# TOWN OF MANCHESTER PUBLIC IMPROVEMENT STANDARDS

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1.01 APPLICABILITY

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

- Design and construction of public roadways and infrastructure associated with new subdivisions
- Improvements to existing public infrastructure required as part of a subdivision or private development approval through the Planning and Zoning Commission
- Repair and restoration work associated with public service utility work
- Requirements to construct curb and sidewalk per Section 14-57 of the Town of Manchester Code of Ordinances
- Installing a new curb cut in an existing roadway

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 private property. This may include, but is not limited to:

- Modifications to private property that will increase the amount of impervious area on the site
- Modifications to private property that will change existing drainage patterns
- Modifications to private property that will impact existing traffic patterns

Requirements for water and sanitary sewer utility design and construction are not included in this document, but may be found in the “Water and Sewer Department – Public Improvement Standards” as published by the Town of Manchester Water and Sewer Department.

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 REFERENCES

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

- “Standard Specifications for Roads, Bridges and Incidental Construction, Form 814A” as published by the Connecticut Department of Transportation, as amended;
- “Highway Design Manual” 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;
- “Manual of Uniform Traffic Control Devices for Streets and Highways” as published by the U.S. Department of Transportation Federal Highway Administration, 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;
- “Rules and 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;
- 2002 Connecticut Guidelines for Soil Erosion and Sedimentation Control (DEP Bulletin 34) as prepared by the Connecticut Department of Environmental Protection, as amended
- “Rules and Regulations” and “Public Improvement Standards – Water and Sewer” as published by the Town of Manchester Water and Sewer Department.
1.03 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:

“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 licensed professional engineer, 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 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 Licensed Land Surveyor, which establishes a specific point of reference, with a clear and precise location.

“Record (As-Built) Drawing”
A plan, prepared and certified by a Licensed Land Surveyor, 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. Proposed plan is reviewed and approved by appropriate parties to ensure compliance with Town of Manchester design standards.  
   (See Section 2.02 – “Types of Plan Reviews”)  
   (See Part 3 – “Design Standards”)  

2. Approved bonding is secured with Town of Manchester.  
   (See Section 4.02 – “Bonding Requirements”)  

3. A preconstruction meeting is held with the Engineer.  
   (if required)  

4. A “Right-of-Way Permit” is obtained from the Town of Manchester.  
   (See Section 4.01 – “Right-of-Way Permits”)  

5. Construction adheres to Town of Manchester standards.  
   (See Part 4 – “Construction”)  

6. Record (As-Built) Drawings are submitted and approved.  
   (if required)  
   (See Section 5.01 – “Record (As-Built) Drawings”)  

7. Warranty Deeds and/or easements are filed on the land records  
   (if required)  
   (See Section 5.02 – “Warranty Deeds and Easements”)  

For a detailed list of activities that must be completed prior to certain milestones, see Appendix “A” – “Project Completion Requirements”.  

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2.01 PRE-SUBMISSION COOPERATION

Consultation with the Town may be most useful before any detailed plans are developed. Attempting to work with Town staff before developing costly plans may help to avoid controversial or problematic locations, structures or construction issues and may prove far more expedient in the long run than attempting to bypass those individuals. Town staff may be able to suggest alternative sites, methods or structures which have proven successfully within the Town in the past and which are more likely to be accepted by the Town in the future. Town staff may also be aware of other public or private development projects which could conflict with the proposed plans. In addition, submission of plans to the Town for review is likely to proceed far more smoothly when the Town has already had the opportunity to discuss the project with the developer or utility company and to consider the implications which the project may have.

2.02 TYPES OF PLAN REVIEWS

The following plans must be reviewed by the Town of Manchester Department of Public Works:

2.02.01 APPLICATIONS BEFORE PLANNING & ZONING COMMISSION

The majority of site development plans are reviewed as part of an active application before the Planning & Zoning Commission or Zoning Board of Appeals. This may include an “Erosion and Sedimentation Control Permit”, an “Inland Wetlands Permit”, a “Subdivision/Resubdivision Application”, a “Zoning Board of Appeals” application or any other site plan or special exception administered through the Town of Manchester Planning Department.

See the “Town of Manchester Zoning Regulations”, “Town of Manchester Subdivision Regulations”, “Inland Wetlands and Watercourses Regulations of the Town of Manchester Connecticut” or contact the Town of Manchester Planning Department for specific plan requirements regarding these permits.
2.02.02 UTILITY LINE ASSIGNMENT REQUESTS

Any utility company proposing to install, extend or upgrade their facilities within Town of Manchester right-of-way is required to submit plans to the Engineering Division for approval prior to construction. This review and approval is referred to as a Utility Line Assignment Request.

**Exception:** If all the proposed work is overhead (i.e. on existing poles) or within existing conduit, and no excavation is proposed within Town right-of-way, then a Utility Line Assignment is not required. This does not relieve the Contractor from taking out a “Right-of-Way Permit” for this work.

In order for a Utility Line Assignment Request to be reviewed for accuracy and in a timely manner, all requests must include the following information:

1. A cover letter indicating the street location and a brief description of the proposed work. The letter should include a name and address of the contact person to address any review comments.

2. Three (3) sets of construction plans prepared by the utility company or their engineer. The plan shall be drawn to a scale not less than 1”= 40’ and should show all existing features, including existing utilities, easements, street names and building addresses. The plan should show the proposed work, including the type of construction (bore, open trench, etc.) and clearances to Town owned utilities (storm, water and sanitary sewer). It is strongly recommended that you obtain the latest information with regard to existing utilities prior to submitting a proposed plan. Minimum horizontal clearance to storm, water and sanitary sewer facilities is 5’. Minimum vertical clearance to storm facilities is 12”; and water and sanitary sewer facilities is 18”.

3. Requests for a Utility Line Assignment shall be addressed to the following:

   Director of Public Works
   494 Main St.
   P.O. Box 191
   Manchester, CT 06045-0191
Typically, the initial review period takes approximately 3 to 4 weeks, depending upon the scope of work. Incomplete plans are the general cause of delays in the process. The Engineering Division will either approve the request or ask for revised plans.

If the request is approved, the utility company will receive one set of plans stamped “Approved for Construction”. The contractor doing the work will need to obtain a “Right-of-Way Permit” prior to construction. Right-of-Way Permits will not be processed unless the application is accompanied by a copy of the stamped approved plans.

2.02.03 APPLICATION FOR CURB CUT

Any person proposing to add a new, or modify an existing, driveway opening within a Town-owned public roadway shall submit an “Application for Curb Cut” to the Engineer for review and approval. Requests shall be made on the “Application for Curb Cut” form in Appendix “B”. This request is not required if the curb cut as proposed is shown on an approved site or subdivision plan. Curb cuts on State-owned roads are regulated through the Connecticut Department of Transportation.

2.02.04 PLOT PLAN REVIEWS

Individual plot plans are required for all proposed principal buildings to be built within the Town. Plans shall be drawn to a scale of 1”= 20’ or 1”= 40’, on paper size 18” x 24” or 24” x 36”. Plans are to be certified by a Connecticut registered land surveyor as an “Improvement Location Survey”, as defined by Sections 20-300b and 4-168 of the Connecticut General Statutes. Three (3) copies of the plot plan shall be submitted to the Town of Manchester Building Department with each application.

Plot plans shall show the following information:

1. Property address. Contact Engineering Division at (860) 647-3156 for this information.
2. Lot number and subdivision name, if applicable.
3. Zone in which property is located. Contact Zoning Enforcement Officer at (860) 647-3052 or the Planning Department at 647-3044 for this information.
4. Area, in both square feet and acres, of building lot.
5. Front, side and rear building lines.
6. Monumentation found, set or to be set.
7. Easements of record, if applicable.
8. All contours and elevations shall be based on the same vertical datum as the approved subdivision plan and field verified, as required. 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. Contact the Engineering Division at (860) 647-3157 for information on available record drawings and benchmarks.
9. Elevations of proposed top of foundation wall, proposed basement, garage and finished floors, and centerline of road opposite the proposed driveway location.
10. Location and outlet elevations of proposed foundation drains or other subsurface drainage, if applicable.
11. Location of water and sanitary sewer services or well and septic system.
12. Existing and proposed sidewalks, curb and driveway aprons. Indicate material type (i.e. concrete, granite, bituminous).
13. Existing catch basins or hydrants along the frontage of the property.
14. Existing utility and/or light poles adjacent to the property. Include owner and pole number.
15. Existing or proposed retaining walls, if applicable
16. Limits of inland wetland and/or flood zone, if applicable. If none exist on property, add appropriate note.
17. Erosion and sedimentation control measures, including anti-tracking pad.
18. Map reference(s), if applicable.

If development will require potable well and/or septic system, contact the Town of Manchester Health Department at 647-3173 for specific requirements.

See Appendix “C” for a sample plot plan.

2.02.05 TRAFFIC CONTROL PLAN

When required by the Engineer, the Contractor shall submit for approval his proposed plan to maintain and protect traffic through the work area. Plans shall show, at a minimum, the size, type and location of signs and other traffic control devices to be used.
3.01 GENERAL

3.01.01 GENERAL REQUIREMENTS

All existing features located within the existing or proposed right-of-way of the Town of Manchester shall be located and identified on all construction and development plans. Plans shall be prepared by a Licensed Land Surveyor 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.

All surveys must be tied into the Town of Manchester Horizontal and Vertical Control Network as established in 1998. Tie sheets for all network control stations are available upon request through the Town of Manchester Engineering Division.

40-scale digital planimetric and topographic mapping of the entire town is available. For further information, contact the Geographic Information Systems (G.I.S.) Department at 647-3062.

All proposed work shall be clearly shown on the plans. Plans shall be prepared and sealed by a Registered Professional Engineer licensed in the State of Connecticut.

3.01.02 DESIGN WAIVERS

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 Director of Public Works. The Design Engineer must clearly indicate why the waiver is being requested and prove that the design will still meet the desired objectives.
3.02 ROADWAY DESIGN

Roadways shall be designed and constructed in conformance with the typical roadway cross section, Plate No. 1, and to the design criteria herein.

The design criteria are generally based upon road classification. Roadways in Manchester are classified as a local road, collector road, or arterial (major or minor). A list of existing road classifications is located in Appendix “D”.

In addition to the design criteria set forth in these Public Improvement Standards, all designs shall meet the minimum criteria of the latest revisions of "A Policy on Geometric Design of Highways and Streets" as published by the American Association of State Highway and Transportation Officials, and the "Geometric Design Standards" as published by the State of Connecticut Department of Transportation.

3.02.01 DESIGN SPEEDS

The following minimum design speeds shall be used:

<table>
<thead>
<tr>
<th>Road Type</th>
<th>Minimum Speed</th>
</tr>
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<tbody>
<tr>
<td>Local Road</td>
<td>30 miles per hour</td>
</tr>
<tr>
<td>Collector Road</td>
<td>40 miles per hour</td>
</tr>
<tr>
<td>Arterial</td>
<td>50 miles per hour</td>
</tr>
</tbody>
</table>

3.02.02 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 minimum design speed. It is preferable to use flatter curves whenever possible. In no case shall a horizontal curve be less than two hundred fifty feet (250’) in length.

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

Curves shall be connected with a minimum tangent of one hundred feet (100’).
The following minimum centerline radii and stopping sight distances shall be met:

<table>
<thead>
<tr>
<th>Design Speed</th>
<th>Centerline Radius</th>
<th>Minimum Allowed Stopping Sight Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 mph</td>
<td>250 feet</td>
<td>250 feet</td>
</tr>
<tr>
<td>40 mph</td>
<td>600 feet</td>
<td>400 feet</td>
</tr>
<tr>
<td>50 mph</td>
<td>950 feet</td>
<td>500 feet</td>
</tr>
</tbody>
</table>

Sight distances shall be measured from a height of eye of 3.5 feet and a height of object of 2 feet. Sight distance lines shall be shown on the proposed plan and profile sheets.

3.02.03 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:

<table>
<thead>
<tr>
<th>Street Classification</th>
<th>Local Road</th>
<th>Collector</th>
<th>Arterial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Road</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Collector</td>
<td>25</td>
<td>35</td>
<td>40</td>
</tr>
<tr>
<td>Arterial</td>
<td>25</td>
<td>40</td>
<td>50</td>
</tr>
</tbody>
</table>

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

The minimum intersection sight distances shall be:

<table>
<thead>
<tr>
<th>Design Speed</th>
<th>Classification of Intersecting Street</th>
<th>Minimum Intersection Sight Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>Local Road</td>
<td>335 feet</td>
</tr>
<tr>
<td>40</td>
<td>Collector</td>
<td>445 feet</td>
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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'.

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

### 3.02.04 VERTICAL ALIGNMENT

The Designer 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 road shall be constructed having a gradient of less than one percent (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:

\[
L = K(G_1 - G_2)
\]

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

<table>
<thead>
<tr>
<th>Design Speed</th>
<th>K (in crest)</th>
<th>K (in sag)</th>
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<tbody>
<tr>
<td>30 mph</td>
<td>35</td>
<td>40</td>
</tr>
<tr>
<td>40 mph</td>
<td>60</td>
<td>65</td>
</tr>
<tr>
<td>50 mph</td>
<td>120</td>
<td>95</td>
</tr>
</tbody>
</table>

Select vertical curves for 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 curves. 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.

The vertical curve must also be large enough to satisfy AASHTO sight distance requirements.
3.02.05  CUL-DE-SACS

Cul-de-sacs shall be designed in accordance with Plate 2. Temporary cul-de-sacs shall be used if there remains developable land adjacent to the property. (See Section 4.08.03 of the Town of Manchester Subdivision Regulations.) Temporary cul-de-sacs are also required when phasing subdivisions.

Reference Plates
#2A - Temporary Cul-de-sac
#2B – Permanent Cul-de-sac

3.02.06  SIDEWALKS AND CURBS

Sidewalks shall be concrete and shall be constructed in accordance with Plate 3.

The minimum width of concrete sidewalks shall be five feet (5’).

The minimum thickness of concrete for sidewalks shall be four inches (4”).

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 six inches (6”) thick. Eight-inch (8”) thick sidewalk ramps are required in commercial areas or in residential areas where the curb radius is less than 25’.

All curbing installed within existing or proposed Town of Manchester right-of-way shall conform to the “Town of Manchester Sidewalk and Curb Plan”.

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

Reference Plates
#3 – Concrete Sidewalk
#4 – Concrete Sidewalk and Curb Monolithic
#5 – Concrete Sidewalk Ramps
#6 – Curb Types
3.02.07 DRIVEWAYS AND APRONS

Driveways shall be located so as to provide at least the minimum required intersection sight distances as defined in Section 3.02.03 of these Public Improvement Standards. Driveways shall be located a minimum of twenty-five feet (25') from a roadway intersection.

Driveway aprons for new local residential roadways shall be constructed of bituminous concrete in accordance with Plate 8.

Roadway type curb cuts are not allowed for commercial driveways unless the intersection is controlled by a traffic signal.

New or modified curb cuts that are not associated with an approved subdivision or private development plan or approved plot plan (i.e., widening of an existing residential driveway) shall be submitted to the Engineering Division on the “Application for Curb Cut” form included in Appendix “B” for approval.

Reference Plates
#7 – Concrete Driveway Apron
#8 – Bituminous Concrete Driveway Apron

3.02.08 PAVEMENT CROSS-SECTIONS

The minimum pavement cross-section for roadways shall be as follows:

Local Road:  
- 1-1/2" Hot Mix Asphalt (Bituminous Concrete) Class 2
- 2-1/2" Hot Mix Asphalt (Bituminous Concrete) Class 1
- 4" Processed Aggregate Base (Broken Angular Stone)
- 8" Grading "A" Bank Run Gravel ConnDOT

Collector:  
- 1-3/4" Hot Mix Asphalt (Bituminous Concrete) Class 1 Surface
- 3-1/2" Hot Mix Asphalt (Bituminous Concrete) Class 1 Intermediate
- 4" Processed Aggregate Base (Broken Angular Stone)
- 10" Grading "A" Bank Run Gravel ConnDOT

Arterial:  
- 1-3/4" Hot Mix Asphalt (Bituminous Concrete) Class 1 Surface
- 3-1/2" Hot Mix Asphalt (Bituminous Concrete) Class 1 Intermediate
- 3-1/2" Hot Mix Asphalt (Bituminous Concrete) Class 4 Base
- 4" Processed Aggregate Base (Broken Angular Stone)
- 12" Grading "A" Bank Run Gravel ConnDOT

Reference Plates
#1A – Typical Roadway Cross Section – Local Road
#1B – Typical Roadway Cross Section – Collector Road
3.02.09 ROADWAY 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 Figure 11-5K of the Connecticut Department of Transportation’s Highway Design Manual.

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

Reference Plates
#1A – Typical Roadway Cross Section – Local Road
#1B – Typical Roadway Cross Section – Collector Road
#1C – Typical Roadway Cross Section - Arterial

3.02.10 SUBSURFACE DRAINAGE

Subsurface drainage (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 27. Underdrains are typically located two feet (2’) behind the curb. All underdrains shall outlet into a catch basin or storm manhole. Access cleanouts shall be provided every 250’. Utility marking tape shall be placed above installed underdrains in accordance with the standard detail.

Reference Plates
#27 – Underdrains
3.02.11 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 9 and be set so that the elevation of the top of the monument is flush with the 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 monumentation shall be furnished and installed by the developer and their accuracy certified by a Licensed Professional Land Surveyor and indicated as such on the Record Drawings.

In the event that any existing monumentation as shown on the original subdivision plan or found in the field after the start of construction is destroyed, damaged or disturbed, the Contractor’s Land Surveyor shall replace or reset the bound to its proper location.

Reference Plates
#9 – Monumentation and Property Markers
3.02.12 GUIDE RAIL AND PROTECTIVE FENCING

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.

All guide rail shall be designed in accordance with the latest Connecticut Department of Transportation standards. Easements may be required for the placement of the guide rail or its anchoring system.

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.).

The use of D.O.T. approved three cable rail is preferred over metal beam guide rail in residential areas for aesthetic purposes provided all safety and design criteria can be achieved.

_Metal Beam Guide Rail_

Metal Beam Guide Rail shall be Type RB-350 and shall conform to the latest Connecticut Department of Transportation standards.

_Three Cable Guide Rail_

Three cable guide rail when used with curbing shall be placed no further than one foot (1’) from the face of curb. When a sidewalk is present or proposed, the guide rail should be placed flush with the back of sidewalk.

Three cable guide rail shall not be placed along a fill slope steeper than 2:1 unless the distance between the back of the post and the break in the fill slope (top of slope) is at least eight feet (8’).
Three cable guide rail shall not be used along horizontal curves with radii less than 230 feet.

The minimum length of three cable guide rail shall be 150 feet. Where possible, gaps of less than 200 feet are to be avoided by installing a continuous run.

The post spacing required for three cable guide rail depends upon the anticipated speed of approach traffic and the allowable space for deflection. Minimum post spacing shall be as follows:

<table>
<thead>
<tr>
<th>Roadway Classification</th>
<th>Allowable Deflection</th>
<th>Post Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Road</td>
<td>9’</td>
<td>16’</td>
</tr>
<tr>
<td></td>
<td>6’</td>
<td>8’ (System 2)</td>
</tr>
<tr>
<td></td>
<td>3’</td>
<td>4’ (System 3)</td>
</tr>
<tr>
<td>Collector or Arterial</td>
<td>11’</td>
<td>16’</td>
</tr>
<tr>
<td></td>
<td>8’</td>
<td>8’ (System 2)</td>
</tr>
<tr>
<td></td>
<td>7’</td>
<td>4’ (System 3)</td>
</tr>
</tbody>
</table>

Protective fencing shall be installed at any vertical dropoffs greater than 4’, including the tops of headwalls, impact basins, etc.

Protective fencing may be required behind sidewalks where an adjacent cut or fill slope exceeds 3:1 or at other locations where deemed necessary by the Engineer.

Protective fencing shall consist of black vinyl coated chain link fence with a minimum height of sixty inches (60”).

3.02.13 RETAINING WALLS

Retaining walls within the roadway zone of influence are only permitted by waiver from the Director of Public Works based on extenuating circumstances. When approval to use a retaining wall has been granted, it shall be cast-in-place concrete designed in accordance with Connecticut Department of Transportation standards. The roadway zone of influence is defined as the area between slope limits using the typical roadway section with 2:1 side slopes.

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

For walls in 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 depending upon the location.

All costs for testing necessary for the construction and inspection of the retaining wall as required by the Engineer shall be the responsibility of the Developer.

The Developer will also be required to post a cash bond equal to ten percent (10%) of the cost of the retaining wall to cover future maintenance and inspection costs borne by the Town.

**3.02.14 STREETLIGHTS**

Streetlights shall be provided on all approved subdivisions and site development plans.

Streetlights shall be spaced no more than 200 feet 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 listing of the type of poles and materials being used in accordance with Town of Manchester standards.

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 30 inches. Identification ribbon is to be placed within the trench area twelve inches (12”) above the installed conduit.

Fixtures and pole types shall have the approval of the Engineer prior to the Planning & Zoning Commission’s approval of the subdivision or site development. The developer is required to submit to the Town of Manchester a lump sum payment for the first twenty-four (24) months of energy costs for all streetlights, prior to the Town’s issuing of any building permits, or prior to any conveyance of any building lots. Payment shall be in accordance with “CL&P’s Partial Streetlighting Service - Rate Structure 117 for Energy Only.

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

Reference Plates
#37 – Streetlights
3.02.15 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.

3.02.16 SIGNS

All traffic and parking signs shall conform to the latest revision of the “Manual on Uniform Traffic Control Devices” conventional road size, the “Standard Highway Signs” book and the “Connecticut Department of Transportation Catalog of Signs”. All signs shall be sheet aluminum, 0.08 inches thick with retroreflective sheeting, engineer grade, ASTM Type I with the following exceptions, which shall be retroreflective sheeting, high intensity grade, ASTM Type III: “STOP”, “YIELD”, “DO NOT ENTER”, “WRONG WAY”. Sign posts shall meet the requirements of the Connecticut Department of Transportation galvanized Type II 3 lbs/ft breakaway channel posts.

For new subdivisions, signs shall be furnished and installed by the Town. The Developer shall make payment to the Town at the unit price of $150.00 per traffic control sign and $100.00 per street sign.

Reference Plates
#10 – Sign Installation

3.02.17 TRAFFIC SIGNALIZATION

When determined as appropriate by the Engineer, traffic signals, including modifications to existing traffic signals, shall be designed and installed by the Developer in accordance with the latest edition of the “Manual on Uniform Traffic Control Devices” and “Connecticut Department of Transportation Signal Design Manual”. Plans and specifications shall be prepared by a licensed Professional Engineer and shall be subject to review by the Engineer at preliminary, semi-final and final design.
The Developer is required to submit to the Town of Manchester a lump sum payment for the first twenty-four (24) months of energy costs for new traffic signals, prior to the Town's 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’s Closed Loop Traffic Signal System(s), including the Town’s 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’s consultant.
3.03 STORMWATER MANAGEMENT

3.03.01 APPLICABILITY

The following stormwater management requirements apply to all land use and development projects within the Town of Manchester, including, but not limited to:

- Zoning Applications to Commissions and Boards
- Subdivision Permits
- Inland Wetland Permits
- Erosion and Sedimentation Control Permits
- Special Exception Applications
- Public Road Construction
- Commercial Site Development

3.03.02 GOALS AND OBJECTIVES

The objectives of these regulations are to minimize the negative environmental impacts of development and to conserve the Town of Manchester’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 using infiltration 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
3.03.03 COMPONENTS OF STORMWATER MANAGEMENT

Each of the following basic components of stormwater management must be investigated and analyzed: off-site analysis, peak runoff control, conveyance systems, stormwater quality, erosion and sedimentation control, and maintenance and operations.

Off-Site Analysis
All proposed projects must identify the upstream tributary drainage area and perform a downstream impact analysis. The levels of analysis required depend on the size and type of project and its potential drainage impact as determined by the Engineer.

Peak Runoff Control
Proposed projects shall attenuate the post-development peak runoff rate to no more than the pre-development peak runoff rate unless it can be proven that such attenuation will have a detrimental impact downstream.

Conveyance Systems
All conveyance systems must be analyzed, designed and constructed to accommodate existing upstream off-site runoff and developed on-site runoff.

Stormwater Quality
Proposed projects shall include provisions for the treatment of surface runoff in order to minimize the discharge of pollutants into waterbodies. The levels of treatment depend on the size and type of project.

Erosion and Sedimentation Control
All plans shall include measures to control soil erosion and sedimentation during construction. Plans shall include sufficient details and an operation and maintenance schedule.

Maintenance and Operation
Maintenance of all proposed drainage facilities not dedicated to the Town of Manchester or other government agency shall be the sole responsibility of the property owner. Maintenance and Operation plans and schedules shall be shown on the plans.
STORMWATER MANAGEMENT REPORTS

Stormwater Management Reports are written reports detailing the proposed drainage design and analysis of a project. The report shall detail the basic components of stormwater management as mentioned in Section 3.03.03 as it pertains to the proposed project. All Stormwater Management Reports must be signed and sealed by a licensed Professional Engineer.

Stormwater Management Reports are required for all site development within Manchester, including, but not limited to, development applications to Commissions and Boards, subdivision applications, inland wetlands applications, public road construction and projects which discharge to public roadways.

A Stormwater Management Report Waiver may be granted by the Director of Public Works for one of the following reasons:

- The proposed project will have little or no impact to the existing drainage system (i.e. building renovation with no site work, single family house).
- The proposed project already has an approved Stormwater Management Report on file in the Engineering Division. (Note: 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.)

To apply for a Stormwater Management Report Waiver, the applicant must completely fill out and sign the waiver request form (Appendix “E”) and submit it with any Planning and Zoning application or directly to the Director of Public Works, 494 Main St., P.O. Box 141, Manchester, CT 06045.

At a minimum, the Stormwater Management Report shall include:

- A narrative summarizing the proposed project, design methods used, and a table comparing post-development peak flows with pre-development peak flows.
- A Drainage Area Map with topographical contours showing upstream contributing drainage areas and labeled to coincide with the drainage computations.
- Floodplain and/or floodway boundaries as defined on the Manchester Flood Insurance Study, Flood Boundary and Floodway Map, 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.
3.03.05 HYDROLOGY METHODS

The Engineer shall analyze the peak rates of runoff for the site for both pre-development conditions and post-development conditions using design procedures outlined in the State of Connecticut Department of Transportation “Drainage Manual”, latest edition, and the criteria specified herein.

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 U.S. Weather Bureau “Rainfall Intensity-Duration-Frequency Curves” for the Hartford rain gauge. Times of concentration and weighted runoff
coefficients shall be clearly identified 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) hydrology method TR-55
- Natural Resources Conservation Service (NRCS) hydrology method TR-20
- U.S. Army Corps of Engineers Method HEC-1

Hydrograph evaluations shall be conducted for both pre-development and post-development conditions for storms with average return frequencies of 2, 10, 25 and 100 years. The hydrograph analysis shall include determination of runoff for each subwatershed and routing runoff through storage impoundments and floodplain storage areas. Subwatersheds shall be selected to determine flows at key structures. The analysis must isolate and identify that portion of the peak flow at critical downstream points associated with the proposed project.

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

<table>
<thead>
<tr>
<th>Storm Frequency (Year)</th>
<th>Rainfall (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>3.2</td>
</tr>
<tr>
<td>5</td>
<td>4.1</td>
</tr>
<tr>
<td>10</td>
<td>4.7</td>
</tr>
<tr>
<td>25</td>
<td>5.5</td>
</tr>
<tr>
<td>50</td>
<td>6.2</td>
</tr>
<tr>
<td>100</td>
<td>6.9</td>
</tr>
</tbody>
</table>

The SCS 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 U.S. Soil Conservation Service TR-55 manual and the D.O.T. Drainage Manual. All flow paths shall be clearly labeled on the drainage area map.
3.03.06 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:

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

*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.

3.03.07 PEAK RUNOFF ATTENUATION

The discharge of stormwater runoff from the proposed developed site(s) must not cause adverse downstream conditions. A complete hydraulic analysis shall be done to compare the existing pre-developed peak rate of runoff with the proposed post-developed peak rate of runoff for 2-year, 10-year, 25-year and 100-year storm events considered individually. If the post-developed peak rate of runoff for either of these storm events exceeds the pre-developed peak rate of runoff, then the Developer must attenuate the peak flows so as not to exceed the pre-developed rate of runoff. Exception: Peak flow attenuation is not required if the site runoff flows directly to a watercourse and it is proven that the peak flow occurs before the peak flow of the watercourse thereby making the increased peak flow from the site negligible. This can be accomplished by limiting impervious coverage, increasing travel times, introducing groundwater recharge, constructing stormwater detention facilities or any other method approved by the Engineer. Increases in peak runoff must be attenuated for the 2-year, 10-year, 25-year and
100-year storm events considered individually.

3.03.08 STORMWATER DETENTION FACILITIES

Stormwater detention facilities may be used as a means to attenuate peak flows. Detention facilities may include, but are not limited to, detention basins, ponds, subsurface infiltrators or a combination thereof.

Any detention facility whose failure could cause significant damage or loss of life may be regulated as a dam by DEP pursuant to Sections 22a-401 through 22a-409 of the General Statutes.

Above ground detention facilities shall be analyzed with hydrograph and storage routine techniques.

**Above Ground Detention Basins**

Above ground detention basins are designed to temporarily store runoff using controls at the outlet structure designed to release the runoff at rates at or below pre-developed conditions. Outlet structures shall be multi-staged designed to attenuate the 2-year, 10-year, 25-year and 100-year storm events. The outlet structure shall be designed such that the detention basin drains completely (i.e., the lowest stage outlet is equal to the bottom of pond elevation and there is a minimum 1% slope toward the outlet). The primary outlet pipe shall be designed with a capacity equal to the discharge from a 100-year storm. Basins shall be sized to provide a minimum one foot (1’) of freeboard for the 100-year storm event. An emergency spillway must be provided at the elevation of the 100-year storm. The emergency spillway shall be located such that overflow follows existing drainage patterns (i.e. does not divert water to a different watershed) and will not be capable of overflowing onto a public roadway.

A minimum 10’ wide maintenance access path shall be provided around the perimeter of the detention basin. Six foot (6’) black vinyl coated chain link fence and evergreen landscape plantings approved by the Engineer shall also be provided around the perimeter of the detention basin.

The procedure for computing the outflow from detention basins consists of the development of storm hydrographs and the routing of these hydrographs through the detention basin. The method developed by the Natural Resources Conservation Service and the United States Department of Agriculture for developing synthetic hydrographs and routing these hydrographs through reservoirs shall be used. Other methods may be used when permitted by the Engineer.
The design of a detention basin shall include the following at a minimum:

- Contoured grading plan of scale not less than 1”=40’
- Outlet structure details
- Inflow hydrograph with outflow hydrograph superimposed on it
- Cross sections of the embankment and spillway
- Inflow mass curve
- Elevation-Stage-Storage curve or table
- Elevation-Discharge curve or table
- Volume required to detain any increase in runoff
- Flood-routing calculations
- Written comments on the subsurface conditions relative to water table, ledge and soil permeability
- Time which is required for the basin to drain completely
- Perimeter fencing
- Minimum 10’ wide access road around perimeter
- Proposed landscaping and vegetative cover used to stabilize slopes
- Any applicable easements required for future maintenance

Subsurface Detention Facilities

Subsurface detention facilities are designed to utilize groundwater infiltration and/or underground storage to attenuate peak flows. The same hydrology methods as above ground detention basins shall be used to design subsurface facilities. All designs that utilize groundwater infiltration shall include supporting documentation of soil permeability in the form of percolation tests. Infiltration type facilities shall be designed with an overflow to accommodate the 100-year storm. Subsurface detention facilities may not be permitted within Town designated aquifer recharge areas. Contact the Water and Sewer Department at 647-3201 for further information.

Maintenance and Operation

The Town will accept ownership of above ground detention basins in residential subdivisions provided it is designed and constructed in accordance with these regulations and the developer provide a one-time cash payment of $10,000 per detention basin to cover the costs for 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.

For detention basins not dedicated to the Town, the plan shall show an operation and maintenance schedule for all detention facilities. It shall identify, at a minimum, items of routine maintenance, frequency of routine maintenance, responsible party for routine
maintenance and emergency operations in the event of a flood.
3.03.09 CONVEYANCE SYSTEMS

All storm drainage conveyance systems shall be designed and constructed to accommodate runoff from upstream land areas. Priority should be given to maintaining natural drainage systems, including perennial and intermittent streams and open channels. Conveyance systems should be designed to minimize changes in the runoff travel time via the use of overland flow, grass lined channels, surface depression storage, etc. They should not impede the movement of fish and other aquatic species. Conveyance systems shall be designed with a minimum capacity to handle the design storm in accordance with Section 3.03.06.

Subsurface storm sewer systems shall be designed in accordance with the methods and procedures defined in the Connecticut Department of Transportation (CDOT) Drainage Manual, latest edition and as may be amended by the requirements of these Public Improvement Standards. Design computations shall be prepared on the appropriate forms contained in the CDOT Drainage Manual.

Storm sewers shall be designed to flow just below full during the peak flow of the design storm with a maximum allowable headwater in the structures no higher than one foot (1’) below the top of grate unless approved by the Engineer. Calculations shall include inlet and outlet control to determine the hydraulic grade line within the conveyance system.

Storm sewers 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 of Manchester right-of-way shall be reinforced concrete pipe (RCP) with a minimum two feet (2’) of cover over the crown of the pipe for Class IV RCP or a minimum one foot (1’) of cover provided for Class V RCP.

The hydraulic design of storm sewer pipes, swales and gutters shall normally be based upon the use of the Manning’s Equation. The value for the roughness coefficient, “n”, used in the Manning’s Equation for reinforced concrete pipe shall be 0.013.

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 CDOT Drainage Manual shall be followed. The maximum allowable spread (width of flooding) shall be one half (1/2) of the 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.

Double grate catch basins shall be used in sags and depressed areas when warranted by the gutter flow analysis.

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

Catch basins subject to potentially high pollutant loads of floatable material (i.e. parking lots) shall be equipped with a hood or baffle to prevent discharge of the floating material.

All catch basin grates shall be bicycle type and galvanized.

All catch basins within Town of Manchester right-of-way shall have a granite curb inlet.

_Culverts and Bridges_

The hydraulic analysis and design of culverts shall consider the orifice flow conditions at the inlet, the capacity of the pipe and the effect of the depth of water at the outlet. All flow conditions shall be analyzed to see which condition is more restrictive. For culverts with steeper invert slopes (generally over 1%), the flow capacity is generally limited by inlet control. It is common practice to increase the inlet flow capacity by allowing the depth of water to rise above the top of the pipe at the inlet creating pressure to help force water into the pipe. The allowable headwater elevation is the permissible depth of water at the culvert inlet. Culverts whose outlets are submerged or partially submerged often have their flow capacity limited by tailwater depth at the outlet.

All culverts and bridges shall be designed in accordance with the methods and procedures defined in the DOT Drainage Manual and shall meet the following requirements:

1. Culverts and bridges will be designed for flood frequencies and underclearances stipulated in the DOT Drainage Manual, except that on local (not State highways) roads and driveways with low traffic volumes and where alternate routes are available, lower design criteria is acceptable when:
Town of Manchester Public Improvement Standards

a. Flood discharges may be allowed to cross over roads that are at or close to the floodplain grade;

b. Water surface elevations shall not be increased by more than one foot, nor allowed to cause damage to upstream properties;

c. Provisions are made to barricade the road when overtopped;

d. The road or driveway is posted as being subject to flooding.

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

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

4. 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 anticipate if the streambed is degrading.

5. The use of solid parapet walls at bridges and culverts located in the sag part of vertical curves is discouraged.

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

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

8. The underclearances and maximum headwaters stipulated in the DOT Drainage Manual may be waived by the Engineer when decreasing the headwater depth at existing structures which could increase downstream peak flows.

9. All wingwalls, endwalls and culvert ends with vertical drops over four feet shall have barrier rails or fences. Object markers shall be used for vertical drops of less than four feet.
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 land grading within a natural stream corridor should be avoided or minimized, except at stream crossings, 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, land grading, and land development. A 50-foot wide vegetated buffer area is desired on 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 and limited ecological value and are intended to convey their design flow within their banks. They shall be designed in accordance with the DOT Drainage Manual and:

1. Freeboard allowances shall be provided in proportion of the potential damages that could occur in the event of overtopping;
2. The use of impervious linings is discouraged except for very high flow velocity and steep slopes; and
3. 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 DOT Drainage Manual and the following where appropriate:

1. Shall have minimum flow capacity of a flood equal to at least 25-year frequency flood;
2. Shall have an inner channel to concentrate low flows with a capacity of a 2-year frequency flood;
3. Shall have water surface profiles prepared for the 2, 25, and 100-year frequency floods;
4. Shall consider the hydraulic capacity of floodplains;
5. Shall have a sediment transport capacity similar to upstream and downstream channels;

6. Shall be designed to minimize the need for artificial linings (concrete, ripraps, etc.) for flows in excess of the 2-year frequency flood;

7. Shall encourage ecological productivity and variety;

8. Shall be visually compatible with its surroundings;

9. The alignment and slope shall be compatible with natural channels in similar site conditions;

10. Variations in width, depth, invert evaluations, and side slopes are encouraged for aquatic and visual diversity;

11. Straightening channels and decreasing their length is discouraged;

12. The cross-sections used to define the channel and floodplain geometry for water surface profile computations shall be located 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

13. 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 open channel projects. The plan shall help 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 DEP is recommended. The channel restoration plan shall include, as appropriate:

- Avoidance of barriers to fish movement;
- Formation of pools and riffles;
- Provision of areas of sheltered flow with use of deflectors, boulders, low check dams;
- Preservation of stream bank vegetation and establishment of new vegetation;
- Use of clean natural bed materials of a suitable size;
- Schedule 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 DOT Drainage Manual and the Connecticut Guidelines for Erosion and Sediment Control.

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

**Storm Drainage Discharge Points**

The discharge of all stormwater that has been collected or otherwise artificially channeled shall be into suitable natural streams or, with approval, into Town or State drainage systems with adequate capacity to carry the discharge. Otherwise, there shall be no discharge onto or over private property within or adjoining the street unless (a) proper easements and discharge rights have been secured by the applicant; (b) such easements and rights are transferable; and (c) there will be adequate safeguards against soil erosion and flood hazards.

No stormwater shall be diverted from one watershed to another without proper DEP Diversion permits and an evaluation of downstream impacts.

Storm drainage discharges shall be coordinated with the National Pollution Discharge Elimination System permit program administered by the Water Compliance Unit of DEP.

Storm drainage systems discharging into watercourses tributary to public water supply reservoirs shall be in compliance with the Public Health Code. The storm drain outlets should be 100 feet from water supply reservoirs or their tributaries.

Storm drainage discharge points shall be selected to minimize their environmental impact.

All storm drain system outlets shall be designed in accordance with Chapter 11 of the DOT Drainage Manual to minimize soil erosion.

Stormwater drainage that discharges into rivers and lakes shall consider the hydraulic impact of having drainage outlets submerged (tailwater effect). The preferred method of determining tailwater levels on non-tidal rivers is based on the use of FEMA Flood Insurance Studies available from Town Clerks and DEP. Published studies are available for most rivers with watersheds of over one square mile and they include flood water elevations for events with average return frequencies of 10, 50, 100, and 500 years.

Historic flood levels and high water marks may be available in some areas and are helpful in estimating tailwater levels.
Tailwater levels can be computed by determining the water profiles in rivers using the Mannings Equation for uniform flow and the standard step method for non-uniform flow.

Reference Plates
#11 – Type “C” Catch Basin with Granite Curb Inlet
#12 – Type “C-L” Catch Basin
#13 – Type “C” Double Grate Type I Catch Basin
#14 – Type “C” Double Grate Type II Catch Basin
#15 – Precast Concrete Catch Basin Top for Granite Curb Inlet
#16 – Precast Concrete Double Grate Type I Catch Basin Top
#17 – Precast Concrete Double Grate Type II Catch Basin Top
#18 – Steel Frame and Grate
#19 – Precast Concrete Storm Drainage Manhole
#20 – Precast Concrete Drywell
#21 – Modify Drop Inlet to Catch Basin with Manhole
#22 – Catch Basin Trap Hood
#23 – Sedimentation Chamber
#24 – Oil/Water Separator
#25 – Trenching and Backfilling
#28 – Standard Endwalls
#29 – Wingwalls
#30 – Impact Basin
3.03.10 STORMWATER QUALITY

3.03.10.1 OVERVIEW

All site development shall include provisions for the treatment of surface runoff in order to minimize the sources and transport of pollutants into wetlands and watercourses following construction.

These requirements are an important part of the Town’s strategy to comply with federal, state and local regulations, including The Federal Clean Water Act, National Pollutant Discharge Elimination System (NPDES) Permit Phase II requirements.

These standards incorporate the latest recommendations from the Connecticut Department of Environmental Protection. For detailed design guidance, see the “Connecticut Stormwater Quality Manual” as published by the Connecticut Department of Environmental Protection.

3.03.10.2 STORMWATER TREATMENT PRACTICES

In general, the procedures for meeting these objectives are broken into three parts: 1) Site Design Best Management Practices (BMPs); 2) Pretreatment; and 3) Primary Treatment.

Site Design Best Management Practices
Site design BMPs are techniques and facilities that the developer can utilize within the site to effectively reduce the amount of runoff and treat runoff from a developed site. Developers are not required to use site design BMPs. However, use of these BMPs will potentially reduce the size of a downstream stormwater treatment facility. Site design techniques include simple cost effective measures such as minimizing unnecessary impervious surface area and retaining native vegetation. Site design facilities include roof downspout infiltration systems and drywells.

Pretreatment
Pretreatment is required prior to discharge to the site’s primary stormwater treatment facility. The purpose of pretreatment is to remove larger particles and debris from runoff and to prevent clogging of and minimize the maintenance of the downstream treatment facility. Acceptable pretreatment facilities include sediment forebays, deep-sump catch basins, vegetated buffers, grass swales, gravel flow spreaders, underground detention systems, oil/water separators and proprietary settling devices. These facilities alone are not considered full treatment to meet the Town’s water quality requirements.
Primary Treatment Facility

Primary treatment is required at all points where stormwater discharges from a developed site into a stormwater conveyance system, wetland or watercourse. Primary treatment facilities shall be capable of capturing and treating the design water quality volume (WQV) or design water quality flow (WQF) (See 3.03.10.3). Primary treatment practices, when properly selected, sited, designed, constructed and maintained in accordance with the guidelines contained in the “Connecticut Stormwater Quality Manual” should be capable of removing at least 80% of the average annual total suspended solids (TSS) load. Examples of proven primary treatment facilities include infiltration trenches or basins, biofiltration swales, surface or underground filtration facilities, bioretention systems and proprietary filtration devices.

3.03.10.3 CRITERIA FOR SIZING STORMWATER TREATMENT FACILITIES

Treatment facilities are sized using two different methods. Vegetated filters, oil/water separators, and some proprietary treatment systems are sized to treat a peak rate of flow draining through them. All other facilities are sized to treat a volume of runoff. For both methods, the calculations assume a “water quality design storm”, which is derived from the premise of treating the first inch of runoff from impervious areas.

Facilities sized to treat a volume of runoff shall use the following formula to calculate the amount of stormwater runoff from any given storm to be captured and treated:

\[
WQV = \frac{(1\text{”}) \times (R) \times (A)}{12}
\]

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

Facilities sized to treat a peak flow rate shall be designed using NRCS TR-55 Graphical Peak Discharge Method. The water quality peak flow should be calculated using the water quality volume (WQV). This WQV, converted to watershed inches, should be substituted for the runoff depth (Q) in the NRCS TR-55 Graphical Peak Discharge Method. See Appendix B of the “Connecticut Stormwater Quality Manual” for more information.
3.03.10.4 TYPES OF TREATMENT FACILITIES

**Infiltration Facilities**

Infiltration facilities are designed to store and infiltrate collected runoff from the water quality design storm. Design requirements in this section differ from the design requirements for flood control drywells or infiltration systems. Properly designed infiltration facilities not only remove many pollutants typically found in stormwater runoff, they can reduce peak increases in storm runoff rates and help replenish groundwater resources.

Infiltration facilities shall not be used in the following areas:

- On or within 10’ of slopes of 15% grade or steeper
- Within areas of historic landslides or slope instability
- Within an identified groundwater protection zone or recharge area
- Within 100’ of active septic drain fields
- Within 20’ of a building or structural foundation
- Where the bottom of the infiltration facility would be within 5’ of the seasonally-high water table, bedrock or other impermeable layer
- Within 10’ of a property line
- Within areas containing or having the potential to contain contaminated soils
- Within areas where tested site infiltration is less than 0.5 inches/hour
- Within other areas restricted by Public Health Code

Pretreatment shall be provided upstream of all infiltration facilities.

The infiltration facility shall be designed to drain completely within 24 hours following the design storm. All infiltration facilities shall contain an outlet designed to route flow, in excess of the facility design volume, into an approved downstream drainage system.

Infiltration facilities shall be sized using the hydrograph routing method or by determining the maximum volume based on the maximum allowable depth using the following formulas:

For infiltration basins:

\[ d_{\text{max}} = f_d \times T_s \]

where:

- \( d_{\text{max}} \) = maximum depth infiltrated in 24 hours (ft)
- \( f_d \) = representative site infiltration rate (ft/hr) (max. of 0.2 ft/hr)
- \( T_s \) = maximum allowable storage time (24 hours)
For infiltration trenches:
\[
d_{\text{max}} = \frac{(f_d \times T_s)}{n}
\]
where:
- \(d_{\text{max}}\) = maximum depth infiltrated in 24 hours (ft)
- \(f_d\) = representative site infiltration rate (ft/hr) (max. of 0.2 ft/hr)
- \(T_s\) = maximum allowable storage time (24 hours)
- \(n\) = the porosity of stone reservoir (assumed to be 0.3)

For infiltration basins, a minimum of 1’ of freeboard is added to the storage depth to determine the total depth of the facility.

**Vegetated Filters**

Vegetated filters are BMPs that treat stormwater by filtering it through vegetation. They are designed to evenly disperse flow over a densely vegetated area. Pollutants are removed through settling, adhesion to vegetation, filtering and adsorption into underlying soils and nutrient uptake in plants. Vegetated filters include filter strips and swales (sometimes called biofiltration swales).

Vegetated filters shall not be used in the following areas:
- Within existing open waterways
- On or within 10’ of slopes of 15% grade or steeper
- Within areas within a history of landslides or slope instability
- Within areas with or having the potential to contain contaminated soils
- In shady areas which do not receive at least 6 hours of sunlight daily during the summer months

Vegetated swales shall conform to the following parameters:
- Longitudinal slope: Min. 1.5%; Max 3.0%
- Width of bottom: Min. 2’; Max 10’
- Length of swale: Min. 100’
- Side slopes: Max 3(H):1(V)
- Freeboard: Min. 6”

Vegetated swales shall be designed for a maximum 3” depth of flow during the water quality design storm. Swale design calculations shall use a Manning’s “n” value of 0.30. The minimum swale length can be calculated with the following formula:

\[
L = 540 \times \frac{Q}{A}
\]
where:
- \(L\) = length of swale required (ft)
- \(Q\) = water quality design storm peak runoff rate (cfs)
- \(A\) = cross sectional area of flow at the design depth of 3” (square feet)
If the same swale is used for flood conveyance, verify that the swale is sized accordingly to handle those flows.

Vegetation within the swale treatment area shall provide dense foliage within 3” above the soil surface. The top 6” of soil within the treatment area should be amended and tilled if the native material contains more than 10% clay.

Vegetated filter strips shall conform to the following parameters:
- Longitudinal slope: Min. 1.5%; Max 15.0%
- Lateral slope (perpendicular to flow): Max. 2.0%
- Longest flow path draining to filter strip: 150’

A gravel flow spreader (gravel filled trench) shall be placed between the impervious area flows and the filter strip for pretreatment.

Filter strips shall be designed for a maximum 1” depth of flow during the water quality design storm. Swale design calculations shall use a Manning’s “n” value of 0.35. The minimum length of filter strip can be calculated with the following formula:

\[ L = 540 \times \left(\frac{Q}{0.08W}\right) \]

where:
- \( L \) = length of filter strip required (ft)
- \( Q \) = water quality design storm peak runoff rate (cfs)
- \( W \) = width of filter strip perpendicular to the direction of flow (ft)

Note: If the design flow velocity \( (Q/0.08W) \) exceeds 0.5 ft/sec, a filter strip may not be used.

Bark, mulch, fertilizers, and pesticides shall not be used on the filter strip.

**Structural Filtration Facilities**

Structural filtration facilities are structural stormwater controls that capture and temporarily store runoff and pass it through a filter bed. A typical filtration system consists of a pretreatment facility, flow spreader, a water storage reservoir, filter media and underdrain system. The filtration media may include sand, peat, leaf compost or soil mixtures. Types of structural filtration devices include surface filtration facilities, underground filtration facilities, bioretention systems and proprietary filtration devices. Structural filtration facilities are typically designed to serve commercial, industrial and multi-residential sites.

Structural filtration facilities shall not be used in the following areas:
- Within existing open waterways
- Within 10’ of a property line
In addition, surface filtration facilities and bioretention systems shall not be used in the following areas:

- On or within 25’ of slopes of 15% grade or steeper
- Within areas within a history of landslides or slope instability
- Within areas containing or having the potential to contain contaminated soils

Surface filtration facilities shall be designed to drain completely within 24 hours following the design storm. The size of the filter area can be determined using the following equation (based on Darcy’s Law):

\[
A_f = \frac{(V \times d_f)}{[(k \times t) \times (h_{avg} + d_f)]}
\]

where:
- \( A_f \) = Surface area of filter bed (square feet)
- \( V \) = Water Quality Design Storm Volume (cubic feet)
- \( d_f \) = Filter bed depth (1.5’ min.; 2.0’ max)
- \( k \) = coefficient of permeability of filter media
  - 3.5 ft/day for sand
  - 2.0 ft/day for sand/peat mix
  - 8.7 ft/day for leaf compost
- \( h_{avg} \) = Average height of water above filter bed (½ max. depth of storage)
- \( t \) = maximum time to drain (1 day)

Underground filtration facilities shall be sized to handle the water quality design storm volume.

Bioretention systems shall be sized according to the following formula:

\[
A_f = \frac{(V \times d_f)}{[(k \times t) \times (h_{avg} + d_f)]}
\]

where:
- \( A_f \) = Surface area of filter bed (square feet)
- \( V \) = Water Quality Design Storm Volume (cubic feet)
- \( d_f \) = Filter bed depth (3’ min. with sand layer; 4.0’ min without)
- \( k \) = coefficient of permeability of filter media
  - 1.0 ft/day for planting bed
- \( h_{avg} \) = Average height of water above filter bed (½ \( h_{max} = 0.25 \) ft)
- \( t \) = maximum time to drain (1 day)

Proprietary filtration devices may be approved provided they effectively treat the water quality design storm volume.
Oil-Water Separators
Oil-water separators are designed to remove oil and grease from storm runoff off of impervious areas on commercial or industrial properties that produce high concentrations of these pollutants. They are not considered full treatment to meet the Town’s water quality regulations.

Oil-water separators are required as a pretreatment measure on all sites where vehicles stop and start frequently, areas where petroleum products are dispensed and areas where vehicles and equipment are maintained or repaired. These areas typically include (but are not limited to) parking lots of convenience stores, fast-food restaurants, grocery stores, shopping malls, discount stores, banks, truck fleets, auto and truck dealerships and delivery services.

Types of oil-water separators include: 1) baffle oil-water separators; 2) coalescing plate oil-water separators; and 3) proprietary oil-water separators.

Baffle oil-water separators are underground vaults with baffles to retain oils and sediment that is separated by gravity from the storm runoff entering the system. The design criteria for these separators necessitate a very large vault to provide adequate residence time for oil separation. Use of these systems is generally not cost effective for less than 2 acres of high-source impervious surfaces.

Coalescing plate oil-water separators are similar to baffle oil-water separators but need considerably less space for separation of the floating oil due to the inclusion of oil retaining plates. The plate packs are typically manufactured and supplied by private companies.

Proprietary oil-water separators are oil-water separators that are manufactured by private companies. Proprietary systems may be submitted for review and approval.

Oil-water separators shall not be used in the following areas:
- Within existing open waterways
- Within 10’ of a property line

Baffle oil-water separators shall have a minimum length-to-width ratio of 5:1 and a water storage depth-to-width ratio of between 0.3 and 0.5. The minimum water storage depth shall be 3’ and maximum water storage depth shall be 6’.

A minimum of 20 sf of forebay surface area shall be provided per 10,000 sf of tributary area draining to the baffle oil-water separator.
3.03.11 EROSION AND SEDIMENTATION CONTROL

All plans shall include provisions for minimizing soil erosion and sedimentation both during construction and after the site is completed.

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

An anti-tracking apron shall be placed at all points where construction equipment will enter or exit onto a Town roadway.

Slopes steeper than 4:1 should be avoided wherever possible. No slopes shall be steeper than 2:1. Slopes that are steeper than 3:1 shall incorporate engineered structural design features (landscaped planting, mulch, turf reinforcement mat, etc.). Slopes greater than fifteen feet (15’) in height and steeper than 3:1 shall be benched in accordance with the “2002 Connecticut Guidelines for Soil Erosion and Sedimentation Control” (DEP Bulletin 34).

Site development plans shall have soil stockpile areas identified as well as appropriate control measures around the perimeter of the stockpile.

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

Reference Plates
#31 – Sedimentation Control Filter Fabric Fence
#32 – Straw Bales for Erosion Control
#33 – Anti-Tracking Apron

3.03.12 OPERATIONS, MAINTENANCE, EASEMENTS AND RIGHTS-OF-WAY

The entities responsible for the operation and routine maintenance of any portion of the proposed drainage system must be clearly identified on the approved construction plan.

In general, the Town of Manchester assumes ownership and responsibility of drainage systems within public streets and Town right-of-way. Drainage rights-of-way or drainage easements may be required to be deeded to the Town of Manchester at locations where the public storm drainage system is located on private property (such as outlet pipes and inlet and outlet structures).
4.01 RIGHT-OF-WAY PERMITS

Any person, company or utility proposing work within the public right-of-way must take out a “Right-of-Way” permit from the Town of Manchester Engineering Division prior to any construction activity. See the Regulations Governing Right-of-Way Permits as published by the Town of Manchester Department of Public Works for more information on policies, procedures, rules and regulations for construction activity.

4.02 BONDING REQUIREMENTS

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 Engineering Division. The Director of Public Works 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. See Appendix “F” for current unit prices.

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 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, 494 Main St., Manchester.

1 – Amended 1/16/07
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 Planning and Zoning Commission.

See “Subdivision Regulations of the Town of Manchester”, Section 8.00, Bonding Requirements 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 bond, letter of credit or certified check 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 Department of Public Works 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 that 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.

4.03  INSURANCE REQUIREMENTS

The Contractor shall provide, pay for, and maintain in full force and 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.

Certificates of Insurance: 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 60 days advance written notice to Engineering Division. 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 Town’s Engineering Division.

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

Additional Insured: 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 insureds on a primary basis.

Retroactive Date and Extended Reporting Period: 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 36 months.

Subcontractors’ Insurance: 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.

Waiver of Subrogation: 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.

Hold Harmless: 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 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: 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

### 4.04 CHANGES FROM APPROVED PLAN

Any changes from 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 Engineer of record, documenting the changes to the approved plan. If the changes affect any previously submitted computations (i.e. drainage), then revised computations shall also be included. Based on the nature of the proposed changes, allow 2 to 4 weeks for review and determination. The Engineer may require two sets of revised, signed and sealed fixed line mylars to be submitted.
TECHNICAL SPECIFICATIONS

The following technical specifications shall apply to all types of construction activity regulated by these Public Improvement Standards. For water and sewer items, refer to the “Water and Sewer Department – Public Improvement Standards” as published by the Town of Manchester Water and Sewer Department.

Where “Form 814A” is referenced, it shall mean the “Standard Specifications for Roads, Bridges and Incidental Construction Form 814A” as published by the Connecticut Department of Transportation, 1995, as amended.
4.05.01 CLEARING AND GRUBBING

DESCRIPTION

This work includes the furnishing of all labor, equipment and materials and performing all operations in connection with clearing and grubbing within the project. The work also includes the proper disposal of all materials resulting from the clearing and grubbing operation away from the project area.

MATERIALS

Not Applicable.

CONSTRUCTION DETAILS

Prior to any clearing and grubbing activities, an erosion control bond must be on file with the Town.

NOTE: All trees approved for removal within Town of Manchester right-of-way must be posted in accordance with Sec. 23-58,59 and 60 of the Connecticut General Statutes.

All trees within the construction limits that are not proposed to be removed shall be protected in accordance with Sec. 23-58, 59 and 60 of the Connecticut General Statutes. This includes protection of underground root systems.

Clearing shall include the felling, cutting up and stacking of all trees to four-foot lengths and the satisfactory removal and disposal of trees, bushes, downed timber, brush and debris and obstructions of any nature. Individual trees directed to be left standing shall be protected in a satisfactory manner to prevent damage incidental to construction operations.

Grubbing shall include the satisfactory removal and disposal of all stumps, roots larger than one inch in diameter, matted roots, debris, surface boulders 6" or larger and other obstructions to a depth not less than 18 inches below finish ground grades, except that in areas to be occupied by structures they shall be removed in their entirety. Stumps shown to be removed on the plans shall be removed by grinding, or other method approved in writing by the Engineer. All depressions resulting from grubbing shall be refilled with selected materials from earth excavation and/or approved off-site sources graded and compacted so as to conform to adjacent ground surfaces at no additional cost to the Town.
4.05.02 EARTHWORK

DESCRIPTION

This work includes the removal and satisfactory disposal of all material taken from within the limits of the construction of the roadbed, subgrade, shoulders and other miscellaneous construction to the limits shown on the plans or directed by the Engineer. It shall also include the removal and disposal of rock in definite ledge formation and boulders, the formation of embankments and the formation of subgrade.

MATERIALS

Not Applicable.

CONSTRUCTION DETAILS

Excavation shall be made in conformance to the limits and grades shown on the plans. Topsoil, sod and other organic matter shall removed and disposed of.

When bedrock is encountered, it shall be excavated to the slope lines and depths indicated on the plans. All loose and unstable material shall be removed and disposed of. Any blasting shall conform to applicable local, State and Federal laws and regulations. The Contractor shall be responsible for all damage due either directly or indirectly to such operation.

All excavated material obtained within the project limits shall be used in the formation of embankments. Embankments shall be constructed of earth only. No bituminous concrete or reclaimed waste shall be used in the embankment. The material shall be free from refuse, stumps, roots, rocks, brush, weeds or other unsuitable material. No embankment shall be deposited on surfaces of snow or ice, nor shall it be placed on frozen or unstable surfaces.

The depth of each layer, before compaction, shall not exceed twelve inches (12”). The embankment shall be crowned or pitched to provide drainage at the close of each day’s operation.

The entire embankment area shall be leveled off by suitable grading equipment and shall be compacted to at least the required minimum density by use of compaction equipment consisting of rollers, compactors or a combination thereof. The dry density after compaction shall not be less than 95 percent of the dry density for that soil when tested in accordance with AASHTO T180, Method D. Each layer shall be compacted at optimum moisture.
All surplus excavated material shall become the property of the Contractor and disposed of off of the project site unless otherwise directed by the Engineer.

Earth slopes shall be tracked by traversing the slopes with cleated tracks so that the cleat indentations are horizontal. Tracking shall be completed prior to placing topsoil.

After all grading for the roadbed has been substantially completed and all drains laid, the subgrade shall be brought to the lines, grades and cross-sections shown on the plans.

No particle over 3” shall in its greatest dimension shall be placed within 12” below the top of the prepared subbase.

All soft and yielding material within the subgrade shall be removed and replaced with suitable free draining material. In cut areas, the surface shall be uniformly compacted by use of equipment manufactured for that purpose. Rollers shall deliver a ground pressure of not less than 300 pounds per linear inch of contact width and weigh not less than ten (10) tons. Vibratory rollers shall have a static weight of not less than four (4) tons. The amount of compactive effort shall be as directed by the Engineer, but in no case shall be less than four (4) complete passes of the compacting equipment being used.

The Contractor shall protect the completed subgrade from damage. The subgrade shall be checked and approved by the Engineer prior to placing pavement structure thereon.
DESCRIPTION

This item shall consist of the construction of a compacted base made of processed aggregate (broken angular stone) on the prepared subbase in accordance with these specifications and in conformity with the lines, grades, compacted thickness and typical cross-section.

MATERIALS

At the discretion of the Engineer, the Contractor 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 the following gradation requirements:

<table>
<thead>
<tr>
<th>Square Mesh Sieves</th>
<th>Percent Passing By Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pass 2-1/4&quot;</td>
<td>100</td>
</tr>
<tr>
<td>Pass 2&quot;</td>
<td>95 - 100</td>
</tr>
<tr>
<td>Pass 3/4&quot;</td>
<td>50 - 75</td>
</tr>
<tr>
<td>Pass 1/4&quot;</td>
<td>25 - 45</td>
</tr>
<tr>
<td>Pass #40</td>
<td>5 - 20</td>
</tr>
<tr>
<td>Pass #100</td>
<td>2 - 12</td>
</tr>
</tbody>
</table>

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 cobbles stones, substantially all faces of which have resulted from the crushing operation. It shall be free of soft disintegrating pieces, mud, dirt, organic or other deleterious material. Only one type of coarse aggregate shall be used on a project unless otherwise permitted by the Engineer.

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**

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.
4.05.04 GRANULAR FILL

DESCRIPTION

This item shall consist of placing and compacting a gravel material to be used as a foundation for structures, to replace unstable material in slopes, in shoulders and elsewhere as indicated on the plans, required by the specifications or ordered by the Engineer.

MATERIALS

Granular fill shall conform to the requirements of Article M.02.01 of Form 814A.

CONSTRUCTION DETAILS

When granular fill is used for foundation for structures 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.
4.05.05 EROSION AND SEDIMENTATION CONTROL SYSTEMS

DESCRIPTION

This item shall consist of the furnishing of all labor, equipment and materials and performing all operations in connection with temporary and permanent erosion and sedimentation control measures.

MATERIALS

Geotextiles shall conform to Article M.08.01-26 of Form 814A.

Straw bales shall be made of hay with forty pounds (40 lbs.) minimum weight and one hundred twenty pounds (120 lbs.) maximum weight. Wood stakes shall be a minimum of 1” x 1” normal size by a minimum three feet (3’) in length.

Erosion control blanket shall be a machine produced mat consisting of 70% agricultural straw and 30% coconut fiber. The blanket shall be of consistent thickness with the straw and 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 1½ inch centers with degradable thread. Straw/coconut fiber erosion control blanket shall be SC150 as manufactured by North American Green, or approved equal. The SC150 erosion control blanket shall have the following properties:

<table>
<thead>
<tr>
<th>Material content</th>
<th>Straw</th>
<th>70%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coconut Fiber</td>
<td>30%</td>
<td></td>
</tr>
<tr>
<td>Netting</td>
<td>Top side heavyweight photodegradable with UV additives (3 lb/1000 sq ft approx wt) Bottom side lightweight photodegradable (1.64 lb/1000 sq ft approx wt)</td>
<td>Degradable</td>
</tr>
<tr>
<td>Thread</td>
<td>Degradable</td>
<td></td>
</tr>
</tbody>
</table>

Physical Specifications

| Width       | 6.5 feet |
| Length      | 83.5 feet |
| Weight      | 30 lbs +/- 10% |

BITUMINOUS CONCRETE
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.

Stone for anti-tracking aprons shall be minimum 2” crushed stone and conform to the requirements of Article M.01.01 of Form 814A.

CONSTRUCTION DETAILS

Erosion and sedimentation control systems shall be installed by the Contractor at locations shown on the plans or as directed by the Engineer. When straw bales are used they shall be installed as specified in Article 2.18.03 of Form 814A. 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 four inches (4") of the fabric is buried by either trenching or by laying the four inch (4") section horizontally on the ground and burying by ramping the soil up to the control fence. All geotextile fences shall be a least 36 inches in exposed height as installed, with not less than a two degree (2°) and not more than a twenty degree (20°) inclination toward the potential silt source. Hardwood posts shall have a minimum cross-section size of at least 2 ½ inches by 2 ½ inches and a minimum length of 36 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 feet (10’), and all posts shall be driven a minimum of 12 inches into the ground.

Anti-tracking aprons shall be installed in accordance with the detail plates.

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.
4.05.06 BITUMINOUS CONCRETE

DESCRIPTION

This work includes the construction of bituminous concrete pavement of the class specified and placed on a prepared base in accordance with these specifications and in conformity with the lines, grades, thickness and typical section shown on the Plan or as ordered by the Engineer. It also includes the construction of bituminous concrete driveway aprons and bicycle paths.

MATERIALS

The materials for the Bituminous Concrete mixture, the sources of supply, formula for the mix, mix tolerances, approval of mix formula and the control of the mixture shall conform to the requirements of Article M.04.01 of Form 814A, for the Class as specified.

The tack coat to be used on all cold joints shall conform to the requirements of Section M.04. of Form 814A.

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.

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

Transportation of Mixture: The mixture shall be transported from the mixing plant in trucks having tight bodies, which have previously been cleaned of all foreign material. The use of kerosene, gasoline, fuel oil 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 proportions recommended by the manufacturer. If such coatings are applied truck bodies shall be raised immediately prior to loading to remove any excess coating material. Loaded trucks shall be tightly covered with waterproof canvas or other suitable covers.
he mixture shall be delivered at a temperature within 25 degrees Fahrenheit of the approved job mix formula.

**Paving Equipment:** Paving equipment shall be of the 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 finished pavement. Some method shall be provided for the tilting of the screed while in operation to secure the proper "drag" and to provide the compressive action necessary to prevent "pulling" and to result in the uniformly screeded surface required. The machine shall have a sufficient number of driving wheels so that there will be no undue amount of slippage. Whenever the design of the equipment and plan of operation are such that the driving wheels travel on the finished surface of a completed pavement, said wheels shall be equipped with rubber tires or other means to protect the finished surface. Screeding members shall be preheated, and means shall be provided for heating the screeding members by some method that will prevent accumulation of bituminous material.

**Placing of Mixture:** Prior to the placement of the bituminous concrete, the underlying base course shall be brought to the plan grade and cross-section within the allowable tolerance. Immediately before placing the mixture, the area to be surfaced shall be cleaned by brooming or by other means acceptable to the Engineer.

The mixture shall not be placed when weather conditions of fog or rain prevail or when the pavement surface shows signs of any moisture. Unless specifically authorized by the Engineer, the mixture shall be laid only when the base temperature is above 32°F and the depth of pavement to be placed is a minimum of 1 inch. For a 1-inch depth of pavement to be placed, the base temperature shall be above 50°F.

The Engineer may permit work to continue when overtaken by sudden storms up to the amount which may be in transit from the plant at the time provided the mixture is within temperature limits specified. At the time of placement the mixture shall be within 25°F ± of the temperature specified in the approved mix formula unless in the opinion of the Engineer job conditions warrant varying these limits. Upon arrival, the mixture shall be dumped into the approved mechanical spreader and immediately spread and struck off to the full width required and to such appropriate loose depth for each successive course that when the work is completed, the designed depth will be obtained. Each course shall be struck off by the mechanical equipment. For use in striking off the bottom course, the machine shall be equipped with easily adjustable strike-off plates. The hopper and tunnel shall be properly loaded at all times during the paving operation.

**BITUMINOUS CONCRETE**
In order to obtain tight and well compacted longitudinal joints, the sequence of the bituminous concrete placing operations for all courses laid shall be subject to the control of the Engineer.

Before any rolling is started, the finished surface struck by the machine shall be checked, any inequalities adjusted, all “drippings”, i.e., fat, sandy accumulations from the screed 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 impracticable to operate the paving equipment, the Engineer permit the use of other type spreaders or the mixture may be spread and screeded by hand. When hand-spreading is permitted by special provisions or when, because of any project conditions it becomes necessary to spread by hand, the mixture, upon arrival, shall be dumped on approved steel dump sheets outside of the area on which it is to be spread and shall then be immediately distributed into place by means of suitable shovels and other tools and spread with metal lutes in a uniformly loose layer of such depth as will result in a completed pavement having the designed depth. Any deviation from standard crown or section shall be immediately remedied by placing additional material or removing surplus as directed. The Engineer may direct that other means of placing the material in addition to the metal lutes be used to insure a better control of the depths of material and the surface finish.

Contact surfaces of curbs, gutters, manholes, etc. shall be painted with a thin, uniform tack coat just before the material is placed against them. Where the bituminous material is spread on a concrete or an old bituminous base, a uniform coat of asphalt, or approved equal, shall be spread out one foot wide along each edge of the pavement to prevent water entering between the new pavement and the base. The Engineer may order a very light web-like coating of emulsion applied to the old pavement. Care must be taken not to apply too heavy a coating; application rate shall be 0.03 to 0.10 gallons per square yard.

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. Before any such equipment and tools are cleaned, they shall be moved off the paved or to be paved area; and they shall not be returned for use until after they have been allowed to dry.

In the case of bridge decks, immediately before placing the bituminous concrete upon a waterproofing membrane, the waterproofing shall be cleaned by a method, which shall not damage the membrane. If damage does occur, it shall
be repaired by patching as directed by the Engineer at no cost to the Town. No traffic shall be allowed on the bituminous concrete course directly over the membrane.

**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 power driven steel wheel, tandem or three wheel rollers weighing not less than ten (10) tons.

Intermediate 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. Final rolling shall be done by a power driven steel wheel tandem roller weighing not less than ten (10) tons. Rollers shall move at a slow and uniform speed not exceeding three miles per hour (3 mph) unless otherwise approved. The roller drive roll or wheel shall be nearest the paver. Any displacement occurring as a result of the reversing of the direction of a roller, or from other causes, shall be corrected at once by the use of rakes and addition of fresh mixture when required. Care shall be exercised in rolling not to displace the line and grade of the edges of the bituminous mixture.

The in-place density of each layer or course of the compacted mixture shall be compacted to a density of at least 95 percent of the target value as determined by these Specifications.

**Vibratory Rollers:** The Contractor may include a vibratory roller in the compaction train providing the vibratory roller meets the requirements stated herein. The vibratory roller shall be of a self-propelled type specifically designed for the compaction of bituminous concrete and meeting the following criteria:

- **Frequency of vibration:** 1500 vpm minimum
  2500 vpm maximum
  
  (A Reed Tachometer shall be supplied by the Contractor to determine the Frequency of Vibration.)

- **Drum Width:** 66 inches minimum (dual vibratory drums)
  84 inches minimum (pneumatic drive wheels)

In addition, all vibratory rollers shall be equipped with a speedometer that indicates roller speed in either 0.5 mph or 50 fpm increments (maximum)
throughout the normal operating range. Vibratory rollers shall be equipped with a speed control device, which shall be set by the Contractor to prevent the roller from traveling in excess of 2.5 mph or 220 fpm when the roller is operating in a vibratory mode. All vibratory rollers shall be equipped with an automatic vibratory shut off and automatic reversing eccentrics (weights).

The Contractor may substitute one vibratory roller for a breakdown roller and a pneumatic roller in the conventional procedure, the course shall be finish rolled with a steel wheel tandem roller having a minimum weight of ten (10) tons.

Dual vibrating drum rollers meeting the requirements of a steel wheel tandem roller and operating in the static mode may be used as the finish roller; however this single vibratory roller shall not be used as both the breakdown roller and the finish roller.

One vibratory roller and one steel wheel tandem roller shall be provided for each single lane paver. The use of a vibratory roller in the dynamic or vibratory mode is strictly prohibited on bridge decks or concrete structures. The Contractor assumes full responsibility for the cost of repairing all damages, which may occur to highway components and adjacent property. If the Engineer determines that the compaction obtained is less than that specified, or damage to highway components and/or adjacent property occurs with the use of the vibratory compaction equipment, the Contractor at no additional expense shall immediately cease using the equipment and shall proceed with the work in accordance with the conventional compaction procedure outlined in the specifications.

Surface Test of the Pavement: For the purpose of testing the finished surface, a standard 10 foot straightedge shall be provided by the Contractor and designate some employees whose duty it is to use the straightedge in checking all surfaces.

The finished pavement shall be such that it will not vary more than ¼ inch from a ten foot (10’) straightedge applied parallel to the centerline of the pavement. Any irregularity of the surface exceeding the above limits shall be corrected. Depressions, which may develop after the initial rolling, shall be remedied. Such portions of the completed pavement as are defective in surface, compression or composition, or that do not comply with the requirements of the specifications shall be taken up, removed and replaced with suitable mixture, properly laid in accordance with these specifications at the expense of the Contractor.

The surface of the finished base course shall not vary more than ¾ inch from a ten foot (10’) straightedge applied parallel to the centerline of the base.
**Joins:** Placement of the bituminous material shall be as continuous as possible. Rollers shall not pass over the unprotected end of a freshly laid mixture unless authorized by the Engineer.

Transverse joints shall be formed by cutting back on the previous run, existing bituminous concrete pavement, or bituminous concrete driveways to expose the full depth of the course. On any cold joint, a brush coat of asphaltic material or approved equal shall be used on contact surfaces of transverse and longitudinal joints just before additional mixture is placed against the previously rolled material.

The Longitudinal joint in one layer shall offset the previous joint in the layer immediately below by approximately six inches; however, the joint in the top layer shall be at the centerline of the pavement if the roadway is more than two lanes in width. In compacting the joint, the steel wheel roller shall be shifted on the previously place lane so that 1 or 2 inches of the drive wheel extends over the uncompacted material. The steel wheel roller shall continue to roll along this line and its position shifted gradually across the joint until the joint has been rolled with the entire width of the drive wheel. Rolling with steel wheel and pneumatic tire rollers shall be continued until a thoroughly compacted, neat joint is obtained. When the vibratory roller is used for breakdown rolling, compacting the joint shall be accomplished with the roller on the uncompacted material shifted 1 to 2 inches across the joint onto the previously placed lane.

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

DESCRIPTION

This Item shall consist 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 or as directed by the Engineer and in accordance with these specifications.

MATERIALS

Materials for this work shall conform to the following requirements:

1. Processed Aggregate base course shall conform to the requirements of Section 4.05.03, “Processed Aggregate Base (Broken Angular Stone) of these Public Improvement Standards.

2. Bituminous Concrete shall conform to the requirements of Article M.04 of Form 814A.

3. The tack coat to be used on all cold joints shall conform to the requirements of Section M.04 of Form 814A.

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 directed. 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 (Broken Angular Stone) 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 requirements of Section 4.06 of the Form 814A, 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 shall be backfilled with suitable material 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.
4.05.08 PAVEMENT RESTORATION FOR UTILITY TRENCHES

DESCRIPTION

This work shall consist of temporarily and permanently repairing utility trenches, patches, or any other cuts into an existing roadway. It shall also include furnishing, installing and compacting of processed aggregate base, sawcutting of existing pavement, and sealing the joints with approved joint sealant.

MATERIALS

The materials for the bituminous concrete mixture, the sources of supply, formula for the mix, mix tolerances, approval of mix formula and the control of the mixture shall conform to the requirements of Article M.04.01 of Form 814A.

The tack coat to be used on all cold joints shall conform to the requirements of Section 04.06.03 of Form 814A.

Joint seal material shall be a rubber compound of the hot poured type and shall conform to the requirements of AASHTO M173.

CONSTRUCTION DETAILS

All road cuts shall be repaired using the following two step process:

1) A temporary patch of the thickness shown below shall be installed immediately following backfilling and compaction of the trench.

   Local Road – 2 ½” Bituminous Concrete over 14” Processed Aggregate Base

   Collector - 4” Bituminous Concrete over 14” Processed Aggregate Base

   Arterial - 5” Bituminous Concrete over 16” Processed Aggregate Base

2) One (1) year following the backfilling of the trench, the temporary patch shall be permanently repaired by sawcutting a neat line, removing the bituminous concrete patch and appropriate amount of processed aggregate base, compacting the base material, tack coating
the surfaces of the existing roadway, placing a full depth section of bituminous concrete pavement (see Plate 1 for thickness), and sealing the joint with an approved joint sealant.
4.05.09 ROUT AND CRACK SEAL

DESCRIPTION

The work covered under this item shall consist of performing all operations and furnishing all materials, labor, and equipment necessary for preparing, routing, cleaning, drying, and sealing cracks in the existing pavement, and vegetation removal and sterilization of cracks where necessary. All materials and equipment shall be approved by the Engineer prior to work commencing.

MATERIALS

1. Asphalt: The asphalt material shall conform to the following requirements:

   PERFORMANCE GRADE BINDER: PG 58-28 (formerly AC-10), PG 64-22, or PG 64-28 (formerly AC-20) with a penetration of 75-100. The penetration shall be conducted in accordance with AASHTO T49.

   The Asphalt Binder shall be a Performance Graded Asphalt Binder (PG) which meets the specification requirements of AASHTO Provisional Standard MP1 and AASHTO PP-6. Acceptance of the PG will be in accordance with AASHTO PP26-96 (June 1996) “Standard Practice For Certifying Suppliers of Performance Graded Asphalt Binders”. PG shall be provided by an Approved Supplier (AS) under the Approved Supplier Certification (ASC) system.

   The Contractor shall furnish vendor's certified test reports for each load of asphalt binder material shipped to the project. The vendor's certified test report for the asphalt binder material can be used for acceptance or tested independently by the Engineer.

   The blending at the project site of PG binders from different suppliers is strictly prohibited. Contractors who blend PG binders will be reclassified as a supplier and required to certify the binder in accordance with AASHTO PP-26.

   A copy of the Material Certificate shall be provided in accordance with the frequency requirements established in the latest version of AASHTO MP-1, and shall include the following:

   a. Flash point
   b. Rotational viscosity at 135°C and 165°C
   c. Specific gravity at 25°C
   d. Original G*/sin$$\delta$$ and phase angle at test temperature
   e. RTFO percent mass loss
   f. RTFO - G*/sin$$\delta$$ and phase angle at test temperature
g. PAV Residue - G*(sinδ) and phase angle at test temperature
h. Creep stiffness and m-value at test temperature
i. Direct tension results (when equipment available)
j. Strain sweep in accordance with AASHTO TP-5 (optional)
k. Physical hardening after 24 hours in accordance with AASHTO TP-1 (optional)

2. Fiber Reinforced Asphalt Cement: The sealing compound may be a liquid asphalt material, conforming to the PG requirements above, which is reinforced with a polyester or polypropylene fiber conforming to the following properties:

(a) Fibers: Polyester fiber
   Concentration – 5% by weight to asphalt
   Length - 1/4 inch (6.25mm)
   Diameter - 0.0008 inch ± 0.0001 inch
   Specific Gravity - 1.32 to 1.40
   Melt Temperature - 480 F minimum
   Ignition Temperature - 1000 F minimum
   Tensile Strength - 75,000 psi ± 5,000 psi
   Break Elongation - 33% ± 9% (Fully drawn)

   This fiber is a polyester which is the polymerized product of crude oil components. These fibers will not shrink, distort, or lose their strength at temperatures below 480 deg. F. The fibers are produced by continuous melt-spinning.

   Composition: 5% minimum by weight of the asphalt material.

(b) Fibers: Polypropylene drawn fiber
   Concentration – 7% by weight to asphalt
   Length - 10mm
   Denier – 15 dpf
   Color – natural
   Crimp – none
   Tensile Strength - 40,000 psi, minimum
   Tenacity – 4 gpd
   Composition: 7% minimum by weight of the asphalt material.

3. Hot-Poured Elastomeric (SS-S-164): The sealing compound may be a hot-poured rubberized joint-sealing material, which will form a resilient and adhesive compound conforming to the following:

   (a) Pour Point - minimum of 20 deg. F. lower than the safe-heating temperature;

   ROUT AND CRACK SEAL

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(b) Penetration (AASHTO M301)- @ 77 deg. F./load 150 grams./5 sec. shall not exceed 0.90 cm.;
(c) Resilience (AASHTO M301) - @ 77 deg. F, minimum recovery of 60%;
(d) Flow (AASHTO M301) - @ 140 deg. F. shall not exceed 0.3 cm.;
(e) Bond (AASHTO M301)- @ -20 deg. F. for three cycles, at any time during the test, there shall not develop a crack, separation, or other opening which is at any point over 1/4" deep, in the sealer or between the sealer and mortar block;

The sealant shall be composed of a mixture of materials that will form a resilient and adhesive compound capable of effectively sealing cracks in asphaltic pavements against the infiltration of moisture and foreign material throughout repeated cycles of expansion and contraction with temperature changes, and that will not, at ambient temperatures, flow from the crack or be picked up by vehicle tire. The material shall be capable of being brought to a uniform pouring consistency suitable for completely filling the cracks without inclusion of large air holes or discontinuities and without damage to the material. It shall remain relatively unchanged in application characteristics for at least six hours at the recommended pouring temperature in the field.

4. Cover Materials: Cover Materials to eliminate tracking from traffic shall be stone screenings, crusher dust, slag, toilet paper, or other material found to prevent adhesion of the crack sealer to tires or pedestrians.

EQUIPMENT

Equipment used in the performance of the work required by this section of the specification shall be subject to the approval of the Engineer and maintained in a satisfactory working condition at all times.

(a) Equipment for cleaning, heating, drying cracks: Equipment for cleaning, heating and drying cracks shall be a hot air lance, or approved equal. The hot air lance shall have a minimum heat capacity of 2500°F (1370°C) and a minimum blast velocity of 2001 ft/s (610 m/s).

(b) Air Compressor: Air compressors for cleaning cracks shall be portable and capable of furnishing a blast pressure not less than 100 lbs per square inch (690 kPa) and a minimum blast flow of 2.5 cubic feet of air per second at the nozzle. The compressor shall be equipped with traps that will maintain the compressed air free of oil and water.
(c) Self-Propelled Vacuum Sweeper: Small self-propelled vacuum sweeper designed especially for use in cleaning highway and airfield pavements shall be used to remove debris, dirt, and dust from cleaned and dried cracks.

(d) Hand Tools: Hand tools shall consist of brooms, shovels, metal bars with chisel shaped ends, and any other tools which may be satisfactorily used to accomplish this work.

(e) Melting Kettle: The unit used to melt the joint sealing compound shall be a double boiler, indirect fired type. The space between the inner and outer shells shall be filled with a suitable heat transfer oil or substitute having a flash point not less than 530 deg. F. The kettle shall be equipped with separate automatic temperature controls for the oil and melting chamber. The kettle shall have accurately calibrated material and heating oil temperature gauges. The kettle shall be equipped with a satisfactory means of agitating the crack sealer at all times. This may be accomplished by continuous stirring with mechanically operated paddles and/or by a continuous circulating gear pump attached to the heating unit. The kettle must be equipped with thermostatic control calibrated between 200 deg. F. and 550 deg. F.

For fiberized sealants, the use of kettles with heavy duty application pumps, large hoses, and full-sweep agitation equipment is required. A 20 HP (15 kW) engine with a 2” (50mm) recirculating pump and discharge line is recommended.

(f) Applicator: The application hose shall be insulated and the applicator wand shall meet or exceed the kettle manufacturer’s specifications.

(g) Routers: Vertical-Spindle Router – equipped with sharp carbide tipped or diamond router bits.
Rotary-Impact Router – equipped with sharp carbide tipped router bits.

(h) Wirebrushing: Mechanical, power-driven wirebrushes shall be used in conjunction with some form of compressed air. The brush attachment shall contain bristles flexible enough to allow penetration into the crack channel, yet rigid enough to remove dirt and debris.

(i) Finishing Tools: Squeegee - heavy-duty, industrial rubber U- or V- shaped squeegee. Prior to installation the Contractor shall demonstrate to the Engineer, by the test strip, that the desired configuration is achieved with the finishing tool.

SAMPLING AND TESTING

The Engineer shall be notified in writing of the proposed sources of crack sealants at least 60 days prior to the date the materials will be required at the

ROUT AND CRACK SEAL

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project site. The contractor shall supply to the Engineer copies of all test reports for each load of sealant prior to use of the materials. Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the materials and are in conflict with these specifications, printed copies of these recommendations shall be furnished to the Engineer prior to use on the project. Installation of the material shall not be allowed until the recommendations are received and reviewed by the Engineer.

Crack sealants may be tested for conformance to the referenced applicable material specifications. The Contractor shall furnish samples of materials, in sufficient quantity to be tested, upon request, at no additional cost. If a sample fails to meet specification requirements, the material represented by the sample shall be removed and replace at no additional cost.

CONSTRUCTION DETAILS

In general, all cracks in the pavement that are greater than 3/16” in width should be sealed from water intrusion.

For transverse thermal cracks and longitudinal paving joints on hot mix asphalt (HMA) pavements needing routine or preventative maintenance, prior to applying the crack sealant material, the cracks are to be routed and cleaned of all foreign material. All other types of cracks to be filled shall be cleaned of all foreign material without routing. All cracks shall be thoroughly dried and heated using a hot air lance or approved equal.

In areas where hot poured joint material was previously used and where bond has broken, that area shall be cleaned prior to sealing. After the cleaning of the cracks, all material removed from the cracks shall be removed from pavement surface by means of power sweepers, hand brooms or air brooms, to the satisfaction of the Engineer. No crack sealing material shall be applied in wet cracks or where frost, snow or ice is present nor when the ambient temperature is below 40 deg. F. All cracks are to be dried prior to material application.

The type of crack sealant material, crack preparation, and placement procedure to utilize will be determined by the maintenance or rehabilitation needs of the pavement and the type of cracks. Pavements that are to receive an overlay in conjunction with the cracking sealing operation may be sealed with Fiber Reinforced crack sealant prior to the overlay, or, sealed with Hot-Poured Elastomeric Crack Sealing in conjunction with a leveling course prior to the overlay. All sealant materials in excess of one-sixteenth inch (1/16”) on the plane surface of the pavement must be removed by suitable methods such as a squeegee tool immediately before the sealant cools.
The cracks shall be routed in a manner that will widen the cracks without deepening them. The cracks shall be routed with a vertical spindle router to a width of 0.5” to 0.75” (12mm to 19mm) and a depth of 0.5” to 0.75” (12mm to 19mm). Every effort shall be made to follow the cracks while cutting and centering the cut over the crack. Secondary cracks spaced farther than 12 inches (300mm) from a primary crack shall be cut. Secondary cracks closer than 12 inches (300mm) to the primary crack shall be cleaned and sealed only. The percentage of missed cracks shall be less than 5%. If the percentage of missed cracks exceeds 5%, the routing operation shall be shut down and adjustments to the procedures, personnel, and/or equipment corrected.

The cracks shall be thoroughly cleaned, dried, and heated prior to application of the crack sealant. The hot air lance shall be utilized to remove dirt, debris, vegetation, and moisture, just prior to installation of the crack sealant. Loosened fragments encountered while cleaning shall be removed. The hot air lance shall provide a continuous stream of hot, high pressure air with no flame at the exit nozzle. The hot air blasting shall be conducted in two steps. The first pass shall be made along the crack in a steady fashion and should clean and heat but not burn the crack sidewalls. The hot air lance shall be held approximately 2” (50mm) above the crack channel. Proper heating is manifested by a slightly darkened color. The pavement shall not be burned, which is apparent by a black color and gritty texture. The second pass of the hot air lance shall completely remove all debris and particles. The crack sealant shall follow the second pass of the hot air lance at a maximum distance of 5 minutes or 164 feet (50 meters).

A. Fiber-Reinforced Crack Sealing: The pre-packaged fibers shall be supplied in polyethylene bags which will dissolve when introduced into the hot (above 275 deg. F) asphalt binder. The melting kettle shall mix and agitate the compounds until a homogenous mixture is achieved. Prior to applying the sealant, it should be heated to a temperature recommended by the manufacturer. Following appropriate cleaning, the sealant should be applied to a slightly overfilled condition and then leveled with a squeegee. All applied sealant shall be "warm-rolled" or "squeeged" in place such that the sealant forms a 3” to 5” (75mm to 125mm) band with a thickness of 1/16” over the crack. Any sealant which is greater than 3/16" below the pavement surface when cooled shall be resealed to the satisfaction of the Engineer. Any sealant sunk into the crack or in insufficient quantity from the pavement surface shall be re-sealed such that its surface is not greater than 1/16” above the pavement surface. The finished band width shall not exceed 6”. For pavements receiving an overlay the cracks shall be filled flush with the pavement surface such that the membrane is well bonded to the pavement.
B. Hot-Poured Elastomeric Crack Sealing: The sealant must be melted in a jacketed double boiler type melting unit equipped with both agitation and recirculation systems. The unit must be capable of safely heating the sealant to 410 deg. F. Prior to applying the sealant, it should be heated to a temperature recommended by the manufacturer. Following appropriate cleaning, the sealant should be applied to a slightly overfilled condition and then leveled with a squeegee in a 3" to 5" wide (75mm to 25mm) band across the crack with a thickness of 1/16". Any sealant sunk into the crack or in insufficient quantity from the pavement surface shall be re-sealed such that its surface is not greater than 1/16" above the pavement surface. The finished band width shall not exceed 6".

The crack sealant materials shall not be overheated, subject to prolonged heating, or reheated beyond the manufacturers’ recommendations. Carbon buildup should be cleaned off the melting vat walls before the kettle is used. The heating oil temperature should be kept no more than 82°F to 108°F above the safe heating temperature of the material, as stated on the manufacturer’s recommendations. Continuous recirculation of the material through the wand into the melting vat during idle periods is required.

Application:
Joint sealing material shall be heated and applied at the temperature specified by the manufacturer and approved by the Engineer. The minimum application temperature shall be 320 degrees F. The crack sealant material shall be applied with the nozzle in the crack channel, so that the channel is filled from the bottom up and air is not trapped beneath the material. The material shall be applied in a continuous motion to the desired level. Material must be reapplied to crack segments where the material has sunk into the crack or an insufficient amount was furnished in the previous pass.

Following the filling operation, the crack sealant shall be leveled with a squeegee. The squeegee shall follow closely behind the wand and be centered over the crack channel. The squeegee shall be kept free of buildup material by regular scraping or use of a propane torch.

The crack sealant shall be installed and finished such that it conforms to the dimensions stated in preparation of cracks. Where traffic requires immediate use of the roadway, an approved covering material shall be utilized. The covering material shall be applied immediately after finishing and in a thin layer fully covering the exposed treatment material.

Asphalt Kettle Cleanout:
Prior to work commencing, the Contractor shall provide written details on the clean out operations to the Engineer. At the end of each day’s work, the applicator lines must be purged of sealant material. Non-heatable materials
must be removed from the melting vat and discharged into containers for disposal. Reheatable materials may remain in the melting vat provided the quantity is minimized as much as possible. If flushing solvents are utilized, the operator must ensure that they do not contaminate the sealant or filler materials.
4.05.10 ENDWALLS

DESCRIPTION

This item includes all work necessary to construct endwalls 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 Article M.03.01 of Form 814A.

CONSTRUCTION DETAILS

Endwalls shall be built in the location and to the dimensions and details shown on the plans or as ordered by the Engineer. They shall be neatly and accurately finished, true to the lines and grades given. Pipes shall be of sufficient length to extend to the exposed face of the endwall, and the end shall be finished to provide neat, watertight joints. The ends of pipe culverts which enter endwalls on a skew shall be cut to the angle of the skew.

Endwalls with a vertical drop of four feet (4’) or greater as measured from the top of the endwall to the ground at the outlet shall include protective fence along the top of the endwall. Protective fence shall be vinyl coated chain link fence, minimum five feet (5’) high, and built in accordance with Section 4.05.21, “Chain Link Fence”, of these Public Improvement Standards.

ENDWALLS
4.05.11 CATCH BASINS AND MANHOLES

DESCRIPTION

Work under this Section includes the furnishing and installation, or modification to existing, concrete catch basins, manholes, drywells or other concrete drainage structures.

MATERIALS

Catch basins and manholes shall conform to Article M.08.02 of Form 814A.

Protective compound material shall conform to Subarticle M.03.01-11.

Mortar shall conform to Article M.11.04 of the Form 814A.

Pervious material shall conform to Article M.02.05 of the Form 814A, 3/4" size on the Gradation Table.

Storm Manhole Frames and Covers, Catch Basin Frames and Grates shall conform to Article M.08.02.05 of Form 814A except where specified on the plans or detailed drawings.

Dampproofing shall conform to Article 7.08.03 of Form 814A.

Granite Curb Inlets shall conform to the requirements of Section 4.05.15 of these Public Improvement Standards.

Stone for drywells shall conform to the requirements of Article M.02 of Form 814A and meet the gradation requirements for 2" crushed stone.

CONSTRUCTION DETAILS

These structures shall be constructed in accordance with the requirements contained herein for the character of work involved. The provisions of Article 6.02.03, of the Form 814A, pertaining to bar reinforcement shall apply except that shop drawings need not be submitted for approval, unless called for on the plans or directed by the Engineer.

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.

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.

Catch basin tops, which are to be reset, shall be removed from their present beds, the walls or sides of existing structures shall be rebuilt to conform to the requirements of the new construction and the top replaced with a new unit. The top will be replaced with the type shown on the plans or as directed by the Engineer.

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.
4.05.12 CULVERTS

DESCRIPTION

This item shall consist of furnishing and installing new pipe culverts, new pipe-arch culverts and relaying existing pipe and pipe-arch culverts of the type, size and length called for on the plans or as ordered, 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 also includes performing all operations in connection with the installation of pipe culverts, which shall also include all excavation, the saw cutting of existing bituminous concrete pavement, processed aggregate base, and permanent pavement repair to the lines and grades designated on the plans, or as directed by the Engineer and as specified herein. It shall also consist of replacing any utility service or lateral damaged by the Contractor at his/her own expense.

MATERIALS

Pipes of the type indicated on the plans shall conform to Section M.08 of Form 814A. Joint sealant shall conform to the requirements of Article M.08.01, "Flexible, Watertight, Rubber-Type Gaskets". Portland cement mortar or bituminous sealers shall not be used for sealing pipe joints.

Bedding material shall consist of sand or sandy soil, all of which passes a \( \frac{3}{8} \)" sieve, and not more than ten percent (10%) passes a No. 200 sieve.

When ground water is encountered, the Engineer may allow \( \frac{3}{4} \)" stone conforming to Article M.01.01 of Form 814A to be used instead of sand or sandy soil.

Bituminous concrete for permanent pavement repair shall conform to the requirements of Section 4.05.06, "Bituminous Concrete", of these Public Improvement Standards.

Class "A" Concrete shall conform to the requirements of Article M.03.01 of Form 814A.

Processed Aggregate Base shall conform to the requirements of Section 4.05.03, "Processed Aggregate Base", of these Public Improvement Standards.

CONSTRUCTION DETAILS
Unless otherwise directed by the Engineer, all new or relaid pipe culverts shall be installed in pipe bedding in accordance with the details as shown on the plans and in conformance with these specifications.

Pipe with an internal diameter of less than 48 inches and pipe-arch of an equivalent horizontal span shall be installed in a Type I installation, and pipe 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 inches (4") and preshaped to a height of ten percent (10%) of the total height of the pipe. After the pipe has been installed, the trench shall be backfilled with bedding material to a height 25 percent (25%) 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 inches (4") and preshaped to a height of ten percent (10%) 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 twelve inches (12") above the top of the pipe.

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, which ever the case may be. When rock is encountered, it shall be excavated to not less than twelve inches (12") below the bottom of the pipe, and this depth shall be refilled with bedding material, which shall be thoroughly tamped.

Where pipe is to be laid in a fill area, the embankment shall be placed and compacted to an elevation twelve inches (12") 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.

Normally, 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 of Form 814A.
4.05.13 RIPRAP

DESCRIPTION

This item of work shall include the furnishing and installing of riprap slope protection at the locations shown on the plans or as directed by the Engineer in accordance with these specifications and details.

It shall consist of excavating, furnishing and placing of angular shaped stones to protect slopes of embankments and waterways from water damage at the locations and to the dimensions and details shown in the plans and specifications or as directed by the Engineer.

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.

Standard Riprap: shall conform to the following:

1) Not more than fifteen percent (15%) of the riprap shall be scattered spalls and stones less than six inches (6”) in size.

2) No stone shall be larger than thirty inches (30”) in size, and at least seventy-five percent (75%) of the mass shall be stones at least fifteen inches (15”) in size.

Intermediate Riprap: shall conform to the following gradation:

<table>
<thead>
<tr>
<th>Stone Size</th>
<th>% of Mass</th>
</tr>
</thead>
<tbody>
<tr>
<td>18” or over</td>
<td>0</td>
</tr>
<tr>
<td>10” to 18”</td>
<td>30-50</td>
</tr>
<tr>
<td>6” to 10”</td>
<td>30-50</td>
</tr>
<tr>
<td>4” to 6”</td>
<td>20-30</td>
</tr>
<tr>
<td>2” to 4”</td>
<td>10-20</td>
</tr>
<tr>
<td>less than 2”</td>
<td>0-10</td>
</tr>
</tbody>
</table>
Modified Riprap: shall conform to the following gradation:

<table>
<thead>
<tr>
<th>Stone Size</th>
<th>% of Mass</th>
</tr>
</thead>
<tbody>
<tr>
<td>10” or over</td>
<td>0</td>
</tr>
<tr>
<td>6” to 10”</td>
<td>20-50</td>
</tr>
<tr>
<td>4” to 6”</td>
<td>30-60</td>
</tr>
<tr>
<td>2” to 4”</td>
<td>30-40</td>
</tr>
<tr>
<td>1” to 2”</td>
<td>10-20</td>
</tr>
<tr>
<td>less than 1”</td>
<td>0-10</td>
</tr>
</tbody>
</table>

B. Geotextile shall meet D.O.T. Standard Specification M.08.01(26) and shall be submitted to the Engineer for approval.

C. Granular Fill shall meet the requirements of Section 4.05.04, “Granular Fill”, of these Public Improvement Standards.

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.
4.05.14 UNDERDRAIN

DESCRIPTION

This item shall consist of furnishing and installing underdrain pipe, pervious to water, laid in a trench refilled with pervious material. Underdrain pipe shall be of the dimensions and details as indicated on the plans.

Outlets for underdrains shall consist of pipe laid in a trench and refilled with earth. The size and type of outlet pipe shall be the same as that of the underdrain to which it is connected, except that it shall not be pervious to water.

This Item also includes performing all operations in connection with the installation of underdrains and outlets, which shall also include all excavation, the sawcutting of existing bituminous concrete pavement, and trench capping, to the lines and grades designated on the plans, or as directed by the Engineer and as specified herein. It shall also consist of connecting any existing underdrain or foundation drain into the proposed trench and replacing any utility service or lateral damaged by the Contractor at his/her own expense.

MATERIALS

The materials for this work shall conform to the following:

The pipe for underdrains and outlets shall conform to the requirements of Subarticle M.08.01-25, of the Form 814A.

The aggregates specified for filling the trench shall be well-graded, clean, durable broken or washed stone and conform to the gradation requirements for Size No. 8 under Article M.01.01 of the Form 814A.

Granular Fill shall conform to the material requirements of Section 4.05.04, “Granular Fill”, of these Public Improvement Standards.

The materials for joint sealants shall conform to the manufacturers specifications for the pipe and the requirements of Article M.08.01 of the Form 814A.

Class "A" Concrete shall conform to the requirements of Article M.03.01 of the Form 814A.

Geotextile shall conform to Subarticle M.08.01-26 of the Form 814A.
CONSTRUCTION DETAILS

Unless otherwise directed by the Engineer, all underdrain and outlets shall be installed in pipe bedding in accordance with the details as shown on the plans and in conformance with these specifications.

The dimensions of the trench shall be as indicated on the plans or as ordered. Where the bottom of the trench is unstable or in rock, the trench shall be excavated twelve (12) inches deeper and an additional twelve (12) inch layer of crushed stone or granular aggregate similar to that used to fill the trench shall be placed and compacted in the trench.

Where the perforations are to be at the bottom of the pipe, the aggregate for filling the trench shall then be placed to a depth of three (3) inches and tamped true to grade. The pipe shall be placed and firmly bedded on the aggregate. This aggregate shall be placed whether the pipe is encased with geotextile or not.

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.

Normally, 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.

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.

Where shown on the plans or directed by the Engineer, the Contractor shall plug existing pipes with cement masonry.

Corrugated Polyethylene pipe shall be carefully butted together and held by bands or other approved means so as to prevent any displacement of the joint.

After the pipe has been installed as described above, the aggregate shall be placed carefully 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 aggregate and tamped in layers as shown on the plans. When the underdrain pipe is used with the holes in an upward position, a protective three (3) inch minimum layer of 3/8 inch aggregate shall be placed over the pipe and around all of the holes. The entire length of each drain pipe shall be wrapped with the geotextile fabric and the

UNDERDRAIN
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 minin of six (6) inches for smaller pipe.

In all cases where subbase material or gravel is to be placed over the underdrains, a layer of a least six (6) inches of subbase material or gravel shall be placed over the underdrain immediately after its completion. Where the upgrade end of the underdrain does not enter a structure, it shall be plugged or capped as directed.
4.05.15 GRANITE CURB

DESCRIPTION

This work shall include the furnishing and installing of straight, radius or sloped 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. This item also includes installing base materials to the dimensions shown on the detailed drawings.

It shall include 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.

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 by the Town of Manchester.

1. Radius 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 curved 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:

<table>
<thead>
<tr>
<th>Type</th>
<th>Width At Top, Inches</th>
<th>Depth, Inches</th>
<th>Minimum Length, Feet</th>
<th>Minimum Width At Bot. Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>V 5 x 18</td>
<td>5</td>
<td>18&quot;-22&quot;</td>
<td>4’</td>
<td>5”</td>
</tr>
</tbody>
</table>

3. Mortar
   Mortar for pointing joints shall conform to Article M.11.04 of Form 814A.

4. Concrete
   Class ‘C’ Concrete shall conform to Article M.03.01 of Form 814A.

5. Processed Aggregate Base
   Processed Aggregate Base shall conform to the material requirements of Section 4.05.03, “Processed Aggregate Base”, of these Standards.

GRANITE CURB
CONSTRUCTION DETAILS

1. **Delivery**
   All granite curb shall be accepted by the Town at the time of delivery and before curbing is installed.

2. **Excavation**
   Excavation shall be made of sufficient depth and width to accommodate the processed aggregate base as shown on the detailed drawings. The processed aggregate base shall be compacted to a firm, even surface and shall be approved by the Engineer.

3. **Transition Section**
   a. **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.
   
   b. **Driveway Transition:**
      All transition sections of granite curbing along driveways shall be set in Class "C" concrete and meet the requirements of the detailed drawings.

4. **Backfilling**
   After all curb is set, the space between it and the wall of the trench will 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 curved granite stone curbing will be set in Class "C" concrete as shown on the detailed drawings.

5. **Protection**
   The contractor shall protect curb stones and keep them in new condition until completion and acceptance.

6. **Joints**
   Joint openings between sections of curbing shall not vary from between $\frac{1}{4}$ inch to $\frac{1}{2}$ inch over the entire depth of the exposed curb. Joints are to be mortared to the full depth and height of the curb, and all excess mortar wiped clean off the face of curb. At intervals of fifty feet (50') one joint shall be left open for expansion purposes.
4.05.16 PRECAST CONCRETE CURB

DESCRIPTION

This item shall consist of furnishing and installing precast concrete curb, straight or curved, placed on a prepared subbase in accordance with the dimensions and details shown on the plans or as ordered by the Engineer.

MATERIALS

Joint filler shall conform to the requirements of Article M.03.01 of the Form 814A. The material for the precast concrete shall conform to Article M.03.01 of the Form 814A, except the coarse aggregate gradation may be varied with the approval of the Engineer.

The tack coat to be used on all cold joints shall conform to the requirements of Section M.04 of Form 814A.

Processed Aggregate Base shall conform to the requirements of Section 4.05.03, “Processed Aggregate Base”, of these Public Improvement Standards.

CONSTRUCTION DETAILS

Methods for precast concrete curb shall conform to the following:

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.

Placing of Curbing: Precast concrete curb units may be constructed in six (6) foot or longer lengths for straight sections. For curves of radius less than 100’, radius precast curb shall be used.

Protection: Precast concrete curb shall not be shipped to the project until the 28 day compressive strength is acquired. Precast curb 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 ordered, 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 LIP CURB

DESCRIPTION

This item consists of machine laid bituminous concrete, constructed on the pavement to the dimensions and details shown on the plans, or as ordered, and in conformity with the specifications.

MATERIALS

Materials, including tack coat, for this work shall conform to the requirements of Section M.04, Bituminous Class 3.

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, the surface of the pavement where the curb 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 RS-1 or other approved bitumen 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 straightedge, and any variation from a true line exceeding 1/4 inch shall be satisfactorily corrected. The only compaction required shall be that obtained by the approved mechanical curbing machine.

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.
4.05.18 METAL BEAM RAIL

DESCRIPTION

This item shall include furnishing and installing metal beam railing, consisting of a single or double line of rail elements fastened to steel posts with or without rub rail, and anchorages 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 ordered by the Engineer.

MATERIALS

The materials for metal beam rail and anchorages shall conform to the requirements of Article M.10.02 of Form 815.

Metal beam rail delineators shall conform to the requirements of Article M.18.09.02 Reflective Sheeting; Bright Wide Angle Retroreflective and M.18.13 Sign Face - Sheet Aluminum.

Plastic Blockouts: Plastic blockouts shall be made with a minimum of 50% recyclable polyethylene plastic comprised of low density and high density polyethylene with a specific gravity less than or equal to 1.0 in accordance with ASTM D-792 and be recyclable after removal from service. Manufactures must enter into an agreement with the Department to recycle their blockouts after removal from service. They shall also have a minimum compressive stress of 450 psi in accordance with ASTM D-695, conform to the dimensions indicated on the plans, and shall be a shade of gray or black. Blockouts must have been crash tested and have written approval from FHWA in compliance with NCHRP Report – 350 Test Level – 3 requirements. Each blockout shall be stamped from the factory with the manufactures identification and lot number. The Contractor shall furnish to the Engineer prior to construction a certified test report and a material certificate for the blockouts in conformance with Subarticle 1.06.07.

CONSTRUCTION DETAILS

The steel posts shall be driven. The Contractor shall use suitable caps and equipment to prevent damage to the posts during driving. Where rock or boulders are encountered in driving the posts, this material shall be removed so as to make a hole of sufficient size to permit the setting of the post. The hole shall then be backfilled and thoroughly compacted before the driving of the posts.
The Contractor is cautioned that within the limits of any project, buried cables for illumination or utilities, which may be energized, may be present.

The posts shall be located as shown on the plans, set plumb and in alignment with the rail or rail treatments. The block outs, rub rails, and rail elements shall then be erected to produce a smooth continuous rail as shown on the plans. The rub rails and rail elements shall be lapped in the direction of traffic.

Whenever rail or rail treatments are being constructed adjacent to roadways open to traffic, the Contractor shall complete the installation to and including the designated terminal treatment at the close of each day’s work.

On long runs or other locations where it is not practical to complete the installation to and including the designed terminal treatment by the end of each day’s work, the Contractor shall use temporary methods for terminating the beam rail so as to minimize any hazard caused by leaving the end of the beam rail exposed to traffic. Temporary methods for terminating the beam rail shall include lowering the rail end to the ground and providing adequate anchorage of the rail end by bolting, securing, burying, etc.

The Contractor shall submit to the Engineer for approval details of his proposed methods for temporary terminating the end section. No work shall be performed adjacent to the areas open to traffic until approval is given.

The Contractor shall be required to furnish extra length posts where field conditions warrant. These posts shall be of such length that the minimum depth in the ground, as shown on the plans, is maintained.

Before final erection, all galvanized elements which have been cut or worked so as to destroy the zinc coating and cause the base metal to be exposed shall have the exposed base metal thoroughly cleaned and brush coated with zinc rich touch up material.

Anchorages, channels, rails, terminal sections and fittings shall be placed as indicated on the plans. The excavation shall be backfilled with suitable material and compacted.

Rail elements shall be lapped in the direction of traffic.
4.05.19 THREE CABLE GUIDE RAIL

DESCRIPTION

This item shall include the furnishing and installation of three wire cables attached to American Standard Beam Posts, as shown on the detail plates, installed in the locations indicated. This item also includes the furnishing and installation of concrete anchors or “deadman”, end posts with base plates, anchor assemblies, turnbuckle cable-end assemblies and spring cable end assemblies, appurtenance hardware, and excavation and backfill as needed to complete the installation.

MATERIALS

Wire rope, steel posts and plate anchors, fittings and anchorages shall conform to Article M.10.08 of Form 815.

Reflective delineators shall conform to Article M.18.09 of Form 815.

CONSTRUCTION DETAILS

Posts shall be spaced as shown on the plans, set plumb and normally with the front faces at a uniform distance from the centerline of the roadway.

Welds shall be of the size and shape as shown on the plans and shall conform to the applicable requirements of the current AWS Structural Welding Code as revised. All welds shall have no visual cracks nor be defective in any way and shall be formed in a neat and workmanlike manner. Any weld found unacceptable by the Engineer shall be corrected by the Contractor at no additional cost.

Line posts shall be driven into the ground as shown on the plans. Posts shall be driven by approved methods and equipment that will provide the posts in their final position free of any distortion, burring or other damage.

End posts are to be set in holes dug in thoroughly compact soil. The bottom of dug holes shall be thoroughly rammed so that the posts have a stable foundation. Backfill for all holes shall be approved material and shall be machine tamped in four inch (4”) lifts. Should rock or boulders be encountered, a hole of sufficient size to set the post to normal depth shall be drilled and backfilled with tamped sand.

Anchorages, plate anchors, cables, turnbuckle cable-end assemblies and spring
cable-end assemblies, singly or in combination, and all fittings shall be placed as indicated on the plan in a workmanlike manner. The cable shall be drawn taut and fastened securely at both ends as shown on the plans. No punching, drilling, cutting or welding of posts, post plates or any hardware will be permitted after galvanizing.

After erection, galvanized cable, fittings, steel posts and plate anchors that have been abraded so that the base metal is exposed, threaded portions of all fittings and fasteners and the cut ends of all bolts shall be painted with two coats of zinc dust primer conforming to Federal Specifications TTP-641B, Type II, or MIL P 21035.

After the rail has been erected, the Contractor shall install a reflectorized delineator on every other line post as shown on the plans or directed by the Engineer. Reflectorized delineators shall not be installed on railing installations or single posts where such installations are greater than twelve feet (12’) from the shoulder. An object marker shall be installed at the end of the anchorage, Type II.
4.05.20 TIMBER RAIL

DESCRIPTION

This item shall consist of wood posts and fence with the necessary fittings, erected in the locations and to the dimensions and details shown on the plans or as ordered by the Engineer and in accordance with these specifications.

MATERIALS

The wood for this shall conform to Article M.10.03 for southern yellow pine pressure treated to 0.40. This broken or crushed stone shall conform to Article M.02.05 (1). Substitute the following: “… shall be sized to meet the requirements of Grading “A”, Article M.02.06.” Stone dust shall conform to Article M.02.05 (1) and sized to meet the requirements of grading “C”, Article M.02.06.

CONSTRUCTION DETAILS

The fence shall be built in the locations and in accordance with the dimensions or as ordered. The posts shall be set firmly in the ground, braced, and the fenced shall be neatly and firmly attached. The fence shall be set on a bed of broken or crushed stone. Bed of broken or crushed stone shall be installed to the dimensions and details shown on the plans. The fence shall be completed in a neat and workmanlike manner to the satisfaction of the Engineer.
4.05.21 CHAIN LINK FENCE

DESCRIPTION

Work under this item shall consist of furnishing and installing black 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.

MATERIALS

The materials for this work shall conform to the requirements of Article M.10.05 of Form 814A.

Fabric shall be black polyvinyl chloride-coated steel. Posts and hardware shall be black polyvinyl chloride-coated.

Bolts, nuts and washers shall be galvanized steel conforming to the requirements of ASTM A307. Galvanizing shall be in accordance with the requirements of ASTM A153.

Grout shall be non-shrink grout conforming to the requirements of Article M.03.01-12 of Form 814A.

CONSTRUCTION DETAILS

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. Where a top rail is used, it 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 (7) inches long, one (1) coupling in every
five (5) to have a heavy spring to take up expansion and contraction in the top rail.

Fabric shall be fastened to line posts with bands or wire clamps of 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. These tie wires shall be 6-1/4 inches long, spaced approximately 24 inches apart.

If a top rail is not specified, a top tension wire shall be provided. The tension wire shall be one continuous length between pull posts. Sufficient tension shall be applied to provide a wire without visible sag between posts. Tension wires shall be tied or otherwise fastened to end, gate, corner or pull posts by a method acceptable to the Engineer. Ties or clips shall be provided for attaching the tension wire to the fabric at intervals not exceeding two (2) feet.

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.

Posts shall be set vertically in drilled holes with non-shrink grout. The diameter of these holes shall be ½ inch larger than the outside diameter of the posts. Install dome caps on tops of posts.
4.05.22 CONCRETE SIDEWALKS, RAMPS AND APRONS

DESCRIPTION

This work includes the construction of concrete sidewalk, monolithic concrete curb and sidewalk, concrete sidewalk ramps and concrete driveway aprons, on a processed aggregate base in conformance with the lines, grades, dimensions and details as shown on the plans or as ordered by the Engineer.

MATERIALS

1. Concrete

   a. The concrete furnished shall conform in respects to composition, transportation, mixing and placing to Class “F” Concrete, 4,000 psi as specified in Article M.03.01 of Form 814A 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 Connecticut DOT approved list.

   d. Entrained air contents shall be maintained as follows:

   | Nominal Max | Average Air Content |
   | Aggregate Size |               |
   | ⅜"          | 7.5%          |
   | ½"          | 7.0%          |
   | ¾"          | 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 concrete driveway aprons, concrete sidewalk ramps and specified concrete 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 shall be 5/8" 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.

3. Construction/Isolation Joint Material

Joint material shall be one-half inch (½”) in thickness, equal in width to the sidewalk width and conform to AASHTO M33-93, Asphaltic Expansion Joint Materials.

4. 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.

5. Processed Aggregate Base (Broken Angular Stone)

Processed aggregate base shall conform to the requirements of Section 4.05.03, “Processed Aggregate Base (Broken Angular Stone)”, of these Standards.

CONSTRUCTION DETAILS

1. Excavation

Excavation, including the removal of any type of existing sidewalk, 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. **Process Aggregate Base (Broken Angular Stone)**

The base course shall be placed in layers not to exceed six (6) inches 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. They shall be of approved section 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 inch (\(\frac{1}{8}\)) 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 and 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 bondbreaker. 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 \(\frac{3}{4}\)” in diameter and twelve inches (12”) 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 feet (15’), a full control joint shall be provided. A tooled joint, to the depth of $\frac{3}{8}”$ shall be installed at approximately five foot (5’) 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 as curbing, building, or other, previously existing paving.

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 $\pm \frac{1}{4}”$.

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 inch (¼") radius tool. For monolithic sidewalk and curb, the exposed faces of curb shall be rubbed with mortar to fill any voids. 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.

6. Reinforcing

Reinforcing of the type specified shall be used in all concrete sidewalk ramps, concrete driveway aprons and concrete sidewalks which cross driveways. Welded Wire Fabric for concrete reinforcement shall be embedded at mid-depth in the slab.

7. 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 subgrade 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 inch (6") 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 texture and appearance.

8. **Tolerances**

Where new or repaired sidewalk abuts existing sidewalk, the surface deviation between the two walks shall not exceed \( \frac{3}{8} \)" when tested with a ten foot (10') straightedge. The alignment of the face of curb shall not deviate more than \( \frac{1}{4} \)" over a ten foot (10') length when measured with a straightedge for tangent sections or radially for curved sections. Completed surfaces not within these tolerances shall be corrected with abrasive grinding or replaced at the sole expense of the Contractor. Determination to repair or replace the deficient work will be at the sole discretion of the Engineer.

9. **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.

10. **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.
RESTORATION OF LAWN AREAS

DESCRIPTION

This work includes the furnishing of all labor, equipment and materials and performing all operations in connection with the turf establishment. This work will include the fine grading of topsoil on all disturbed slopes and lawn areas as designated on the contract drawings, along with the fertilizing, seeding, and the proper replacement, removal (if required), resetting, and/or protection of all existing lawn structures of all these areas, in accordance with the plans or at the direction of the Engineer. It also includes the maintenance of the newly planted lawn until established.

MATERIALS

Fertilizer: Shall conform to the Standards of the Association of Official Agricultural Chemists for a 10-10-10 mixture and shall be furnished in unopened bags bearing the manufacturer's statement of analysis.

Topsoil: 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 millimeter (2mm) sieve and subjected to a particle size analysis. The topsoil shall not contain less than six (6) nor more than twenty (20) percent organic matter as determined by loss-on-ignition of oven dried samples dried at 105° 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” 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 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.
Seed Mixture: Seed mixture for lawns shall conform to the following requirements:

<table>
<thead>
<tr>
<th>Seed Mixture</th>
<th>Proportion by Weight (Percent)</th>
<th>Minimum Purity (Percent)</th>
<th>Minimum Germination (Percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kentucky Bluegrass</td>
<td>33</td>
<td>85</td>
<td>75</td>
</tr>
<tr>
<td>Creeping Red Fescue</td>
<td>33</td>
<td>98</td>
<td>85</td>
</tr>
<tr>
<td>Perennial Ryegrass</td>
<td>33</td>
<td>98</td>
<td>90</td>
</tr>
</tbody>
</table>

Straw Mulch: Provide air-dry, clean, mildew and seed free, salt hay or threshed straw of wheat, rye, oats or barley.

Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic; free of plant-growth or germination inhibitors; with maximum moisture content of fifteen percent (15%) and a pH range of 4.5 to 6.5.

Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant growth or germination inhibitors.

**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 inches (4”) with all stone larger than ½” removed.

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. Fertilizer shall be placed at the rate of 400 pounds per acre and thoroughly mixed with the loam, prior to seeding.

Seed shall be uniformly applied to all disturbed areas at a rate of 150 pounds per acre. At the option of the Engineer, hand rolling of all loam and seed areas shall be completed.
The Contractor shall maintain the area until sufficient seed growth has occurred to stabilize the soil. This includes the watering, fertilizing, weeding, mowing, trimming, replanting, restoration of eroded areas, and the placing and maintaining of hay bales as required to prevent further erosion.

Normal seeding season for grass shall be April 1st through June 15th for spring seeding and August 15th through October 15th for autumn seeding. Normal seeding season for wildflower shall be March 1st to May 15th for spring seeding and November 15th to December 15th for autumn seeding. Seeding at other times shall be allowed only with permission of the Engineer.

Hydroseeding: Where hydroseeding is specified or directed by the Engineer, it shall conform to the following:

1. Mix specified seed, fertilizer and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogenous slurry suitable for hydraulic application.

2. Mix slurry with nonasphaltic tackifier.

3. Apply slurry uniformly to all areas to be seeded in a one-step process. Apply mulch at a minimum rate of 1500 lb/acre dry weight but not less than the rate required to obtain specified seed-sowing rate.
4.05.24 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 Drawings, specified herein and as necessary for a complete and proper installation.

QUALITY ASSURANCE:

A. Industry Reference Standards:


3. State of Connecticut Department of Agriculture


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.
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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.

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: \(\frac{1}{2}'' - 3''\), finely shredded.


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:

   From March 15 to June 15 for spring planting and from August 15 to November 15 for fall planting.

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 to the 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 from 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 fold back the burlap at least 2/3 down the height of the ball and cut it off leaving only the burlap on the bottom 1/3 of the ball to remain. In a like manner, wire baskets shall be removed from the top 1/3 of the ball.

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 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.
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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.
4.05.25 MONUMENTATION

DESCRIPTION

Work under this item shall consist of the installation of new granite monuments at the locations as shown on the plans and in conformity of these specifications. All monuments will be supplied and installed by the Contractor and located by the Contractor’s Licensed Land Surveyor.

MATERIALS

1. Granular Fill for Backfill shall conform to the requirements of Section 4.05.04, “Granular Fill”, of these Public Improvement Standards.

2. Processed Aggregate Base shall conform to Section 4.05.03, “Processed Aggregate Base”, of these Public Improvement Standards.

3. Granite shall conform to Section 4.05.15, “Granite Curb” of these Public Improvement Standards.

CONSTRUCTION DETAILS

All granite monuments shall be installed by the Contractor at the locations as shown on the plan sheet or as directed by the Engineer.

The Contractor shall employ a Licensed Land Surveyor, licensed in the State of Connecticut, to locate existing monuments prior to excavation and to locate the new monument at the time of installation.

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 backfill material and compacted in 6” layers.

The granite monuments shall be installed so that they are flush with the finished grade or as directed by the Engineer.
4.05.26 MAINTENANCE AND PROTECTION OF TRAFFIC

DESCRIPTION

This item includes the furnishing, installing, maintaining, and removing of all signs, barricades, traffic cones, temporary pavement markings or any other traffic control devices necessary to maintain traffic as specified. It shall also include all work associated with complying with the Town of Manchester Traffic Control Ordinance.

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. It shall be the sole responsibility of the Contractor to warn 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. The Contractor shall furnish, install, maintain, adjust, and store all signs, suitable barricades, and traffic cones, as necessary to carry out the traffic routing plan and maintain vehicular and pedestrian traffic. All of this work shall meet with the approval of the Town.

MATERIALS AND METHODS

All signs, barricades, flashing lights, traffic personnel, detours, etc. and all else necessary and incidental shall conform to the Manual on Uniform Traffic Control for Streets and Highways as approved and amended.

1. 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.

2. Signs: Properly lighted, adequately sized clear, concise, legible signs shall be furnished as required in the detail drawing or as necessary for the safe regulation of traffic.

3. Barricades: Suitable lighted barriers or barricades shall be furnished by the Contractor and put up and maintained at all times during the night or daytime, around all open ditches, trenches, excavations, or other work potentially dangerous to pedestrians and traffic. Barricades shall be placed on all sides and throughout the entire length of all open ditches, trenches, excavations, or other work which must be barred to the general public. Barricades shall be properly painted in order to retain a high degree of visibility to vehicular and pedestrian traffic.

4. Flashers: Barricades shall be lit by flashers in accordance with this paragraph or other lighting methods approved by the Engineer in lieu thereof. Flashers shall be placed along the entire length of the barricades at an interval no greater than 8 feet, center to center. Flashers shall be power operated, lens directed, enclosed light units which shall provide intermittent light from 70 to 120 flashes per minute, with the period of light emittance occurring not less than 25 percent of each on-off cycle, regardless of temperature. The emitted light shall be yellow in color and the area of light on at least one face of the unit shall be not less than 12 square inches. The discernable light shall be bright enough to be conspicuously visible during the hours of darkness at a minimum distance of 800 feet from the unit under normal atmospheric conditions. For units which beam light in one or more directions the foregoing specifications shall apply 10 degrees or more above and below the photometric axis.

Contractor shall furnish and securely fasten flashing units to signs, barricades, and other objects in such numbers and for such lengths of time as are required for the maintenance and protection of traffic. The flasher shall be in operation during all hours between sunset and sunrise, and during
periods of low visibility. The Contractor shall maintain, relocate and operate barricades and flashers throughout the life of the contract. No special payment will be made for barricades or flashers.

5. Non-Performance: Should the Contractor or his/her employees neglect to set out and maintain barricades or lights, as required in these Specifications, the Engineer immediately, and without notice, may furnish, install and maintain barricades or lights. The cost thereof shall be borne by the Contractor. Should the Contractor or his/her employees neglect to safely maintain and protect traffic as required in these Specifications, uniformed Town of Manchester police officers will be used in accordance with the Town of Manchester Traffic Control Ordinance. The costs for hiring the police officers will 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 payments that are due or may become due to the Contractor under this contract.

6. Uniformed Police Officers may be required depending upon the nature of the work and the street the work is on. Contact the Manchester Police Department at 645-5500 for questions regarding the Town of Manchester Traffic Control Ordinance.
4.05.27 STREETLIGHTING

DESCRIPTION

This item consists of the installation of Town owned streetlighting in new subdivisions approved by the Planning & Zoning Commission. The installation will be performed by the Town’s electrical subcontractor and the costs of installation will be borne by the Developer of said subdivision. Installation will include the materials and labor to install and connect each streetlight proposed on the approved plans. Also, the cost of two years worth of electricity for the streetlights will be paid to the Town by the Developer, according to the fixtures monthly electric cost.

MATERIALS

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

A. Light Standards

The pole will be able to support a load of 7.9 sq.ft. EPA and a total weight of 150 pounds in a 100 MPH wind with a 1.3 gust factor. The pole will be a direct bury type with a mounting height of fourteen feet (14’) and a shaft length of eighteen feet (18’). The color of the pole will be black.

The round tapered pole shall be constructed of fiberglass to withstand the forces and weights specified above.

The resin used to make the pole shall be ultraviolet resistant and pigmented approximately the same color as the final coating to be applied. The color shall be uniform throughout the entire wall thickness of the pole. A highly weather resistant, pigmented, polyurethane coating shall be applied to the pole. The coating shall have a minimum dry thickness of 1.5 mils.

The surface of the pole shall have a natural finish that shall be uniform along the entire length of the pole.

The pole shall be flame resistant in accordance with ASTM D635. Specimens must cease to burn before the gauge mark of 100mm (3.9 inches) is reached.

Tenons shall be permanently bonded to the fiberglass shaft and shall be hot-dipped galvanized steel to ASTM A153. Tenon should be a maximum three inches (3”) diameter to accommodate the luminaire fixture.

The handhole shall be 2.5”x5” and provided with a vandal-resistant, stainless
steel ¼” socket head screw.

B. Luminaires

Luminaires shall be high-pressure sodium, full cut-off, wattage to be determined by the Town Engineer per application. The luminaire shall be manufactured by GE and will be the Salem fixture, Type TRCR. The outside finish shall be black.

A photoelectric control will be installed on the luminaire and will be finished in a black color.

CONSTRUCTION DETAILS

Streetlighting will be installed on new roads per the above specifications. Poles will be spaced to adequately light the roadway and sidewalks. Streetlight poles will be installed on the same side as the sidewalks, in most cases. Poles will be spaced roughly every two hundred feet (200’), at intersections, at curves in the road, and at the end of cul-de-sacs. The layout of streetlights will be made when the subdivision is being reviewed for approval. This may be changed as field conditions may warrant extra lighting or fewer lighting.

Coordination with CL&P to energize the streetlights will be made by the Town’s electrical subcontractor. Streetlights must be installed prior to the first Certificate of Occupancy of the subdivision.
4.05.28 TRAFFIC CONTROL SIGNS

DESCRIPTION

This item shall consist of furnishing and installing sign face sheet aluminum signs of the type specified on metal sign posts at the locations indicated on the plans or where directed by the Engineer.

MATERIALS

All signs shall be sheet aluminum, 0.08 inches thick.

Reflective sheeting shall conform to the requirements of Article M.18.09.01, Type I, II or III of Form 814A. Use high intensity grade retroreflective sheeting for the following signs: “STOP”, “YIELD”, “DO NOT ENTER” and “WRONG WAY”.

Silk screening shall conform to the requirements specified by the reflective sheeting manufacturer.

Metal sign posts shall conform to the requirements of Article M.18.14 of Form 814A.


CONSTRUCTION DETAILS

Placement and dimensions of copy, border and mounting holes shall conform to the requirements of the Connecticut Department of Transportation standard 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. Signs that are mounted in concrete sidewalks shall have breakaway anchors.
PAVEMENT MARKINGS

DESCRIPTION

This work shall consist of furnishing and installing reflectorized white and yellow epoxy resin pavement markings or symbols of the width and color specified at the locations indicated on the plan. It also includes the removal of pavement markings.

MATERIALS

Epoxy resin pavement markings shall conform to the requirements of Article M.07.22 of the State of Connecticut Department of Transportation’s “Standard Specifications for Roads, Bridges, and Incidental Construction, Form 815”.

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 on pavements over existing pavement, the existing pavement shall be thoroughly power washed.

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.
5.01 RECORD (AS-BUILT) DRAWINGS

Record drawings are required for all subdivisions, private development or other work regulated by these Public Improvement Standards.

For subdivisions, record drawings shall be submitted to the Engineering Division for review prior to the issuance of building permits for 50% of the approved bonded lots. (i.e., on a 12-lot subdivision, 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 or other work regulated by these Public Improvement Standards, the Developer/Contractor shall submit to the Engineering Division four complete sets of record drawings for review. Upon approval of record drawings, the Developer/Contractor shall submit two fixed line mylars and one electronic copy of the record drawings in .dwg or .dxf format submitted on compact disc. This data will be incorporated into the Town’s Geographic Information Systems (GIS) map. See the “Town of Manchester Geographic Information Systems Data, Map Products and Policies” manual for more information.

The Developer shall contact the Water and Sewer Department at (860) 647-3119 to coordinate the preparation of Record Drawings for all water main and sanitary sewer facilities.


The following information shall be shown on the record drawings:

1. All geometry pertaining to street lines, the perimeter boundary of the development, internal property or lot lines, and easement lines. All surveys must be tied into the Town of Manchester Horizontal and Vertical Control Network as established in 1998. Tie sheets for all Network Control Stations are available upon request through the Engineering Division.

2. Title sheet showing sheet layout and phase lines, if applicable.

3. Building setback lines.
4. As-built location of all types of sidewalks, curbs, sidewalk ramps, driveway openings, guide rail, traffic signs, pavement markings and protective fence.

5. Dimensions of major features, such as width of roadway and sidewalk, cul-de-sac radius, etc.

6. Locations of all drainage structures together with top of frame elevations, top of headwall elevations and invert elevations. Revised design calculations may be required should the system constructed differ in elevation from the approved drawings.

7. As-built location of water mains, water services, curb boxes, valve boxes, hydrants, sanitary sewer mains and laterals, and manholes (with top of frame and invert elevations).

8. As-built locations of all street light poles with owners and numbers.

9. As-built locations of all underground utilities (i.e. electric, gas, telephone, and cable) as well as all above ground utility transformer pads, manholes, junction boxes, vaults (with dimensions) and handholes.

10. 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 Licensed Professional Land Surveyor in the State of Connecticut. This certification shall also indicate the approximate date that all monumentation and iron pins were set.

11. Semi-permanent benchmarks shall be set at all roadway intersections and along newly constructed roadways. The maximum distance between benchmarks shall not exceed 600’. No less than 3 benchmarks shall be set. Datum shall be NGVD 1988.

12. Lot numbers and street addresses.

13. North arrow.

14. All existing foundations with dimensions off of property line shown to the nearest tenth (0.1) of a foot.

15. As-built locations of detention basins, including topography, top of berm elevations, inverts of inlet and outlet structures, and elevations of spillway.

16. Volume and page of all easements conveyed to the Town of Manchester.
17. As-built location of all foundation drains that discharge into Town drainage structures.

18. As-built dimensions of riprap splashpads at drainage outlets.

19. Title block indicating “As-Built” or “Record Drawing” with a date.

20. Legend which accurately describes monumentation set and found (i.e. 5/8” rebar, 1” iron pipe, concrete monument with brass cap, etc.)

21. 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.

22. Traffic signal plan(s), if applicable.

23. At the discretion of the Engineer, a final grading plan of the site with two-foot contours shall be submitted to the Town for filing.

The scale of the drawings shall be the same as the originally approved subdivision plans. Mylars are to be stamped (embossed seal and wet signature) by the Licensed Land Surveyor in the State of Connecticut responsible for the record drawing.

5.02 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 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. Said conveyances are to be in the 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.
The Developer shall submit to the Engineer for review, documentation for all conveyances identified on the approved plan. Upon approval, the Developer shall deliver executed conveyances for all land to the Engineer. Said conveyances are to be in the approved format.

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.

5.03 STREET ACCEPTANCE PROCEDURE FOR 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 5.01 of these Public Improvement Standards.
- Results of testing on sanitary sewer systems as required by the Manchester Water and Sewer Department.
- Results of testing of water supply systems as required by the Manchester Water and Sewer Department.
- Certification from the Sanitary Sewer Authority that all fees and/or charges have been paid.
GRASS SLOPE AT 1:2 PER FOOT

circle

GRANITE MONUMENT (TOP)

RADIAL GRANITE CURB

STRAIGHT GRANITE CURB

R = 49'

R = 60'

SEE PLATE 1

CONCRETE SIDEWALK RAMP

STREETLINE

SEE PLATE 3
Concrete Sidewalk

Expansion Joint - Detail

Notes:
1. Processed aggregate base
2. Grass shield
3. Class "F" Concrete
4. 1/4" joint (depth 3/8"
5. 3/8" smooth metal dowels

Safety:
1. Approved bond breaker
2. At the end of the daily pour of concrete, metal dowels
3. Insall approved bond breaker between granite curb

Plan:
12" TP.
Every 15 feet.
Material w/dowels
Expansion Joint
1/2" Asphalt
Expansion Joint
1/2" Asphalt
Material
Expansion Joint

Section:
Processsed aggregate base
Grass shield
Concrete

Revision:
No. Description
Date Approved
No.

Date: May 2003
Drawn by:
Checked by:
Public Works Department
Town of Manchester
Engineering Division
No Scale
Curb Types

1. Minimum curb length of 14".
2. Granite curb shall be finished-sawn top.
3. If granite curb is 14" or less, graduate curb with a radius of 100 or less.

NOTES:

ENGINEERING DIVISION
PUBLIC WORKS DEPARTMENT
TOWN OF MANCHESTER

REVISIONS

NOTE: AND SET IN 6" OF CONCRETE.

NAME: PLATE 6
FILENAME: PLATE6.DWG
DATE: MAY 2003
DRAWN BY: N.F.
CHECKED BY: J.L.
NO. DESCRIPTION DATE APPROVED

PRECUT CURB

BETUNIOUS CONCRETE CURB

SLOPED GRANITE CURB

STRAIGHT GRANITE CURB

AND GRANITE CURB AT DRIVEWAYS

PRECUT CURB
1. Concrete driveway aprons shall be 8” thick.
2. Residential driveway aprons shall be 6” thick
3. Maximum width of apron is 4’ at curb line

Notes:
- Processed aggregate base (min.)
- 6x6 wmv. 4x4w. Welded wire mesh
- See plate 1 for thickness
- B7 Class 7 Concrete (Commercial)
- B6 Class 6 Concrete (Residential)

Section A-A

Plan

- B6x6 concrete apron
- 6' thick concrete apron
- Expansion joint with domes
- Tool joint with domes (TP)
- Welded wire mesh (TP)
- Expansion joint material
- Concrete side walk
- Concrete apron
- 4’ granite transition curb
- 4” granite curb
- Streetline

No. Description Date Approved
NOTES

2. See perspective details for concrete sidewalk ramp.
3. Openings shall be 10.
4. Minimum distance between multiple driveways.
5. Maximum width of apron is 42\" AT CURB LINE

SECTION A-A

6" PCCopot Bases (Min.)
6x6 W/4" x 4" Welded Wire Mesh
6" PCCopot Bases (Min.)
2" Bit. Conc. Class II Base Course
2" Bit. Conc. Class II Surface Course

PLAN

Curb and Joint Seal

Concrete Sidewalk

Grass Area

Driveway (Min. 12\" Max. 30\")

6" Thick Concrete Sidewalk

6" Thick Concrete Sidewalk

Existing Roadway

Sawcut and Joint Seal

Sawcut and Joint Seal

Maintain Gutter Flow Line

Sawcut and Joint Seal

Sawcut and Joint Seal

Sawcut and Joint Seal

1/4" Max.
Granite Monument

Base

Section

Iron Rod or Iron Pipe

NOTE:

Each iron rod or iron pipe shall be placed at finished grade.
All survey points as described above.

NOTE:

Land Surveyor Responsible For License Number of the Professional
Licensee Name and Occupation
BE CAPPED WITH A SURVEY MARKER
SAWN OR DRESSED TOP SURFACE
FINISHED GROUND
SIDE TO BE EITHER SPUT
OR DRESSED OR COMBINATION THEREOF
NOTES

1. Supports shall be metal galvanized steel posts with cross arm coupling system.

2. Where posts cannot be installed behind sidewalks, they shall be installed 12" from face of sidewalk.

SIDEWALK WITHOUT SHELF

SIDEWALK WITH SHELF
NOTES

PLATE 20

Precast Concrete Drywell

ENGINEERING DIVISION
PUBLIC WORKS DEPARTMENT
TOWN OF MANCHESTER

SECTION A-A

**NOTES**

1. ALL DRYWELLS WILL BE CONSTRUCTED WITH STONE WALLS. 
2. PRODUCTION AND PERMEABILITY TESTS ARE REQUIRED AT LOCATION OF THE PROPOSED DRYWELL. 
3. CONSTRUCTION DRAINAGE AREA FROM A 25 YEAR STORM FLOODPLAIN TO RECEIVE ANYFALL FROM ITS ENTIRE SURFACE. DRAINAGE AREA WILL BE SIZED TO ALLOW FLOODPLAIN RATES WILL BE DETERMINED. THE DRAINAGE AREA WILL BE 
4. OVERFLOW SYSTEM CONNECTED TO A STANDARD TEE-O. CATCH Basin for

PLAN

DATE: MAY 2007
CHECKED BY: J.L.
DRAWN BY: N.E.
CHANGED BY:

TOWN OF MANCHESTER
Modify drop inlet to catch basin with manhole.

- Existing catch basin (broken angular stone)
- 5" processed aggregate base
- 6" slope at bottom of manhole
- 6" centers each way
- #8 bars spaced on 16" centers
- 5" concrete sidewalk
- 22 gauge steel decking
- Frame at cover
- Manhole frame and gROUT
- 5" concrete curb
- Precast type "C" catch basin top
- Granite or concrete curb
NOTE:

CAST IRON TRAPS.

ON SHOP DRAWINGS FOR

NUMBER TO BE INDICATED

1. MANUFACTURER CATALOG

A B PIPE SIZE, WT. LBS. SETTING METHOD

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</table>

<table>
<thead>
<tr>
<th>HANGER PLATE</th>
<th>HANDLE</th>
</tr>
</thead>
</table>

Pipe Size

6 1/2"
2. Use Waterton rubber casings in all pipe joints unless otherwise specified.

1. All concrete pipe to be minimum Class IV

**NOTES:**

- For horizontal elliptical pipe, use 60% over 30% under 1 1/2" pipe, 1 1/2" pipe, or horizontal span.
- Min. in rock 4" in earth.
- 12" min. in rock.
- Varies by hand.
- Subgrade elevation.
- Granular fill or approved material compacted in 12" (max) layers.
- Trench excavation limits by hand.
NOTES:

1. BASE PERFORATIONS TO BE PLACED UP OR AROUND GRANULAR FILL.
2. HOLES ARE TO BE 1/2" DIA OR 5/8" DIA.
3. ALL UNDERDRAIN TO BE OUTLINED.
4. TOPSOIL, AS SPECIFIED BY THE ENGINEER, TO MATCH THE TOP OF THE OUTLET PIPE.
5. THE TOP OF THE UNDERDRAIN PIPE IS DIRECTLY INTO A CATCH BASIN.
6. UTILITIY MARKING TAPE OR APPROVED NATIVE MATERIAL
7. GRANULAR FILL
8. FULL OVERLAP ON TOP
9. GEOTEXTILE WITH 1/2" WASHED ROUND STONE OR PEA STONE
10. TRENCH BOTTOM IS UNSUITABLE USE "GRANULAR FILL".
11. PIPE O.D. +2.0" TRENCH WIDTH
12. 6" HIDE UNDERDRAIN
**NOTES:**

1. **Wall at Foot of Slope**
   - **Slope:** 1:2
   - **Class:** "A" Concrete Masonry
   - **Flow Line:**
     - **Length of Wall:** 12'
     - **Height of Embankment:** 1.4'
     - **Exposed Height of Back:** 0.8'
   - **Volume of Pipe:** 8.075

2. **Volume Based on 3% and 95% Occupancy at Center Line**
   - **Pipe:**
     - 4.8% for Slope: 0.76% 0.69% 0.56% 0.43% 0.30% 0.17% 0.04% 0.00%
     - 4.8% for Slope: 0.76% 0.69% 0.56% 0.43% 0.30% 0.17% 0.04% 0.00%
     - 4.8% for Slope: 0.76% 0.69% 0.56% 0.43% 0.30% 0.17% 0.04% 0.00%
     - 4.8% for Slope: 0.76% 0.69% 0.56% 0.43% 0.30% 0.17% 0.04% 0.00%
     - 4.8% for Slope: 0.76% 0.69% 0.56% 0.43% 0.30% 0.17% 0.04% 0.00%

3. **Exposed Height of Embankment**
   - **Flow Line:**
     - **Length of Wall:** 12'
     - **Height of Embankment:** 1.4'
     - **Exposed Height of Back:** 0.8'

4. **Flow Line:**
   - **Length of Wall:** 12'
   - **Height of Embankment:** 1.4'
   - **Exposed Height of Back:** 0.8'

5. **Volume Based on 3% and 95% Occupancy at Center Line**
   - **Pipe:**
     - 4.8% for Slope: 0.76% 0.69% 0.56% 0.43% 0.30% 0.17% 0.04% 0.00%
     - 4.8% for Slope: 0.76% 0.69% 0.56% 0.43% 0.30% 0.17% 0.04% 0.00%
     - 4.8% for Slope: 0.76% 0.69% 0.56% 0.43% 0.30% 0.17% 0.04% 0.00%
     - 4.8% for Slope: 0.76% 0.69% 0.56% 0.43% 0.30% 0.17% 0.04% 0.00%
     - 4.8% for Slope: 0.76% 0.69% 0.56% 0.43% 0.30% 0.17% 0.04% 0.00%

**DIMENSIONS AND QUANTITIES FOR ONE**

---

**Engineering Division**

**Public Works Department**

**Town of Manchester**

**Revisions**

**Date Approved**
NOTES:

- For pipe sizes greater than 30".
- All pipes 24" in diameter or less.
- All pipe sizes greater than 30".
- In place of concrete end walls for framed end section can be used.
- For slopes 4:1 or less precast.

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<tr>
<td>WALL</td>
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</tbody>
</table>

***30"***

PLAN:

- For pipe sizes greater than 30".

SECTION:

- 3/4" Rein. Bar

ELEVATION:

- 6" Piled Aggregate Base
- 6" Processed Aggregate Base
- 6" Processed Aggregate Base
- Velocities and soil type according to the outlet
- Pipe size, size per OMA guidelines
- Length of riprap dependent on
- Outlet discharge and outlet
- Length of riprap dependent on

REVISIONS:

NO. DESCRIPTION DATE APPROVED

ENGINEERING DIVISION
PUBLIC WORKS DEPARTMENT
TOWN OF MANCHESTER

DRAWN BY: E.L.
CHECKED BY: J.L.

DATE: MAY 2003
FILENAME: PLATE 29A
NOTES:

1. Centerline of pipe should be adjusted to the center of the traveled way.
2. Pipe should be placed on the embankment as shown.
3. Spacing between bars should be uniform.
4. Dimensional notes for one wingwall endwall.

DIMENSIONS AND QUANTITIES FOR ONE WINGWALL ENDWALL:

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<tr>
<th>Dimension</th>
<th>Value</th>
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<tr>
<td>Height</td>
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<td>Width</td>
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<tr>
<td>Depth</td>
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</tbody>
</table>

PLATE 29B

ENGINEERING DIVISION
PUBLIC WORKS DEPARTMENT
TOWN OF MANCHESTER

NO DESCRIPTION DATE APPROVED

REVISED

DRAWN BY: E.F.
CHECKED BY: J.L.

DATE: MAY 2003
FILENAME: WINGWALLS FOR PIPES WITH 30" DIAMETER LARGER THAN 30"
1. Hay bales shall be maintained and/or replaced as required or as directed by the engineer.

2. Place hay bales such that none are placed above the excavated soil.

NOTES:

1. Bales to be butt-together.

2. Two 2" x 2" x 6' long stakes.

3. Excavated soil at toe of slope.
NOTES:

1. Maintain anti-tracking pavement

2. Roadway shall be swept daily

3. For individual residential lots, length of may be tracked onto the pavement.

4. Remove any material that.

PLAN

2 1/2" continuous concrete

26" min.

SECTION A - A

FILTER FABRIC

6" of 2" crushed stone

TOTAL LENGTH = 50'-0"
Rout and Crack Seal

ENGINEERING DIVISION
PUBLIC WORKS DEPARTMENT
TOWN OF MANCHESTER

PLATE 36

NO. SCALE

DATE: MAY 2003

FILENAME:

CHECKED BY: JL

DRAWN BY: NF.

DESCRIPTION

DATE APPROVED

REV. NO.

0.5" MAX. DEEP. "RED"

2.5" MAX. OVER BAND

PAVEMENT SURFACE

SEALANT MATERIAL

RESERVOIR

CRACK

2" MIN. DEPTH

0.25" RECESS

1" MAX. RECESS
FOR STREET LIGHT CONDUITORY. INSTALL 1/4" PULL ROPE FROM HANDHOLE TO TOP OF POLE.

3. INSTALL NON-METALLIC CONDUIT 1-1/4" MAXIMUM OD., AND EXTEND UP INTO POLE

1/4" PULL ROPE WITH TIES TO STAYING CONDUIT DETERMINATION.

2. CONDUITS SHALL EXTEND ON MORE THAN 6 HOLES UP INTO THE ENCLOSURE. INSTALL

SECURE 90 DEGREE BENDS AND END OF PULLABLE CONDUIT TOGETHER WITH DUCT TAPE TO

12-1/4" BEVELLED HANDHOLE. 3.07408". SHALL BE ON FEEL SIDE OF POLE FUSH WITH GROUND.

NOTES:

SEE NOTE 1

8" X 18" FC HANDHOLE

NOTE 2

NOTE 3
PROJECT COMPLETION REQUIREMENTS

The following activities must be completed prior to any construction activity:

- Stamped approved plans are filed at the Engineering Division.
- An approved Erosion and Sedimentation Control Bond is filed with the Engineer.
- A preconstruction meeting is held with the Engineer.
- A valid “Right-of-Way” permit has been issued by the Engineering Division Construction Unit.
- At least three (3) after hours phone numbers of project manager/superintendent for contact in case of emergency have been submitted to the Engineer.
- 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 Town Tree Warden.
- If required by the Engineer, existing monumentation within the work area has been field located by a Licensed Land Surveyor.

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 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.
- All streetline monumentation has been set.
- A maintenance bond has been submitted 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.
STREET CLASSIFICATIONS

Road or road segments not listed here are designated as “Local Road”.

<table>
<thead>
<tr>
<th>ARTERIALS</th>
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<tr>
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<td>Broad Street (Center to MTW)</td>
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<td>Bell Street</td>
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<td>Bidwell Street</td>
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<tr>
<td>16</td>
<td>6” House Sanitary Lateral</td>
</tr>
<tr>
<td>17</td>
<td>External Grease Trap</td>
</tr>
<tr>
<td>18</td>
<td>8” CLDIP Water Main</td>
</tr>
<tr>
<td>19</td>
<td>10” CLDIP Water Main</td>
</tr>
<tr>
<td>20</td>
<td>12” CLDIP Water Main</td>
</tr>
<tr>
<td>21</td>
<td>Air Release Manhole</td>
</tr>
<tr>
<td>22</td>
<td>Fire Hydrant Assembly (Complete)</td>
</tr>
<tr>
<td>23</td>
<td>1” Service</td>
</tr>
<tr>
<td>24</td>
<td>2” Service</td>
</tr>
<tr>
<td>25</td>
<td>Fire Service</td>
</tr>
<tr>
<td>26</td>
<td>Type &quot;C&quot; Catch Basin</td>
</tr>
<tr>
<td>27</td>
<td>Type &quot;C-L&quot; Catch Basin</td>
</tr>
<tr>
<td>28</td>
<td>Type &quot;C&quot; Double Grate Catch Basin</td>
</tr>
<tr>
<td>29</td>
<td>Modify Drop Inlet to Catch Basin w/ Manhole</td>
</tr>
<tr>
<td>30</td>
<td>Precast Storm Drainage Manhole</td>
</tr>
<tr>
<td>31</td>
<td>Precast Storm Drainage Doghouse MH</td>
</tr>
<tr>
<td>32</td>
<td>Precast Concrete Drywell</td>
</tr>
<tr>
<td>33</td>
<td>Endwalls</td>
</tr>
<tr>
<td>34</td>
<td>Impact Basin</td>
</tr>
<tr>
<td>35</td>
<td>Reset Catch Basin Top</td>
</tr>
<tr>
<td>36</td>
<td>Adjust Structure To Grade</td>
</tr>
<tr>
<td>37</td>
<td>Clean Existing Catch Basin</td>
</tr>
<tr>
<td>38</td>
<td>Hydrodynamic Particle Separator</td>
</tr>
<tr>
<td>39</td>
<td>15” RCP w/ rubber gaskets</td>
</tr>
<tr>
<td>40</td>
<td>18” RCP w/ rubber gaskets</td>
</tr>
<tr>
<td>41</td>
<td>24” RCP w/ rubber gaskets</td>
</tr>
<tr>
<td>42</td>
<td>30” RCP w/ rubber gaskets</td>
</tr>
<tr>
<td>43</td>
<td>36” RCP w/ rubber gaskets</td>
</tr>
<tr>
<td>44</td>
<td>42” RCP w/ rubber gaskets</td>
</tr>
<tr>
<td>45</td>
<td>15” Slotted RCP w/ rubber gaskets</td>
</tr>
<tr>
<td>46</td>
<td>18” Slotted RCP w/ rubber gaskets</td>
</tr>
<tr>
<td>47</td>
<td>24” Slotted RCP w/ rubber gaskets</td>
</tr>
<tr>
<td>48</td>
<td>15” Rein. Conc. Culvert End</td>
</tr>
<tr>
<td>ITEM NO.</td>
<td>ITEM DESCRIPTION</td>
</tr>
<tr>
<td>---------</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td>49</td>
<td>18&quot; Rein. Conc. Culvert End</td>
</tr>
<tr>
<td>50</td>
<td>24&quot; Rein. Conc. Culvert End</td>
</tr>
<tr>
<td>51</td>
<td>30&quot; Rein. Conc. Culvert End</td>
</tr>
<tr>
<td>52</td>
<td>6&quot; HDPE Underdrain</td>
</tr>
<tr>
<td>53</td>
<td>Surface Detention Basin</td>
</tr>
<tr>
<td>54</td>
<td>Subsurface Detention/Infiltration System</td>
</tr>
<tr>
<td>55</td>
<td>Processed Aggregate Base</td>
</tr>
<tr>
<td>56</td>
<td>Granular Fill</td>
</tr>
<tr>
<td>57</td>
<td>Granite Curb</td>
</tr>
<tr>
<td>58</td>
<td>Radius Granite Curb</td>
</tr>
<tr>
<td>59</td>
<td>Reset Granite Curbing</td>
</tr>
<tr>
<td>60</td>
<td>Granite Curb Inlet</td>
</tr>
<tr>
<td>61</td>
<td>Precast Concrete Curb</td>
</tr>
<tr>
<td>62</td>
<td>Bituminous Concrete Lip Curbing</td>
</tr>
<tr>
<td>63</td>
<td>Structural Concrete (Class &quot;A&quot;)</td>
</tr>
<tr>
<td>64</td>
<td>Concrete Sidewalk</td>
</tr>
<tr>
<td>65</td>
<td>Concrete Sidewalk &amp; Curb Monolithic</td>
</tr>
<tr>
<td>66</td>
<td>Concrete Sidewalk Ramps</td>
</tr>
<tr>
<td>67</td>
<td>Concrete Driveway Apron</td>
</tr>
<tr>
<td>68</td>
<td>Textured Concrete Sidewalk</td>
</tr>
<tr>
<td>69</td>
<td>Mill Bituminous Concrete Pavement</td>
</tr>
<tr>
<td>70</td>
<td>Bituminous Concrete</td>
</tr>
<tr>
<td>71</td>
<td>Bituminous Concrete Driveway Apron</td>
</tr>
<tr>
<td>72</td>
<td>Bituminous Concrete Bikepath</td>
</tr>
<tr>
<td>73</td>
<td>Permanent Pavement Repair</td>
</tr>
<tr>
<td>74</td>
<td>Joint/ Crack Sealing</td>
</tr>
<tr>
<td>75</td>
<td>Metal Beam Guide Rail (Type RB-350)</td>
</tr>
<tr>
<td>76</td>
<td>Three Cable Guide Rail</td>
</tr>
<tr>
<td>77</td>
<td>Timber Rail</td>
</tr>
<tr>
<td>78</td>
<td>Vinyl Coated Chain Link Fence</td>
</tr>
<tr>
<td>79</td>
<td>Cast-in-Place Concrete Retaining Wall</td>
</tr>
<tr>
<td>80</td>
<td>Segmental Block Retaining Wall</td>
</tr>
<tr>
<td>81</td>
<td>Epoxy Resin Pavement Markings</td>
</tr>
<tr>
<td>82</td>
<td>Epoxy Resin Pavement Symbols</td>
</tr>
<tr>
<td>83</td>
<td>Painted Pavement Markings</td>
</tr>
<tr>
<td>84</td>
<td>Painted Pavement Symbols</td>
</tr>
<tr>
<td>85</td>
<td>Street Lights</td>
</tr>
<tr>
<td>86</td>
<td>Signs</td>
</tr>
<tr>
<td>87</td>
<td>Traffic Signal</td>
</tr>
<tr>
<td>88</td>
<td>Traffic Signal (Modify)</td>
</tr>
<tr>
<td>89</td>
<td>Granite Monument</td>
</tr>
<tr>
<td>90</td>
<td>Iron Pipe/Rods/Drill Holes</td>
</tr>
<tr>
<td>91</td>
<td>Town GPS Control Network Monuments</td>
</tr>
<tr>
<td>92</td>
<td>Maintenance &amp; Protection of Traffic</td>
</tr>
<tr>
<td>93</td>
<td>As-Built Drawings</td>
</tr>
<tr>
<td>Description</td>
<td>Amount</td>
</tr>
<tr>
<td>-----------------------------------------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>Bond Amount, per P&amp;Z Approved Plan</td>
<td>$0.00</td>
</tr>
<tr>
<td>10% Inflation Factor</td>
<td></td>
</tr>
<tr>
<td>Total Bond Amount</td>
<td>$0.00</td>
</tr>
<tr>
<td>Bond Reduction Limit (10% of Total Bond)</td>
<td>$0.00</td>
</tr>
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**Work Completed to Date**

<table>
<thead>
<tr>
<th>Reduction #</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction # 1</td>
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<tr>
<td>Reduction # 2</td>
<td>$0.00</td>
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<tr>
<td>Reduction # 3</td>
<td>$0.00</td>
</tr>
<tr>
<td>Reduction # 4</td>
<td>$0.00</td>
</tr>
</tbody>
</table>

**Required Bond to Date**

<table>
<thead>
<tr>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0.00</td>
</tr>
</tbody>
</table>

**Recommended**

Chief Construction Inspector

**Approved**

Asst. Town Engineer
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
To Whom It May Concern:

Attached please find three (3) examples of acceptable forms 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 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 L/C 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, CofO’s, water & sewer permits.
(Review time 3-4 working days)

Type 3 - **Certified Check**
Used for the Bonding of Erosion Control, Public Improvements, or Landscaping.
* Must fill out a W-9 form along with the check 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. December 1996)

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.

<table>
<thead>
<tr>
<th>Name (If a joint account or you changed your name, see Specific Instructions on page 2.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business name, if different from above. (See Specific Instructions on page 2.)</td>
</tr>
<tr>
<td>Please print or type</td>
</tr>
<tr>
<td>Check appropriate box: ☐ Individual/Sole proprietor ☐ Corporation ☐ Partnership ☐ Other</td>
</tr>
<tr>
<td>Address (number, street, and apt. or suite no.)</td>
</tr>
<tr>
<td>City, state, and ZIP code</td>
</tr>
</tbody>
</table>

### Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. For individuals, this is your social security number (SSN). However, if you are a resident alien OR a sole proprietor, see the instructions on page 2. 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 2.

**Note:** If the account is in more than one name, see the chart on page 2 for guidelines on whose number to enter.

### Part II For Payees Exempt From Backup Withholding (See the instructions on page 2.)

### Part III 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.

**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 2.)

<table>
<thead>
<tr>
<th>Sign Here</th>
<th>Signature ▶</th>
<th>Date ▶</th>
</tr>
</thead>
</table>

**Purpose of Form.**—A person who is required to file an information return with the IRS must get your correct taxpayer identification number (TIN) to report, for example, income paid to you, 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 to give your correct TIN to the person requesting it (the requester) and, when applicable, to:

1. Certify the TIN you are giving is correct (or you are waiting for a number to be issued),
2. Certify you are not subject to backup withholding, or
3. Claim exemption from backup withholding if you are an exempt payee.

**Note:** If a requester gives you a form other than a W-9 to request your TIN, you must use the requester's form if it is substantially similar to this Form W-9.

**What Is Backup Withholding?**—Persons making certain payments to you must withhold and pay to the IRS 31% of such payments under certain conditions. This is called "backup withholding." Payments that may be subject to backup withholding include interest, dividends, broker and barter exchange transactions, rents, royalties, nonemployee pay, and certain payments from fishing boat operators. Real estate transactions are not subject to backup withholding.

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, or
2. The IRS tells the requester that you furnished an incorrect TIN, or
3. 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
4. You do not certify to the requester that you are not subject to backup withholding under 3 above (for reportable interest and dividend accounts opened after 1983 only), or

5. You do not certify your TIN when required. See the Part III instructions on page 2 for details.

Certain payees and payments are exempt from backup withholding. See the Part II instructions and the separate Instructions for the Requester of Form W-9.

**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.
Town of Manchester
Rules of Right of Way Permit

In consideration of the grant by the Town of Manchester for a Right of Way 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. 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. At least one lane, wide enough to permit the safe passage of all vehicles, shall be maintained fully at all times.

2. Traffic on roads on or around the work area will not be detoured prior to receipt of express permission to do so from the Director of Public Works. If the detouring of traffic becomes necessary, the applicant will submit for approval a detailed plan showing signs, arrangement of traffic lanes, number of flag persons to be used at the detour, the period of time during which traffic will be detoured and any other safety measures that may be ordered by the Director.

3. Any and all portions of the road(s) disturbed by the applicant and/or its agents, assigns, employees, contractor and/or subcontractors shall be speedily restored, in accordance with the Town’s Public Improvements Standards, Section 4.

4. The applicant agrees to reimburse the Town for any expenses incurred by the Town for maintenance or repair work in connection with this Permit.

5. Applicant will comply with all laws, ordinances, rules and regulations of the Town and/or State 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.

6. The ROW Permit will become null and void if the work for which such permit has been issued is not commenced within thirty (30) calendar days from the Issue Date of the Permit.

7. Any failure by the applicant, its agents, assigns, employees, contractors and/or subcontractors to adhere to the preceding rules and the Town’s Public Improvements Standards will result in the immediate revocation of the ROW Permit. In addition, such failure will result in denial by the Town of further ROW permits to the applicant.

8. The Applicant agrees to pay for Police services in a timely manner, and if payment for Police services goes into arrears, the Town will use the Permit Bond to pay for these services. Furthermore, the Town will not issue any further Permits till all accounts are up to date.
**R.O.W. Permit Application**

<table>
<thead>
<tr>
<th>Permit Type</th>
<th>G Public Works Project</th>
<th>G Subdivision</th>
<th>G Private Development</th>
<th>G Utility</th>
<th>G Driveway</th>
<th>G Other</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Permit Type</strong></td>
<td>G (Fee Waived)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Issue Date** / / 

---

**Location of Work:** St #______ Street____________________________ Working on Side Street? _____________

**Description of Work:** ____________________________________________________________________________________

**Start Date:** ___/___/___  
**Duration:** ___________ (hours/days)  
**Completion Date** / / 

**Applicant Name:** ____________________________  
**G Utility**  **G Engineer**  **G Contractor**  **G Other**

**Address:** ____________________________  
**City:** ____________________________  
**State:** _________  
**Zip Code:** ____________

**Office #** ____________________________  
**Fax#** ____________________________  
**email:** ____________________________

**Field Contact:** ____________________________  
**cell #** ____________________________  
(24 hour Emergency # for response)

**Sketch of proposed work or furnish pre-approved drawing**

**G Per Attached Plan**

---

I have read the “Rules of ROW Permit” on the reverse side and understand them and agree to abide by them by signing of this Permit.

**Applicant’s Signature:** ____________________________  
**Date:** ___/___/___

---

**For Office Use Only**

**G Stamped Plans (if needed)  G Perm. Pvmnt. Repair Size _____ ft x _____ ft**

**G New Drive Opening Application Approved (if needed)  G Depth of Pavement _________ inches**

**G Insurance on File**

**G Bond Amount Calculated (minimum $10,000) & on File**

**G All Fees & Fines Paid Up**  
**Approved by: ____________________________**

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*THIS APPROVED PERMIT MUST ALWAYS BE AVAILABLE AT PERMIT SITE FOR REVIEW BY TOWN PERSONNEL*
TRAFFIC CONTROL AT CONSTRUCTION ACTIVITY
ORDINANCE

a. 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 (herein after 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.

b. 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:

Principal Arterial

- Route 83 (Main Street) – Charter Oak Street to Center Street
- Buckland Street – Tolland Turnpike to South Windsor town line

Minor Arterial

- Broad Street
- West and East Middle Turnpike – New State Road to Woodbridge Street
- North Main Street – Main Street to Tolland Turnpike
- New State Road – West Middle Turnpike to Adams Street
- Tolland Turnpike – North Main Street to East Hartford town line
- Adams Street – Center Street to Tolland Turnpike
- Keeney Street – Hartford Road to Glastonbury town line
- McKee Street
- Woodbridge Street – East Middle Turnpike to Route 83 (Main Street)
- Buckland Hills Drive
- Slater Street
- Hale Road
- Parker Street – Tolland Turnpike to Colonial Road
- Pine Street
- Summit Street
- Pavillions Drive
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. The expense of such police protection shall be paid by the entity engaged in such Repair Work at rates determined by the Town. Notwithstanding any other provisions of this Ordinance, 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.

c. If no Police Officer of the Manchester Police Department is available to accept the extra police duty referenced herein, and the Repair Work is conductive 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.