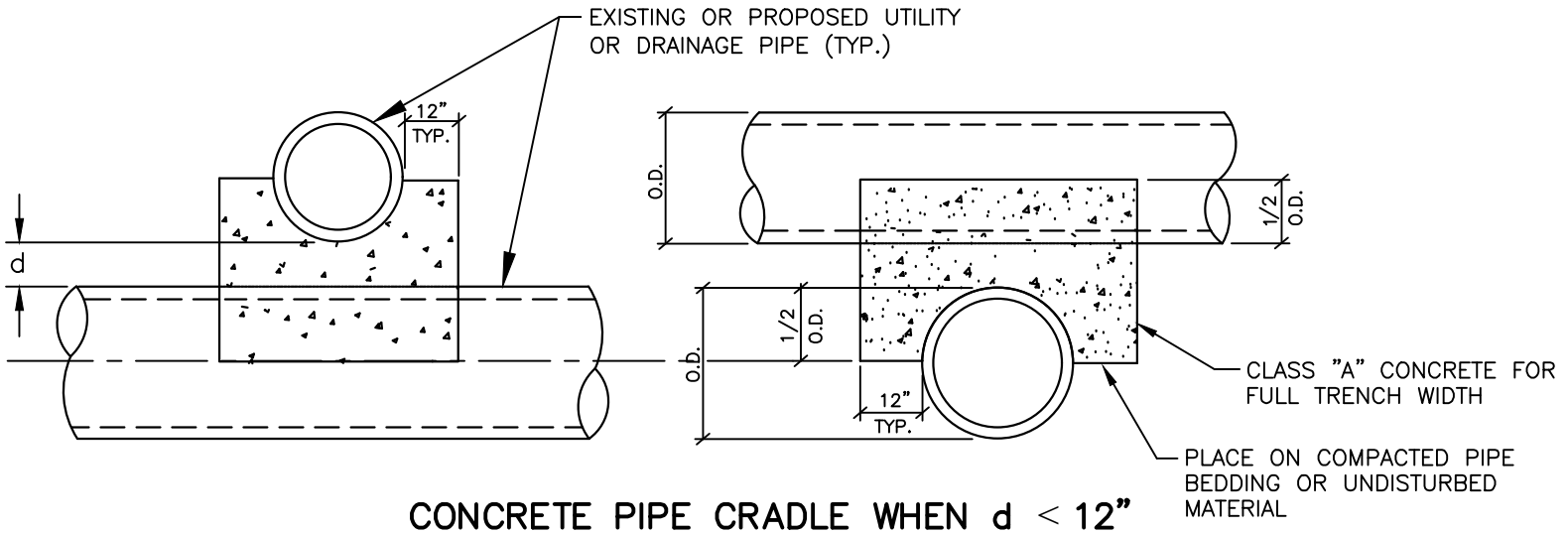
SECTION

NOTES:
1. OIL/WATER SEPARATORS SHALL HAVE A MINIMUM 1,000 GALLON CAPACITY (AS SHOWN).
2. CONCRETE SHALL HAVE A MINIMUM STRENGTH OF 5,000 P.S.I. AT 28 DAYS.
3. REINFORCEMENT SHALL BE ASTM A615 (REBAR) GRADE 60 REINFORCEMENT AND ASTM A185 (WWF) WITH FY=60,000 PSI.
4. CONSTRUCTION JOINTS SHALL BE SEALED WITH 1" DIA. BUTYL RUBBER OR EQUAL.
5. DESIGN LOADING FOR STRUCTURE SHALL MEET AASHTO HS20-44.
6. ALL MATERIALS SHALL BE DESIGNED, CONSTRUCTED, INSTALLED AND MAINTAINED IN CONFORMANCE WITH THE REGULATIONS OF CT STATE AGENCIES, SECTION 22a-449(d)-1(e) AND RESISTANT TO CORROSION AND DEGRADATION FOR ANTICIPATED CHEMICAL CONCENTRATIONS.
7. NO DOMESTIC WASTEWATER OR STORMWATER SHALL BE DISCHARGED TO THIS SYSTEM.
8. CONCRETE COVERS PROVIDED BY THE MANUFACTURER MUST BE PERMANENTLY REMOVED.

REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				OIL/WATER SEPARATOR
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE23.DWG		NO SCALE — PLATE 23.2



CRUSHED STONE SUPPORT WHEN d ≥12"

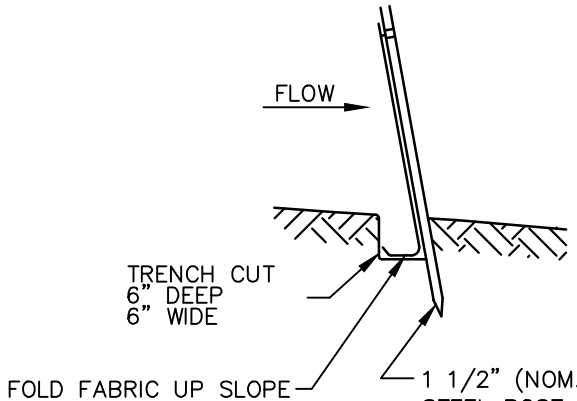


CONCRETE PIPE CRADLE WHEN d < 12"

NOTES:
1. d = DISTANCE BETWEEN UTILITY AND DRAINAGE PIPES.
2. SUPPORTS SHALL BE INSTALLED WHERE SPECIFIED ON THE PLANS AND WHERE DIRECTED BY THE TOWN.

REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				TYPICAL UTILITY SUPPORTS
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE24.DWG		NO SCALE

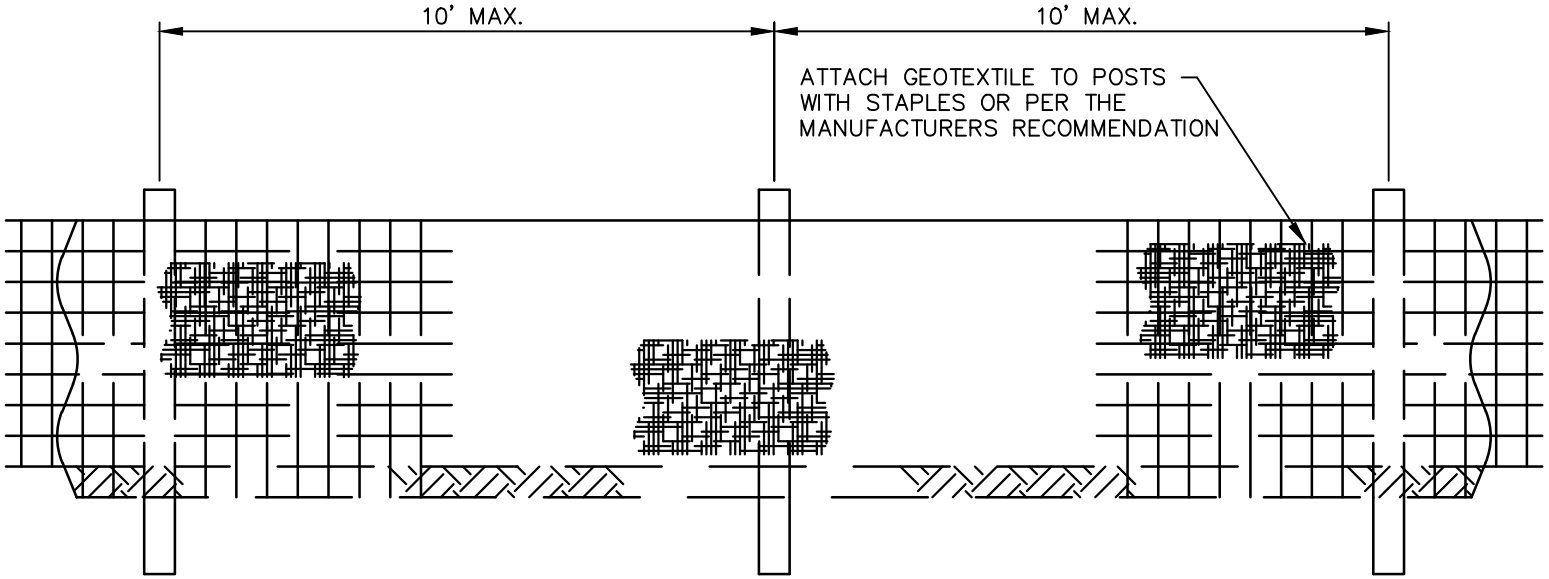
PLATE 24.1



NOTES:

1. SEDIMENT CONTROL FABRIC TO BE A GEOTEXTILE MATERIAL TREATED TO RESIST DEGRADATION FROM EXPOSURE TO SUNLIGHT.
2. FOR EACH SPECIFIC USE, ONLY GEOTEXTILES ON THE CONNECTICUT DEPARTMENT OF TRANSPORTATION APPROVED LIST ARE TO BE USED.
3. AFTER FOLDING FABRIC EDGE, BACKFILL TRENCH WITH ORIGINAL SOIL AND BUTTRESS THE SPLAY WITH MULCH OR LEAF LITTER.

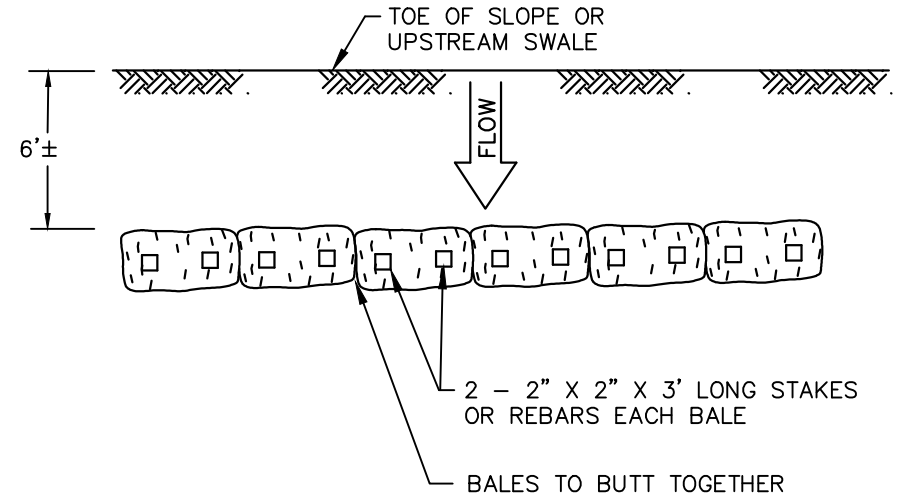
SECTION



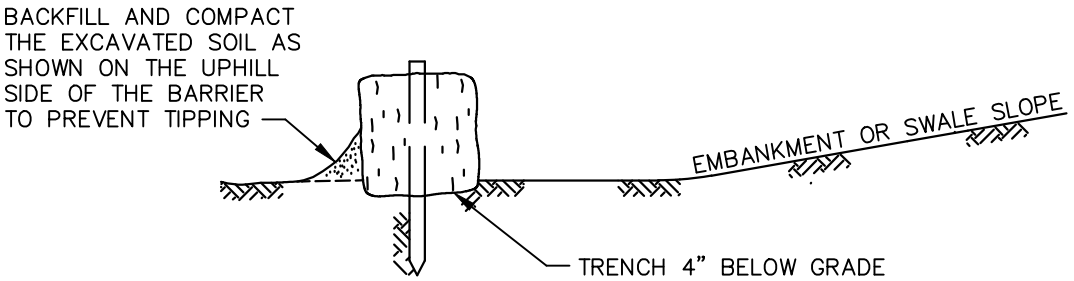
ELEVATION

REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				SILT FENCE
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE26.DWG		NO SCALE

PLATE 25.1



PLAN



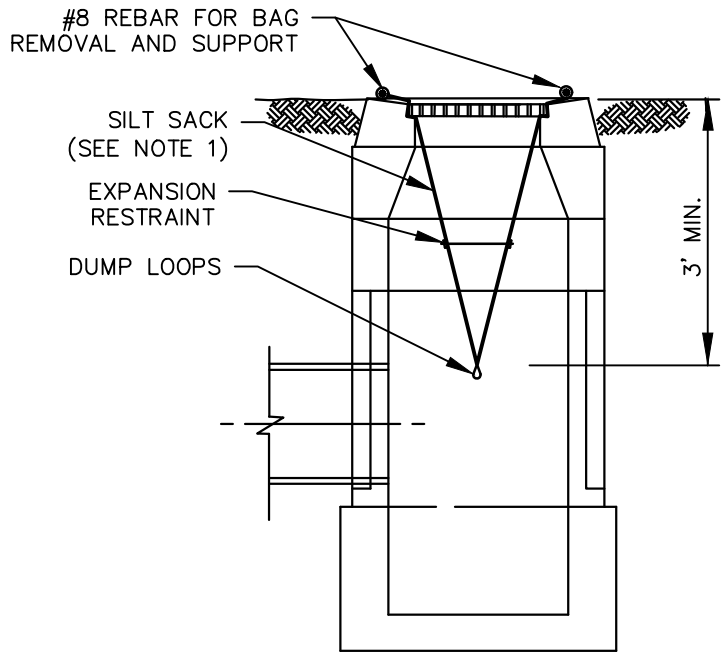
SECTION

NOTES:

1. HAY BALES SHALL BE MAINTAINED AND/OR REPLACED AS REQUIRED OR AS DIRECTED BY THE TOWN.
2. PLACE HAY BALES SUCH THAT TWINE OR BINDING WIRE IS PARALLEL TO THE EXISTING GROUND.

REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				HAY BALES
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE26.DWG		NO SCALE

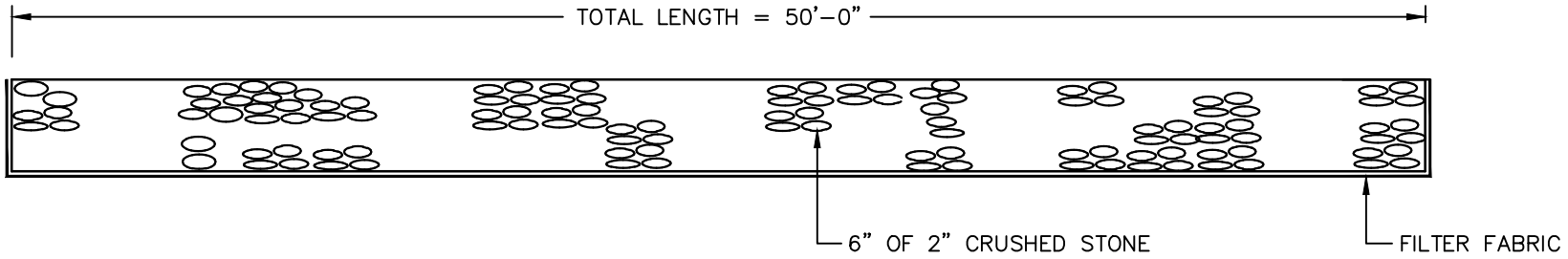
PLATE 25.2



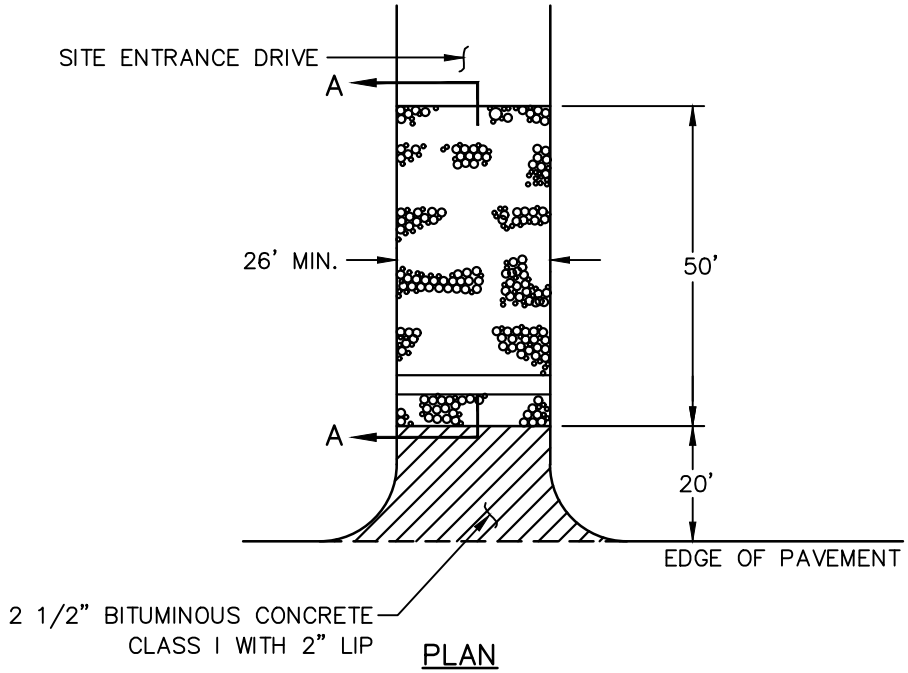
NOTES:

1. SILT SACKS SHALL BE HI-FLOW SILTSACK® 'TYPE A' FOR TYPE "C-L" CB TOPS AND 'TYPE B' WITH CURB DEFLECTORS FOR TYPE "C" CB TOPS OR OTHER STRUCTURES WITH CURB INLETS AS MANUFACTURED BY ACF ENVIRONMENTAL, INC OR APPROVED EQUAL.
2. SILT SACKS SHALL BE PROVIDED WITH INTERNAL OVERFLOWS.
3. SILT SACKS SHALL BE EMPTIED WHEN THEY HAVE COLLECTED 6" TO 12" OF SEDIMENT. INSPECT EVERY 1 TO 2 WEEKS AND AFTER EVERY MAJOR RAINFALL EVENT.

REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				SILT SACK
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE26.DWG		NO SCALE — PLATE 25.3



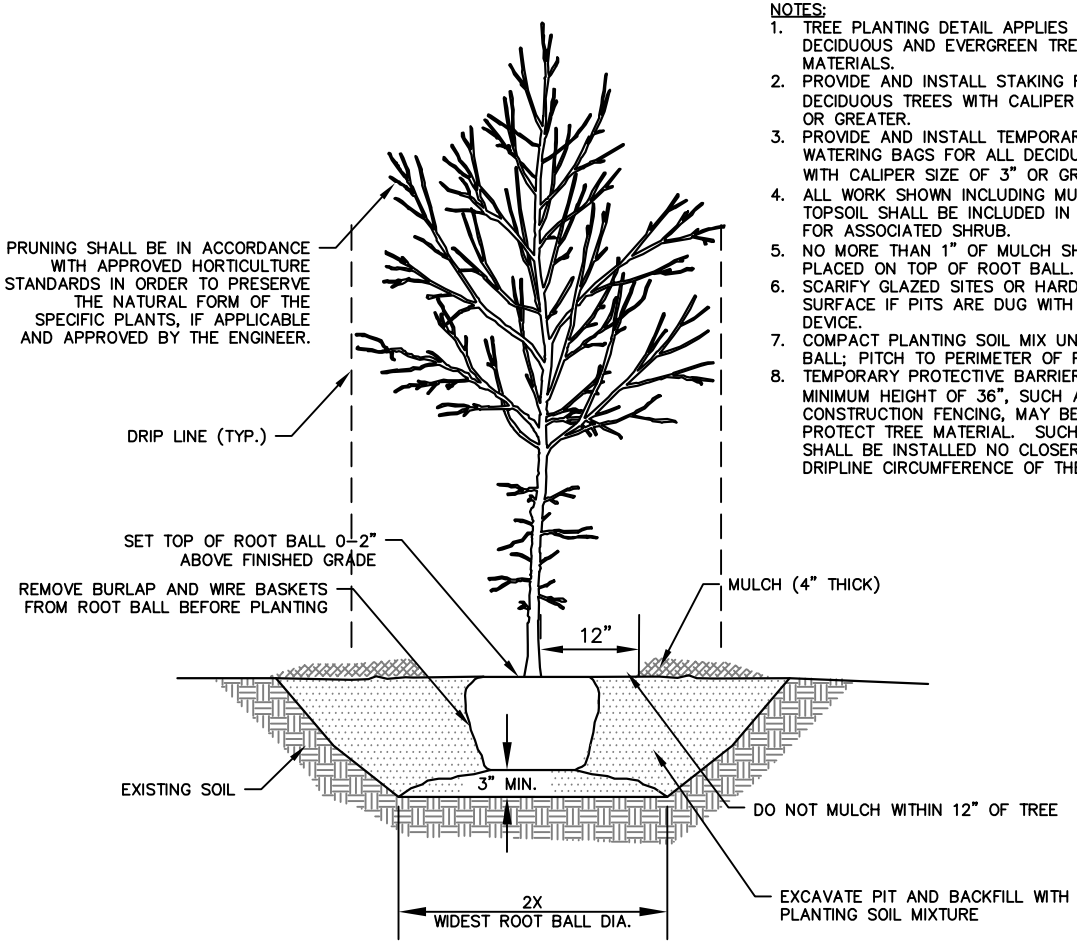
SECTION A – A



PLAN

NOTES:
1. MAINTAIN PAVEMENT AT APRON IN GOOD CONDITION THROUGHOUT THE CONSTRUCTION PERIOD.
2. ROADWAY SHALL BE SWEPT DAILY TO REMOVE ANY MATERIAL THAT MAY BE TRACKED ONTO THE PAVEMENT.
3. FOR INDIVIDUAL RESIDENTIAL LOTS, THE LENGTH OF CONSTRUCTION ENTRANCE MAY BE REDUCED TO 20' MINIMUM AND THE WIDTH MAY BE REDUCED TO 12' MINIMUM.

REVISIONS				TOWN OF MANCHESTER PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION
NO.	DESCRIPTION	DATE	APPROVED	
				CONSTRUCTION ENTRANCE
DRAWN BY: DG		CHECKED BY: JL		
DATE: OCT 2020		FILENAME: PLATE26.DWG		NO SCALE — PLATE 25.4



NOTES:

1. TREE PLANTING DETAIL APPLIES TO BOTH DECIDUOUS AND EVERGREEN TREE MATERIALS.
2. PROVIDE AND INSTALL STAKING FOR ALL DECIDUOUS TREES WITH CALIPER SIZE OF 3" OR GREATER.
3. PROVIDE AND INSTALL TEMPORARY TREE WATERING BAGS FOR ALL DECIDUOUS TREES WITH CALIPER SIZE OF 3" OR GREATER.
4. ALL WORK SHOWN INCLUDING MULCH AND 4" TOPSOIL SHALL BE INCLUDED IN PAYMENT FOR ASSOCIATED SHRUB.
5. NO MORE THAN 1" OF MULCH SHALL BE PLACED ON TOP OF ROOT BALL.
6. SCARIFY GLAZED SITES OR HARDENED SURFACE IF PITS ARE DUG WITH AUGERING DEVICE.
7. COMPACT PLANTING SOIL MIX UNDER ROOT BALL; PITCH TO PERIMETER OF PIT
8. TEMPORARY PROTECTIVE BARRIER WITH A MINIMUM HEIGHT OF 36", SUCH AS CONSTRUCTION FENCING, MAY BE USED TO PROTECT TREE MATERIAL. SUCH BARRIER SHALL BE INSTALLED NO CLOSER THAN THE DRIPLINE CIRCUMFERENCE OF THE PLANTING.

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED

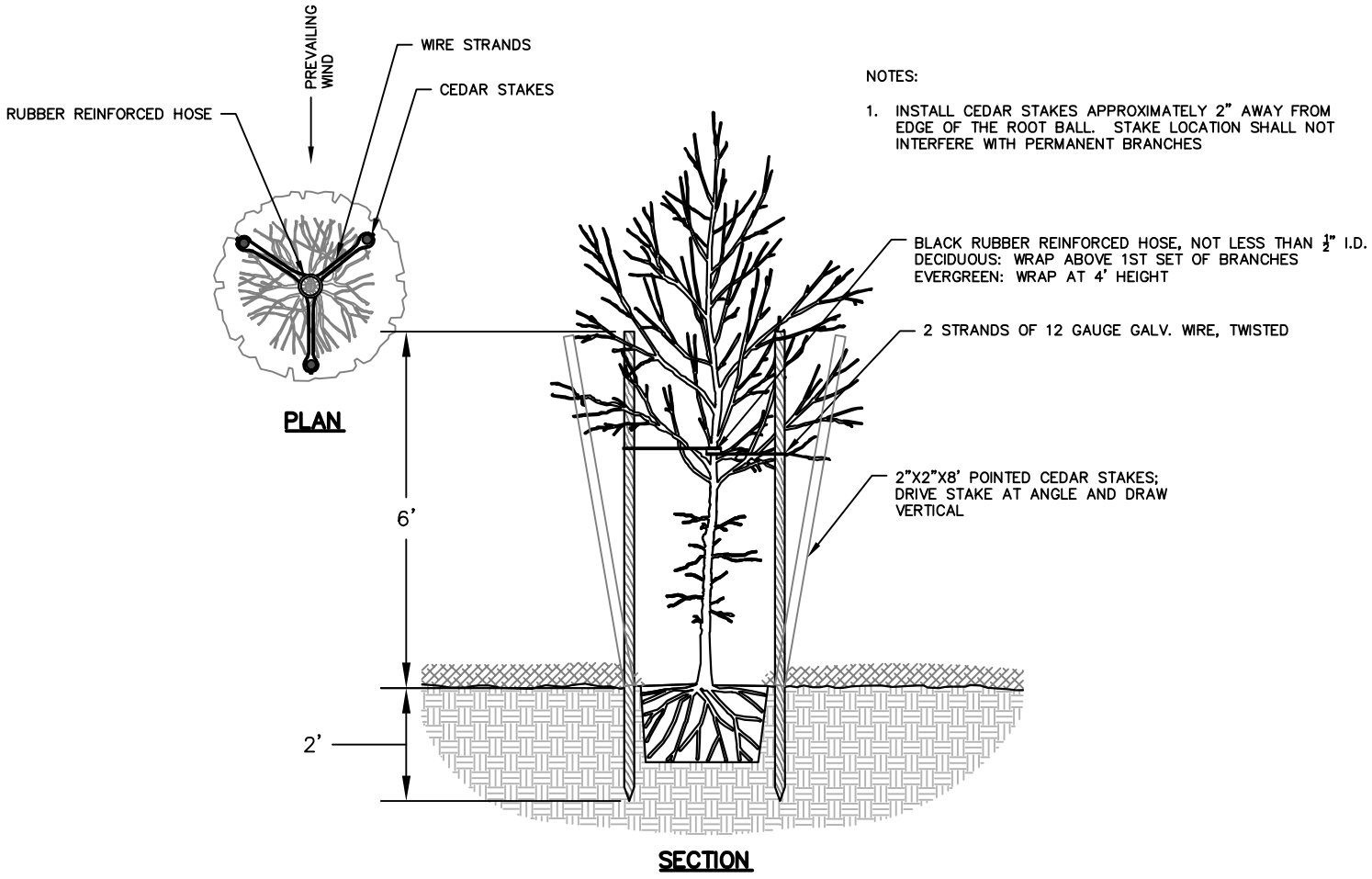
TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

TREE PLANTING

DRAWN BY: DG	CHECKED BY: JL
DATE: OCT 2020	FILENAME: PLATE27.DWG

NO SCALE

PLATE 27.1



REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED
DRAWN BY: DG	CHECKED BY: JL		
DATE: OCT 2020	FILENAME: PLATE27.DWG		

TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

TREE STAKING

NO SCALE

PLATE 27.2

Appendix A

Right-of-Way and Water and Sewer Permit Application

Print

PERMIT APPLICATION FORM

PERMIT TYPE	PERMIT NUMBER	PERMIT DATES
Right of Way Permit ☐	Permit Number _____	Issue Date _____
Water & Sewer Permit ☐	CBYD Number _____	Expires On _____

LOCATION AND TYPE OF WORK

Work Site Address: _____ Estimated Start Date: _____

Property Owner: _____ Estimated Completion Date: _____

Description of Work: _____

Provide sketch of proposed work below or furnish additional drawing

APPLICANT INFORMATION

Name: _____ Field Contact: _____

Address: _____ 24-hour Phone: _____

City: _____ State: _____ Zip: _____ Email Address: _____

Phone: _____ Fax: _____ Plumbing License #: _____

CONTRACTOR INFORMATION (IF DIFFERENT THAN APPLICANT)

Name: _____ Field Contact: _____

Address: _____ 24-hour Phone: _____

City: _____ State: _____ Zip: _____ Email Address: _____

Phone: _____ Fax: _____ Plumbing License #: _____

I have read the applicable rules and regulations governing these permits and agree to abide by them.

Applicant Signature: _____ Owner ☐ Agent ☐ Date: _____

Town of Manchester
Engineering Division
494 Main Street
Manchester, CT 06040
Phone: (860) 647-3152
Fax: (860) 647-3140
www.townofmanchester.org

--FOR OFFICE USE ONLY--

Right of Way Permit Fee:	
Water & Sewer Permit Fee:	
Total Permit Fee:	
Date Paid:	
Check No.:	
Approved By:	

Town of Manchester
Right of Way and Water & Sewer Permit Requirements

In consideration of the grant by the Town of Manchester for a Right of Way and/or Water & Sewer Permit, the applicant, by signature of the permit, agrees, for itself and its agents, assigns, employees, contractors and/or subcontractors to adhere to the following rules while carrying out the work detailed in its application for such permit:

1. No other person, customer, contractor, developer or individual shall be allowed to operate water and sewer facilities. The Town of Manchester Water and Sewer Department will be the sole operator of its infrastructure.
2. Unauthorized use of, tampering with or causing degradation to the water distribution system, Water Treatment Plant (WTP), the sanitary sewer collection system and/or the Water Pollution Control Facility (WPCF) may result in prosecution in accordance with the applicable Federal, State and local laws, regulations and ordinances and the Rules and Regulations.
3. The road or roads on or around the work area will not be closed to traffic at any time while the work is being carried out without prior authorization by the Town. At least one lane, of minimum width of ten feet (10'), shall be maintained at all times.
4. Any and all portions of the road(s) disturbed by the applicant and/or its agents, assigns, employees, contractor and/or subcontractors shall be restored in accordance with the Town's *Public Improvements Standards*.
5. The applicant agrees to reimburse the Town for any expenses incurred by the Town for any work in connection with this Permit.
6. Applicant will comply with all laws, ordinances, rules and regulations of the Town and/or State (CTDOT, DPH, CBYD, PURA, and (CT-OSHA) while carrying out the work detailed in its application and permit. Applicant agrees to that it will promptly comply with any and all requests and/or orders related to such work issued by the Town and will hold the Town harmless for any and all injuries, (including death), and/or damage to property related to its work which may occur while such work is being carried out for its benefit.
7. The Permit will become null and void if the work for which such permit has been issued is not commenced within the calendar year of the issue date of the Permit.
8. The Applicant shall maintain throughout the duration of the permit the applicable bonding and insurance as required in the Town's *Regulations Governing Right of Way Permits*.
9. Any failure by the applicant, its agents, assigns, employees, contractors and/or subcontractors to adhere to the preceding rules, the Town's *Public Improvements Standards*, the Town's *Regulations Governing Right of Way Permits*, and the Town's *Water & Sewer Department Rules & Regulations* will result in the immediate revocation of the Permit. In addition, such failure will result in denial by the Town of further permits to the applicant.

Town of Manchester
Public Works Department
Engineering Division
PERMIT AND INSURANCE REQUIREMENTS

The Contractor must provide the following to the Manchester Engineering Division prior to approval of a Right-of-Way Permit and/or Water and Sewer Permit:

Surety Bond:	**$10,000** on attached Town of Manchester Permit Bond Form
Insurance Certificate:	1. General Aggregate: **$2,000,000** 2. Automobile: **$1,000,000** 3. Workmen's Compensation: **Statutory Limit** 4. Town of Manchester listed as **Additional Insured**
Permit Fees:	**$50** for Right-of-Way Permit Application **$50** for Water and Sewer Permit Application Additional fees required for inspection, connection to public utilities and installation of water meters are based on the current water and sewer rates published annually by the Water and Sewer Department. Contact the Maps and Records Unit at 860-647-3119 for additional information.

Effective Date: 7/1/2007 per Board of Directors

TOWN OF MANCHESTER, CONNECTICUT
PUBLIC WORKS DEPARTMENT

PERMIT BOND

KNOW ALL MEN BY THESE PRESENTS, That We

_____

_____

of the Town of _____, County of _____, and State of _____ as Principal and

_____

_____

having an office and place of business at

_____

_____

as Surety, as held and firmly bound unto the TOWN OF MANCHESTER, in the sum of

TEN THOUSAND Dollars ($10,000.00)

lawful money of the United States to be paid to the TOWN OF MANCHESTER for which payment well and truly to be made, we bind ourselves, our heirs, executors, and administrators and assigns, jointly and severally by these presents.

The condition of this obligation is such that:

WHEREAS, the above named principal has received, or may, upon his application receive, a permit or permits from the TOWN OF MANCHESTER to perform work on, about or adjacent to a highway within said TOWN OF MANCHESTER as is or may be particularly specified in said permit or permits, to which permit or permits reference is hereby made and are made a part hereof, and

WHEREAS, the said Principal has undertaken and does hereby agree to comply with all the rules, regulations and restrictions of said TOWN OF MANCHESTER in regard to said permit or permits.

NOW THEREFORE, if the said Principal shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions and agreements specified in said permit or permits, and shall well hand truly save harmless and indemnify the said TOWN OF MANCHESTER, from all damages an costs that the TOWN OF MANCHESTER may suffer, be liable for, or be compelled to pay, or in fact does pay, for any injuries or damages which may be caused by any action or work being carried on either by said Principal, his servants, agents or employees, under any permit or permits issued or which may be issued by said TOWN OF MANCHESTER or its authorized agent, or by reason of negligence or violation of any law on the part of said Principal, his servants, agents or employees, and shall further, indemnify said TOWN OF MANCHESTER for any expenses that said TOWN OF MANCHESTER may suffer be liable for, or be compelled to pay, or in fact does pay, in refilling openings or excavations, in removing cable guard railings, in removing trees, tree stumps and other obstructions, in replacing drainage involving driveways, and restoring pavements opened or excavated by said Principal, his servants, agents or employees to its former condition, then this obligation shall be void; otherwise to remain in full force an effect.

The Term of this bond shall be from _____ to _____
Signed Sealed and dated this _____ day of _____, 20_____.

Witness

_____ BY: _____

_____ BY: _____
Agent Representing Bond Company

STANDARD INSURANCE AND INDEMNIFICATION REQUIREMENTS
FOR BIDS, PERMITS AND THE USE OF ANY TOWN FACILITY

The successful bidder (Contractor) shall, within ten (10) business days of award notice or prior to the start of work, whichever occurs first, furnish a Certificate of Insurance, including automobile, comprehensive general liability, property damage liability, bodily injury liability and Workers' Compensation. If excavation is needed, XCU coverages must not be excluded. Certificate must list standard ISO coverages specifically excluded (i.e. completed operations, XCU, Contractual).

THE TOWN OF MANCHESTER (OWNER) MUST BE LISTED AS ADDITIONAL INSURED ON SUCH CERTIFICATE OF INSURANCE. ALL COMPANIES WRITING SUCH INSURANCE MUST BE APPROVED BY THE TOWN OF MANCHESTER.

VERAGES

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED, NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATED MAY BE ISSUED OR MAY PERTAIN. THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YY)	POLICY EXPIRATION DATE (MM/DD/YY)	ALL LIMITS IN THOUSANDS	
GENERAL LIABILITY ☐ COMMERCIAL GENERAL LIABILITY ☐ CLAIMS MADE ☐ OCCUR. ☐ OWNER'S CONTRACTOR'S PROT. ☐ _____				GENERAL AGGREGATE PRODUCTS-COMP/OPS AGGREGATE PERSONAL & ADVERTISING INJURY EACH OCCURRENCE FIRE DAMAGE (ANY ONE FIRE) MEDICAL EXPENSE (ANY ONE PERSON)	$2000 $1000 $1000 $1000 $50 $5
AUTOMOBILE ☐ ANY AUTO ☐ ALL OWNED AUTOS ☐ SCHEDULED AUTOS ☐ HIRED AUTOS ☐ NON-OWNED AUTOS ☐ GARAGE LIABILITY ☐				COMBINED SINGLE LIMIT BODILY INJURY (PER PERSON) BODILY INJURY (PER ACCIDENT) PROPERTY DAMAGE	$1000 $ $ $
EXCESS LIABILITY ☐ ☐ OTHER THAN UMBRELLA FORM				EACH OCCURRENCE $	AGGREGATE $
WORKER'S COMPENSATION AND EMPLOYERS' LIABILITY				STATUTORY $ (EACH ACCIDENT) $ (DISEASE-POLICY LIMIT) $ (DISEASE-EACH EMPLOYEE	
OTHER					

TION OF OPERATIONS/LOCATIONS/VEHICLES/RESTRICTIONS/SPECIAL ITEMS

THE TOWN OF MANCHESTER IS LISTED AS ADDITIONAL INSURED.

Should blasting be required, the "EACH OCCURRENCE" of the Commercial General Liability coverage must be increased to $2,000,000.

Should blasting be required, all of the necessary permits for the use of explosives shall be obtained from the Fire Marshal.

"NOTE: If an Umbrella Policy, or Excess Liability Policy is used to meet the minimum limits, it must be at least as broad in coverage as the underlying. ANY exceptions should be listed."

The Director of General Services may, should conditions warrant it, increase these limits. In the event that the insurance provided pursuant to the requirements herein does not provide protection to the Town of Manchester (Owner) for any reason, including the disclaimer of coverage, by any insurance carrier, or in the event that the successful bidder (Contractor) does not provide such insurance for any reason, the successful bidder (Contractor) shall, without delay, upon written notice from the Town of Manchester (Owner), comply with the following:

(a) The Contractor shall indemnify and hold harmless the Owner and, if applicable, the Engineer, and their agents and employees from and against all claims, damages, losses and expenses, including attorney's fees of counsel selected by the Owner, arising out of or resulting from the performance of the work, and/or the supplying of materials, provided that any such claim, damage, loss or expense (a) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property including the loss of use resulting therefrom and (b) is caused in whole or in part by any negligent act or omission of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder.

(b) In any and all claims against the Owner or the Engineer, if applicable, or any of their agents or employees by any employee of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation under this article shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any Subcontractor under Workers' Compensation Acts, Disability Benefit Acts or other employee benefit acts.

Revised 5-22-86
9-12-88

C:\OFFICE\WPWIN\WPDOCS\CHARTER.WPD

Town of Manchester
Public Works Department
Engineering Division
PERMIT PROCEDURES

Right-of-Way Permits and Water and Sewer Permits are issued at the Maps and Records Office in the Engineering Division which is located on the 2nd floor of the Lincoln Center at 494 Main Street. To ensure that our customers have all necessary information and to minimize any inconvenience when making application for a permit, the Town has developed this document for guidance. Please contact the Engineering Division at the phone numbers below with any questions regarding these procedures. Questions concerning other types of permits should be directed to the appropriate contacts listed below.

STEP NUMBER	REQUIRED INFORMATION/ DOCUMENT	SOURCE OF INFORMATION/DOCUMENT	COMMENTS
1	Call Before You Dig (CBYD) Number	Contact CBYD Monday-Friday 7:00 AM – 5:00 PM 1-800-922-4455 or 811	Whenever excavation is planned to be done utilizing power or mechanized equipment, CBYD must be contacted at least two (2) full working days prior to the proposed excavation. They will issue a CBYD number. This number must be presented at the time of application for Right-of-Way and Water and Sewer Permits to be issued.
2	State of Connecticut Dept. of Transportation Encroachment Permit	Contact CONNDOT District 1 Monday – Friday 7:30 AM – 4:00 PM 860-258-4540	If work is being done in the State of Connecticut right-of-way, then a copy of the State's Encroachment Permit must be presented at the time of application for Right-of-Way and Water and Sewer Permits to be issued.
3	Right-of-Way Permit	Contact Engineering / Maps and Records Office Monday – Friday 7:30 AM – 4:30 PM 860-647-5211 860-647-3157, OR 860-647-3119	If work is being done within the Town right-of-way, a Right-of-Way Permit application must be submitted at the time of application for a Water and Sewer Permit for the permit to be issued.
4	Water and Sewer Permit	Contact Engineering / Maps and Records Office Monday-Friday 8:00 AM – 4:30 PM 860-647-3119	Prior to making application for a Water and Sewer Permit, contact the Engineering Division to determine what fees apply, if any assessments are due, and to determine if any other information is required. All fees and assessments must be paid by a check made out to the "Town of Manchester" at the time of permit application.
5	Eighth Utilities District Sewer Permit	Contact Eighth Utilities District Monday – Friday 7:00 AM – 4:00 PM 860-643-6192	If connection is being made to the Eighth Utilities District Sanitary Sewer System, then a copy of the issued Water and Sewer Permit must be presented at the time of application for the District to be able to issue their Sewer Permit. **Issuance of a Water and Sewer Permit is required regardless of whether the property is to be served by public water or a private well.**

Appendix B

Driveway Curb Cut Application

TOWN OF MANCHESTER
PUBLIC WORKS DEPARTMENT
DRIVEWAY CURB CUT APPLICATION

Return completed and signed application to: Engineering Division, P.O. Box 191, Manchester, CT 06045

Applicant:

Name

Address

City, State, Zip

Phone

Signature

Agent:

Name

Address

City, State, Zip

Phone

Signature

Street Address: _____

Side of Street: ☐ North ☐ East ☐ West ☐ South

Distance from Nearest Intersection: _____ feet _____ of _____

Show existing layout, dimensions, proposed work and include lot and building lines, building location, proposed parking and driveway location, parked cars and all physical features within 10 feet of each side of the proposed driveway.

Width of Curb Cut: _____ Width of Driveway: _____

Building Line: _____ Zone: _____

No. of Parking Spaces: _____ No. of Dwelling Units: _____

--DO NOT WRITE BELOW THIS LINE--

☐ APPROVED ☐ DENIED

Permit No.:
Date:
Contractor:

Legal Traffic Authority Representative

Copy: Public Works Dept./Legal Traffic Authority/Zoning
January 2020

Appendix C

Minimum Plot Plan Requirements

Town of Manchester
Public Works Department
Engineering Division

MINIMUM PLOT PLAN REQUIREMENTS

Plot plans for all proposed principle buildings are to be plotted on 24" x 36" sheets at a scale not to exceed 1"= 40'. Plans showing existing conditions are to be certified and sealed by a Land Surveyor licensed in the State of Connecticut and prepared in accordance with the "Minimum Standards for Surveys and Maps in the State of Connecticut" as adopted by the Connecticut Association of Land Surveyors, Inc. on September 26, 1996, as amended. Plans showing proposed construction shall be prepared, certified and sealed by a Professional Engineer licensed in the State of Connecticut. Applicant shall submit three (3) copies of the plot plan with each application.

At a minimum, plot plans shall include the following information:

1. The property address, lot number and subdivision name (if applicable) within the title block - Contact the Engineering Division at 860-647-3152 for this information.

2. Owner names, addresses and lot numbers for all abutting properties.

3. Zone in which property is located. Contact the Zoning Enforcement Officer at 860-647-3057 for this information.

4. Lot area in both square feet and acres.

5. The front, side and rear building lines with appropriate labels.

6. Monumentation found, set or to be set (in accordance with the Town of Manchester Public Improvement Standards).

7. All proposed and existing easements on or abutting the subject lot with appropriate labels.

8. All existing and proposed topography for the property that is based on the same vertical datum as the approved subdivision plan and field verified (as required). Topography shall be shown in one-foot or two-foot contour intervals. Elevations on older approved lots and individual lots of record should be based on the most accessible vertical datum available. Provide a benchmark on the plot plan relative to the data submitted, which may be a field surveyed structure frame elevation in the vicinity. Contact the Engineering Division at 860-647-3152 for information on available record drawings and benchmarks.

9. Proposed house location with building dimensions and dimensions to property lines (minimum of three).

10. Elevations for proposed top of foundation wall, basement, garage and finished floors, and centerline of the road opposite the proposed driveway location.

11. Location of proposed foundation drains with labels identifying pipe size and type and proposed invert elevations at the foundation and the outlet, or other subsurface drainage (if applicable).

12. Location of proposed water and sanitary sewer laterals and mains with labels identifying pipe sizes and types or location of proposed well and septic system*.

13. Show all existing, proposed and/or deferred sidewalk with labels identifying type and width (place any deferment notes from the approved subdivision on the plan).

14. Show all curb type limits and driveway aprons with labels identifying material type (i.e. concrete, granite, bituminous).

15. Existing catch basins with labels identifying top of frame, invert elevations and pipe sizes and types along the frontage of the property.

16. All existing and proposed above and underground utilities along the frontage of the property.

17. Existing hydrants along the frontage of the property.

18. Existing utility and/or light poles adjacent to the property with labels identifying the owner and pole number.

19. Existing or proposed retaining walls (if applicable) with labels for top and bottom of wall elevations.

20. Limits of inland wetland and/or flood zone (if applicable). If no wetlands are within 100' and no flood zone exists on the property, then add an appropriate note to the plan.

21. Maximum limits of clearing.

22. Proposed erosion and sedimentation control measures such as silt fence, haybales, construction entrances, etc. and all associated details.

23. Topsoil stockpile area with an appropriate erosion and sedimentation control barrier.

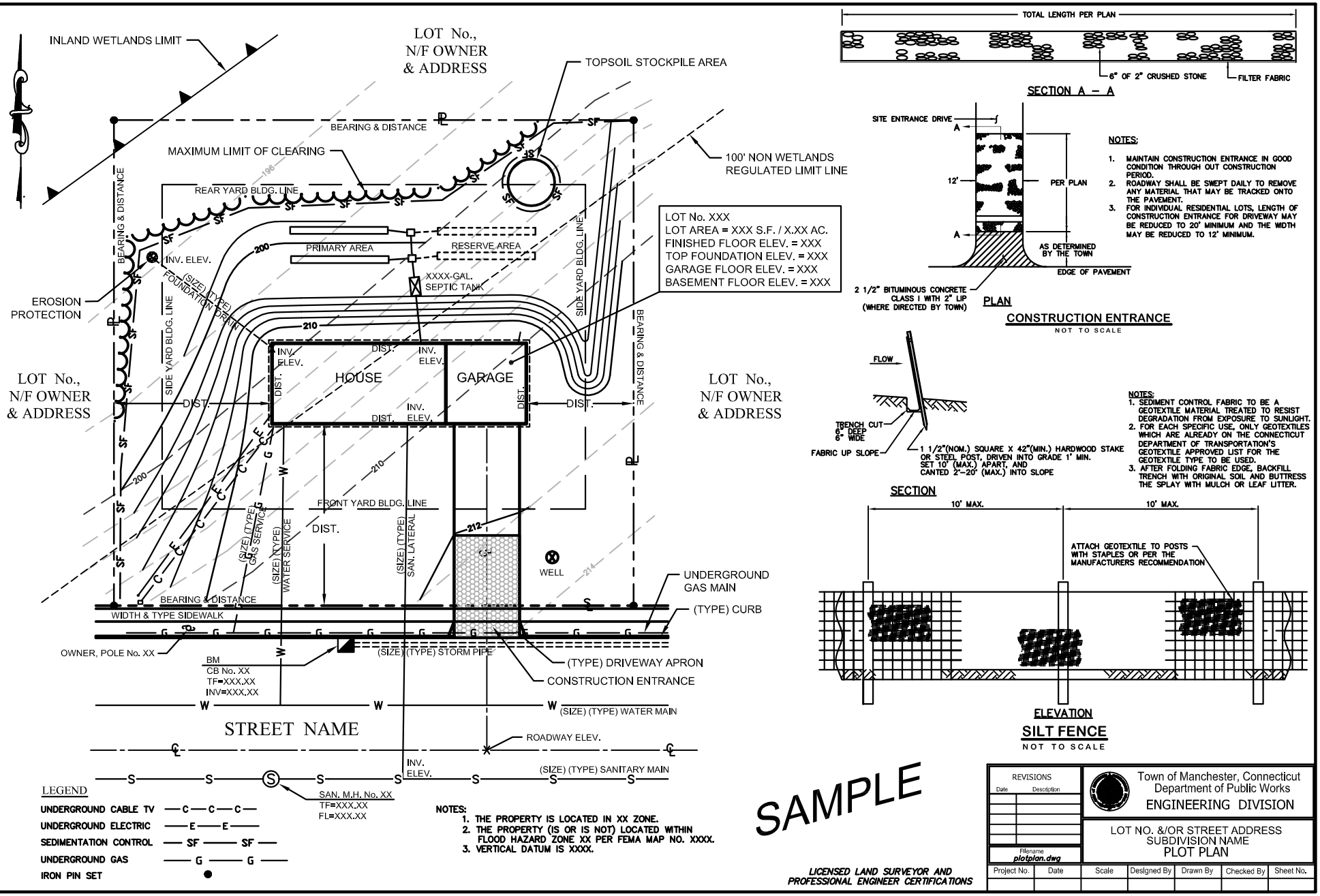
24. Map reference(s), if applicable.

25. Complete Legend and North Arrow.

* If the development will require a potable well and/or septic system, contact the Town of Manchester Health Department at 860-647-3173 for specific requirements.

Note that these are the minimum submission requirements; the Town reserves the right to request additional information as required for review of the application.

See the "Sample Plot Plan" on the reverse for examples and additional requirements.


INLAND WETLANDS LIMIT
LOT No.,
N/F OWNER
& ADDRESS
TOPSOIL STOCKPILE AREA
BEARING & DISTANCE
MAXIMUM LIMIT OF CLEARING
100' NON WETLANDS
REGULATED LIMIT LINE
REAR YARD BLDG. LINE
LOT No. XXX
LOT AREA = XXX S.F. / X.XX AC.
FINISHED FLOOR ELEV. = XXX
TOP FOUNDATION ELEV. = XXX
GARAGE FLOOR ELEV. = XXX
BASEMENT FLOOR ELEV. = XXX
PRIMARY AREA
RESERVE AREA
INV. ELEV.
XXXX-GAL.
SEPTIC TANK
(SIZE) (TYPE)
FOUNDATION DRAIN
EROSION
PROTECTION
SIDE YARD BLDG. LINE
HOUSE
GARAGE
DIST.
FRONT YARD BLDG. LINE
WELL
UNDERGROUND
GAS MAIN
(TYPE) CURB
WIDTH & TYPE SIDEWALK
OWNER, POLE No. XX
BM
CB No. XX
TF=XXX.XX
INV=XXX.XX
(SIZE) (TYPE) STORM PIPE
(TYPE) DRIVEWAY APRON
CONSTRUCTION ENTRANCE
(SIZE) (TYPE) WATER MAIN
STREET NAME
ROADWAY ELEV.
(SIZE) (TYPE) SANITARY MAIN
SAN. M.H. No. XX
TF=XXX.XX
FL=XXX.XX
LEGEND
UNDERGROUND CABLE TV
UNDERGROUND ELECTRIC
SEDIMENTATION CONTROL
UNDERGROUND GAS
IRON PIN SET
NOTES:
1. THE PROPERTY IS LOCATED IN XX ZONE.
2. THE PROPERTY (IS OR IS NOT) LOCATED WITHIN FLOOD HAZARD ZONE XX PER FEMA MAP NO. XXXX.
3. VERTICAL DATUM IS XXXX.
TOTAL LENGTH PER PLAN
6" OF 2" CRUSHED STONE
FILTER FABRIC
SECTION A – A
SITE ENTRANCE DRIVE
12'
PER PLAN
AS DETERMINED BY THE TOWN
EDGE OF PAVEMENT
2 1/2" BITUMINOUS CONCRETE CLASS I WITH 2" LIP (WHERE DIRECTED BY TOWN)
PLAN
NOTES:
1. MAINTAIN CONSTRUCTION ENTRANCE IN GOOD CONDITION THROUGH OUT CONSTRUCTION PERIOD.
2. ROADWAY SHALL BE SWEPT DAILY TO REMOVE ANY MATERIAL THAT MAY BE TRACKED ONTO THE PAVEMENT.
3. FOR INDIVIDUAL RESIDENTIAL LOTS, LENGTH OF CONSTRUCTION ENTRANCE FOR DRIVEWAY MAY BE REDUCED TO 20' MINIMUM AND THE WIDTH MAY BE REDUCED TO 12' MINIMUM.
CONSTRUCTION ENTRANCE
NOT TO SCALE
FLOW
TRENCH CUT
6" DEEP
6" WIDE
FABRIC UP SLOPE
1 1/2"(NOM.) SQUARE X 42"(MIN.) HARDWOOD STAKE OR STEEL POST, DRIVEN INTO GRADE 1' MIN. SET 10' (MAX.) APART, AND CANTED 2'-20' (MAX.) INTO SLOPE
NOTES:
1. SEDIMENT CONTROL FABRIC TO BE A GEOTEXTILE MATERIAL TREATED TO RESIST DEGRADATION FROM EXPOSURE TO SUNLIGHT.
2. FOR EACH SPECIFIC USE, ONLY GEOTEXTILES WHICH ARE ALREADY ON THE CONNECTICUT DEPARTMENT OF TRANSPORTATION'S GEOTEXTILE APPROVED LIST FOR THE GEOTEXTILE TYPE TO BE USED.
3. AFTER FOLDING FABRIC EDGE, BACKFILL TRENCH WITH ORIGINAL SOIL AND BUTTRESS THE SPLAY WITH MULCH OR LEAF LITTER.
SECTION
10' MAX.
10' MAX.
ATTACH GEOTEXTILE TO POSTS WITH STAPLES OR PER THE MANUFACTURERS RECOMMENDATION
ELEVATION
SILT FENCE
NOT TO SCALE
SAMPLE
LICENSED LAND SURVEYOR AND PROFESSIONAL ENGINEER CERTIFICATIONS
REVISIONS
Date
Description
Filename
plotplan.dwg
Town of Manchester, Connecticut
Department of Public Works
ENGINEERING DIVISION
LOT NO. &/OR STREET ADDRESS
SUBDIVISION NAME
PLOT PLAN
Project No.
Date
Scale
Desigined By
Drawn By
Checked By
Sheet No.

Appendix D

Minimum Record (As-Built) Drawing Requirements

Town of Manchester
Public Works Department
Engineering Division

MINIMUM RECORD (AS-BUILT) DRAWING REQUIREMENTS

Record drawings for all subdivisions, private developments and other work regulated by these Public Improvement Standards are to be plotted on 24" x 36" sheets at the same scale shown on the approved subdivision or private site development plans. Plans are to be certified and sealed by a Land Surveyor licensed in the State of Connecticut and prepared in accordance with the "Minimum Standards for Surveys and Maps in the State of Connecticut" as adopted by the Connecticut Association of Land Surveyors, Inc. on September 26, 1996, as amended.

Record drawings shall be based on the Town of Manchester Horizontal and Vertical Control Network as established in 1998 utilizing published CTDOT values. The horizontal values are based on NAD 83 and the vertical values are based on NAVD 88 utilizing the Geoid 96 model. When using either traditional terrestrial survey methods or utilizing GPS, site values are to be localized with the existing network. Adequate care and methods shall be utilized in accordance the "Minimum Standards for Surveys and Maps in the State of Connecticut" as referenced herein. Plans must be certified by a land surveyor licensed in the State of Connecticut. Plan shall be submitted on 24" x 36" sheets on mylar that is no less than 0.004 inch (4 mils) thickness.

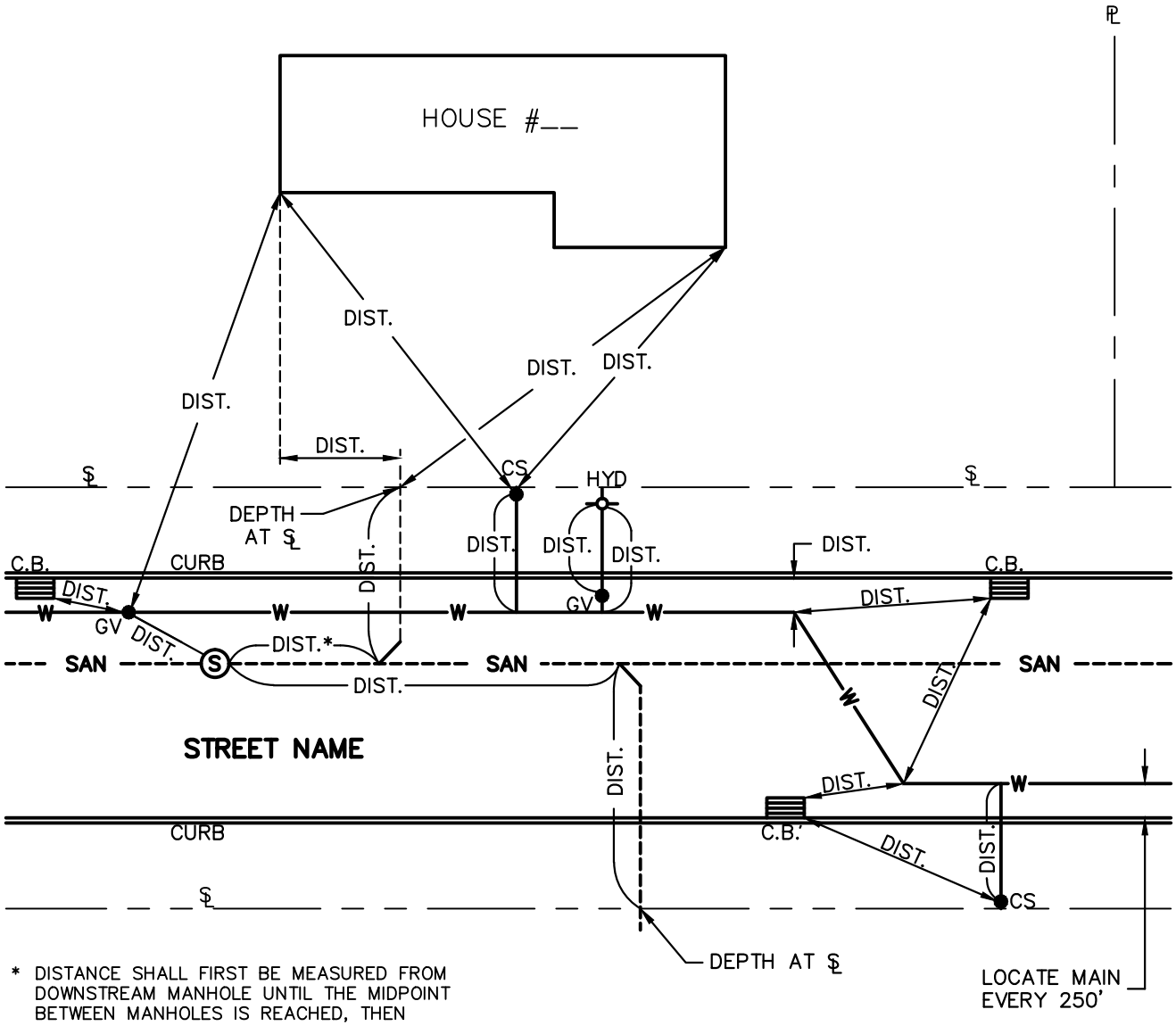
Tie sheets for all existing Network Control Stations are available upon request from the Engineering Division. Refer to Section 7.01 of the Manchester Public Improvement Standards for additional information.

At a minimum, record drawings shall include the following information:

1. All geometry pertaining to street lines, the perimeter boundary of the development, internal property or lot lines, and easement lines.
2. All monumentation set and found for project perimeter, streetline, lot corners, angle points and easements. The above locations shall be certified to an A-2 Standard of Accuracy by a Land Surveyor licensed in the State of Connecticut. This certification shall also indicate the approximate date that all monumentation and iron pins were set.
3. Town Control Stations observed and values utilized, method/methods utilized for developing site values, and coordinates displayed on three (3) physically monumented site or referenced locations on all applicable sheets.
4. Semi-permanent benchmarks set at all roadway intersections and along newly constructed roadways. The maximum distance between benchmarks shall not exceed 600' and no less than three (3) benchmarks shall be set. The datum shall be NGVD 1988.
5. Volume and page of all easements conveyed to the Town of Manchester or applicable party.
6. Title sheet showing sheet layout and phase lines, if applicable.
7. Title blocks indicating "As-Built" or "Record Drawing" with a date.
8. Lot numbers and street addresses for the subject property and all abutting properties.
9. All building setback lines.
10. All existing foundations with a minimum of three (3) dimensions from separate property lines shown to the nearest one-tenth (0.1) of a foot (not required for Subdivision Plans).
11. As-built location of all types of sidewalks, curbs, sidewalk ramps, driveway openings, guide rail, traffic signs, pavement markings and protective fence.
12. Dimensions of major features, such as width of roadway and sidewalk, cul-de-sac radius, etc.

13. As-built locations of all drainage structures and pipes with labels for top of frame, top of headwall, invert elevations and pipe size and material. Submission of revised design calculations may be required if the constructed system differs from the approved drawings as determined by the Engineer.
14. As-built locations of stormwater treatment systems with appropriate top, bottom and invert elevations. Labels for hydrodynamic separators shall include the manufacturer and model number.
15. As-built location of all water mains, water services, curb boxes, valve boxes, hydrants, sanitary sewer mains and laterals, and manholes (with labels for top of frame and invert elevations).
16. As-built locations of all street light poles with labels for owners and pole numbers.
17. As-built locations of all underground utilities (i.e. electric, gas, telephone, and cable) as well as all above ground utility boxes, transformer pads, manholes, junction boxes, vaults (with dimensions) and handholes.
18. As-built locations of detention basins that include topography, and labels for the top of berm, emergency spillway and bottom of basin elevations, and invert elevations for all inlet and outlet structures. Include the locations and dimensions of any trash racks.
19. As-built location of all foundation drains that discharge into Town drainage structures with labels for pipe size, material and invert elevations.
20. Limits and dimensions of riprap aprons and/or scour holes at drainage outlets with labels for the type (size) of riprap installed.
21. All existing topography for the property that is based on the same vertical datum as the approved subdivision or development plan. Topography shall be shown in one-foot or two-foot contour intervals with spot grades at all high and low points, top and bottom elevations of curbs and retaining walls, and other critical locations.
22. For Subdivisions, profile sheets showing existing and finished roadway centerline profile with final roadway centerline grades at every 50 foot interval and at all low, high and intersection points. Profile sheets shall also include all underground utilities, including pipe sizes and materials, top of frame and invert elevations, flow lines and slopes of pipe. Preliminary road profiles shall identify the base course of pavement if the surface course has not been installed.
23. Traffic signal plan(s), if applicable.
24. Legend which accurately describes monumentation set and found (i.e. 5/8” rebar, 1” iron pipe, concrete monument with brass cap, etc.)
25. North arrow.

Note that these are the minimum submission requirements; the Town reserves the right to request additional information as required for review.



* DISTANCE SHALL FIRST BE MEASURED FROM DOWNSTREAM MANHOLE UNTIL THE MIDPOINT BETWEEN MANHOLES IS REACHED, THEN CONNECTIONS SHALL BE MEASURED FROM THE UPSTREAM MANHOLE.

NOTES:

1. INFORMATION SHOWN HERE SHALL BE PROVIDED ON ALL RECORD (AS-BUILT) DRAWINGS AND SHALL BE APPROVED BY THE TOWN.
2. ALL SWING TIES SHALL BE MEASURED FROM FIXED PHYSICAL FEATURES AND BE LESS THAN 100' WHENEVER POSSIBLE.
3. PROVIDE AT LEAST TWO TIES AND DISTANCE FROM WATER MAIN FOR ALL CURB STOPS (CS).
4. PROVIDE AT LEAST TWO TIES TO ALL WATER MAIN BENDS.
5. PROVIDE AT LEAST TWO TIES (THREE PREFERRED) TO ALL GATE VALVES.
6. PROVIDE AT LEAST TWO TIES AND DISTANCE FROM SANITARY SEWER MAIN AT THE POINT WHERE LATERALS CROSS STREETLINE.

TOWN OF MANCHESTER

RECORD (AS-BUILT) INFORMATION REQUIRED FOR WATER MAIN AND SANITARY SEWER TIES

Not to Scale

Appendix E

Road Classification List

Town of Manchester
Public Works Department
Engineering Division
ROAD CLASSIFICATIONS

Road segments not listed here are classified as "Local Roads"
and those listed in **BOLD** are State-owned

ARTERIALS

Adams Street
Avery Street
Broad Street (Center St to MTW)
Buckland Hills Drive
Buckland Street
Burnham Street West
Center Street
Charter Oak Street
Clark Street
Deming Street
East Center Street
Hale Road
Hartford Road
Highland Street (Autumn St to I-384 Ramps)
Keeney Street
Main Street
McKee Street
Middle Turnpike East (MTE)
Middle Turnpike West (MTW)
New Bolton Road
New State Road
North Main Street
Oakland Street (Route 83)
Oakland Street (Route 83 to Woodbridge St)
Pine Street
Pleasant Valley Road
South Main Street
Spencer Street
Tolland Turnpike (Route 30)
Tolland Turnpike (East Hartford to Route 30)
West Center Street
Woodbridge Street

COLLECTOR ROADS

Adams Street South
Autumn Street
Bell Street
Bidwell Street
Birch Mountain Road
Broad Street (MTW to Hilliard St)
Bush Hill Road
Camp Meeting Road
Chapel Street
Colonial Road
Ferguson Road
Gardner Street
Hackmatack Street
Highland Street (I-384 Ramps to Porter St)
Hilliard Street
Hills Street
Hillstown Road
Lake Street
Lydall Street
Oakland Street (Woodbridge St to Green Rd)
Olcott Street
Parker Street
Porter Street
Prospect Street
Sheldon Road
Slater Street
Spring Street
Spruce Street
Summit Street
Taylor Street
Union Street
Vernon Street
Vernon Street West
Waddell Road
Wetherell Street
Woodland Street
Woodside Street
Wyllys Street

Appendix F

Approved List of Construction Materials

TOWN OF MANCHESTER WATER & SEWER DEPARTMENT

APPROVED LIST OF CONSTRUCTION MATERIALS

Revised 10/29/14

INDEX

MATERIAL **PAGE**

Note: Please contact the Engineering Division – Maps and Records Section at 860-647-3119 or 860-647-3157 for further information regarding these specified materials.

BRASS

1. Corporation Stops shall have a male iron pipe thread inlet, pack or quick joint connection for copper tubing outlet, a ball style valve, and shall meet the requirements of ANSI/AWWA C800 with latest revisions. Brass shall be "no-lead brass" meeting the requirements of USEPA's Reduction of Lead in Drinking Water Act. The corporation stop shall be a one (1) inch or two (2) inch: Model No. FB1100-4-NL, FB1100-4-Q-NL, FB1100-7-NL or FB1100-7-Q-NL as manufactured by the Ford Meter Box Co., Inc., Wabash, IN.; Model No. P-25028N or B-25028N as manufactured by Mueller Co., Decatur, IL.; or Model No. NL 74704B-22, NL 74704BT or NL 74704BQ as manufactured by A.Y. McDonald Mfg. Co., Dubuque, IA.

2. Couplings for reconnecting existing ¾", 1", 1¼", 1½" and 2" copper, brass or galvanized steel services shall be compression couplings meeting the requirements of ANSI/AWWA C800 with latest revisions. Brass shall be "no-lead brass" meeting the requirements of the USEPA's Reduction of Lead in Drinking Water Act. Couplings shall be Model No. C44-XX-NL or C44-XX-Q-NL as manufactured by Ford Meter Box Co., Inc., Wabash, IN.; Model No. P-15403N or H-15403N as manufactured by Mueller Co., Decatur, IL.; or Model No. 74758-22, 74758T or 74758Q as manufactured by A.Y. McDonald Mfg. Co., Dubuque, IA. Couplings used for connections to other pipe sizes and materials shall be approved by the Engineer.

3. Curb Stops shall meet the requirements of ANSI/AWWA C800 with latest revisions. Brass shall be "no-lead brass" meeting the requirements of the USEPA's Reduction of Lead in Drinking Water Act. The curb stop shall be a one (1) inch or two (2) inch: Model No. B44-444-NL, B44-444-Q-NL, B44-777-NL or B44-777-Q-NL as manufactured by Ford Meter Box Co., Inc., Wabash, IN.; Model No. P-25209N or B-25209N as manufactured by Mueller Co., Decatur, IL.; or Model No. 76100-22, 76100T or 76100Q as manufactured by A.Y. McDonald Mfg. Co., Dubuque, IA.

BRASS FITTINGS

1. Fittings shall be manufactured in North America by the Ford Meter Box Co., Mueller Co., A.Y. McDonald Mfg. Co. or approved equal. Brass shall be "no-lead brass" meeting the requirements of USEPA's Reduction of Lead in Drinking Water Act and shall meet the requirements of ANSI/AWWA C800 with latest revisions.

BUTTERFLY VALVES

1. Butterfly Valves shall be wrench operated, non-rising stem with O-ring stem seals and have mechanical joints on both ends. Each valve shall be supplied with two (2) sets of mechanical joint retainer glands. Valves shall meet or exceed the requirements of the latest revision of AWWA C504. Valves shall have epoxy coated cast iron bodies with mechanical joint ends complying with the latest revisions of ANSI A21.11 (AWWA C111). Valves shall be a minimum Class 150B and suitable for a maximum nonshock shutoff pressure of 140 psi. The valves shall provide bubble-tight shutoff at 150 psi when tested in accordance with AWWA C504. Valve discs shall seat at an angle of 90 degrees to the axis of the pipe.

2. Valve seats shall be molded natural rubber. Rubber seats may be attached to the body or the disc. If the rubber seat is attached to the disc, the seat ring on the body shall be of stainless steel. The valve disc shall be of either case Ni-Resist of cast iron Class 40 conforming to ASTM A48. Rubber seats mounted on the disc shall be securely clamped to the disc. All clamps, retaining rings, and their fasteners shall be Series 300 stainless steel.

3. The valve shaft shall be Type 300 stainless steel or carbon steel with stainless steel joints. The valve disc and shaft connection shall be by means of mechanically secured taper pins extending through the disc and shaft. Taper pins, lockwashers and nuts shall be 18-8 stainless steel. The shaft seals shall be designed for the use of standard "O" - ring seals.

4. The manual operating mechanism shall be firmly fixed to the valve body and shall be rated at 450 lb. The operator shall be permanently lubricated, shall be totally enclosed with a cast iron case. The operator shall be suitable for submersion. The operator shall have adjustable threaded collars at each end of stroke. **Valves shall be right-opening (clockwise) or left-opening (counter clockwise) as directed by the Engineering Division.**

5. Valves shall be only those models and manufacturers listed below.

Manufacturer	Model
Mueller	Lineseal III
M & H	Style 450

COPPER TUBING - TYPE “K”

1. Water service lines shall be Type K seamless copper tubing of one (1) inch or two (2) inch nominal diameter. Tubing shall meet the requirements of ASTM Specification B 88 of latest revision.

CURB BOXES

1. The curb box shall be the extension type with a 42” or 45" stationary rod. Box shall be adjustable from 4' to 5' and be provided with a foot piece for 2" services. The upper sections of slide type curb boxes shall have a drop type cover with the word "WATER" or "W" cast on top and shall be a 2-hole Erie style. Valve boxes shall be installed for curb boxes located in paved areas and sidewalk, and for blow offs, and shall meet the requirements of “Valve Boxes” as defined in the pertinent sections of these Specifications. Only curb boxes manufactured in North America will be accepted. Curb boxes shall be manufactured in North America by Mueller, Ford, A.Y. McDonald, Sames, Trumball, Bibby St. Croix, Fonderie La Roche or approved equal.

DUCTILE IRON FITTINGS

1. Fittings, including mechanical joint plugs and caps, shall be ductile iron meeting the requirements of AWWA C110 (ANSI A21.10) with mechanical joints in conformance with AWWA C111 (ANSI A21.11). Fittings shall have a minimum pressure rating of 350 psi and shall have an inside lining of cement-mortar in accordance with AWWA C104 (ANSI A21.4). Compact fittings meeting the requirements of AWWA C153 (ANSI A21.53) of latest revision may be used. Fittings shall have an asphalt coating both inside and outside, and be manufactured in North America by Griffin, Tyler, U.S. Pipe, Sigma, Clow, Union or approved equal.

DUCTILE IRON COUPLINGS

1. Couplings for connecting new main to oversized cast iron pipe shall be made of ductile iron with high strength low alloy steel nuts and bolts and shall be Rockwell Model 441 Cast Transition Couplings, or approved equal. These couplings shall be used only when oversized cast iron pipe is encountered which does not allow the use of solid sleeves.

DUCTILE IRON SLEEVES

1. Sleeves for connecting new mains to existing mains shall be mechanical joint solid sleeves with the mechanical joint ends restrained by the means of retainer glands. Solid sleeves shall meet the requirements of the latest revision of AWWA C110 (ANSI A21.10) and shall be Model F-1014 as manufactured by the Clow Corporation, Oak Brook, Illinois, or approved equal.

2. Connecting sleeves for connecting new water mains to existing metal lined cement mains (stovepipe) shall be Model 227 as manufactured by Rockwell, Pittsburgh, PA or approved equal.

DUCTILE IRON PIPE

1. Ductile iron pipe shall meet the requirements of the latest revision of AWWA C151 (ANSI A21.51). Joints shall be “Tyton Joint” design, rubber gasket push-on type manufactured in accordance with the latest revision of AWWA C111 (ANSI A21.11).

2. Pipe shall be supplied with the standard exterior bituminous coating of either coal tar or asphalt base approximately one mil thick. The interior shall be double cement lined in accordance with the latest revision of AWWA C104 (ANSI A21.4).

3. Pipe shall be of thickness Class 52 unless otherwise indicated.

4. Pipe shall be manufactured by Clow, Griffin, U.S. Pipe, Atlantic States or approved equal.

FIRE HYDRANT

1. Hydrants shall be dry-barrel, post-type hydrants, with compression shut-offs which open with the pressure. Hydrants shall meet the requirements of AWWA C502. They shall have a main valve opening of 5-1/4 inches and have a 6-inch mechanical joint inlet. Bury length shall be 5-1/2 feet. Two 2-1/2 inch hose and one 4-1/2 inch pumper nozzles shall be provided in standard nozzle arrangement. Outlet nozzle threads shall meet the requirements of ANSI B26, "National Standard Fire-Hose Coupling Screw Threads."

2. Hydrants shall be of break flange construction, shall have 0-ring seals and **shall be right-opening (clockwise) or left-opening (counter clockwise) as directed by the Engineering Division.** Interior and exterior coatings shall meet the requirements of the latest revision of AWWA C502, and the color for that portion of the hydrant above the ground line shall be as directed by the Manchester Water Department.

3. In addition, that portion of each hydrant below finished grade shall be given a coating of hot bitumastic material, equal to that used for exterior coating of pipe and fittings, prior to installation. A drain outlet is required.

4. Hydrants shall be Eddy Model F-2640 manufactured by Clow Corporation, Bensenville, Illinois, the Pacer Model WB-67 with 16" traffic section manufactured by Waterous, South St. Paul, Minnesota, the Metropolitan 250-Model 94 manufactured by U.S.Pipe and Foundry Co., Birmingham, AL., or Super Centurion 250 by Mueller Co., Decatur, IL. Hydrants shall be installed so as to maintain an 18-inch nozzle height above finished grade without use of extension sections.

5. The type of hydrant to be installed shall be determined in the field by the Engineer.

6. Mechanical joint anchor tees shall be used to connect the hydrant lead to the water main.

7. All hydrant auxiliary gate valves shall be resilient wedge gate valves and shall meet the requirements specified in the pertinent section of these Specifications. **Auxiliary gate valves shall be right-opening (clockwise) or left-opening (counter clockwise) as directed by the Engineering Division.**

8. Paint for hydrants shall be high performance industrial coating alkyd enamel. Paint shall have a high gloss finish. Paint colors shall be Fire Hydrant Red (245385) for left-opening (counter clockwise) hydrants or Yellow (245488) for right-opening (clockwise) hydrants as manufactured by Rust-Oleum Corporation or approved equal. Surface preparation and paint application shall be in accordance with the manufacturer's recommendations.

FIRE HYDRANT EXTENSION KITS

1. Hydrant extension kits shall be specifically manufactured for the hydrants listed under "Fire Hydrant". Kits shall include an upper extension, drip rod extension, stem extension and all appurtenances necessary to complete the installation.

FIRE HYDRANT PARTS

1. Hydrant parts and traffic repair kits shall be specifically manufactured for the hydrants listed under "Fire Hydrant".

JOINT RESTRAINT FOR DUCTILE IRON PIPE

1. Restrained bell and spigot push on joints for ductile iron pipe shall meet the requirements of the latest revision of AWWA C151 (ANSI A21.51). Each restrained bell and spigot joint shall be achieved using a single rubber FIELD LOK 350 gasket, a Series 1700 Megalug restraint harness as manufactured by Ebaa Iron, Inc., Eastland, Texas, or approved equal, manufactured in accordance with the latest revision of AWWA C111 (ANSI A21.11). The bell and spigot push on joint restraint provided shall be sufficient to restrain working pressures of 350 psi (4" to 10" diameter), 250 psi (12" to 16" diameter) and 200 psi (18" to 20" diameter).

2. Mechanical joint thrust restraining glands, for valves and fittings, shall be the Megalug Series 1100, manufactured by Ebaa Iron, Eastland, Texas, or Ford series 1400.

3. Tiebolts, tiebolt nuts, rod couplings, threaded rods and rod nuts, retainer clamps, and round flat washers may be used for restrained joints and shall be steel meeting the requirements of ASTM A 36-77a. These components shall be similar or equal to the following figure numbers manufactured by Star National Products.

ITEM	STAR FIGURE
Tiebolt	7, 7-5, or SST 7
Tiebolt and Rod Nut	8
Rod Coupling	10
Retainer Clamp	11
Threaded Rod	12
Round Flat Washer	17

MANHOLE FRAMES AND COVERS

1. Manhole frames and covers located within paved areas shall be heavy duty and shall be Model 1027C as manufactured by Campbell Foundry Company, Model 2927E as manufactured by Laperle Foundry Company or Model/Product Numbers 00133872 and 00124811 as manufactured by East Jordan Ironworks.

2. Manhole frames and covers located within unpaved areas shall be heavy duty and water-tight (bolted and gasketed) with ½" stainless steel bolts and shall be Model 1502 as manufactured by Campbell Foundry Company, Model 6502 as manufactured by Laperle Foundry Company or Model/Product Numbers 00124872 and 0124872W03 as manufactured by East Jordan Ironworks.

3. The cover shall be cast with the words "MANCHESTER SEWER". Cast iron shall conform to ASTM A-48 Class 30B or its latest revisions. Frames and covers shall be coated with a bitumastic coating.

MANHOLE INVERTS

1. Inverts shall be constructed of precast concrete or cast-in-place concrete and shall conform accurately to the size of the adjoining pipes. Brick and mortar inverts shall be installed where directed by the Engineer.

MISCELLANEOUS SANITARY SEWER APPURTENANCES

1. Manhole frame adjustment rings shall be pressure injected molding consisting of a polypropylene/fiberglass mixture, precast concrete, concrete block or brick.

2. Polypropylene/fiberglass adjustment rings shall be manufactured by the Turner Company of Raleigh, North Carolina or Markham, Ontario.

PRECAST MANHOLE SECTIONS

1. Precast manhole sections shall be 4' diameter, unless specified otherwise, and shall conform to ASTM C-478 and C-443 (joint).
2. Coating for exterior surfaces of all manhole components shall be bituminous waterproofing material. The material shall be Minwax Fibrous Brush Coat made by Minwax Co., New York, New York; Tremco 121 Foundation Coating made by the Tremco Manufacturing Company, Cleveland, Ohio; Bitumastic Black Solution made by the Koppers Company, Inc., Pittsburgh, Pennsylvania; or approved equal product.

3. Precast manhole sections shall be manufactured by Arrow, Field, Leonard, United Concrete or approved equal.

PVC PIPE and FITTINGS

1. Polyvinyl chloride (PVC) pipe and fittings shall conform to the requirements of the latest revisions of either ASTM D3034, "Standard Specifications for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings" or ASTM F789, "Standard Specifications for Type PS-46 Poly (Vinyl Chloride) (PVC) Plastic Gravity Flow Sewer Pipe and Fittings."

2. The pipe shall have a maximum pipe diameter to wall thickness ratio (SDR) of 35 or minimum pipe stiffness (PS) of 46 psi. Straight pipe shall be furnished in lengths not more than thirteen (13) feet, unless otherwise indicated on the plans, and Y-branches shall be furnished in lengths of not more than three (3) feet. Saddle Y-branches will not be allowed.

3. Joints for PVC pipe shall be push-on bell and spigot joints using elastomeric ring gasket. The gaskets shall be securely fixed into place in the bells so that they cannot be dislodged during joint assembly. The gaskets shall be of a composition and texture which is resistant to common ingredients of sewage and industrial wastes, including oil and groundwater, and which will endure permanently under the conditions of the proposed use. The joints shall conform to the requirements of the latest revision of ASTM D-3212.

RESILIENT WEDGE GATE VALVES

1. All gate valves shall be resilient wedge gate valves and shall meet the requirements of AWWA C515 of latest revision. The valve body, bonnet, stuffing box and operating nut shall be composed of ASTM A536 ductile iron. The body and bonnet shall adhere to the minimum wall thickness as set forth in AWWA C515-09 Table 2, Section 4.4.1.2. Valves shall have non-rising stems, mechanical joint ends meeting the requirements of AWWA C111 of latest revision and have O-ring stem seals. Each valve shall be supplied with two (2) sets of mechanical joint retainer glands.

2. Valves shall be wrench-operated and rated at a minimum working pressure of 200 psi. **Valves shall be right opening (clockwise) or left opening (counter clockwise) as directed by the Engineering Division.**

3. Wedge shall be encapsulated in molded rubber per AWWA C515. Valve shall be coated with a fusion bonded epoxy-resin both inside and outside. Coating shall be a minimum of 10 mils thick and meet or exceed all requirements of the latest revision of AWWA C550. All exterior nuts and bolts shall be 5/8" minimum diameter and shall be Type 18-8, Series 300, stainless steel at a minimum.

4. Resilient wedge gate valves shall be only those models and manufacturers listed below.

Manufacturer	Model
American Flow Control	Series 2500
AVK	Series 65
Clow	2638
M & H	Style 7000
Mueller	A-2361
U.S. Pipe	A-USP1

SANITARY SEWER REPAIR SLEEVES

1. Repair sleeves for connecting clay to clay, clay to plastic and plastic to plastic sanitary sewers shall be Strong Back Couplings – 1000 RC Series stainless steel shielded with a molded in flexible PVC gasket as manufactured by Fernco, Inc., Stainless Steel Shear Rings for use with flexible PVC gaskets as manufactured by Fernco, Inc., or SDR 35 PVC Gasketed Repair Coupling Sleeves (without stop) as manufactured by Harco, Inc.

SERVICE SADDLES

1. The service saddle shall have a double strap with a one (1) inch or two (2) inch iron pipe thread tapping, meeting the requirements of ANSI/AWWA C800 with latest revisions.

2. Service saddle shall be only those models and manufacturers listed below.

Manufacturer	Model
Ford	FCD202
JCM	JCM 406
Romac	Model 202NS

TAPPING SLEEVE AND VALVE - TYPE I (CAST IRON PIPE)

1. Tapping sleeves shall consist of a full body two-piece ductile iron or cast iron sleeve/tee with mechanical joint ends on the run and a flanged end on the branch. Each sleeve shall be supplied with two (2) sets of mechanical joint retainer glands. Tapping valves shall be resilient wedge gate valves meeting the requirements described below. The tapping valve shall have one flanged end and one mechanical joint end.

2. Valves shall be wrench operated, non-rising stem with O-ring stem seals. Each valve shall be supplied with one (1) set of mechanical joint retainer glands. **Valves shall be right-opening (clockwise) or left-opening (counter clockwise) as directed by the Engineering Division.**

3. Wedge shall be encapsulated in molded rubber. Valve shall be coated with a fusion bonded epoxy-resin both inside and outside. Coating shall be a minimum of 10 mils thick and meet or exceed all requirements of the latest revision of AWWA C550.

4. Valves and joints shall meet or exceed all requirements of the latest revision of AWWA C509 and AWWA C111 respectively.

5. Valves shall be only those models and manufacturers listed below.

Manufacturer	Model
American Flow Control	Series 2500
AVK	Series 25
Clow	2638
M & H	Style 7000
Mueller	A-2361
U.S. Pipe	A-USP1

6. Tapping sleeves shall be manufactured by U.S. Pipe, Mueller, American Flow Control or approved equal.

TAPPING SLEEVE AND VALVE - TYPE II (DUCTILE IRON PIPE)

1. Tapping sleeve shall consist of a stainless steel body with either a stainless steel or carbon steel integral mechanical joint outlet flange. Gasket shall be full circumference. Tapping valves shall be resilient wedge gate valves meeting the requirements described below. The tapping valve shall have mechanical joint ends.

2. Valves shall be wrench operated, non-rising stem with O-ring stem steals. Each valve shall be supplied with two (2) sets of mechanical joint retainer glands. **Valves shall be right-opening (clockwise) or left-opening (counter clockwise) as directed by the Engineering Division.**

3. Wedge shall be encapsulated in molded rubber. Valve shall be coated with a fusion bonded epoxy-resin both inside and outside. Coating shall be a minimum of 10 mils thick and meet or exceed all requirements of the latest revision of AWWA C550.

4. Valves and joints shall meet or exceed all requirements of the latest revision of AWWA C515 and AWWA C111 respectively.

5. Valves shall be only those models and manufacturers listed below.

Manufacturer	Model
American Flow Control	Series 2500
AVK	Series 65
Clow	2368
M & H	Style 7000
Mueller	A-2361
U.S. Pipe	A-USP1

6. Tapping sleeves shall be only those models and manufacturers listed below.

Manufacturer	Model
Ford	FAST-MJ
JCM	439 or 469
Smith-Blair	662-MJ or 663-MJ

VALVE BOXES

1. Valve boxes shall be 5-1/4", consisting of a base and adjustable slide type top section with top flange and cover that is adjustable from 4' to 5'.

2. Valve boxes shall be made of centrifugally spun iron with ¼" uniform wall thickness and shall be coated with heavy bituminous coating.

3. Box cover shall have the word "WATER" cast on top.

4. Valve boxes shall be manufactured in the United States or Canada by Water Quality Products, Bibby Ste. Croix, Charlotte, Tyler, Bingham and Taylor, or approved equal.

WATER MAIN REPAIR SLEEVES

2. Repair sleeves for cast iron or ductile iron water main shall be double band, full circle clamps with lap type gaskets having molded tapered ends and shall be only those models and manufacturers listed below.

Manufacturer	Model
Ford	F2
JCM	102
Smith-Blair	227/228

3. Sleeves must cover the OD ranges indicated below:

Pipe Size	OD Range (inch)
6”	6.90 – 7.10
8”	9.05 – 9.30
10”	11.10 - 11.40
12”	13.20 – 13.50
16”	17.40 – 17.80

Appendix G

Approved Wet Tap Contractors

Town of Manchester
Water and Sewer Department

APPROVED CONTRATORS FOR LARGE DIAMETER WET TAPS
(greater than or equal to 4" diameter)

Jack Farrelly Co.
97 Old Poquonock Road
Bloomfield, CT 06002
860-243-9714

John Hoadley and Sons, Inc.
672 Union Street
Rockland, MA 02370
781-878-8098

Everett J. Prescott, Inc.
36 Clark Road
Vernon, CT 06066
860-875-9711

Northeast Tapping Services Inc.
156 Old Turnpike Road
Southington Ct. 06489
860-621-6921

Yankee Water Services
177 Kensington Rd
Berlin, CT 06037-2601
860-828-4543

Superior Products Distributors, Inc.
1403 Meriden-Waterbury Rd.
P. O. Box 57
Milldale, CT 06467
860-621-3621

Scott T. Noonan, Pipeline Services Manager
Hanson Pressure Pipe - Pipeline Services
P.O. Box 101
Coldwater, OH 45828
Tel: 419-678-2596
Fax: 419-678-2917

Appendix H

Standard Easement Format

(TYPE/PURPOSE) EASEMENT

KNOW YE THAT, _____ a _____ company having a place of business in the Town of _____, County of _____ and State of Connecticut hereinafter ("Grantor"), for valuable consideration does hereby grant to the TOWN OF MANCHESTER, a municipal corporation having its territorial limits within the County of Hartford and State of Connecticut hereinafter ("Grantee"), a perpetual easement covering the premises described herein, hereafter as, ("Easement Area") and for the purposes set forth in Exhibit A attached hereto and made a part hereof.

Grantor herein covenants and agrees and Grantee herein, by acceptance of this easement, covenants and agrees as follows:

1. Grantor will not cause or permit any activities or cause or permit any utilities, buildings, structures or fences to be erected or plant or cause to be planted any trees, shrubs etc. which will in any way interfere with the exercise by Grantee of any rights hereby granted.

2. After completion of any work performed pursuant to the rights granted hereby, Grantee will restore all premises to substantially the same condition which existed at the time of the commencement of such work.

3. Grantee will indemnify and save harmless the Grantor, its successor and assigns, against any and all claims for injury, death or damages arising out of any activities conducted by Grantee or others pursuant to the rights hereby granted.

4. The non-exercise by Grantee or any of the rights hereby granted shall not be construed to be a waiver by Grantee of ay such rights.

5. The terms, conditions and covenants herein contained shall be biding upon and inure to the benefit of Grantor and Grantee, their respective successors and assigns.

6. The easement rights granted herein are non-exclusive. However, prior to any individual or entity ("Third Party") exercising any easement rights within the Easement Area, said Third Party shall contact the Town of Manchester Engineering Department requesting the consent of the Grantee with respect to any of the activities described in Paragraph 1 contained herein. The consent of the Grantee shall not be unreasonably withheld or delayed. The Grantee shall promptly respond in writing to any request by a Third Party, either granting its consent or specifically stating why said consent has not been granted. The Third Party shall provide, in a timely manner, any information requested in the Grantee's written response that is deemed by the Grantee to be necessary to properly evaluate the Third Party's request. The Grantee shall make all reasonable efforts to minimize its requests for additional information. The Grantee will work in a cooperative manner with any Third Party in order to accommodate both the easement rights granted to the Grantee in this document and any easement rights that might be granted to any Third Party in the future. The Grantor agrees to include in any future documents

prepared for the granting of easement rights in the Easement Area to a Third Party, language that makes clear the requirements of Paragraph 6 contained herein.

IN WITNESS WHEREOF, the Grantor has executed this Instrument in this ____ day of _____, 2009.

Signed, sealed and delivered
in the presence of:

_____ By_____

_____ Its_____

STATE OF CONNECTICUT)
) ss:
COUNTY OF HARTFORD)

On this ____ day of _____, 2009, before me, the undersigned officer, personally appeared _____, known to me to be the person described in the foregoing instrument and acknowledged that he/she executed the same before me of his/her free act and deed.

IN WITNESS WHEREOF, I hereunto set my hand and seal.

_____

Commissioner of the Superior Court
Notary Public
My Commission Expires:

EXHIBIT A

A perpetual easement for the purpose of constructing, maintaining, repairing and Replacing _____(Purpose of Easement)_____ through, across and/or beneath the parcel designated as _____, on a map or plan entitled: "_____" said map which is filed or will be filed with the Town Clerk for the Town of Manchester.

Easement Type or Purpose

Choose the Appropriate Easement Type or Purpose Below and Insert into Exhibit "A" of the Easement Form

- **Access**
- **Highway Use**
- **Sidewalk**
- **Multi-Use Trail**
- **Traffic Signs**
- **Traffic Signal Appurtenances**
- **Roadside Barrier**
- **Sightline**
- **Utility**
- **Storm Drainage**
- **Water**
- **Sanitary Sewer**
- **Landscaping**
- **Fence**
- **Sloping or Grading**
- **Retaining Wall**
- **Bridge/Culvert**
- **Right to Grade**
- **Right to Slope**
- **Right to Drain**

Appendix I

Standard Bond Forms

Town of Manchester
Public Works Department
Engineering Division

TYPES OF ACCEPTABLE BONDS

The following are three (3) acceptable methods for the bonding of Public Improvements, Erosion Control, or Landscaping:

Type 1 **Surety Bond**

This type of format is acceptable to the Town of Manchester. References are to be made to the plans (title) and Design Engineers (Name and Address) on the Bond form.

The Surety Company **MUST** have an office in the State of Connecticut.
(Review time is 3-4 working days)

Type 2 **Letter of Credit**

The time limit shall be for a minimum of two (2) years or the length of the project, with a renewal clause (extension of time) being the responsibility of the lending institution.

If the Letter of Credit expires before work is completed, NO further inspections or permits granted will be made on the project and for the homes within the project (i.e. building permits, C of O's, water & sewer permits, etc.).

The lending institution **MUST** have an office in the State of Connecticut.
(Review time is 3-4 working days)

Type 3 **Certified Check**

Used for the Bonding of Erosion Control, Public Improvements, or Landscaping. A completed W-9 form must be provided along with the check bond form.
(Immediate acceptance of Bond)

SURETY BOND BOND NO.

KNOW ALL THESE MEN BY THESE PRESENTS

THAT WE, _____hereinafter called Principal, as PRINCIPAL, AND THE _____ of the City of _____of the County of _____ in the State of _____as SURETY are held and firmly bound unto **TOWN OF MANCHESTER, CT** in the sum of_____ to be paid to the Said **TOWN OF MANCHESTER, CT** its successors and assigns, for which payment well and truly to be made, we bind ourselves, our heirs, executors and administrators, successors and assigns, firmly by these presents.

WHEREAS, the Principal has submitted to the Planning and Zoning Commission of the **TOWN OF MANCHESTER, CT** for its approval, a _____

_____

and

WHEREAS, the Planning and Zoning Commission of the **TOWN OF MANCHESTER, CT** has approved said Plan on condition that the said Principal file with the **TOWN OF MANCHESTER, CT** a Bond in the amount of _____with Surety and in form approved by the Town and with conditions satisfactory to the Planning and Zoning Commission securing to the **TOWN OF MANCHESTER, CT** actual completion within _____(Years) of certain work and installations required by the Planning and Zoning Commission as more fully appears on the application maps, plans and profiles filed by the Principal.

NOW, THEREFORE, if the said Principal shall on or before _____ make and complete to the satisfaction of the **TOWN OF MANCHESTER, CT** in accordance with its subdivision regulations the work, installations herein referred to, and attached conditions, this obligation shall be null and void, otherwise to remain in full force and effect.

IN WITNESS WHEREOF, we have hereunto set our hands and seals at _____, Connecticut, this _____ day of _____, 20___.

_____
DEVELOPER'S NAME

BY:_____(L.S.)
(NAME OF BONDING COMPANY)

BY:_____
Attorney-in-Fact

A VALID POWER OF ATTORNEY MUST BE ATTACHED TO THE SURETY BOND

LETTER OF CREDIT

LETTERHEAD OF LENDING INSTITUTION

STAND BY LETTER OF CREDIT NO._____

TOWN OF MANCHESTER
41 CENTER STREET
MANCHESTER, CT 06040

ATTN: _____, TOWN ENGINEER
(NAME)

We hereby establish our Irrevocable Credit in your favor for the account of (Name and Address of Developer).

Available by your drafts drawn as SIGHT on US up to the aggregate amount of (Written and Numerical Amount of Credit Given).

Your drafts are to be accompanied by:

THE ORIGINAL OF THIS CREDIT NO._____, ANY AMENDMENTS THERETO and,

A STATEMENT SIGNED BY AN AUTHORIZED OFFICER OF THE TOWN OF MANCHESTER, CONNECTICUT STATING THAT THE CONDITIONS SET FOURTH IN A LETTER DATED _____ FROM THE TOWN OF MANCHESTER, CONNECTICUT ADDRESSED TO (Name and Address of Developer) IN CONNECTION WITH THE (Name of Location of Project) HAVE NOT BEEN FULFILLED.

Drafts must be drawn and presented to us at our counters on or before _____Date_____(minimum two years).

It is a condition of this credit that it shall be extended and the expiration date set forth above shall be extended, without amendment, for an additional period of one (1) year from the present or future expiration date hereof, unless sixty (60) days prior to such expiration date we shall notify you in writing by registered mail, to the above address, that we elect not to renew this Letter of Credit for such additional period.

Drafts drawn under this Credit must bear on their face the clause "Drawn under" (Name of Lending Institution with Bank Credit No. and Date).

We hereby agree with you that all drafts drawn under and in compliance with the terms of this Credit will be duly honored upon presentation to the drawee.

Very truly yours,

AUTHORIZED SIGNATURE
Officer of Lending Institution

CERTIFIED CHECK BOND FORM

PUBLIC IMPROVEMENTS/EROSION CONTROL/LANDSCAPING

PROJECT: _____

I, this day, deposited with the Town of Manchester, a Certified bank check made out to the Town of Manchester #_____ in the amount of $_____drawn on the _____ Bank by way of bond to secure the performance by _____ of certain subdivision requirements and regulations in the construction of site improvements for _____
_____

Prepared by:_____
_____
_____

It is a condition of the Bond that:

a) If such performance is not to the satisfaction of the Town of Manchester, then said Town will be entitled to have any and all required work properly completed and will be entitled to withdraw funds sufficient to cover the cost thereof.

b) If and when such performance is to the satisfaction of the Town, as determined by the Director of Public Works, the Town will return to _____the balance of funds remaining together with a release of all right that the Town may have.

c) That the amount of the bond be forfeited to the Town of Manchester if all improvements subject thereto have not been completed to the satisfaction of the Director of Public Works within two years from the date hereof.

IN WITNESS WHEREOF, _____ has caused this instrument to be executed by _____this _____ day of _____, 20__.

_____
By:(Applicant/Owner)

FILL OUT THE FOLLOWING W-9 FORM FOR TAX REPORTING PURPOSES

Form **W-9**
(Rev. August 2013)
Department of the Treasury
Internal Revenue Service

Request for Taxpayer Identification Number and Certification

Give Form to the requester. Do not send to the IRS.

Print or type See **Specific Instructions** on page 2.

Name (as shown on your income tax return)

Business name/disregarded entity name, if different from above

Check appropriate box for federal tax classification:
☐ Individual/sole proprietor ☐ C Corporation ☐ S Corporation ☐ Partnership ☐ Trust/estate

☐ Limited liability company. Enter the tax classification (C=C corporation, S=S corporation, P=partnership) ▶ _____

☐ Other (see instructions) ▶

Exemptions (see instructions):
Exempt payee code (if any) _____
Exemption from FATCA reporting code (if any) _____

Address (number, street, and apt. or suite no.)

Requester's name and address (optional)

City, state, and ZIP code

List account number(s) here (optional)

Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on the "Name" line to avoid backup withholding. For individuals, this is your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the Part I instructions on page 3. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN* on page 3.

Note. If the account is in more than one name, see the chart on page 4 for guidelines on whose number to enter.

Social security number
			–		–				

Employer identification number
		–							

Part II Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me), and
2. I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding, and
3. I am a U.S. citizen or other U.S. person (defined below), and
4. The FATCA code(s) entered on this form (if any) indicating that I am exempt from FATCA reporting is correct.

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the certification, but you must provide your correct TIN. See the instructions on page 3.

Sign Here **Signature of U.S. person** ▶ **Date** ▶

General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

Future developments. The IRS has created a page on IRS.gov for information about Form W-9, at *www.irs.gov/w9*. Information about any future developments affecting Form W-9 (such as legislation enacted after we release it) will be posted on that page.

Purpose of Form

A person who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) to report, for example, income paid to you, payments made to you in settlement of payment card and third party network transactions, real estate transactions, mortgage interest you paid, acquisition or abandonment of secured property, cancellation of debt, or contributions you made to an IRA.

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN to the person requesting it (the requester) and, when applicable, to:

1. Certify that the TIN you are giving is correct (or you are waiting for a number to be issued),
2. Certify that you are not subject to backup withholding, or
3. Claim exemption from backup withholding if you are a U.S. exempt payee. If applicable, you are also certifying that as a U.S. person, your allocable share of any partnership income from a U.S. trade or business is not subject to the withholding tax on foreign partners' share of effectively connected income, and
4. Certify that FATCA code(s) entered on this form (if any) indicating that you are exempt from the FATCA reporting, is correct.

Note. If you are a U.S. person and a requester gives you a form other than Form W-9 to request your TIN, you must use the requester's form if it is substantially similar to this Form W-9.

Definition of a U.S. person. For federal tax purposes, you are considered a U.S. person if you are:

- An individual who is a U.S. citizen or U.S. resident alien,
- A partnership, corporation, company, or association created or organized in the United States or under the laws of the United States,
- An estate (other than a foreign estate), or
- A domestic trust (as defined in Regulations section 301.7701-7).

Special rules for partnerships. Partnerships that conduct a trade or business in the United States are generally required to pay a withholding tax under section 1446 on any foreign partners' share of effectively connected taxable income from such business. Further, in certain cases where a Form W-9 has not been received, the rules under section 1446 require a partnership to presume that a partner is a foreign person, and pay the section 1446 withholding tax. Therefore, if you are a U.S. person that is a partner in a partnership conducting a trade or business in the United States, provide Form W-9 to the partnership to establish your U.S. status and avoid section 1446 withholding on your share of partnership income.

In the cases below, the following person must give Form W-9 to the partnership for purposes of establishing its U.S. status and avoiding withholding on its allocable share of net income from the partnership conducting a trade or business in the United States:

- In the case of a disregarded entity with a U.S. owner, the U.S. owner of the disregarded entity and not the entity,
- In the case of a grantor trust with a U.S. grantor or other U.S. owner, generally, the U.S. grantor or other U.S. owner of the grantor trust and not the trust, and
- In the case of a U.S. trust (other than a grantor trust), the U.S. trust (other than a grantor trust) and not the beneficiaries of the trust.

Foreign person. If you are a foreign person or the U.S. branch of a foreign bank that has elected to be treated as a U.S. person, do not use Form W-9. Instead, use the appropriate Form W-8 or Form 8233 (see Publication 515, Withholding of Tax on Nonresident Aliens and Foreign Entities).

Nonresident alien who becomes a resident alien. Generally, only a nonresident alien individual may use the terms of a tax treaty to reduce or eliminate U.S. tax on certain types of income. However, most tax treaties contain a provision known as a "saving clause." Exceptions specified in the saving clause may permit an exemption from tax to continue for certain types of income even after the payee has otherwise become a U.S. resident alien for tax purposes.

If you are a U.S. resident alien who is relying on an exception contained in the saving clause of a tax treaty to claim an exemption from U.S. tax on certain types of income, you must attach a statement to Form W-9 that specifies the following five items:

1. The treaty country. Generally, this must be the same treaty under which you claimed exemption from tax as a nonresident alien.
2. The treaty article addressing the income.
3. The article number (or location) in the tax treaty that contains the saving clause and its exceptions.
4. The type and amount of income that qualifies for the exemption from tax.
5. Sufficient facts to justify the exemption from tax under the terms of the treaty article.

Example. Article 20 of the U.S.-China income tax treaty allows an exemption from tax for scholarship income received by a Chinese student temporarily present in the United States. Under U.S. law, this student will become a resident alien for tax purposes if his or her stay in the United States exceeds 5 calendar years. However, paragraph 2 of the first Protocol to the U.S.-China treaty (dated April 30, 1984) allows the provisions of Article 20 to continue to apply even after the Chinese student becomes a resident alien of the United States. A Chinese student who qualifies for this exception (under paragraph 2 of the first protocol) and is relying on this exception to claim an exemption from tax on his or her scholarship or fellowship income would attach to Form W-9 a statement that includes the information described above to support that exemption.

If you are a nonresident alien or a foreign entity, give the requester the appropriate completed Form W-8 or Form 8233.

What is backup withholding? Persons making certain payments to you must under certain conditions withhold and pay to the IRS a percentage of such payments. This is called "backup withholding." Payments that may be subject to backup withholding include interest, tax-exempt interest, dividends, broker and barter exchange transactions, rents, royalties, nonemployee pay, payments made in settlement of payment card and third party network transactions, and certain payments from fishing boat operators. Real estate transactions are not subject to backup withholding.

You will not be subject to backup withholding on payments you receive if you give the requester your correct TIN, make the proper certifications, and report all your taxable interest and dividends on your tax return.

Payments you receive will be subject to backup withholding if:

1. You do not furnish your TIN to the requester,
2. You do not certify your TIN when required (see the Part II instructions on page 3 for details),
3. The IRS tells the requester that you furnished an incorrect TIN,
4. The IRS tells you that you are subject to backup withholding because you did not report all your interest and dividends on your tax return (for reportable interest and dividends only), or
5. You do not certify to the requester that you are not subject to backup withholding under 4 above (for reportable interest and dividend accounts opened after 1983 only).

Certain payees and payments are exempt from backup withholding. See *Exempt payee code* on page 3 and the separate Instructions for the Requester of Form W-9 for more information.

Also see *Special rules for partnerships* on page 1.

What is FATCA reporting? The Foreign Account Tax Compliance Act (FATCA) requires a participating foreign financial institution to report all United States account holders that are specified United States persons. Certain payees are exempt from FATCA reporting. See *Exemption from FATCA reporting code* on page 3 and the Instructions for the Requester of Form W-9 for more information.

Updating Your Information

You must provide updated information to any person to whom you claimed to be an exempt payee if you are no longer an exempt payee and anticipate receiving reportable payments in the future from this person. For example, you may need to provide updated information if you are a C corporation that elects to be an S corporation, or if you no longer are tax exempt. In addition, you must furnish a new Form W-9 if the name or TIN changes for the account, for example, if the grantor of a grantor trust dies.

Penalties

Failure to furnish TIN. If you fail to furnish your correct TIN to a requester, you are subject to a penalty of $50 for each such failure unless your failure is due to reasonable cause and not to willful neglect.

Civil penalty for false information with respect to withholding. If you make a false statement with no reasonable basis that results in no backup withholding, you are subject to a $500 penalty.

Criminal penalty for falsifying information. Willfully falsifying certifications or affirmations may subject you to criminal penalties including fines and/or imprisonment.

Misuse of TINs. If the requester discloses or uses TINs in violation of federal law, the requester may be subject to civil and criminal penalties.

Specific Instructions

Name

If you are an individual, you must generally enter the name shown on your income tax return. However, if you have changed your last name, for instance, due to marriage without informing the Social Security Administration of the name change, enter your first name, the last name shown on your social security card, and your new last name.

If the account is in joint names, list first, and then circle, the name of the person or entity whose number you entered in Part I of the form.

Sole proprietor. Enter your individual name as shown on your income tax return on the "Name" line. You may enter your business, trade, or "doing business as (DBA)" name on the "Business name/disregarded entity name" line.

Partnership, C Corporation, or S Corporation. Enter the entity's name on the "Name" line and any business, trade, or "doing business as (DBA) name" on the "Business name/disregarded entity name" line.

Disregarded entity. For U.S. federal tax purposes, an entity that is disregarded as an entity separate from its owner is treated as a "disregarded entity." See Regulation section 301.7701-2(c)(2)(iii). Enter the owner's name on the "Name" line. The name of the entity entered on the "Name" line should never be a disregarded entity. The name on the "Name" line must be the name shown on the income tax return on which the income should be reported. For example, if a foreign LLC that is treated as a disregarded entity for U.S. federal tax purposes has a single owner that is a U.S. person, the U.S. owner's name is required to be provided on the "Name" line. If the direct owner of the entity is also a disregarded entity, enter the first owner that is not disregarded for federal tax purposes. Enter the disregarded entity's name on the "Business name/disregarded entity name" line. If the owner of the disregarded entity is a foreign person, the owner must complete an appropriate Form W-8 instead of a Form W-9. This is the case even if the foreign person has a U.S. TIN.

Note. Check the appropriate box for the U.S. federal tax classification of the person whose name is entered on the "Name" line (Individual/sole proprietor, Partnership, C Corporation, S Corporation, Trust/estate).

Limited Liability Company (LLC). If the person identified on the "Name" line is an LLC, check the "Limited liability company" box only and enter the appropriate code for the U.S. federal tax classification in the space provided. If you are an LLC that is treated as a partnership for U.S. federal tax purposes, enter "P" for partnership. If you are an LLC that has filed a Form 8832 or a Form 2553 to be taxed as a corporation, enter "C" for C corporation or "S" for S corporation, as appropriate. If you are an LLC that is disregarded as an entity separate from its owner under Regulation section 301.7701-3 (except for employment and excise tax), do not check the LLC box unless the owner of the LLC (required to be identified on the "Name" line) is another LLC that is not disregarded for U.S. federal tax purposes. If the LLC is disregarded as an entity separate from its owner, enter the appropriate tax classification of the owner identified on the "Name" line.

Other entities. Enter your business name as shown on required U.S. federal tax documents on the "Name" line. This name should match the name shown on the charter or other legal document creating the entity. You may enter any business, trade, or DBA name on the "Business name/disregarded entity name" line.

Exemptions

If you are exempt from backup withholding and/or FATCA reporting, enter in the *Exemptions* box, any code(s) that may apply to you. See *Exempt payee code* and *Exemption from FATCA reporting code* on page 3.

Exempt payee code. Generally, individuals (including sole proprietors) are not exempt from backup withholding. Corporations are exempt from backup withholding for certain payments, such as interest and dividends. Corporations are not exempt from backup withholding for payments made in settlement of payment card or third party network transactions.

Note. If you are exempt from backup withholding, you should still complete this form to avoid possible erroneous backup withholding.

The following codes identify payees that are exempt from backup withholding:

1—An organization exempt from tax under section 501(a), any IRA, or a custodial account under section 403(b)(7) if the account satisfies the requirements of section 401(f)(2)

2—The United States or any of its agencies or instrumentalities

3—A state, the District of Columbia, a possession of the United States, or any of their political subdivisions or instrumentalities

4—A foreign government or any of its political subdivisions, agencies, or instrumentalities

5—A corporation

6—A dealer in securities or commodities required to register in the United States, the District of Columbia, or a possession of the United States

7—A futures commission merchant registered with the Commodity Futures Trading Commission

8—A real estate investment trust

9—An entity registered at all times during the tax year under the Investment Company Act of 1940

10—A common trust fund operated by a bank under section 584(a)

11—A financial institution

12—A middleman known in the investment community as a nominee or custodian

13—A trust exempt from tax under section 664 or described in section 4947

The following chart shows types of payments that may be exempt from backup withholding. The chart applies to the exempt payees listed above, 1 through 13.

IF the payment is for . . .	THEN the payment is exempt for . . .
Interest and dividend payments	All exempt payees except for 7
Broker transactions	Exempt payees 1 through 4 and 6 through 11 and all C corporations. S corporations must not enter an exempt payee code because they are exempt only for sales of noncovered securities acquired prior to 2012.
Barter exchange transactions and patronage dividends	Exempt payees 1 through 4
Payments over $600 required to be reported and direct sales over $5,000[1]	Generally, exempt payees 1 through 5[2]
Payments made in settlement of payment card or third party network transactions	Exempt payees 1 through 4

[1] See Form 1099-MISC, Miscellaneous Income, and its instructions.

[2] However, the following payments made to a corporation and reportable on Form 1099-MISC are not exempt from backup withholding: medical and health care payments, attorneys' fees, gross proceeds paid to an attorney, and payments for services paid by a federal executive agency.

Exemption from FATCA reporting code. The following codes identify payees that are exempt from reporting under FATCA. These codes apply to persons submitting this form for accounts maintained outside of the United States by certain foreign financial institutions. Therefore, if you are only submitting this form for an account you hold in the United States, you may leave this field blank. Consult with the person requesting this form if you are uncertain if the financial institution is subject to these requirements.

A—An organization exempt from tax under section 501(a) or any individual retirement plan as defined in section 7701(a)(37)

B—The United States or any of its agencies or instrumentalities

C—A state, the District of Columbia, a possession of the United States, or any of their political subdivisions or instrumentalities

D—A corporation the stock of which is regularly traded on one or more established securities markets, as described in Reg. section 1.1472-1(c)(1)(i)

E—A corporation that is a member of the same expanded affiliated group as a corporation described in Reg. section 1.1472-1(c)(1)(i)

F—A dealer in securities, commodities, or derivative financial instruments (including notional principal contracts, futures, forwards, and options) that is registered as such under the laws of the United States or any state

G—A real estate investment trust

H—A regulated investment company as defined in section 851 or an entity registered at all times during the tax year under the Investment Company Act of 1940

I—A common trust fund as defined in section 584(a)

J—A bank as defined in section 581

K—A broker

L—A trust exempt from tax under section 664 or described in section 4947(a)(1)

M—A tax exempt trust under a section 403(b) plan or section 457(g) plan

Part I. Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. If you are a resident alien and you do not have and are not eligible to get an SSN, your TIN is your IRS individual taxpayer identification number (ITIN). Enter it in the social security number box. If you do not have an ITIN, see *How to get a TIN* below.

If you are a sole proprietor and you have an EIN, you may enter either your SSN or EIN. However, the IRS prefers that you use your SSN.

If you are a single-member LLC that is disregarded as an entity separate from its owner (see *Limited Liability Company (LLC)* on page 2), enter the owner's SSN (or EIN, if the owner has one). Do not enter the disregarded entity's EIN. If the LLC is classified as a corporation or partnership, enter the entity's EIN.

Note. See the chart on page 4 for further clarification of name and TIN combinations.

How to get a TIN. If you do not have a TIN, apply for one immediately. To apply for an SSN, get Form SS-5, Application for a Social Security Card, from your local Social Security Administration office or get this form online at *www.ssa.gov*. You may also get this form by calling 1-800-772-1213. Use Form W-7, Application for IRS Individual Taxpayer Identification Number, to apply for an ITIN, or Form SS-4, Application for Employer Identification Number, to apply for an EIN. You can apply for an EIN online by accessing the IRS website at *www.irs.gov/businesses* and clicking on Employer Identification Number (EIN) under Starting a Business. You can get Forms W-7 and SS-4 from the IRS by visiting IRS.gov or by calling 1-800-TAX-FORM (1-800-829-3676).

If you are asked to complete Form W-9 but do not have a TIN, apply for a TIN and write "Applied For" in the space for the TIN, sign and date the form, and give it to the requester. For interest and dividend payments, and certain payments made with respect to readily tradable instruments, generally you will have 60 days to get a TIN and give it to the requester before you are subject to backup withholding on payments. The 60-day rule does not apply to other types of payments. You will be subject to backup withholding on all such payments until you provide your TIN to the requester.

Note. Entering "Applied For" means that you have already applied for a TIN or that you intend to apply for one soon.

Caution: *A disregarded U.S. entity that has a foreign owner must use the appropriate Form W-8.*

Part II. Certification

To establish to the withholding agent that you are a U.S. person, or resident alien, sign Form W-9. You may be requested to sign by the withholding agent even if items 1, 4, or 5 below indicate otherwise.

For a joint account, only the person whose TIN is shown in Part I should sign (when required). In the case of a disregarded entity, the person identified on the "Name" line must sign. Exempt payees, see *Exempt payee code* earlier.

Signature requirements. Complete the certification as indicated in items 1 through 5 below.

1. Interest, dividend, and barter exchange accounts opened before 1984 and broker accounts considered active during 1983. You must give your correct TIN, but you do not have to sign the certification.

2. Interest, dividend, broker, and barter exchange accounts opened after 1983 and broker accounts considered inactive during 1983. You must sign the certification or backup withholding will apply. If you are subject to backup withholding and you are merely providing your correct TIN to the requester, you must cross out item 2 in the certification before signing the form.

3. Real estate transactions. You must sign the certification. You may cross out item 2 of the certification.

4. Other payments. You must give your correct TIN, but you do not have to sign the certification unless you have been notified that you have previously given an incorrect TIN. "Other payments" include payments made in the course of the requester's trade or business for rents, royalties, goods (other than bills for merchandise), medical and health care services (including payments to corporations), payments to a nonemployee for services, payments made in settlement of payment card and third party network transactions, payments to certain fishing boat crew members and fishermen, and gross proceeds paid to attorneys (including payments to corporations).

5. Mortgage interest paid by you, acquisition or abandonment of secured property, cancellation of debt, qualified tuition program payments (under section 529), IRA, Coverdell ESA, Archer MSA or HSA contributions or distributions, and pension distributions. You must give your correct TIN, but you do not have to sign the certification.

What Name and Number To Give the Requester

For this type of account:	Give name and SSN of:
1. Individual	The individual
2. Two or more individuals (joint account)	The actual owner of the account or, if combined funds, the first individual on the account [1]
3. Custodian account of a minor (Uniform Gift to Minors Act)	The minor [2]
4. a. The usual revocable savings trust (grantor is also trustee)	The grantor-trustee [1]
b. So-called trust account that is not a legal or valid trust under state law	The actual owner [1]
5. Sole proprietorship or disregarded entity owned by an individual	The owner [3]
6. Grantor trust filing under Optional Form 1099 Filing Method 1 (see Regulation section 1.671-4(b)(2)(i)(A))	The grantor*
For this type of account:	**Give name and EIN of:**
7. Disregarded entity not owned by an individual	The owner
8. A valid trust, estate, or pension trust	Legal entity [4]
9. Corporation or LLC electing corporate status on Form 8832 or Form 2553	The corporation
10. Association, club, religious, charitable, educational, or other tax-exempt organization	The organization
11. Partnership or multi-member LLC	The partnership
12. A broker or registered nominee	The broker or nominee
13. Account with the Department of Agriculture in the name of a public entity (such as a state or local government, school district, or prison) that receives agricultural program payments	The public entity
14. Grantor trust filing under the Form 1041 Filing Method or the Optional Form 1099 Filing Method 2 (see Regulation section 1.671-4(b)(2)(i)(B))	The trust

[1] List first and circle the name of the person whose number you furnish. If only one person on a joint account has an SSN, that person's number must be furnished.

[2] Circle the minor's name and furnish the minor's SSN.

[3] You must show your individual name and you may also enter your business or "DBA" name on the "Business name/disregarded entity" name line. You may use either your SSN or EIN (if you have one), but the IRS encourages you to use your SSN.

[4] List first and circle the name of the trust, estate, or pension trust. (Do not furnish the TIN of the personal representative or trustee unless the legal entity itself is not designated in the account title.) Also see *Special rules for partnerships* on page 1.

***Note.** Grantor also must provide a Form W-9 to trustee of trust.

Note. If no name is circled when more than one name is listed, the number will be considered to be that of the first name listed.

Secure Your Tax Records from Identity Theft

Identity theft occurs when someone uses your personal information such as your name, social security number (SSN), or other identifying information, without your permission, to commit fraud or other crimes. An identity thief may use your SSN to get a job or may file a tax return using your SSN to receive a refund.

To reduce your risk:

- Protect your SSN,
- Ensure your employer is protecting your SSN, and
- Be careful when choosing a tax preparer.

If your tax records are affected by identity theft and you receive a notice from the IRS, respond right away to the name and phone number printed on the IRS notice or letter.

If your tax records are not currently affected by identity theft but you think you are at risk due to a lost or stolen purse or wallet, questionable credit card activity or credit report, contact the IRS Identity Theft Hotline at 1-800-908-4490 or submit Form 14039.

For more information, see Publication 4535, Identity Theft Prevention and Victim Assistance.

Victims of identity theft who are experiencing economic harm or a system problem, or are seeking help in resolving tax problems that have not been resolved through normal channels, may be eligible for Taxpayer Advocate Service (TAS) assistance. You can reach TAS by calling the TAS toll-free case intake line at 1-877-777-4778 or TTY/TDD 1-800-829-4059.

Protect yourself from suspicious emails or phishing schemes. Phishing is the creation and use of email and websites designed to mimic legitimate business emails and websites. The most common act is sending an email to a user falsely claiming to be an established legitimate enterprise in an attempt to scam the user into surrendering private information that will be used for identity theft.

The IRS does not initiate contacts with taxpayers via emails. Also, the IRS does not request personal detailed information through email or ask taxpayers for the PIN numbers, passwords, or similar secret access information for their credit card, bank, or other financial accounts.

If you receive an unsolicited email claiming to be from the IRS, forward this message to *phishing@irs.gov*. You may also report misuse of the IRS name, logo, or other IRS property to the Treasury Inspector General for Tax Administration at 1-800-366-4484. You can forward suspicious emails to the Federal Trade Commission at: *spam@uce.gov* or contact them at *www.ftc.gov/idtheft* or 1-877-IDTHEFT (1-877-438-4338).

Visit IRS.gov to learn more about identity theft and how to reduce your risk.

Privacy Act Notice

Section 6109 of the Internal Revenue Code requires you to provide your correct TIN to persons (including federal agencies) who are required to file information returns with the IRS to report interest, dividends, or certain other income paid to you; mortgage interest you paid; the acquisition or abandonment of secured property; the cancellation of debt; or contributions you made to an IRA, Archer MSA, or HSA. The person collecting this form uses the information on the form to file information returns with the IRS, reporting the above information. Routine uses of this information include giving it to the Department of Justice for civil and criminal litigation and to cities, states, the District of Columbia, and U.S. commonwealths and possessions for use in administering their laws. The information also may be disclosed to other countries under a treaty, to federal and state agencies to enforce civil and criminal laws, or to federal law enforcement and intelligence agencies to combat terrorism. You must provide your TIN whether or not you are required to file a tax return. Under section 3406, payers must generally withhold a percentage of taxable interest, dividend, and certain other payments to a payee who does not give a TIN to the payer. Certain penalties may also apply for providing false or fraudulent information.

Appendix J

Unit Price List

BOND QUANTITIES FORM

Project Name:		**Owner/Developer:**	
Address:		**Address:**	
Bond Amount:			
Project No.:		**Phone No:**	
Bond Type:		**Email:**	

Bond Amount per Approved P&Z Plan

ITEM NO.	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	ITEM AMOUNT
1	Clearing and Grubbing		ACRE	$5,000.00	
2	Anti-Tracking Pad		EA	$1,500.00	
3	Sedimentation Control System		LF	$10.00	
4	Erosion Control Blanket		SF	$3.00	
5	Riprap		CY	$75.00	
6	Restoration of Lawn Areas		SY	$9.00	
7	Mulch		SY	$7.00	
8	Landscape Trees		EA	$300.00	
9	Landscaping		SF	$3.00	
10	Sanitary Manhole 0-10'		EA	$4,500.00	
11	Sanitary Manhole 10-15'		EA	$5,500.00	
12	Sanitary Manhole 15-20'		EA	$6,500.00	
13	8" PVC Sanitary Sewer		LF	$70.00	
14	12" PVC Sanitary Sewer		LF	$80.00	
15	15" PVC Sanitary Sewer		LF	$90.00	
16	6" House Sanitary Lateral		EA	$3,000.00	
17	External Grease Trap		GAL	$5.00	
18	8" CLDIP Water Main		LF	$75.00	
19	10" CLDIP Water Main		LF	$80.00	
20	12" CLDIP Water Main		LF	$85.00	
21	Air Release Manhole		EA	$5,500.00	
22	Fire Hydrant Assembly (Complete)		EA	$5,700.00	
23	1" Service		EA	$2,500.00	
24	2" Service		EA	$3,000.00	
25	Fire Service		LF	$55.00	
26	Type "C" Catch Basin		EA	$3,250.00	
27	Type "C-L" Catch Basin		EA	$2,500.00	
28	Type "C" Double Grate Catch Basin		EA	$5,500.00	
29	Modify Drop Inlet to Catch Basin w/ Manhole		EA	$4,500.00	
30	Precast Storm Drainage Manhole		EA	$3,500.00	
31	Precast Storm Drainage Doghouse MH		EA	$3,000.00	
32	Precast Concrete Drywell		EA	$3,000.00	
33	Endwalls		EA	$2,500.00	
34	Reset Catch Basin Top		EA	$1,000.00	
35	Adjust Structure To Grade		EA	$500.00	
36	Clean Existing Catch Basin		EA	$250.00	
37	Hydrodynamic Particle Separator		CFS	$15,000.00	
38	15" RCP w/ rubber gaskets		LF	$50.00	
39	18" RCP w/ rubber gaskets		LF	$65.00	
40	24" RCP w/ rubber gaskets		LF	$80.00	
41	30" RCP w/ rubber gaskets		LF	$95.00	
42	36" RCP w/ rubber gaskets		LF	$125.00	
43	42" RCP w/ rubber gaskets		LF	$150.00	
44	15" Slotted RCP w/ rubber gaskets		LF	$55.00	
45	18" Slotted RCP w/ rubber gaskets		LF	$70.00	
46	24" Slotted RCP w/ rubber gaskets		LF	$85.00	
47	15" Rein. Conc. Culvert End		EA	$850.00	
48	18" Rein. Conc. Culvert End		EA	$1,000.00	
49	24" Rein. Conc. Culvert End		EA	$1,250.00	

Bond Amount per Approved P&Z Plan

ITEM NO.	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	ITEM AMOUNT
50	30" Rein. Conc. Culvert End		**EA**	$1,400.00	
51	6" HDPE Underdrain		**LF**	$35.00	
52	Surface Detention Basin		**AC-FT**	$10,000.00	
53	Subsurface Detention/Infiltration System		**CF**	$10.00	
54	Processed Aggregate Base		**TON**	$35.00	
55	Granular Fill		**CY**	$45.00	
56	Granite Curb		**LF**	$50.00	
57	Radius Granite Curb		**LF**	$55.00	
58	Reset Granite Curbing		**LF**	$35.00	
59	Precast Concrete Curb		**LF**	$50.00	
60	Bituminous Concrete Lip Curbing		**LF**	$9.00	
61	Structural Concrete (Class "A")		**CY**	$750.00	
62	Concrete Sidewalk		**SF**	$8.00	
63	Concrete Sidewalk & Curb Monolithic		**SF**	$10.00	
64	Concrete Sidewalk Ramps		**SF**	$8.50	
65	Concrete Driveway Apron		**SF**	$9.50	
66	Textured Concrete Sidewalk		**SF**	$15.50	
67	Mill Bituminous Concrete Pavement		**SY**	$4.00	
68	Bituminous Concrete		**TON**	$100.00	
69	Bituminous Concrete Driveway Apron		**SY**	$45.00	
70	Bituminous Concrete Bikepath		**SY**	$50.00	
71	Permanent Pavement Repair		**TON**	$300.00	
72	Joint/Crack Sealing		**LF**	$3.50	
73	Metal Beam Guide Rail (Type RB-350)		**LF**	$50.00	
74	Three Cable Guide Rail		**LF**	$35.00	
75	Timber Rail		**LF**	$50.00	
76	Vinyl Coated Chain Link Fence		**LF**	$35.00	
77	Cast-in-Place Concrete Retaining Wall		**SF**	$40.00	
78	Segmental Block Retaining Wall		**SF**	$35.00	
79	Epoxy Resin Pavement Markings		**LF**	$1.50	
80	Epoxy Resin Pavement Symbols		**SF**	$4.00	
81	Painted Pavement Markings		**LF**	$0.50	
82	Painted Pavement Symbols		**SF**	$2.00	
83	Street Lights		**EA**	$1,750.00	
84	Signs		**EA**	$150.00	
85	Traffic Signal		**EA**	$125,000.00	
86	Traffic Signal (Modify)		**EA**	$30,000.00	
87	Granite Monument		**EA**	$325.00	
88	Iron Pipe/Rods/Drill Holes		**EA**	$175.00	
89	Town GPS Control Network Monuments		**EA**	$3,000.00	
90	Maintenance & Protection of Traffic		**LS**	1.5% of total cost of Items #1-89	
91	As-Built Drawings		**LS**	$3000 plus 2% of total cost of Items #1-89	
				SUBTOTAL	**$0.00**
				+ 10%	$0.00
				BOND TOTAL	**$0.00**
				25% amount	$0.00
				75% amount	$0.00

Appendix K

Project Requirements

Town of Manchester
Public Works Department
Engineering Division
PROJECT REQUIREMENTS

The following activities must be completed prior to *any* construction activity:

- When Planning and Zoning Commission approval is required, approved plans stamped by the Planning Department are filed at the Engineering Division
- An Erosion and Sedimentation Control Bond has been submitted to the Engineer and approved
- A preconstruction meeting is held with the Engineer
- A valid Right-of-Way Permit has been issued by the Engineering Division
- At least three (3) phone numbers for the project manager/superintendent have been submitted to the Engineer for contact in case of an emergency outside of standard operating hours
- All required materials submittals have been approved by the Engineer
- If applicable, trees within public right-of-way proposed to be cut, pruned or removed have been posted and work has been approved to proceed by the Manchester Tree Warden
- If required by the Engineer, existing monumentation within the work area has been field located by a Land Surveyor licensed in the State of Connecticut

The following activity must be completed prior to the posting of a Public Improvements Bond:

- All easements in favor of the Town of Manchester as shown on the approved plans have been recorded with the Town Clerk.
- The following activities must be completed prior to issuance of 50% of the building permits for an approved site: Sanitary sewer has been installed, inspected and tested
- Water mains have been installed, inspected and tested
- Storm sewer systems have been installed and inspected
- Curbs and sidewalk have been installed and inspected
- Binder course of pavement for roadways has been installed and inspected
- Site grading and compaction is completed per plan
- Utility trenches have been backfilled and compacted
- Streetlights have been installed and energized
- A check has been made out to the “Town of Manchester” to cover the first twenty-four (24) months of energy costs
- Post-construction erosion control measures have been installed
- Check prints of record (as-built) drawings have been submitted for review
  (Water and Sewer Department requires these prior to first “Certificate of Occupancy”)
- Street signs and traffic signs have been installed and inspected

The following activities must be completed prior to the start of the one-year maintenance period (i.e., prior to reduction of bonding below 10%):

- Surface course of pavement has been installed and accepted
- Pavement markings have been installed and accepted
- Record (as-built) drawings have been approved and mylars have been filed at the Engineering Division
- All streetline monumentation has been set
- A Maintenance Bond has been submitted to the Engineer and approved

The following activities must be completed prior to the release of the Maintenance Bond (i.e. final acceptance):

- A request in writing has been made for final inspection of all completed public improvements
- All outstanding punchlist items have been corrected to the satisfaction of the Engineer and all public improvements have been accepted
- A title policy or attorney's certificate evidencing clear title in the grantor(s) of all deeds and easements has been submitted to the Engineer
- All outstanding interests in third parties must be released or subordinated to the interest or estate which is to be conveyed to the Town. Releases or subordinations shall also be submitted.
- If applicable, a petition asking for acceptance and adoption of streets and other public improvements has been submitted to the Engineer

Appendix L

Manchester Traffic Control Ordinance

Chapter 279. Streets and Sidewalks

Article II. Traffic Control at Construction Activity

[Adopted 11-18-1997 (Sec. 14-14 of the 1996 Code)]

§ 279-14. Barricades and other protection at repair work sites.

When any excavation, construction or repair of or on any public roadway, street (excluding limited access highways, adjoining ramps and state/federal roads) or sidewalk or the destruction of any building within the Town of Manchester (hereinafter referred to as "repair work") creates or may create a hazard or inconvenience to vehicular or pedestrian traffic or in any way causes or may cause a hazard to the public safety, as determined by the Chief of Police or his designee, the person so engaged in any repair work must provide adequate protection, as the Chief of Police or his designee may require. If the Chief of Police or his designee determines that the site may be adequately protected by placement of appropriate barricades, the person engaged in any such repair work shall provide such barricades and barricade warning lights as the Chief of Police or his designee shall require.

§ 279-15. Use of municipal flagpersons.

A. If the Chief of Police or his designee, in his sole discretion, determines that the public safety requires the use of a flagperson, and the repair work takes place during normal business hours of 7:00 a.m. to 6:00 p.m., Monday through Saturday; and affects one or more of the following Town principal or minor arterial roads, and the repair work is not de minimis in nature, the Chief of Police shall require that the person engaged in the repair work first utilize officers of the Manchester Police Department as flagpersons.

   (1) Principal arterials.

      (a) Route 83 (Main Street) — Charter Oak Street to Center Street.

      (b) Buckland Street — Tolland Turnpike to South Windsor Town line.

   (2) Minor arterials.

      (a) Broad Street.

      (b) West and East Middle Turnpike — New State Road to Woodbridge Street.

      (c) North Main Street — Main Street to Tolland Turnpike.

(d) New State Road — West Middle Turnpike to Adam Street.

(e) Tolland Turnpike — North Main Street to East Hartford Town line.

(f) Adams Street — Center Street to Tolland Turnpike.

(g) Keeney Street — Hartford Road to Glastonbury Town line.

(h) McKee Street.

(i) Woodbridge Street — East Middle Turnpike to Route 83 (Main Street).

(j) Buckland Hills Drive.

(k) Slater Street.

(l) Hale Road.

(m) Parker Street — Tolland Turnpike to Colonial Road.

(n) Pine Street.

(o) Summit Street.

(p) Pavilions Drive.

B. The expense of such police protection shall be paid by the entity engaged in such repair work at rates determined by the Town.

C. Notwithstanding any other provision of this article, any repair work performed by the municipality or any of its offices or agents, or initiated by the municipality or any of its offices or agents and performed by a private contractor, regardless of location, may at the Chief of Police or his designee's discretion utilize properly equipped and trained municipal employees or agents of the municipality as flagpersons. In addition, the Chief of Police or his designee may in his sole discretion recommend to contractors working on state or federal roads that they utilize officers of the Manchester Police Department if a flagperson is needed for public safety.

§ 279-16. Use of nonmunicipal flagpersons.

If no police officer of the Manchester Police Department is available to accept the extra police duty referenced herein, and the repair work is conducive to the use of flagpersons as determined by the Chief of Police or his designee, or in any other instance when flagpersons are utilized, the entity responsible for the repair work shall provide, pay for and utilize a flagperson equipped with a high visibility traffic control vest and high visibility traffic control flag whose sole function shall be to control vehicular and pedestrian traffic during all hours when repair work is being done or when a hazard to such traffic or to public safety exists.

§ 279-17. Authority to close repair work if no flagperson is provided.

When such police officer or flagperson has not been provided and the Chief of Police or his designee determines that a hazard to pedestrian and/or vehicular traffic exists, the Chief of Police or his designee may order the repair work closed until a flagperson has been provided in accordance with §§ **279-14** through **279-17** of this article, or other appropriate action is taken as ordered by the Chief of Police or his designee.

§ 279-18. Authority of Traffic Control Authority during emergencies.

Nothing herein shall prevent the Traffic Control Authority from taking any and all necessary action in the time of emergency.

Appendix M

Manchester Sidewalk and Curb Ordinance

Chapter 279. Streets and Sidewalks

Article IV. Assessments for Sidewalks and Curbs

§ 279-31. Sidewalk and curb installation on existing streets simultaneous with building construction.

[Amended 7-22-2003]

A. The owner of lands on which any structure is hereafter erected, fronting on public highways or streets in the Town, shall install concrete sidewalks and granite curbs in accordance with the public improvement standards of the Department of Public Works, if such installation is in conformance with the sidewalk and curb plan of the Town as approved by the Town Planning and Zoning Commission. Said walks and curbs shall be installed concurrently with the construction of said structure. When, for good cause shown, the installation of either sidewalks or curbs is not advisable or desirable, the Planning and Zoning Commission may allow and/or require the owner of said lands to make a payment to the Town in lieu of the installation. The Planning and Zoning Commission shall not make its determination until it has received a recommendation from the Director of Public Works on the advisability of installing the sidewalks and/or curbs. The Director of Public Works shall make his recommendation no later than 20 working days from the receipt of the request for an opinion from the Planning and Zoning Commission or its designated staff.
[Amended 3-3-2009]

B. When payment in lieu of installation is required, payments shall be in an amount based upon the prevailing costs of said improvements as determined by the director of public works. If a substitute material for granite curbing is required temporarily for good cause, the cost of the substitute material shall be deducted from the cost of the granite, and the balance will constitute the payment in lieu of installation.

C. Payments in lieu of installation shall be deposited into a dedicated fund to be used solely for the installment of new sidewalks and curbs. A record of all property owners and properties subject to the payment in lieu of installation shall be kept by the Planning Department, and said property owners shall not be liable for any fee or assessment for the installation of sidewalks or curbs in front of their property in the future.

D. The Planning and Zoning Commission shall prepare and adopt a sidewalk and curb plan for the Town. The plan shall set forth the policies for determining where sidewalks and curbs would be installed; enumerate examples of what constitutes good cause for allowing or requiring payment in lieu of installation; and recommend priority locations for the extension or removal of sidewalks. The sidewalk and curb plan shall be

reviewed and amended as appropriate every five years. The plan shall be so revised and adopted within six months of the adoption of this section and every five years thereafter. Before adoption, the plan shall be submitted to the Board of Directors for review and comment, and at least one public hearing shall be held.

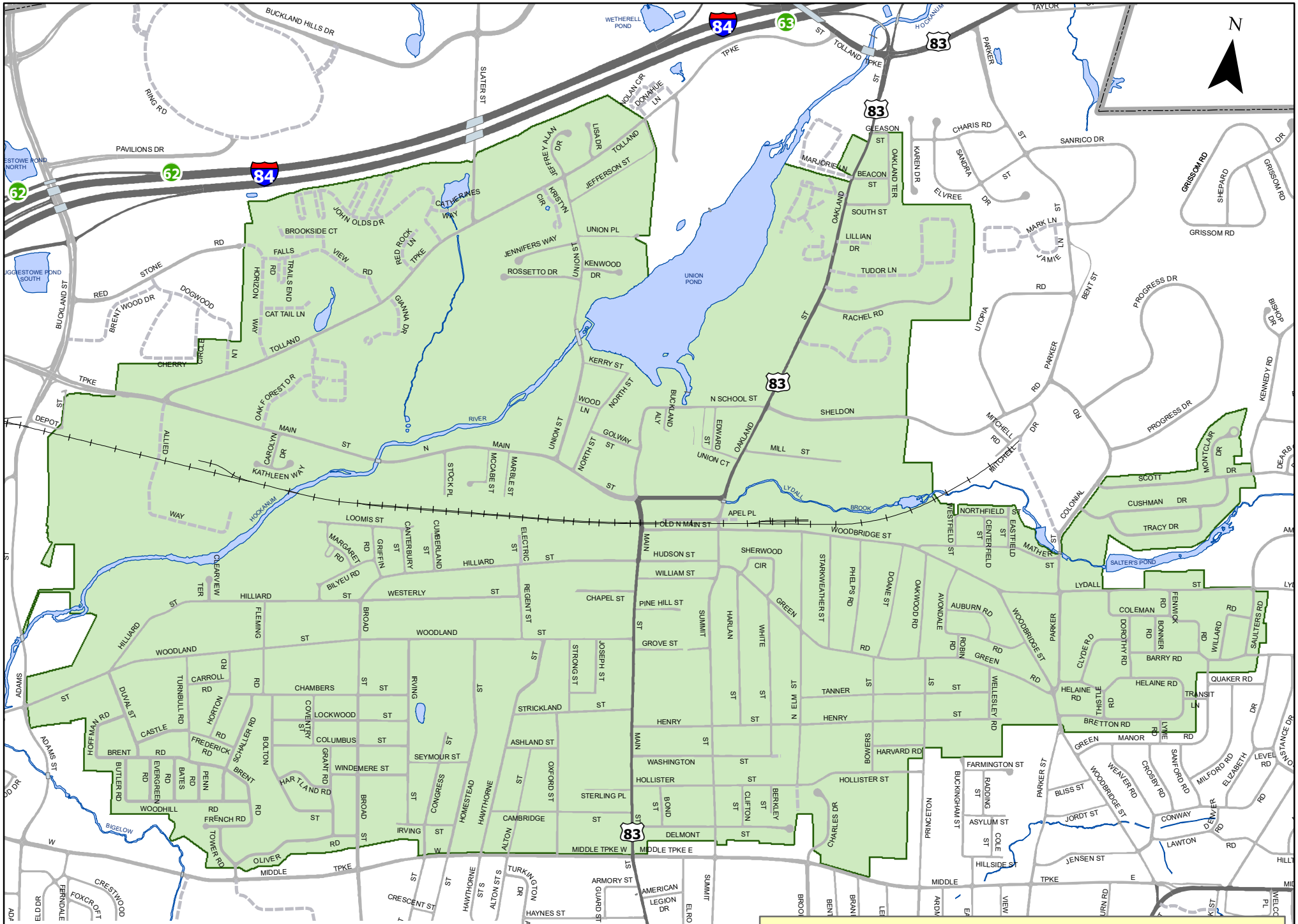
E. If concrete sidewalks, concrete curbs or granite curbs are in existence abutting the land on which any structure is hereinafter erected, fronting on public highways or streets in the Town, the owner of such lands shall repair said sidewalks and curbs to the satisfaction of the Director of Public Works or his designated representative. Existing bituminous curbs shall be removed and replaced with granite curbs.
[Amended 3-3-2009]

F. The Building Department shall affix a copy of this regulation to all building permits issued by it.

G. From the effective date of this section forward, any previously granted deferments may be called by the Board of Directors, and the then-owner of the property shall be required to pay the cost of said installation. Before calling a deferment, the Board of Directors shall request a written recommendation from the Planning and Zoning Commission and Director of Public Works on the advisability of calling said deferment.

Appendix N

Eighth Utilities Sewer District Map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EIGHTH UTILITIES SEWER DISTRICT
MANCHESTER, CT
Date: 1/31/2020
Note:
Contact the Manchester Maps and Records Office at 860-647-3119 to confirm if specfic properties are located within the Eighth Utilities Sewer District.
PIS_8thSanDist.mxd