TOWN OF GLASTONBURY CONNECTICUT

# STANDARDS FOR PUBLIC IMPROVEMENTS

ISSUE DATE:

SEPTEMBER, 2008

CONSTRUCTION DETAILS UPDATED THROUGH SEPTEMBER, 2014

PREPARED BY:

DEPARTMENT OF PHYSICAL SERVICES
ENGINEERING DIVISION

**TABLE OF CONTENTS**

# 1.0 GENERAL

## *1.1 Applicability*

The requirements set forth in these Public Improvement Standards shall apply to 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;
- Repair and restoration work associated with public service utility work;
- Installation of a new curb cut for a proposed driveway; or
- Private developments receiving approval through the Town Plan and Zoning Commission.

Portions of this document shall also apply to private developments that 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:

- Impact existing traffic patterns;
- Increase the amount of impervious area on the property; or
- Change existing drainage patterns.

These standards are intended to supplement the policy set in the "*Subdivision and Resubdivision Regulations* ", "Building Zone Regulations", and "Code of Ordinances" for the Town of Glastonbury as amended to date. Any conflicts between this manual and the aforementioned regulations should be brought to the attention of the Engineering Division and Office of Community Development for resolution.

Nothing in this document shall relieve the Developer or Contractor from complying with any federal, state or local permits or regulations.

## *1.2 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 816*" as published by the Connecticut Department of Transportation, as amended;
- "*Highway Design Manual*" as published by the Connecticut Department of Transportation,

as amended;

- *"Drainage Manual 2000"* 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;
- "*Code of Ordinances"* as prepared by the Town of Glastonbury, as amended;
- "*Subdivision and Resubdivision Regulations*" as prepared by the Town of Glastonbury, as amended;
- *"Town of Glastonbury Building Zone Regulations"* as prepared by the Town of Glastonbury, as amended;
- *"Town of Glastonbury Inland Wetlands and Watercourses Regulations",* as prepared by the Town of Glastonbury, 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;
- *"2004 Connecticut Stormwater Quality Manual"* as prepared by the Connecticut Department of Environmental Protection, as amended.

### *1.3 Definitions*

*Building Zone Regulations* - Town of Glastonbury Building Zone Regulations as amended to date.

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

*Code of Ordinances* – Town of Glastonbury Code of Ordinances, as amended.

*Design Engineer* - a licensed professional engineer representing the Developer or Contractor who is responsible for the design of the proposed 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.

*Director of Community Development* - the Director of Community Development of the Town of Glastonbury or an authorized representative.

*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.

*Interceptor Sewers or Collector Sewer* - those sanitary sewers that receive part or all of the

sewage of the system from within a sub watershed.

*Lateral Sewer* - the sanitary sewer pipe from the main sewer in the street to the property line. In the case of a main sewer located within a right-of-way, it shall mean the sewer pipe from the main line to the edge of the right-of-way or easement.

*Master Drainage Plan* - the adopted comprehensive drainage plan for the future growth, protection, and development of the Town of Glastonbury, as amended to date.

*Master Sewer Plan* - the most recent map approved by the Water Pollution Control Authority showing the limits of projected sanitary sewer extensions and service within the Town.

*Master Traffic Plan* - the adopted comprehensive traffic management plan for the future growth, protection, and development of the Town of Glastonbury, as amended to date.

*Right-of-Way* – the area of property between opposing street lines that is owned and maintained by the Town, or any public right-of-way as shown on a map of an approved subdivision, whether or not the streets within such subdivision have yet been accepted by the Town.

*Record (Asbuilt) 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 or subdivision plan.

*Sewerage System* - any device, equipment, appurtenance, facility, and method for collecting, transporting, receiving, disposing of, or discharging sanitary sewerage.

*Standard Details* - the Town of Glastonbury Standard Details, as revised.

*Standard Specifications* - the Town of Glastonbury Standard Construction Specifications, as revised.

*Statute* - a law or laws enacted by the Connecticut General Assembly, as amended to date.

*Street* - any street, avenue, boulevard, road, land, alley or other way, open or proposed to be open to public vehicular traffic and owned and/or maintained, or proposed to be owned and/or maintained, by the Town.

*Street Line* – the property line between the public right-of-way and a private lot.

*Street Sewer* - a sanitary sewer into which the sewage from two or more laterals is discharged.

*Subdivision and Resubdivision Regulations* - the Town of Glastonbury "Subdivision and Resubdivision Regulations", as amended to date.

*Town* - the Town of Glastonbury, Connecticut.

*Town Engineer or Engineer* - the Town Engineer of the Town of Glastonbury or an authorized representative.

### *1.4 Typical Project Chronology*

1. Informal Review

The Developer consults with various Town Staff as required to gather input and informal feedback prior to preparation of plans. The Developer then presents preliminary plans to Town Staff at an administrative review meeting scheduled through the Office of Community Development prior to formal submission to various boards and commissions.

2. Plan Preparation and Review by Regulatory Commissions

Plans are prepared and submitted in accordance with Sections 2.0 through 5.0 of these standards, the Subdivision and Resubdivision Regulations, or other pertinent Town regulations. Plot plans or utility line assignment requests are submitted directly to the Engineering Division for review. Applications are made as required before the Inland Wetlands and Watercourse Agency, Town Plan and Zoning Commission, Water Pollution Control Authority, Town Beautification Committee, and various subcommittees for approval of the proposed development, and plans are modified to address conditions of approval. Final plans, easements, and warranty deeds are filed and subdivision bonds are posted by the Developer as described in the Subdivision and Resubdivision Regulations.

4. Construction

Right-of-way permits and sanitary sewer permits are filed as required for any work within the Town right-of-way or for any sewer system modifications as described in Sections 6.1 to 6.4. A preconstruction meeting (when necessary) is scheduled by the Engineering Division at the request of the Developer as described in Section 6.8, and construction is completed according to Town Standards and the approved plans.

5. Project Closeout

After construction of public improvements, Record (as-built) drawings are submitted for all public improvements as described in Section 7.1, and public improvement acceptance procedures are initiated per Section 7.2.

# 2.0 PLAN REVIEW PROCEDURES

### *2.1 Consultation with Town Staff*

Consultation with Town Staff is recommended before any detailed plans are developed to avoid costly design changes. Town staff may be aware of other public or private development projects that could have an effect on the proposed project, and may also be able to suggest alternative methods or designs that have proven successful within the Town in the past and are more likely to be accepted. In addition, submission of plans to the Town for review is likely to proceed more efficiently when Town staff has already had the opportunity to discuss the project with the Developer and consider the project implications.

### *2.2 Applications before Town Regulatory Agencies*

The majority of site development plans are reviewed by the Engineering Division and Office of Community Development as part of the submission of an application to the Town Plan and Zoning Commission or Inland Wetlands and Watercourses Agency. This may include an "Inland Wetlands Permit", a "Subdivision/Resubdivision Application", a "Special Permit", or any other site plan or special exception administered through the Town of Glastonbury Office of Community Development. The specific requirements for site development plans, construction plans, and sediment and erosion control plans can be found in this manual and in Section 5.0 of the Subdivision and Resubdivision Regulations. Questions on these plan requirements should be directed to the Engineering Division or Office of Community Development as appropriate.

### *2.3 Utility Line Assignment Requests*

Any utility company proposing a significant installation, extension, or upgrade of their facilities extending over more than 200 feet of Town of Glastonbury Right-of-Way is required to submit plans to the Town Engineer for review and approval prior to requesting a Right-of-Way permit for the work. This review and approval is referred to as a Utility Line Assignment Request. Note that if all of the proposed work is overhead (i.e. on existing poles) or within existing conduit then a Utility Line Assignment is not required, however the Contractor is still responsible for taking out a "Right-of-Way Permit" for the 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.

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

Town Engineer / Manager of Physical Services
2155 Main Street, P.O. Box 6523.
Glastonbury, Connecticut 06033-6523

2. One (1) set of construction plans prepared by the utility company or their Design Engineer. The plans should show enough detail regarding the proposed work to properly demonstrate the effect on Town storm drainage and sanitary sewer facilities, other utilities, street trees, watercourses and wetlands, and adjacent private property. Plans should describe the type of construction (bore, open trench, etc.) as well as proposed clearances from all existing utilities. It is strongly recommended that the latest information be obtained with regard to the location of existing Town facilities and other utilities prior to submitting a proposed plan. Minimum recommended horizontal clearance to storm and sanitary sewer facilities is five (5) feet. Minimum recommended vertical clearance to storm facilities is twelve (12) inches; and to sanitary sewer facilities is eighteen (18) inches, or as approved by the Town Engineer.
3. One (1) set of plans shall also be transmitted to the Town of Glastonbury Tree Warden at the Parks and Recreation Department (652-7686) for review and approval if an area of excavation extends within the canopy or drip line of a Town-owned tree within the Town right-of-way or on other Town property.
4. One (1) set of plans shall also be forwarded to the Town Environmental Planner in the Office of Community Development (652-7510) for review and approval if an area of excavation occurs within the regulated area adjacent to a watercourse or wetland.

If the request is approved, the utility company will receive one set of plans stamped “Approved for Construction”. The Contractor performing 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, and appropriate approvals have been received from both the Tree Warden and Environmental Planner.

### *2.4 Plot Plan Requirements and Procedures*

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 Section 20-300b of the Connecticut General Statutes.

Plot plans shall show the following information:

1. Property address, Lot number and subdivision name, as applicable.
2. North Arrow, plans should be oriented with north up or to the right whenever possible.
3. Zone in which property is located.
4. Area of building lot, in both square feet and acres.
5. Front, side, and rear building setback lines.
6. Monuments or iron pins, found, set, or to be set.
7. Easements of record, as applicable.
8. Existing catch basins or hydrants along the frontage of the property.
9. Existing utility and/or light poles adjacent to the property. Include owner and pole number.
10. Vertical datum with benchmark location. 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. Contact the Engineering Division for information on available record drawings and benchmarks.
11. Proposed contours depicting site grading (cuts and fills).
12. Existing or proposed retaining walls, as applicable. Proposed retaining walls over three (3) feet in height require certification by a Professional Engineer.
13. Proposed top of foundation wall elevation, proposed basement and garage floor finished floor elevations, and centerline elevation of the road opposite the proposed driveway location.
14. Proposed foundation drains or other subsurface drainage systems including outlet elevations, as applicable. Discharge shall be to a Town drainage system, wetland/watercourse, or properly designed drywell with supporting test pit documentation.
15. Proposed stormwater management measures (vegetated swales, paved leak-offs, riprap aprons, yard drains, etc.) as required to prevent erosion from concentrated flows of stormwater runoff from driveways, roof tops, or areas of compacted soil.
16. Proposed location of water and sanitary sewer service connections, as applicable.
17. Proposed well location and/or on-site sewage disposal system design in conformance with Connecticut Public Health Code Section 19-13-B103 and associated Technical Standards, and Section 20.8.3 of the Building Zone Regulations, where sanitary sewer service and public water supply is not available.
18. Existing and proposed sidewalks, driveway aprons, and curbing, including material type. Note that proposed driveway aprons shall meet the requirements of Sections 3.21 through 3.23.
19. Limits of inland wetlands and/or flood zone, if applicable. If none exist on property, add

appropriate note.

20. Limits of inland wetland and conservation buffer areas.
21. Limits of vegetative clearing, including identification of specimen trees to be saved.
22. Proposed erosion and sedimentation control measures, including anti-tracking pad. Measures should include specific vegetative stabilization guidelines (topsoil, lime, fertilize, seed, mulch), including recommended seed mix and seeding dates.
23. Proposed point of discharge for slurry for well drilling operation with proposed sediment barrier location, as applicable.
24. Proposed stockpile locations for excavated material from foundation or septic system excavations with proposed sediment barrier.
25. Responsible party for maintenance of erosion and sediment control measures with emergency contact information.
26. A note stating underground utility excavation (sanitary sewer, electric, telephone, gas, etc.) shall provide effective erosion and sediment control measures to their point of connection.
27. Listing of all applicable conditions of approval (wetlands permit, subdivision approval, rear lot special permit) that are relevant to the development of the subject lot.
28. Street tree planting requirements per Subdivision and Resubdivision Regulations.
29. Map reference(s), if applicable.

Questions regarding requirements for wells and/or on-site sewage disposal (septic) systems should be directed to the Town of Glastonbury Health Department at 652-7534. Questions regarding connections to Town sanitary sewers or storm drains, installation of sidewalks or driveways, or any other proposed work within the Town right-of-way should be directed to the Engineering Division at 652-7735. All other questions should be directed to the Office of Community Development at 652-7510.

Three (3) copies of the plot plan shall be submitted to the Engineering Division when connecting to public water and sewer, and four (4) copies of the plan submitted for lots with private wells and/or septic systems. After review by the Engineering Division, plot plans will be stamped to indicate the need for right-of-way permits, sanitary sewer permits, and private drainage connection waivers. Plans are then forwarded to the Health Department (only for building lots with wells and/or on-site sewage disposal), Community Development/ Environmental Planning, and the Building Department, respectively for review and approval.

Of the set of plot plans submitted, the Engineering Division will label one copy as the “Builder’s Copy” and second copy as the “Building Department Copy”. These two labeled plans are the

only plans that will contain the Environmental Planning Staff's requirements, which will typically appear in the form of highlighted aspects of the plan and handwritten notes. For lots with on-site sewage disposal systems, a third "Septic Installer's Copy" of the plans will be labeled by the Engineering Division. The Health Department will comment on the "Builder's Copy" and the "Septic Installer's Copy", as applicable. Other remaining copies will simply be signed off as reviewed and approved, however the "Builder's Copy" is the official plan to implement at the building lot. This copy should be kept at the site and readily accessible to all pertinent site workers, especially earth moving equipment operators, worker's responsible for anti-tracking pads and other sediment control measures, landscapers, and Town inspectors.

# 3.0 STREET DESIGN STANDARDS

### *3.1 Purpose*

Maximum livability, safe and efficient traffic movement, and economical construction and maintenance are consistent and compatible objectives for streets. Streets also serve pedestrian and bicycle traffic and often accommodate public utility facilities within the right-of-way. It is the intent of these guidelines to assist Design Engineers in the achievement of these objectives in the design of new streets.

### *3.2 Related Town Policies*

- Subdivision and Resubdivision Regulations, Sections 6, 9, 10, and 11.
- Building Zone Regulations, Sections 6.8.
- Town Code of Ordinances, Chapter 17.

### *3.3 Background*

The Engineering Division has incorporated information from a variety of sources to assure that sound engineering practices are employed in the development of new streets. The recommendations of the Connecticut Department of Transportation (CONNDOT), American Association of State Highway and Transportation Officials (AASHTO), and the Institute of Transportation Engineers (ITE) form the basis for these guidelines. References to specific guidance documents from these organizations are noted throughout these guidelines as applicable.

### *3.4 Street Classifications*

Design requirements for new streets are based on five (5) street classifications that are defined relative to average daily traffic (ADT) levels as described in the Subdivision and Resubdivision Regulations.

For proposed streets, the ADT shall be calculated using the ITE publication "Trip Generation" Manual latest edition. If the probability exists that a street will be opened to future development, then it shall be designed to the classification required to accommodate the future development.

Special design criteria may be considered by the Town Engineer when the classifications are not applicable to the proposed development.

### *3.5 Right-of-Way (ROW)*

The right-of-way shall be conveyed by warrantee deed to the Town in fee simple. The right-of-way width shall provide for, but not be limited to, the following:

a. Roadway pavement;
b. Curbing and sidewalk;
c. Bicycle lanes or multi-use paths;
d. Municipal and public utilities;
e. Traffic control devices and street lights;
f. Safety and operational control devices;
g. Snow storage;
h. Horizontal and intersection sight distance requirements.

Right-of-way width requirements are described in Table 3-1 based on the roadway classification.

**Table 3-1. General Design Guidelines for Streets**

| | **Street Classification** | | | | |
|---|---|---|---|---|---|
| **Design Element** | **Limited Local** | **Light Local** | **Local** | **Collector** | **Arterial** |
| Average Daily Traffic | 0-200 | 200-500 | 500-1500 | 1500-3000 | >3000 |
| Design Speed (mph) | 25 | 25 | 30 | 35 | 40 |
| Pavement Width (ft) | 22 | 24 | 26 | 30 | 32 |
| Right of Way Width (ft) | 40 | 50 | 50 | 50 | 60 |
| Clear Zone (ft) | 7 | 7 | 10 | 12 | 14 |
| Stopping Sight Distance* (ft) | 155 | 155 | 200 | 250 | 305 |
| Min. Horizontal Radius (ft) | 180 | 180 | 300 | 450 | 660 |
| Min. Horizontal Tangent Length Between Reverse Curves (ft) | 50 | 50 | 50 | 100 | 100 |
| Max. Vertical Grade (%) | 10 | 10 | 10 | 10 | 7 |
| Intersection Sight Distance (ft) | See Section 3.12 | | | | |
| Min. Intersection Curb Radius (ft) | 25 | 25 | 25 | 30 | 45 |

*See Section 3.8 for adjustments due to grade.

### *3.6 Design Speed*

Minimum design speeds vary by roadway classification as described within the Subdivision and Resubdivision Regulations. Design speeds are also provided for convenience of Design Engineers in Table 3-1.

### *3.7 Street Cross Section*

Pavement widths shall be as described within the Subdivision and Resubdivision Regulations and are provided in Table 3-1. A wider street cross section may be required by the Town Engineer in areas where provisions for bicycles lanes are determined to be in the best interest of the Town. On-street parking areas are not considered to be part of the pavement width.

Snow shelf widths and grades shall also be provided as shown in the Standard Details and as described in the Subdivision and Resubdivision Regulations. A reduction of snow shelf width to reduce grading in Open Space Subdivisions may be permitted at the discretion of the Town Engineer as described in Section 6.2-d of the Subdivision and Resubdivision Regulations.

Minimum pavement material depths depend on street classification and shall be as follows below and as shown in the Standard Details.

| **Pavement Materials** | **Street Classification** | | |
|---|---|---|---|
| | **Local Street** | **Collector Street** | **Arterial Street** |
| Bituminous Pavement Class 2 | 1 ½” | 1 ½” | n/a |
| Bituminous Pavement Class 1 | 2” | 2” | 3” (in two lifts) |
| Bituminous Pavement Class 4 | n/a | n/a | 6” |
| Processed Stone Base Course | 4” | 4” | n/a |
| Gravel Subbase Course | 10” | 12” | 10” |

An engineered design of the proposed pavement cross section may be required as directed by the Town Engineer to account for sites with poor soil conditions or to accommodate projected truck traffic volumes.

All construction plans shall have a note stating that the pavement wearing surface shall not be installed until the binder course has been installed for a minimum of 4 months or one full winter season.

Reference Details –. Plates 1A, 1B, 1C, 1D, 1E.

### *3.8 Stopping Sight Distance (SSD)*

Stopping sight distance (SSD) is the length of roadway ahead that is visible to the driver. Minimum SSD shall be provided as described in Table 3-1, and shall be sufficient to enable a vehicle traveling at the design speed to stop before reaching a stationary object in its path. The SSD is measured from a height of eye of 3.5 feet to an object height of 2.0 feet. Adjustments to the minimum SSD for grades over 3 percent are required in accordance with Chapter 7 of the CONNDOT Highway Design Manual, latest edition.

### *3.9 Horizontal Alignment*

Design of the horizontal alignment shall meet the following general criteria:

- Horizontal curves shall meet the minimum radii described in Table 3-1, shall provide at least the minimum stopping sight distance, and shall have a minimum length of 200 feet;
- Reverse curves shall incorporate a minimum tangent as described in Table 3-1;
- Compound curves and spirals shall not be used for the layout of new streets;
- Superelevation will not be used except when supplemented by an engineering study.

For proposed local residential roads, designers should provide a curvilinear horizontal alignment that discourages high speeds by including designed “slow points” with minimum horizontal radii or other traffic calming features at regular intervals. Layout of new local residential streets should also discourage cut-through traffic by providing a circuitous route for potential through vehicles.

### *3.10 Vertical Alignment*

Design of the roadway vertical alignment shall meet the following general criteria:

- Vertical alignment shall be designed to fit as closely as practical to the existing topography;
- Maximum grades based on street classification shall be as described in Table 3-1;
- Minimum grades of not less than one (1) percent shall be provided to allow for surface drainage;
- Vertical curves shall be incorporated for all changes in grade in excess of 0.5%, and shall be parabolic with a minimum length of 100 feet;
- Vertical curves shall have the stopping sight distance labeled on the profile sheet;
- A minimum landing area of 100 feet at a grade of three percent (3%) or less is recommended for all side street intersection approaches. Where conditions make such improvements too costly or otherwise undesirable, a maximum grade of five percent (5%)

may be used with corresponding adjustments to geometry to achieve required intersection sight distances.

### *3.11 Intersections*

In the layout of new streets, no more than four streets shall intersect at any one point to form an intersection. The centerline of all streets entering the intersection shall pass through a single point. Good traffic engineering practice shall be followed to minimize offset intersections when existing streets are present. Intersecting streets shall be laid out at such intervals that minimum block lengths between streets provide adequate sight distance. Intersections shall connect at or near a 90-degree skew angle as determined by the intersecting centerline. Skew angles between 75 degrees and 105 degrees may be allowed at the discretion of the Town Engineer.

Adequate curb radii shall be provided as shown in Table 3-1 to avoid unnecessary lane encroachment, traffic conflict, and related accident potential. At street intersections, the curb radius of the higher street classification shall be used. Curb radii may be reduced only as approved by the Town Engineer.

Intersection grading plans at a scale not greater 1" = 20' and a contour interval not greater than 0.5' shall be provided for all intersections to ensure proper drainage.

### *3.12 Intersection Sight Distance*

Minimum intersection sight distance (ISD) shall be provided according to AASHTO using gap acceptance methodology. A passenger car design vehicle shall be used for determining required ISD for new local residential roads. Design vehicles for other roadway classifications or for industrial or commercial facilities shall be selected based on the composition of traffic to the site.

The table below shows guidelines for ISD for turns onto a two-lane road with minor road approach grades less the 3%. Designers should refer to Chapter 11 of the CONNDOT Highway Design Manual, latest edition for more detailed information.

For the purposes of measuring sight distance, the driver's eye will be located 15 feet from the curb line of the crossing street. This distance may be alternatively measured from the travel-way of the crossing street where restrictions limit the offset. The height of the driver's eye shall be 3.5 feet and the viewed height of object shall also be 3.5 feet.

Intersections sight lines shall be shown on the plan and profile sheets. If the intersection sight line extends outside of the street line, sight line easements will be required.

| Design Speed or 85th Percentile Speed of Major Road | ISD (feet)* | | |
|---|---|---|---|
| | Passenger cars | Single Unit Trucks | Semi-trailers |
| 25 | 280 | 350 | 425 |
| 30 | 335 | 420 | 510 |
| 35 | 390 | 490 | 595 |
| 40 | 445 | 560 | 680 |
| 45 | 500 | 630 | 765 |
| 50 | 555 | 700 | 850 |

* ISD applies for minor road approach grades less than 3%.

### *3.13 Cul-de-Sacs*

Cul-de-sacs shall be designed as described within the Subdivision and Resubdivision Regulations and the Standard Details. Temporary cul-de-sacs shall be used if there remains developable land adjacent to the property or when phasing subdivisions. The normal gutter line for the road shall be carried through a temporary cul-de-sac as shown in the Standard Details.

A detailed grading plan at a scale of 1"=10' with a contour interval of 0.5-feet shall be provided for removal of temporary cul-de-sacs to demonstrate the grading necessary to properly integrate the former cul-de-sac area with the surrounding terrain and to ensure proper drainage.

Reference Detail – Plate 2.

### *3.14 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 one foot (1') from the existing edge of pavement. If the cross slope of the existing roadway is greater than 3/8-inch 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 sealer.

Transition tapers shall be provided from the existing curb/edge of road to the widened roadway section according to Figure 11-5G of the CONNDOT Highway Design Manual, included in the

appendix of this manual. Where bypass is required for left-turning movements, the design shall be in accordance with Figure 11-5K of the CONNDOT Highway Design Manual, also included the appendix.

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

### *3.15 Curbing*

Curbs shall be provided on new roadways for drainage control and reduction of maintenance operations, unless otherwise directed by the Engineer. Curb shall generally be bituminous concrete lip curbing or bituminous concrete cape cod curbing, and shall be installed on the pavement binder course per the Standard Details. Cul-de-sacs shall use cape cod curbing as shown in the Standard Details for improved snow removal operations. Arterial roads in certain designated areas of Town, including the Town Center and Historic District, shall require the installation of vertical granite curb, as shown on the Standard Details and as directed by the Town Engineer.

Reference Details – Plate 5.

### *3.16 Subsurface Drainage*

The design shall provide for the installation of underdrains in all areas where wet conditions prevail or where directed by the Town Engineer.

All construction plans for public improvement projects shall have a note stating that underdrains shall be installed by the Contractor to address wet conditions experienced in the field as directed by the Town Engineer.

Underdrains shall consist of a trench cut below the elevation of the bottom of the subbase, containing a suitable perforated or slotted conduit backfilled with a pervious material and wrapped in geotextile fabric according to the Standard Detail. Clean outs shall be provided at intervals not to exceed 150 feet. Utility marking tape shall be provided for all underdrains according to the Standard Detail.

The conduits for underdrains shall be not less than six inches in diameter.

Connections of outlets for underdrain conduits shall be to catch basins or manholes. If no drainage structure is available, the outlet conduit shall discharge into an existing watercourse or wetland area. Alternate discharges require approval of the Town Engineer.

Reference Detail – Plate 20.

### *3.17 Side Slopes*

Streets in cut or fill shall be provided with slopes not steeper than two feet horizontal to one foot vertical (2:1). Fill slopes flatter than 4:1 are recommended whenever possible to reduce or eliminate the need for guiderail.

Where rock cuts steeper than two feet horizontal to one foot vertical (2:1) are necessary within existing or proposed right-of-way, the completed slopes shall be evaluated and certified to be safe by a licensed professional engineer who specializes in geotechnical design.

Where new streets abut private property, necessary slope rights shall be shown on the final layout submission. The developer shall investigate the effect of fills on existing adjacent properties within the slope right area, and shall provide the Town Engineer with adequate evidence including a detailed grading plan to ensure that no drainage problems will arise on adjacent property due to construction of cut or fill areas.

### *3.18 Retaining Walls*

Retaining walls shall not be installed within the roadway zone of influence or otherwise included as part of a subdivision or other public improvement project unless approved by the Town Engineer. The roadway zone of influence is defined as the area between slope limits using the typical roadway section with 2:1 side slopes.

When approval to use a retaining wall has been granted, it shall be designed in accordance with Connecticut Department of Transportation standards. Form liners or other aesthetic treatments for cast-in-place concrete walls may be required depending upon the location.

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

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

### *3.19 Guiderail and Protective Fencing*

Guiderail shall be installed as required to protect against roadside hazards within the designated

clear zone. Designers should refer to Chapter 13 of the CONNDOT Highway Design Manual, latest edition for general guidance.

Guiderail shall be installed for fill slopes adjacent to the roadway where both of the following conditions exist:

- Side slopes are steeper than four feet horizontal to one foot vertical (4:1); and
- Height of the fill section embankment (measured from the edge of the travelway to the toe of slope) exceeds 4 feet for 2:1 slopes, 8 feet for 3:1 slopes, or otherwise as indicated in Figure 13-3A of the CONNDOT Highway Design Manual, included with this manual in the appendix.

When guiderail is required, a note shall be provided on all construction plans to indicate that it shall be installed within 60 days of binder course paving.

Guiderail installations shall be Metal Beam Rail Type RB-350 with weathering steel and shall be designed and installed in accordance with the latest Connecticut Department of Transportation standards and specifications. Galvanized steel may be considered as an option for areas where the improved aesthetics of weathering steel are not required, as determined by the Town Engineer. Merritt Parkway Guiderail meeting the Connecticut Department of Transportation standards is also an acceptable guiderail, however due to significant maintenance costs it shall not be installed unless required as a condition of approval from the Town Plan and Zoning Commission or as directed by the Town Engineer.

On local and collector streets, the face of the guiderail should be set back 12-inches from the face of curb for ease of curb maintenance and to provide an operational offset to prevent damage from snow plows. When a sidewalk is present, the guiderail should typically be placed with the rail element flush with the back of the sidewalk.

Guiderail anchoring systems shall be CONNDOT Type 1 or Type 2 End Anchorages, which shall be installed outside of the designated clear zone. Terminal end wraps may only be used upon approval by the Town Engineer.

The layout of guiderail shall include appropriate flare rates as shown in the table below to allow for installation of the end anchorages outside the designated clear zone.

Easements may be required for the placement of the guiderail or its anchoring system and should be indicated on the plans.

| Design Speed (mph) | Shy Line Offset (ft) | Flare Rate Inside Shy Line (ft / ft) | Flare Rate Beyond Shy Line (ft/ft) |
|---|---|---|---|
| 30 | 3.5 | 13:1 | 7:1 |
| 40 | 5 | 16:1 | 8:1 |
| 45 | 5.8 | 18:1 | 10:1 |
| 50 | 6.5 | 21:1 | 11:1 |

Protective fencing shall be installed at any vertical drop offs greater than four (4) feet, including the tops of headwalls, retaining walls, etc.

Protective fencing may be required behind sidewalks where an adjacent fill slope exceeds three feet horizontal to one foot vertical (3:1) or at other locations where deemed necessary by the Town Engineer.

Protective fencing shall consist of galvanized chain link fence with a minimum height of sixty inches (60”), split rail fence, or other suitable fence type as deemed appropriate by the Town Engineer for the area of concern.

### *3.20 Sidewalks*

Sidewalks shall be provided as described within the Subdivision and Resubdivision Regulations and shall be constructed of concrete as shown on the Standard Details. Bicycle paths or other multi-use paths may also be required in lieu of or in addition to sidewalks for encouragement of multi-modal transportation, when determined to be in the best interest of the Town or as required by a condition of approval from the Town Plan and Zoning Commission.

Sidewalks shall be placed such that the back of walk is one foot (1’) in front of the street line unless otherwise approved by the Town Engineer.

Sidewalks shall be continuous through all residential driveways. The need for sidewalks to extend through commercial or industrial facility driveways shall be determined on a case by case basis by the Town Engineer.

Sidewalk ramps shall be provided as per the Standard Details and as required to meet current

ADA standards.

Additional drainage measures such as yard drains or open back catch basins may be required to prevent ponding of water for sidewalks adjacent to long sag vertical curves.

Reference Details – Plates 6 and 7.

### *3.21 General Requirements for Driveways*

General guidelines for driveways are provided in the Town Code of Ordinances Section 17-151 through 160, and include the following bulleted items:

- Driveways shall not be constructed within four feet of a crosswalk;
- Two driveways shall be not constructed closer together than eight feet at the gutter line;
- Driveways shall not be constructed within twenty feet of a street intersection;
- Culverts for driveways shall be installed as required to accommodate existing drainage patterns in the area. Such culverts shall be privately owned and maintained.

Driveway aprons shall have a one and a half (1-1/2) inch lip at the gutter line, and a positive slope from the gutter line to the street line as shown on the Standard Details.

For detailed guidance on driveway layout and design, designers should refer to Chapter 11 of the CONNDOT Highway Design Manual, latest edition.

Construction of a new driveway or repaving of an existing driveway requires a right-of-way permit in order to ensure compliance with these standards.

Reference Details – Plate 8.

### *3.22 Residential Driveways*

A typical three-foot curb radius shall be provided on each side of a residential driveway to allow passenger vehicles to enter or exit the drive without encroaching over the roadway centerline. Larger radii should be considered for residential driveways on high speed roads.

Residential driveways may be a maximum width of 12 feet as measured at the street line, except under the following conditions:

- After a written request is made to the Town Manager for a wider driveway and approval is

granted (per the Town Code of Ordinances Section 17-154).

- When serving one or two rear lots, driveways shall be16-feet wide (per Section 6.8.4 of the Building Zone Regulations).
- When serving three rear lots, driveways shall be 20-feet wide for the portion serving three lots (per Section 6.8.4 of the Building Zone Regulations).

The recommended maximum grade for a residential driveway is 12%, but shall not exceed 15%. Rear lot driveways in excess of 8% shall be paved in accordance with Section 6.8.4 of the Building Zone Regulations.

### *3.23 Commercial and Industrial Driveways*

Commercial and industrial driveways shall not exceed 30-feet in width as measured at the street line without approval by the Town Manager, and should not exceed 8% in grade. Commercial and Industrial driveway curb radii should generally be designed to accommodate a single unit truck (SU-30) design vehicle without encroachment on the opposing lane of traffic, unless otherwise directed by the Town Engineer. In certain situations, a semi-trailer (WB-50) design vehicle may be required as directed by the Town Engineer.

### *3.24 Signs*

All traffic signs shall be conventional road size, and shall conform to the latest revision of the "Manual on Uniform Traffic Control Devices", the "Standard Highway Signs" book and the "Connecticut Department of Transportation Catalog of Signs". Traffic signs shall be constructed of sheet aluminum, 0.08 inches thick, with retroreflective sheeting, high intensity grade, ASTM D4956 Type III. Posts for traffic signs shall meet the requirements of the Connecticut Department of Transportation for 3 lbs/ft galvanized channel posts with a Type II breakaway base installation as shown in the Standard Detail.

Street name signs shall be constructed of sheet aluminum, 0.080 inch thick, with high intensity prismatic sheeting according to the Standard Detail. Posts for street signs shall be galvanized square channel posts with breakaway base as shown in the Standard Detail.

Object marker signs shall be installed to identify all off-road drainage structures and outlet locations. Posts for object markers shall be 1.12 lbs / ft galvanized channel posts as shown in the Standard Detail.

Reference Details - Plates 9, 10, 11, 12.

### *3.25 Pavement Markings*

All proposed pavement markings shall be epoxy coated resin unless otherwise directed by the Town Engineer and shall be designed in accordance with the latest Connecticut Department of Transportation and MUTCD standards. Preformed plastic markings (60 mil) from a manufacturer approved by the Connecticut Department of Transportation may also be utilized if inlaid.

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

Stop bars and cross walks shall be installed on all streets according to MUTCD and the Standard Details. Local residential roads shall not have a painted centerline.

Reference Detail – Plate 13.

### *3.26 Utility Line Assignments*

Utility line assignments are intended to permit a reserved area for construction of utilities with minimum conflict to other utilities. Proposed subdivision roads shall accommodate these line assignments shown in the Standard Detail unless approved otherwise by the Town Engineer.

Along existing roads, utility line assignments shall be followed to the extent practical, as determined by the Town Engineer. In all cases, utility companies shall submit plans for review and approval by the Town Engineer as described in Section 2.3.

### *3.27 Monuments*

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 Town Engineer. Monuments shall conform to the Standard Detail 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 Town 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 Details – Plate 14.

### *3.28 Traffic Signalization*

New traffic signals and modifications to existing traffic signals shall be designed and installed by the Developer in accordance with the MUTCD and the "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 Town Engineer at preliminary, semi-final and final design. Developers shall be responsible for obtaining approval from the State Traffic Commission for the installation of new traffic signals.

### *3.29 Traffic Impact Studies*

A Traffic Impact Study (TIS) will be required for all developments or additions to existing developments generating 100 or more trips during the peak hour of the generator or over 750 trips in an average day.

A TIS may also be required for commercial developments generating lower peak hour volumes where; current traffic problems or concerns exist, the public may perceive an adverse impact on the adjacent neighborhoods or other areas, the proximity of site drives to other drives or intersections could create traffic concerns, or based on other specific problems or concerns that may be aggravated by the proposed development. Should such conditions arise the Town Engineer will evaluate the need for the study based on technical merit.

Traffic Impact Studies shall be prepared under the supervision of a Professional Traffic Operations Engineer (PTOE) or a Professional Engineer licensed in the State of Connecticut who specializes in traffic engineering.

Reference shall be made to the Master Traffic Study for data analysis and level of service where applicable. Care shall be taken to reference all pertinent data and recommendations described in the Master Traffic Study.

The limits of the traffic study shall be determined by the Town Engineer. Within these limits, manual turning movement counts of adjacent intersections shall be performed as required to

assess the existing operating conditions of the study area.

Traffic counts shall be adjusted according to CONNDOT procedures to account for the time of year the count was completed. Adjustments shall also be made to include other approved developments within the study area that are not fully developed at the time of the study.

Site generated traffic for a proposed development shall be determined using the ITE Trip Generation Manual latest edition, or actual traffic counts from similar facilities.

Pass-by traffic shall be limited to 20 percent.

The planning horizon for the traffic impact study shall generally be the opening year for the proposed facility. However, for larger scale developments a longer planning horizon may be required, which will be determined by the Town Engineer based on the traffic generation of the proposed development. Where off-site public improvements are required to mitigate traffic impacts from a proposed development, improvements shall be designed and evaluated to accommodate future 10-year volumes, or as indicated in the CONNDOT Highway Design Manual.

Capacity analysis shall be performed using the recommendations of the Highway Capacity Manual latest edition, and shall be performed using the Highway Capacity Software (HCS) or Synchro. Data provided to support the analysis shall include all input data, supportive computation sheets, and/or charts. Electronic files shall be provided at the request of the Town Engineer.

Queuing and Storage Analysis supporting the existing and combined traffic shall be provided for all signalized intersections. The available storage and the maximum queue length associated with 95% probability occurrence shall be summarized in tabular form.

An evaluation of accident history in the vicinity of the site shall be performed. Research of existing accident history shall include data from both the Town of Glastonbury Police Department, and CONNDOT as applicable.

# 4.0 STORMWATER MANAGEMENT DESIGN STANDARDS

## *4.1 General*

The objectives of these design standards are to minimize negative environmental impacts caused by development and to conserve the Town of Glastonbury's natural resources. This can be accomplished by the following means:

- Preserving existing natural drainage patterns;
- Reducing the rate of run-off from newly developed land to minimize increases in flooding;
- Emphasizing non-structural approaches to controlling run-off whenever possible;
- 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;
- Reducing the soil erosion potential from development or construction projects;
- Decreasing non-point source pollution and water quality degradation;
- Preventing pollution of underground sources of drinking water (aquifers);
- Maintaining stream channels for their biological, recreational, functional and aesthetic benefits;
- Preserving open space and naturally vegetated riparian buffers through stream corridor and floodplain protection.

The design of stormwater management systems shall apply sound engineering practices and judgment based on all available data and in conformance with the Master Drainage Study amended to date. The design shall satisfy all Federal, State, and local regulations.

## *4.2 Related Town Policies*

- Subdivision and Resubdivision Regulations, Sections 12 and 15.
- Building Zone Regulations Sections 19 and 20.
- Town Code of Ordinances, Sections 17-136 through 17-141.

## *4.3 Components of Stormwater Management*

Each of the following basic components of stormwater management must be investigated and analyzed by the Design Engineer for proposed developments:

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 Design Engineer.

Peak Run-off Control

Proposed projects shall attenuate the post-development peak run-off rate to no more than the pre-development peak run-off rate unless it is determined that such attenuation will have a detrimental impact downstream.

Conveyance Systems

All conveyance systems must be designed and constructed to accommodate existing upstream off-site run-off and developed on-site run-off.

Stormwater Quality

Proposed projects shall include provisions for the treatment of surface run-off in order to minimize the discharge of pollutants into water bodies. The levels of treatment depend on the size and type of project.

Erosion and Sedimentation Control Plan

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

Operation and Maintenance Plan

Maintenance and operation plans and schedules shall be shown on the plans. Maintenance of all proposed drainage facilities not dedicated to the Town of Glastonbury or other government agency shall be the sole responsibility of the property owner.

### *4.4 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 4.3 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 the Town of Glastonbury, including, but not limited to, development applications to the Town Plan and Zoning Commission and Inland Wetland and Watercourses Agency, subdivision applications, inland wetlands applications, public road construction, and any projects with drainage systems that discharge to public roadways.

The need for a Stormwater Management Report may be waived 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 Office of Community Development. (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.)

At a minimum, the Stormwater Management Report shall include:

- Narrative summarizing the proposed project, design methods used, and a table comparing post-development peak flows with pre-development peak flows.
- Drainage Area Map with topographical contours showing upstream contributing drainage areas and labeled to coincide with the drainage computations.
- Inland Wetland boundaries as field delineated by a soil scientist.
- Identification of hydraulic structures and watercourses within the downstream zone of influence that are inadequate under existing or reasonably anticipated future conditions as indicated in the Master Drainage Study or identified by the Town Engineer or Town Environmental Planner. The downstream zone of influence generally extends to the next two existing hydraulic structures downstream of the proposed outlet. If peak flow attenuation is not provided, these structures shall be evaluated for their physical condition and flow capacity and upgraded as required.
- Identification of the peak rate of run-off and flow velocities at various key points in the watershed and the relative timing of the peak flow rates.
- Supporting calculations (including times of concentration and run-off coefficients) for all proposed drainage facilities, including but not limited to: piping, structures, riprap, swales, detention basins, drywells, etc.
- Identification of ground water protection zones within the limits of the project.

The report shall be supplemented with a complete set of construction plans showing, in both plan and profile, all existing and proposed storm drain features. Tops of frame and invert elevations of all structures are required. Construction details shall also be provided for all drainage structures.

Drainage structures and pipe systems shall be labeled to coincide with the drainage calculations.

All plans for development proposals within or adjacent to a flood zone shall show the location of and elevation of the 500-year and 100-year flood zones. This information shall be as described in the "FLOOD INSURANCE STUDY TOWN OF GLASTONBURY, CONNECTICUT HARTFORD COUNTY DECEMBER 1977 U.S. DEPARTMENT OF HOUSING & URBAN DEVELOPMENT FEDERAL INSURANCE ADMINISTRATION" and any amendments thereto.

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

### *4.5 Peak Run-off Attenuation*

The discharge of stormwater run-off from proposed developments must not cause adverse impact on downstream areas. Developers must attenuate the peak stormwater flows from the site so as not to exceed the pre-development rate of run-off as required for compliance with the Master Drainage Study, or as directed by the Town Engineer.

Peak run-off attenuation may not be required for certain areas in the lower reaches of a watershed if it can be shown that site run-off flows directly to a watercourse such that the peak flow from the site occurs before the peak flow of the watercourse and attenuation would be problematic.

### *4.6 Hydrology Methods*

The Design Engineer shall analyze the peak rates of runoff for the site for both predevelopment 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) may 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.). Rainfall intensity used for Rational Method drainage calculations shall be as described in Chapter 6 of the CONNDOT Drainage Manual, latest edition for Hartford County. Times of concentration and weighted runoff coefficients shall be clearly identified within the drainage computations.

For watersheds greater than 200 acres in area or for any watersheds with existing or proposed detention, one of the following hydrology 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

Note that the Rational Method was developed for determining steady state peak flow rates rather than time based hydrographs and run off volumes and therefore should not be used for designing peak flow attenuation (detention) systems.

Computerized 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:

| **Storm Frequency (Year)** | **Rainfall (inches)** |
|---|---|
| 2 | 3.2 |
| 5 | 4.1 |
| 10 | 4.7 |
| 25 | 5.5 |
| 50 | 6.2 |
| 100 | 6.9 |

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 CONNDOT Drainage Manual. All flow paths shall be clearly labeled on the drainage area map.

### *4.7 Design Storm Selection*

Design storm return frequency for all curb inlet storm drainage systems and channels conducting site storm water (not carrying a watercourse) shall be 10 years.

Design storm return frequency for cross culverts or channels carrying a watercourse shall be based on watershed area as follows:

| Culvert or Channel Classification | Drainage Area (Sq. Miles) | Design Return Frequency (Year) | Minimum Freeboard (Ft)** |
|---|---|---|---|
| Minor (no established water course) | <1 | 25 | 1 |
| Small | <1 | 50 | 1 |
| Intermediate* | 1 – 10 | 100 | 1 |
| Large* | >10 | 100 | 2 |

* The designer shall also consider bridge alternatives for this class when area > 1 sq. mile.

** Freeboard is defined as the vertical distance between the design water surface and the upstream control such as the low point of the roadway edge, sill of a building or other controlling element.

Design storm frequency for gutter flow calculations shall be based on Town road classification as follows:

| Street Classification | Typical Design Frequency | Sag Condition Design Frequency |
|---|---|---|
| All Local Road Classifications | 5 years | 10 years |
| Collectors and Arterials | 10 years | 25 years |

Gutter flow calculations shall be according to Section 11.9 of the CONNDOT Drainage Manual. Allowable gutter flow spread shall be up to ½ of the travel lane.

### *4.8 Conveyance System Design*

The following guidelines are to assist in the design of storm drainage conveyance systems. The designs should be the product of sound engineering practices and judgment and based on the best available data, including the following items:

- Layout, sizing, and material selection for storm conduits;
- Assessment of hydraulic capacity of the proposed facility;
- Design of outlet protection.

### *4.8.1 Hydraulic Grade Line Calculations*

Hydraulic analysis of storm drain systems shall be prepared in accordance with Section 11.11 of the CONNDOT Drainage Manual, latest edition, except as noted otherwise.

Hydraulic capacity of the storm drain system shall include an evaluation of the hydraulic grade line for all enclosed systems.

A minimum clearance of one (1) foot below the top of grate shall be provided for the headwater at any storm structure.

Stormwater 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 Study. 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.

### *4.8.2 System Layout*

Layout of storm drain systems shall be in accordance with Section 11.8 of the CONNDOT Drainage Manual, latest edition, except as noted otherwise below.

Placement of structures (catch basins or manholes) shall generally be at each grade change, at each significant change in horizontal direction, and at each junction point.

The location of the first catch basin in a storm drain system shall be within 300 feet of the roadway high point. Spacing of additional catch basins shall be a maximum of 300 feet apart or as required to meet the allowable gutter flow spread.

The design shall include the installation of catch basins as required to properly drain surface run off from all intersections. 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.

### *4.8.3 Conduit Design*

Design of storm drain conduits shall meet the following requirements:

- Circular conduits for the conveyance of roadway surface drainage shall not be less than 15 inches nominal diameter.
- Conduits providing for the passage of area drainage from one side of the street to the other (cross culverts) shall not be smaller than 18 inches.
- Minimum conduit slopes shall be 0.5%
- Minimum velocity shall be two (2) feet per second, maximum velocity shall not exceed twelve (12) feet per second.
- Reinforced Concrete Pipe (RCP) Class IV shall normally be used except where minimum or maximum fills require otherwise. A minimum cover of two (2) feet shall be provided for RCP under the finished roadway grade, or one (1) foot for Class V RCP. This may vary based on recommended manufacturer's specifications and approval by the Town Engineer.
- High Density Polyethylene Pipe (HDPE) should not be used within the public right-of-way in areas where there is significant likelihood of future utility excavation that would damage the pipe or disturb the supporting soil envelope, as determined by the Town Engineer. HDPE may be used for storm drain outfalls or parking lot installations outside the public right-of-way where future utility excavation and potential for damage is less likely. Further considerations for Design Engineers regarding the use of HDPE are provided in Section 4.8.4 below.
- The installation of any other substitute type of pipe requires approval by the Town Engineer.
- Conduits will normally be on straight alignments, both horizontally and vertically, with structures providing access. In special cases, conduits may be on curved horizontal alignments subject to approval by the Town Engineer. Curved alignments must not exceed the manufacturer's recommendations.
- Storm drainage conduits along streets shall avoid infringement on the snow shelf area and conflict with other utilities.

Reference Details – Plate 20.

### *4.8.4 High Density Polyethylene Pipe (HDPE) Design Considerations*

Designer Engineers should recognize that a buried plastic pipe is a composite structure made up of a plastic ring and the supporting soil envelope, and that both materials play a vital part in the structural integrity of the plastic pipe. In contrast, a buried reinforced concrete pipe is less

influenced by the soil envelope and less likely to be damaged by future utility excavation. The successful performance of HDPE pipe depends upon proper bedding, backfill, and care in installation. As such, the Design Engineer shall consider the following information relative to the use of this type of pipe:

- HDPE can easily be damaged during excavation activities for items such as installation or repair of underground utilities. Although field repairs can be accomplished using repair couplers available from the manufacturer, the Design Engineer should assess the overall risk of damage associated with other excavation activities before selecting HDPE pipe.
- When HDPE is specified, the Design Engineer shall assess the native soils for suitability as backfill and shall specify a DOT Type II Bedding installation when native backfill material is judged to be inadequate for use.
- Minimum cover shall be established by the Design Engineer based on an evaluation of specific site conditions. In the absence of pipe strength calculations, the minimum cover above the HDPE pipe shall be at least three (3) feet or one pipe diameter (whichever is larger). The minimum cover should be maintained before allowing vehicles or heavy construction equipment to traverse the pipe trench. A note shall also be shown on the construction plans regarding minimum cover required to be maintained over proposed HDPE pipe during construction according to manufacturer instructions.
- Maximum cover over HDPE pipe should be limited to 8 feet (measured to top of pipe).
- Because HDPE pipe is relatively lightweight, buoyancy forces, especially at the culvert inlet, may be a concern. Anchorage in the form of a headwall, slope paving or other stabilization methods may be necessary.
- Since proper bedding and backfill are vital to a successful installation, diligent construction and inspection is needed. Installation shall conform to Section 6.5.1 of the Connecticut DOT Standard Specifications, Form 816.
- Vibratory compaction of backfill can cause HDPE to shift and therefore appropriate measures and monitoring during installation are necessary. Normally, visual inspections are adequate to confirm the installation is acceptable. However, a mandrel test may be requested by the Town Engineer when it is necessary to confirm the acceptability of an installation.

### *4.8.5 Structure Requirements*

Drainage structures shall meet the requirements of the Connecticut Department of Transportation, except as indicated otherwise herein or in the Standard Details.

All catch basins shall have a sump to trap sediment. The sump shall be a minimum two feet (2') below the lowest pipe invert. Deeper sumps may be used under certain circumstances as noted

in Section 4.12.

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.

Deep catch basins or manholes (over ten feet deep), non-standard endwalls, siltation chambers, and other special structures shall be designed in accordance with good engineering practices. All special structure designs are subject to the approval of the Town Engineer.

Manholes within off-road drainage easements shall incorporate bolted covers according to the Standard Details.

An object marker sign on a galvanized sign post shall be installed to locate off-road drainage structures and outfalls as shown in the Standard Details.

Reference Details – Plates 21, 22, 23, and 24.

### *4.8.6 Culverts and Bridges*

Culverts and bridges shall be designed in accordance with Chapter 8 and Chapter 9 of the CONNDOT Drainage Manual.

### *4.8.7 Open Channels*

The use of open channels within the right-of-way to carry roadway storm water is only permitted with approval from the Town Engineer. When required to accommodate an existing roadside channel or watercourse, the design of a channel shall consist of computing a cross section, grade, and permanent lining that will accommodate the design discharge under the controlling conditions with a minimum 1 foot of freeboard. Open channel flow shall be evaluated and designed in accordance with Chapter 7 of the CONNDOT Drainage Manual, latest edition.

Temporary lining analysis for grass channels shall also be provided to prevent erosion until the permanent lining has been established. Temporary linings shall be erosion control matting from the Department of Transportation Approved Products list.

### *4.9 Outlet Locations*

The discharge of all stormwater that has been collected or otherwise artificially channeled shall be into suitable watercourses, wetlands, 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 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.

### *4.10 Outlet Protection*

Design of outlet protection shall consist of riprap aprons or scour holes designed according to Section 11.13 of the CONNDOT Drainage Manual, latest edition and as shown in the Standard Details. Flared ends for culverts or drainage system outfalls shall incorporate a concrete footing as described in the Standard Details.

Reference Details – Plates 24, 25, 26, and 27.

### *4.11 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. Detention facilities shall be 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 and designed to attenuate the 2-year, 10-year, 25-year and 100-year storm events.

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

For proposed discharges to watercourses identified in the Master Drainage Study as having significant erosion potential or for other watercourses as directed by the Town Engineer or Environmental Planner, detention facilities shall be sized for over-control of the 2 year frequency storm to 50% of the pre-development level, as described in Section 7.6.1 of the Connecticut Stormwater Quality Manual, latest edition.

*4.11.1 Above Ground Detention Basins*

The outlet structure for above-ground detention basins 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 from the top of berm elevation. 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.

Detention basins shall incorporate a forebay sized to handle the water quality volume. Detention basin side slopes shall be 4:1 (horizontal to vertical) or flatter for ease of maintenance.

Maintenance access roads with appropriate easements shall be provided to both the sediment forebay and outlet structure. Access roads shall meet the requirements noted under Section 4.14.

Detention basins should be located such that the outer berm of the detention basin is a minimum of 100-feet from the nearest designated building area for a residential home, or as directed by the Town Engineer. Wherever possible, the basin should be located in areas where existing native vegetation between the detention basin and the nearest residence can be preserved to provide visual screening. Installation of fencing and/or screening shall be as required by the Conservation Commission, Town Plan and Zoning Commission, or Town Engineer. Screening and fencing shall be designed to accommodate access needs of the Town.

Impoundments greater than 20-feet deep or storing volumes in excess of 50 acre-feet are subject to the requirements of the Safe Dams Act unless the volume is achieved through excavation. See Section 10.5 of the CONNDOT Drainage Manual, latest edition for more detailed guidance.

Other items to be included with the design of a detention basin include:

- Contoured grading plan of scale not less than 1"=40';

- Outlet structure details;
- Cross sections of the embankment and spillway;
- Inflow hydrograph with outflow hydrograph superimposed;
- Elevation-Stage-Storage curve or table;
- Elevation-Discharge curve or table;
- Volume required to detain any increase in run-off;
- Flood-routing calculations;
- Written comments on the subsurface conditions relative to water table, ledge and soil permeability;
- Proposed landscaping and vegetative cover used to stabilize slopes.

#### *4.11.2 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. Subsurface detention systems shall not be installed for new public roadways to be constructed as part of a subdivision.

#### *4.11.3 Maintenance and Operation of Detention Facilities*

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. When a private stormwater detention facility is proposed, operation and maintenance responsibilities of the property owner shall be clearly stated on the plans.

### ***4.12 Stormwater Quality***

All site development plans shall include provisions for the treatment of surface run-off 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.

The recommendations of the Connecticut Stormwater Quality Manual published by the Connecticut Department of Environmental Protection shall be incorporated into all site

development projects, as directed by the Town Engineer and Office of Community Development.

For stormwater management systems serving new public roadways constructed as part of a subdivision, water quality measures may include any of the following, as directed by the Town Engineer:

*4.12.1 Primary Treatment*

- Dry detention basins shall incorporate infiltration practices when applicable, and shall have a sediment forebay sized for the water quality volume;
- Infiltration practices shall be incorporated into other portions of the drainage system as soil conditions allow;
- Water quality swales should be incorporated wherever possible to provide additional treatment of water before it reaches the detention basin or outfall.

*4.12.2 Secondary / Pretreatment*

- Sedimentation structures shall be installed as the last structure in a storm drainage system draining to a detention basin or other primary water quality treatment system. These structures shall be installed with a diversion manhole in an "off-line" configuration. The diversion manhole shall be designed to direct flows up to the water quality flow into the sedimentation structure, with greater flows bypassing the sedimentation structure to avoid flushing of captured soil / sand particles during storm higher intensity storm events;
- Hydrodynamic separators sized for the water quality flow and designed in accordance with ConnDOT Standards may be required in areas where storm drains discharge directly to a watercourse as required by conditions of approval from the Inland Wetlands Watercourses Agency or the Town Plan and Zoning Commission;
- Deep sump catch basins (3' or 4' sump depth without a hood) may be used for small drainage systems (3 inlets or less) when no sedimentation structure is proposed and no utility or ledge conflicts are present.

In designated groundwater protection zones, designers should also reference Section 20.13.3 and 20.13.4 of the Building Zone regulations for additional requirements related to storm water quality.

### *4.13 Erosion and Sediment Control*

During construction, soil erosion and sediment control procedures shall be according to the "Connecticut Guidelines for Soil Erosion and Sediment Control", published by the Connecticut Department of Environmental Protection, and as outlined in Section 19 of the Building Zone

Regulations and Section 15 of the Subdivision and Resubdivision Regulations.

Anti-tracking pads shall be installed at all construction entrances, and shall be maintained as required to prevent tracking of material onto public roadways for the duration of construction and as directed by the Town Engineer.

### *4.14 Drainage Easements*

Easements for drainage conduits, ditches, or channels shall be a minimum of 25 feet in width, and shall extend to a suitable discharge location as described in Section 4.9. Easements for ditches and channels shall be of sufficient minimum width to allow ten-foot access strips along each bank. Drainage easement maps shall include flow arrows that depict the general path of flow to the discharge point.

Drainage easements shall incorporate suitable load bearing access roads for access to all drainage structures. The access road shall be a minimum of 12 feet wide and shall be constructed of 12 inches of process stone base formed in two equal lifts. In lawn areas, access roads shall be covered with 4 inches of loam and seeded. The maximum grade of the access road shall not exceed 15 percent. Long grades steeper than 8% for access roads may require special treatment to prevent erosion, as directed by the Town Engineer. If additional easements are required for access and/or maintenance of the drainage system due to the physical or topographic restrictions of the site, they shall be of such width, character, and location as approved by the Town Engineer.

A document containing the typical language for drainage easements to be granted to the Town of Glastonbury is included in the appendix of this manual.

### *4.15 Private Drains Connected to the Town System*

The Town Engineer must approve the size and locations of all private storm drains that connect to the Town system. Connection of private systems must be made at a catch basin or manhole structure. Tee connections directly to a town storm drain pipe are prohibited.

The property owner must also file a waiver with the Department of Physical Services, which shall relieve the Town of Glastonbury of any responsibility in the event of any failure of the storm drainage system. The waiver is included in the appendix of this manual.

The final as-built plans must show rear yard drains, cellar, or foundation drains connected to the storm drainage system.

# 5.0 SANITARY SEWER DESIGN STANDARDS

### *5.1 General*

The design and construction of new sanitary sewers is regulated by the Town of Glastonbury Water Pollution Control Authority (WPCA) with guidance from the Engineering Division. The design of sanitary sewers shall apply sound engineering practices and judgment based on the best available data and in conformance with the Town of Glastonbury Master Sewer Plan as adopted under the authority of the State of Connecticut General Statutes. All Federal, State, and Local regulations shall also be satisfied. Sanitary sewers and appurtenances shall meet the requirements of the Public Health Code of the State of Connecticut Regulations and Technical Standards for Subsurface Sewage Disposal Systems, as amended. Sanitary sewer design standards within Ground Water Protection Zones shall also conform to Section 20.13.5 of Building Zone Regulations.

### *5.2 Related Town Policies*

- Subdivision and Resubdivision Regulations, Section 13.
- Building Zone Regulations, Section 20.13.5
- Town Code of Ordinances, Chapter 19.

### *5.3 Subdivision and Special Permit Application Procedures*

The typical procedures for WPCA review and approval of new connections to the Town sewer system as part of a Special Permit Application are included in the appendix of this manual. Typical procedures for the review and approval of the installation of new live sewers or on-site sewage disposal systems related to Subdivision Applications are also included in the same appendix.

### *5.4 Sanitary Sewer Impact Reports*

All developments proposing to discharge to the Town sanitary sewer must provide an estimated sewage flow rate to the WPCA for review. Applications for new construction, changes of property use with increased sewage flows typically require a sanitary sewer impact report. Guidelines for estimating sanitary sewage flow rates and for preparing Sanitary Sewer Impact Reports are included the WPCA Policy Statement for Sanitary Sewer Impact Reports, in the appendix of this manual.

### *5.5 Capped Sewers*

One of the principal purposes of the Town's "Capped Sewer" Ordinance is to assure that any

development that occurs is undertaken with due regard for the future need for sanitary sewers. Therefore, all developments proposed within the Master Sewer Plan area where sewer service is not readily available must appear before the WPCA for guidance regarding the need for construction of capped sewers. Policies and Procedures for Capped Sewers are included in the WPCA Policy Statement for Capped Sewers, in the appendix of this manual.

### *5.6 Developer's Permit Agreements (DPA)*

Construction of new public sanitary sewers requires that the Developer enter into an agreement with the WPCA. The installation of sanitary sewers by the Developer must meet the criteria as outlined in the Town Code of Ordinances, Sections 19-51 through 19-65. The standard form for this agreement is included in the appendix of this manual. Funds equal to ten (10) percent of the estimated construction cost are set aside through this agreement to reimburse the Town for the costs of inspection for new sanitary sewer systems.

### *5.7 Private Community Sewer System Agreements*

Privately owned community sewer systems as defined in the Connecticut General Statutes Section 7-246F that serve multiple units and discharge into the Town sewer system must meet the criteria outlined in the aforementioned state statute section. These systems are regulated by the Connecticut Department of Environmental Protection, and require that an agreement be put in place between the WPCA and the association that will own, operate, and maintain the private community sewer system to ensure that proper funding is set aside for future maintenance, repair, and replacement of said sewer system. The standard form of this agreement is included in the appendix of this manual.

### *5.8 Sewer Assessments*

Section 7-250 of the Connecticut General Statutes and Sections 19-73 through 19-85 of the Town Code of Ordinances describe in detail the regulations governing assessment of benefits for sewers against private property owners. Policies of the WPCA on this topic, including current sewer assessment rates, are included in the appendix of this manual.

### *5.9 Gravity Sewer Conduit Design*

Sewage should flow at all times with sufficient velocity to prevent the settlement of solid matter or objectionable wastes in the sewer. When designing a sewer for a given service area, particular consideration should be given to the actual conditions of operation likely to arise at times of minimum flow during the first few years after construction. It should be made certain that the velocities will not be so low for significant periods of time so as to result in objectionable deposits in the sewer.

General requirements for the design of gravity sewers are as follows:

- Minimum size of trunk and interceptor sewers shall be eight (8) inches in diameter.
- Minimum size of laterals and building connections shall be six (6) inches in diameter.
- Materials for gravity sewer pipes shall be as described in the Standard Details and Specifications.
- Tight pipe standards shall be required in ground water protection zones according to Section 20.13.5 of the Building Zone Regulations, including provisions to monitor for subsurface leakage.
- Velocity shall be a minimum of two (2) feet per second and a maximum of ten (10) feet per second at flows of one-half full depth.
- Minimum slopes for sanitary sewer shall be as follows:

| **Pipe Diameter (inches)** | **Minimum Slope (Ft. / Ft.)** |
|---|---|
| 8 | 0.0050 |
| 10 | 0.0040 |
| 12 | 0.0022 |
| 15 | 0.0015 |
| 18 | 0.0012 |
| 21 | 0.0010 |
| 24 | 0.0009 |
| 27 and larger | 0.0008 |

- All gravity sanitary sewers shall be laid on straight alignments, both horizontally and vertically, with manholes providing access at all deflection points or at a junction of two or more lines.
- Minimum or maximum depths shall be in accordance with recommended manufacturers' specifications for the specific type and class of pipe, or as directed by the Town Engineer.
- Minimum cover of four (4) feet shall be maintained over sanitary sewer pipe lines.
- Except where indicated by a special study, sanitary sewers shall be designed to flow with a depth of one-half full.
- Sanitary sewers and sewer laterals shall be bedded in crushed stone as shown in the Standard Details.
- Tees or wyes shall be provided for all laterals and building connections when not tying directly into a manhole.
- Commercial and industrial buildings may require a sanitary manhole installed on the

subject property at the street line for the purposes of sampling sewage as described in Section 19-212 of the Town Code of Ordinances. If the lateral connects directly to a Town-owned sewer manhole, this requirement may be waived at the discretion of the Town Engineer.

Reference Details – Plates 30, 37, 38, 39, 40.

### *5.10 Gravity Sewer Manhole Requirements*

Manholes shall be located in the centerline of the right-of-way and all conduits placed as near the roadway centerline as practical. Manholes shall be constructed at the terminus of the sanitary sewer and at intervals not to exceed a distance of 350 feet, and shall be placed at all changes of grade or direction and at each junction of two or more sewers.

In sewers twenty-four (24) inches and smaller, a turn of 90 degrees or less may be made in one manhole. In sewers twenty-seven (27) inches and larger, a 90-degree turn shall be made in two manholes, each located about six diameters from the point or intersection with a straight alignment from manhole to manhole.

The manholes on sewers twenty-four (24) inches or smaller shall be four (4) feet in diameter. On larger sewers, larger manholes shall be constructed to allow a suitable table for maintenance as directed by the Town Engineer.

Whenever the difference in elevation between the inflow and outflow sewer exceeds two (2) feet, a drop shall be constructed for the inflow pipe. Inside drops shall be constructed for pipes twelve (12) inches and smaller, outside drops shall be constructed for pipes fifteen (15) inches or larger.

Manholes installed along off-road sanitary sewer easements shall incorporate bolted manhole covers as shown in the Standard Details.

Reference Detail – Plates 31, 32, 33, 34, 35, 36.

### *5.11 Low Pressure Sewer*

#### *5.11.1 Force Main Design Requirements*

General requirements for low pressure sewer force mains are as follows:

- Minimum size of force main shall be a one and one-half inch (1½") diameter.
- Materials for force main shall conform to the Standard Details and Specifications.

- An average flow velocity of at least two (2) feet per second shall be used for design of low pressure sewer force mains.
- Friction losses through force main shall be based on the Hazen-Williams formula or other acceptable method.
- The force main shall have a minimum four (4) feet of cover as measured from the top of the pipe to final finished grade.
- The force main and building lateral connections shall be installed so as to provide for proper vertical separating distances from other utilities.
- Force mains shall enter the gravity sewer main in a downstream direction, an angle not less than ninety degrees (90°) to the downstream pipe and the invert of the force main shall match the invert of the gravity main.
- Thrust restraint shall be provided at all fittings and other changes in direction by the method of joint restraint only.
- Automatic air relief and vacuum valve manholes shall be placed at high points in the force main according to the Standard Details.
- Manholes shall also be incorporated at the terminal end of the sewer, at all changes in size and pipe material, at all junctions with other sewer mains and gravity sewer mains, and at any junctions with future roads.
- The distance between any two (2) consecutive manholes shall not exceed five hundred (500) linear feet.

Reference Details – Plates 41, 42, and 43.

### *5.11.2 Force Building Sewer Design*

General requirements for force building sewers are as follows:

- Material for force building sewers shall be as described in the Standard Details.
- Minimum size of force building sewer pipes shall be one and one-quarter inch (1¼") diameter.
- Velocity of at least two (2) feet per second shall be maintained for force building sewers at the design flow rate;
- Force building sewers shall have a minimum of four (4) feet of cover, and shall connect to the force main via a "tee" connection;
- Thrust restraint shall be provided at all fittings and other changes in direction by the method of joint restraint only.

Reference Details – Plates 44 and 45.

*5.11.3 Grinder Pump Requirements*

Grinder pumps shall meet the following general requirements when connecting to a Town-owned low pressure sewer system:

- The requirements of Section 20.13.5 of the Building Zone Regulations shall be met for pump/lift stations within designated Groundwater Protection Zones;
- Pump and pipe sizing information shall be submitted to the Town by a Professional Engineer licensed in the State of Connecticut for review and approval by the Town Engineer prior to installation;
- Pumps shall be the grinder type only, as manufactured by Barnes, Myers, A.B.S., or equal, and shall be enclosed in a concrete or fiberglass vault with and installed according to the manufacturer's requirement;
- Vaults shall have a minimum liquid storage reservoir of 300 gallons, and shall be located a minimum of 10 feet away from the building foundation;
- All outside grinder pump station installations shall have stainless steel hardware and C-channel rails for ease of pump removal;
- Commercial/industrial and multi-family dwelling installations shall use duplex pumps;
- Once installed, a Professional Engineer licensed in the State of Connecticut shall submit an as-built certification that the installation meets the design parameters as submitted.

The Professional Engineer certification and vault reservoir size requirements may be waived by the Town for private grinder pump systems that connect directly to a Town owned gravity sewer system. Under these circumstances, the licensed plumber performing the installation shall submit a letter confirming that the system was installed in accordance with the manufacturer's specifications.

Electrical requirements for the grinder pump installation are as follows:

- The electrical installation shall be in accordance with the prevailing electrical code;
- Electrical controls shall be mounted outside the pump chamber;
- An approved emergency power connection shall be provided for all pumps to allow for connection of a backup power source in the event of a power failure;
- Emergency power connection shall be properly sized and configured to match the electrical power requirements of the pump motor;
- All pump installations shall have an audio/visual alarm at the pump control panel;
- A remote audio alarm may also be required to ensure that the pump failure alarm can be heard from the occupied portion of the premises, as directed by the Building Official;
- Alternate configurations must have the prior approval of the Building Official.

Reference Details – Plates 46 and 47.

### *5.12 Sewer Easements*

Easements shall be provided for all sewers which are not installed within roadways or lands to be dedicated to the Town. Easements shall be a minimum of 25 feet in width and centered on the sanitary sewer.

Access to all sanitary sewer structures must be provided at a grade of 15% or less along a suitable, load bearing access road as described under Section 4.14. If additional easements are required for access and/or maintenance of the sewer based on physical or topographic restrictions, they shall be of such width, character, and location as approved by the Town Engineer.

A document containing the typical language for sanitary sewer easements to be granted to the Town of Glastonbury is included in the appendix of this manual.

# 6.0 CONSTRUCTION

### *6.1 Right-of-Way Permits and Licenses*

Requirements for work within the Town right-of-way are described in the Town Code of Ordinances Sections 17-96 through 17-111. In general, right-of-way permits shall be obtained by all persons or contractors performing construction activities within existing Town right-of-ways. Right-of-way permits are also required for work in any public right-of-way as shown on a map of an approved subdivision whether or not the streets within such subdivision have yet been accepted by the Town, unless the work performed is part of an approved and bonded subdivision.

A current right-of-way license is required for work within the Town right-of-way which must be renewed on a yearly basis. Appropriate state licensure including plumbing licenses for storm drainage or sanitary sewer construction shall be demonstrated at the time of application for a right-of-way license.

As described in the Town Code of Ordinances Section 17-101, right-of-way permits and licenses are non-transferable, meaning that each contractor working within the Town right-of-way must have a separate right-of-way license and permit for work being performed.

Driveway installations within the Town right-of-way must meet the requirements described in Section 3.22 and 3.23 before a right-of-way permit is issued, including the need for prior approval from the Town Manager for installation of residential driveways wider than twelve (12) feet or commercial driveways wider than thirty (30) feet.

Lawn irrigation systems to be installed within the Town right-of-way require a right-of-way permit, and shall present a “Private Irrigation System Permission and Release of Claim” form signed by the property owner at the time filing for the permit. This form is included in the appendix of this manual.

Connections of private drains to the Town storm drainage system require a right-of-way permit, and shall present a “Private Drainage Permission and Release of Claim” form signed by the property at the time filing for the permit. This form is also included in the appendix of this manual.

Pavement repairs for street excavations shall be made as shown in the Standard Details and Standard Specifications. Contractors making such repairs shall be responsible for maintenance of said pavement patches for a period of one (1) year from completion of the permanent

pavement patch. Temporary pavement patches shall remain in place for a period of at least four (4) months or one winter season unless otherwise directed by the Town Engineer.

### *6.2 Sanitary Sewer Permits and Licenses*

Sanitary Sewer Permits are required for all activities performed on the sanitary sewer system whether located within town owned property or within private property. These activities include the installation or repair of a private sanitary sewer house connection, street sewer, sewer trunk line, or any other activity involving the sanitary sewer system.

Permits are issued only to Contractors licensed by the State of Connecticut for this type of work and not to individual property owners. Applicable licenses include a P-1 Unlimited Plumbing / Piping License, W-9 Limited Plumbing-Piping Contractor's license, and P-7 Contractor-Limited to water, sewer, and storm lines. Work performed on the sanitary sewer system without a License and a Permit is a violation of the Town Code of Ordinances.

### *6.3 Right-of-Way Bonds*

As described in the Town Code of Ordinances Section 17-99, a surety bond shall be filed by the applicant for a right-of-way license with the Engineering Division Office. The surety bond shall be in the amount of five thousand dollars ($5,000) and shall be written by an indemnity or surety company authorized to transact business in the state and approved by the Town Manager or his agent.

The release of right-of-way surety bonds will only be allowed after satisfactory completion of the one-year maintenance period for the improvements completed within the Town right-of-way. Requests should be made by Contacting the Engineering Division at (860) 652-7735.

### *6.4 Insurance Requirements for Work in the Town Right-Of-Way*

#### *6.4.1 General:*

As described in the Town Code of Ordinances Section 17-100, Contractors filing for a right-of-way license must obtain and keep in force for the entire duration of the work appropriate Commercial General Liability and Automotive Liability insurance, and must furnish a valid certificate of insurance to the Engineering Division Office. Based on current Town Policy, the Contractor's insurance must satisfy the following additional requirements.

#### *6.4.2 Additionally Insured:*

Contractor's insurance must cover the Contractor and all of its agents, employees and subcontractors, and other providers of services, and shall name the Town of Glastonbury, its

employees and agents as an additional insured on a primary and non-contributory basis to the Contractor's Commercial General Liability and Automobile Liability policies. Insurance shall be written with Carriers approved in the State of Connecticut and with a minimum Best's Rating of A-. In addition, all Carriers are subject to approval by the Town of Glastonbury.

*6.4.3 Worker's Compensation Liability Limits:*

- Statutory Coverage
- Employer's Liability
- $100,000 each accident /$500,000 disease-policy limit/ $100,000 disease each employee

*6.4.4 Commercial General Liability Limits:*

Including Premises and Operations, Products and Completed Operations, Personal and Advertising Injury, Contractual Liability and Independent Contractors
Limits of Liability for Bodily Injury and Property Damage:

- Each Occurrence: $1,000,000
- Annual Aggregate: $2,000,000
- A Waiver of Subrogation shall be provided.

*6.4.5 Automobile Insurance Liability Limits:*

Including all owned, hired, borrowed, and non-owned vehicles
Limit of Liability for Bodily Injury and Property Damage Per Accident: $1,000,000

*6.4.6 Certificate Requirements / Notice of Cancellation:*

The Contractor shall direct its insurer to provide a Certificate of Insurance to the Town of Glastonbury before any work is performed. The Certificate shall specify that the Town of Glastonbury shall receive 30 days advance written notice of cancellation or non-renewal. The Certificate shall evidence all required coverage, including the Additional Insured and Waiver of Subrogation.

*6.4.7 Hold Harmless Clause:*

To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Town and its consultants, agents, and employees from and against all claims, damages, losses and expenses, direct, indirect or consequential (including, but not limited to, fees and charges of engineers, attorneys and other professionals, and court and arbitration costs) arising out of or resulting from the performance of the Contractor's work, provided that such claim, damage, loss, or expense is caused in whole or in part by any negligent act or omission by the Contractor, any person or organization directly or indirectly employed or engaged by the Contractor to perform or

furnish either of the services, or anyone for whose acts the Contractor may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder.

### *6.5 Work Zone Traffic Control*

Any work within the Town right-of-way shall require the proper maintenance and protection of traffic through the work area by the Contractor. At the request of the Town Engineer or Chief of Police (Legal Traffic Authority), the Contractor shall submit for approval a 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.

At the time of filing for a right-of-way permit, Applicants working within a public street shall contact the Police Department Traffic Unit at (860) 652-4254 to determine if certified flaggers or private duty police officers are required for traffic control.

### *6.6 Subdivision Bonds and Partial Bond Releases*

Public improvement bonds for subdivisions that have received final approval shall be posted by the Developer as described in Section 7.0 of the Subdivision and Resubdivision Regulations. As part of this process, the Design Engineer must submit a quantity estimate for the proposed public improvements and common facilities for certain private improvements to the Engineering Division. This estimate is reviewed by the Engineering Division and a recommendation for a construction and maintenance bond amount is made to the Office of Community Development and Town Plan and Zoning Commission *based on unit costs assigned by the Engineering Division.*

Requests for partial bond releases for accepted public improvements may be made by the Developer to the Engineering Division or to the Office of Community Development as described in Section 7.0 of the Subdivision and Resubdivision Regulations. After receiving the request, the Engineering Division will review the work completed for acceptability and will determine an appropriate amount for the bond release based on the value of work completed and remaining work to be done. A recommended bond amount available for release will then be made by the Engineering Division to the Office of Community Development. The amount and frequency of bond releases will be at the sole discretion of the Town.

<u>In the event that unit prices increase significantly over the duration of construction, the Town reserves the right to withhold bond funds based on the current cost of the remaining public improvements as determined by the Town.</u>

### *6.7 Easements and Warranty Deeds*

The Developer shall submit to the Town for review, draft documentation for all easements as identified on the approved plans. Said conveyances are to be in the approved format as described in the appendix of this manual. Upon approval by the Town, the Developer shall deliver executed conveyances for all easements to the Town Office of Community Development. The Developer will then file the final easement documents along with the appropriate approved mylars at the Town Clerk's office.

All warranty deeds for land to be acquired by the Town of Glastonbury within approved subdivision or site development plans shall be submitted to the Town for review and approval and shall meet the requirements of Section 9.0 of the Subdivision and Resubdivision Regulations. Upon approval by the Town, the warrantee deed will be held in escrow by the Town until final acceptance of the Public Improvements by the Town.

### *6.8 Preconstruction Meeting*

The Developer is responsible for contacting the Engineering Division to request that a pre-construction meeting be scheduled after all filing has been completed and appropriate bonds have been posted. This meeting is then held with the Developer, Design Engineer, Contractor, Utility Company representatives, and Town Staff to review conditions of approval and ensure good communication and coordination during construction.

Note that if construction of a public water main is included as part of the project, the plans must be approved by the Metropolitan District Commission prior to scheduling of a pre-construction meeting with the Town.

Developer responsibilities for the pre-construction meeting include the following:

- Provide two (2) paper copies of the final construction plans for use by the Engineering Division staff;
- Provide a list of sub-contractors and material suppliers for the project;
- Ensure that the Contractor's representative who will be at the project site during construction attends the meeting.

### *6.9 Changes to Approved Plans*

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 Town Plan and Zoning Commission, Inland Wetlands and Watercourses

Agency, Water Pollution Control Authority, or other regulatory agencies. Any changes to approved plans should be submitted to the Office of Community Development for a determination.

The Contractor should notify the Town immediately of any potential changes to the approved plan. If deemed necessary by the Town, the Contractor must submit a plan, prepared and certified by the Design Engineer of record, documenting the changes to the approved plan.

# 7.0 PROJECT CLOSEOUT

### *7.1 Record Drawings (As-Builts)*

Record drawings 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.

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.

Electronic copies of the record drawing shall be provided to the Town in AutoCAD DWG format, and shall reference NAD 83 horizontal datum and NGVD 1988 vertical datum.

The following information shall be shown on the record drawings:

- All geometry pertaining to street lines, the perimeter boundary of the development, internal property or lot lines, and easement lines.
- All monumentation and iron pins set and found related to public improvements, including street lines, designated open space, 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.
- As-built location of all types of sidewalks, curbs, sidewalk ramps, driveway openings, guide rail, traffic signs, pavement markings, and protective fence.
- 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 depict pipe sizes and materials, top of frame and invert elevations, flow lines and slopes of pipe for underground utilities.
- Dimensions of major features, such as width of roadway and sidewalk, cul-de-sac radius, etc.
- Locations of all drainage structures together with top of frame elevations, top of headwall elevations, invert elevations, and riprap splash pad dimensions at drainage outlets.
- As-built location of all foundation drains that discharge into Town drainage structures.
- As-built topography of detention basins, including top of berm elevations, inverts of inlet and outlet structures, and elevations of spillway.

- 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).
- 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 hand holes.
- Lot numbers and street addresses.
- North arrow.
- Volume and page of all easements conveyed to the Town of Glastonbury.
- Title block indicating “As-Built” or “Record Drawing” with a date.
- Title sheet showing sheet layout and phase lines, if applicable.
- Legend that accurately describes monumentation set and found (i.e. 5/8” rebar, 1” iron pipe, concrete monument with brass cap, etc.)
- 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.

A certification letter from a licensed professional engineer shall also be provided for any stormwater detention basins stating that the basin was constructed in conformance with the approved plans.

## *7.2 Public Improvement Acceptance Procedures*

### *7.2.1 Substantial Completion and One-Year Maintenance Period*

When public improvements are substantially complete, the Engineering Division shall be notified by the Developer and a punch list will be prepared detailing final items to be addressed. When these punch list items have been satisfactorily addressed by the Developer, a recommendation for release of the Construction Bond is made by the Town Engineer to the Office of Community Development and Town Plan and Zoning Commission. The Construction Bond will then be released and the one-year maintenance period initiated after review and approval by the Town Plan and Zoning Commission at a regularly scheduled meeting.

### *7.2.2 Public Improvement Acceptance*

After completion of the one-year maintenance period and satisfactory resolution of all maintenance items that arise during this period, the Town Engineer will recommend acceptance of the public improvements to the Office of Community Development and Town Plan and Zoning Commission. The Maintenance Bond will then be released after acceptance of the public

improvements by the Town Plan and Zoning Commission at a regularly scheduled meeting. After final acceptance of the road by the Town Council, the warrantee deed for the road is filed on the land records by the Town.

### *7.2.3 Sanitary Sewer Acceptance*

After construction of new public sanitary sewers and satisfactory completion of air testing and all punch list items identified by the Engineering Division, a recommendation will be made to the Water Pollution Control Authority that the sanitary sewers be accepted. Note that Sanitary Sewers along new public roadways will not be accepted until the binder course of pavement has been installed. After initial acceptance by the WPCA, there will be a one-year maintenance period for the sewers before final acceptance of the sewers by the Town as described within the Developer's Permit Agreement.

# 8.0 STANDARD SPECIFICATIONS

### *8.1 Reference to CONNDOT Standard Specifications, Form 816*

In general, the Town of Glastonbury Standard Specifications follow the specifications as described in the State of Connecticut Department of Transportation Standard Specifications for Roads, Bridges and Incidental Construction, Form 816 as amended to date, except as otherwise described or amended in the following sections of this manual. Any items not listed in the following sections of this manual shall be constructed as specified in the applicable section of the Form 816. In the case of any discrepancy between this document and the Form 816, the matter shall immediately be submitted to the Town Engineer for a determination. The Town Engineer shall have sole authority in resolving any discrepancies.

## *8.2 List of Standard Specifications*

## 002.0 CLEARING AND GRUBBING

002.1 General: The Contractor shall furnish all labor, materials, tools, and equipment necessary and shall do all work to prepare the site as indicated on the drawings and as herein specified.

002.2 Tree Removal Guidelines: In general, no trees, etc. in public streets and highways are to be cut or damaged in any way except as noted on the plans. Trees, bushes and growing crops on other lands may be cut, removed, or trimmed only to the extent provided in the terms of the rights-of-way or access rights possessed by the Town, and also only within the limits and in the manner, if any, indicated by the Engineer or by the drawings or Special Conditions.

The Contractor shall mark all trees, shrubs and plants to be removed in accordance with the plans and these specifications. The Engineer shall have 7 days to field review the markings and make any adjustments prior to the start of the clearing operation.

Trees and shrubs within the right-of-way or within any property owned by the Town of Glastonbury that are designated for removal must be posted as such by the Glastonbury Tree Warden (Mr. Greg Foran of the Parks and Recreation Department, 652-7686) for a period of 10 days prior to removal. **No trees or shrubs within the Town of Glastonbury right-of-way shall be cut or removed until such posting has been completed and subsequent approval given by the Tree Warden.**

Where trees or tree roots are to be trimmed, cut or removed, such work shall be done carefully, only by men skilled in such work, to avoid damage to remaining parts of these or other trees, or to bushes, ornamentation, overhead wires, structures, etc. All debris from such cutting and removal will be cleaned up.

002.3 Tree Protection and Care of Property: The Contractor shall install high visibility construction fence at the drip line of the tree canopy as shown on the plans and as directed by the Engineer to protect existing trees that are not to be cut from damage during construction. The Engineer, at his sole discretion, may also direct the Contractor to enclose the trunks of trees adjacent to his work that are not to be cut with substantial wooden boxes of such height as may be necessary to protect them from injury from piled material, from equipment, from his operations, or otherwise due to his work. Excavating machinery and cranes shall be of suitable type and be operated with care to prevent injury to trees not to be cut, and particularly to overhanging branches and limbs.

Branches, limbs, and roots shall not be cut except by permission of the Engineer. All cutting shall be smoothly and neatly done without splitting or crushing. In case of cutting or unavoidable injury to branches, limbs, and trunks of trees, the cut or injured portions shall be neatly trimmed and covered with an application of grafting wax or tree-healing paint, as directed.

Cultivated hedges, shrubs, and plant that might be injured by the Contractor's operations shall be protected by suitable means or shall be dug up and temporarily replanted and maintained. After the construction operations have been substantially completed, they shall be replanted in their original positions and cared for until growth is re-established. If cultivated hedges, shrubs, and plants are injured to such a degree as to affect their growth or diminish their beauty or usefulness, they shall be replaced by items of kind and quality at least equal to the kind and quality existing at the start of the work.

On paved surfaces, the Contractor shall not use or operate tractors, bulldozers, or other power-operated equipment, the treads of wheels that are so shaped as to cut or otherwise injure such surfaces.

002.4 Clearing: From areas to be cleared, the Contractor shall cut or otherwise remove all trees, saplings, brush, vines, and other vegetable matter such as snags, sawdust, bark, etc., and refuse. The area to be cleared shall be confined to the width shown on the plans or stipulated in the Proposal. Vines, brush, and similar undergrowth shall be cut as close to the ground as practicable. Trees may be cut leaving a longer stump to facilitate their removal by power-operated equipment. No trees shall be cut or trimmed unless they are so indicated on the drawings.

Clearing shall also include removal and disposal of all items shown on the plans to be removed, or directed by the Engineer to be removed as part of the project, including, but not limited to, removal and disposal of existing sidewalk, steps, drainage structures, fences, and any and all other structures or materials not specifically listed in the Bid Proposal but required to be removed to accomplish the work.

All road signs, mail boxes, etc., shall be removed and reset as directed.

002.5 Grubbing: Grubbing shall consist of the complete removal of all tree stumps and roots larger than two inches in diameter to a minimum depth of 12-inches below the finish grade surface. All excavations made below the finished surface by the removal of trees, stumps, etc. shall be filled with suitable material and thoroughly compacted in such manner that its surface will conform to the surrounding surface.

002.6 Disposal: All materials removed during clearing and grubbing operations shall be disposed of by the Contractor in a manner satisfactory to the Engineer. No burial of stumps or debris will be permitted.

**004.0 TEST PITS**

004.01 General: The work covered under this item includes furnishing of all plant, labor, equipment, appliances, materials and incidentals and performing all operations in connection with excavating and backfilling by machine and/or by hand, exploratory test pits at locations indicated or directed. The purpose of the test pits is for locating and examining soils, ground water, drains, pipes, rocks, utilities, structure foundations or any other obstacles.

004.02 Execution:

A. Test pit excavations shall have neat, clean-cut and vertical sides. Upon completion of the test pit excavation, the Engineer shall be notified so that he can make the necessary location measurements. Excavation and backfilling shall conform to the applicable requirements of the Section entitled, “Trench Excavation - earth and backfill”. Hand digging shall be employed when required by the Engineer.

B. It shall be agreed that the Contractor entered into this contract with full knowledge that in any work involving excavation, operation in public highways or adjacent to other developments, some unforeseen utility relocations, obstacles, difficulties, unforeseen soil or groundwater conditions, etc., may be encountered, and that the Contractor has included in his bid and contract obligations the assumptions of the risks and costs to which such obstacles, etc., may subject him.

## 103.0 ROCK EXCAVATION AND DISPOSAL

103.1 General: The Contractor shall excavate rock (as defined below), if encountered, to the lines and grades indicated on the drawings or as directed, shall dispose of the excavated material, and shall furnish acceptable material for backfill in place of the excavated rock.

In general, rock in pipe trenches shall be excavated so as to be not less than 6 inches from the pipe after it has been laid. Before the pipe is laid, the trench shall be backfilled to the correct subgrade with thoroughly compacted, suitable material or, when so specified or indicated on the drawings, with the same material as that required for bedding the pipe, furnished and placed at the expense of the Contractor.

Definition of Rock: The work "rock", whenever used as the name of an excavated material or material to be excavated, shall mean only boulders and pieces of concrete or masonry exceeding one-half (½) cubic yard in volume, or solid ledge which, in the opinion of the Engineer, requires for its removal drilling, and blasting, wedging, sledging, barring, or breaking up with a power-operated tool. No soft or disintegrated rock that can be removed with a hand pick or power-operated excavator or shovel, no loose, shaken, or previously blasted rock or broken stone in rock filings or elsewhere, and no rock exterior to the maximum limits of measurement allowed that may fall into the excavation will be measured or allowed as "rock".

103.2 Excess Rock Excavation: If rock is excavated beyond the limits of payment indicated on the drawings, specified, or authorized in writing by the Engineer, the excess excavation, whether resulting from overbreakage or other causes, shall be backfilled by and at the expense of the Contractor as specified before in this Section.

In pipe trenches, excess excavation below the elevation of the top of the bedding cradle or envelope shall be filled with material of the same type, placed and compacted in the same manner as specified for the bedding, cradle, or envelope.

In excavations for structures, excess excavation in the rock beneath foundations shall be filled with concrete which shall be Class A or Class B, at the option of the Contractor. Other excess excavation shall be filled with earth as specified in the Section entitled "Backfilling Around Structures" under BACKFILLING AND CONSOLIDATION.

103.3 Blasting: If explosives are used, all requirements for transportation, use and storage of Local, State, and Federal laws and regulations must be complied with and all necessary permits and licenses obtained by the Contractor at his expense. Permits and licenses must be shown to the Engineer upon request. Permits are issued through the Town of Glastonbury Fire Marshalls Office, and may require a pre / post blast survey.

Explosives must be carefully transported, stored, handled, and used. The Contractor will keep on the job only such quantities of explosives as may be needed for the work underway and only during such time as they are being used. Explosives shall be stored in a secure manner in locked containers and separate from all tools. Caps and detonators shall be stored separately from other explosives. When the need for explosives is ended, all such material remaining on the job shall be promptly removed from the premises. Care must be taken that no explosives, caps, or detonators are stolen or get into the hands of unauthorized persons, or left unguarded where they may cause accidents.

Explosives shall be of such power and placed and used in such quantities as will not make the excavation unduly large or shatter unnecessarily the rock upon or against which the main or structure is to be built, or injure adjacent persons or property, those

portions of the new work or structure as may already be in place, or other adjacent pipes, ducts, or other structures. The quantity of explosives fired at one blast must be small enough and the tie for blasting selected to avoid undue annoyance to persons owning or occupying the premises near the work.

The rock must be completely matted when blasts are fired to prevent damage or injury to persons or property or the scattering of broken fragments on the adjacent ground. Adequate warning shall be given to all persons in the vicinity before any blast is discharged.

When blasting is required, the operation shall be conducted with such care as not to cause damage to any of the existing underground utilities. Should such occur, the cost of repairs shall be the sole responsibility of the Contractor.

The Contractor shall notify each public utility or others having structures in proximity to the site, and others who may be affected, of his intention to use explosives. Said notice shall be given in accordance with the applicable regulations therefore, and sufficiently in advance to enable the involved agencies/companies/persons and the Contractor to take such steps as may be necessary to protect life and property. Such notice shall not, in any way, relieve the Contractor of responsibility for any damage resulting from his blasting operations.

When in sufficiently close proximity to existing gas, water, sanitary, storm, or other utilities and structures, and all services connected thereto, the Contractor shall remove the rock by methods other than blasting, if necessary, in order to protect said utilities and their services from damage. Approved methods other than blasting are barring and wedging, jackhammer, drilling, rock jacks, or other such hand or machinery methods that will not damage the adjacent utility.

No explosives shall be brought into, stored, or used on the site of any job by the Contractor unless and until he shall have furnished the Engineer with a satisfactory Certificate of Insurance showing that the risks arising from the presence of and use of explosives, and from blasting, are included within the insurance provided by the Contractor to secure his obligations to the Town. Insurance should also cover damage to underground utilities or other underground facilities.

When blasting for trench excavation, each shot sequence shall begin sufficiently ahead of completed work to prevent damage to the completed work, which must be properly protected prior to each shot.

The provisions herein shall apply where soil formation resembles rock, whether in trench, structure, or general excavation, even if it is of such nature that it is not classified and paid for as rock excavation and, if so ordered by the Engineer, will apply to openings cut through masonry, nested boulders, or other materials not herein classified as rock.

103.4 Blasting Records: An accurate blasting log must be maintained continuously for the duration of the Contract. The log shall record, for each shot, the location, amount of holes, depth, spacing, exact date and time of the blast, amount of explosives per hole, and the number of caps used. In addition, a sketch showing displacement of direct and delay caps for each shot shall be recorded.

103.5 Test Blasting and Monitoring Program: The Contractor shall employ an acceptable, independent vibration/blasting consultant to conduct test blasting prior to production blasting to devise suitable blasting procedures for production blasting, and to monitor production blasting. The vibration/blasting consultant shall be a Registered Professional Engineer in the State of Connecticut and shall have a minimum of ten years experience

as a vibration/blasting consultant. The Contractor shall submit the name of the vibration/blasting consultant to the Engineer prior to starting the work.

The purpose of the test blasting is to develop control procedures for production blasting so that no disturbance or damage shall be done to utilities, equipment, buildings, structures, groundwater wells, or the aquifer.

Based on the results of the test blasting, the vibration/blasting consultant shall develop a suitable blasting program and distance-quantity of explosive tables of the production blasting. The blasting program and the distance-quantity tables shall be submitted to the Engineer 21 days prior to the commencement of production blasting. All production blasting operations shall be in accordance with the blasting program.

The vibration/blasting consultant shall also perform continuous monitoring of all initial blasting operations and intermittent monitoring of subsequent blasting, as deemed necessary by the vibration/blasting consultant. Blasts shall be monitored with a minimum of two 3-component seismometers that record the entire particle velocity wave train and not just peak velocities. Accurate, legible seismometer records of all monitored blasts shall be obtained, and one copy of all blast records shall be submitted to the Engineer within seven days after blasting.

103.6 Wells: The Contractor's attention is directed to the existence of active groundwater supply wells near the area of construction. The Contractor shall locate all wells within or near the project area that could be affected by his operations.

The Contractor shall conduct his operations so that no disturbance or damage shall be done to the groundwater supply wells or to the aquifer from which they draw water. The aquifer is herein defined as underlying soil and rock formations within a distance of 1,500 feet from the wells and the groundwater within those formations.

The Contractor shall be fully responsible for determining the methods and controls necessary so that his construction operations do not disturb groundwater wells or the aquifer, and do not change the quality or quantity of water reaching the well.

If evidence of a change in well water quality or well yield, or disturbance or damage to any utility, equipment, building, or structure is observed or reported to the Contractor, he shall immediately notify the Engineer and all blasting operations shall be discontinued and the Contractor's vibration/blasting consultant shall recommend revised blasting procedures. The Contractor shall initiate the revised procedures, once approved by the Engineer, before blasting is continued.

The Contractor shall furnish potable water to any home where the well is disrupted or the water is declared unfit for human consumption. The water shall be supplied in such quantity as necessary to allow the homeowner to function on a normal day-to-day basis without any significant inconvenience or expense. The water shall be delivered as frequently as necessary to assure its freshness. The Contractor shall continue to furnish water until the problem is resolved.

The Contractor shall be fully responsible for the restoration or replacement of all water supply wells, utilities, equipment, buildings, or structures damaged by his operations at no cost to the Town.

103.7 Shattered Rock: If the rock below normal depth is shattered due to drilling or blasting operations of the Contractor and the Engineer considers such shattered rock to be unfit for foundations, the shattered rock shall be removed and the excavation shall be backfilled with concrete as required, except that in pipe trenches, screened gravel may

be used for backfill, if approved. All such removal and backfilling shall be done by and at the expense of the Contractor.

103.8 Preparation of Rock Surfaces: Whenever so directed during the progress of the work, the Contractor shall remove all dirt and loose rock from designated areas and shall clean the surface of the rock thoroughly using steam to melt snow and ice, if necessary. Water in depressions shall then be removed, as required, so that the whole surface of the designated area can be inspected to determine whether seams or other defects exist.

The surfaces of rock foundations shall be left sufficiently rough to bond well with the masonry and embankments to be built thereon and, if required, shall be cut to rough benches or steps.

Before any masonry or embankment is built on or against the rock, the rock shall be scrupulously freed from all vegetation, fragments, ice, snow, and other objectionable substances. Picking, barring, wedging, streams of water under sufficient pressure, stiff brushes, hammers, steam jets, and other effective means shall be used to accomplish this cleaning. All free water left on the surface of the rock shall be removed.

103.9 Removal of Boulders: Piles of boulders or loose rock encountered within the limits of earth embankments shall be removed to a suitable place of disposal.

103.10 Disposal of Excavated Rock: Excavated rock may be used in backfilling trenches subject to the following limitations:

a. Pieces of rock larger than permitted under the section entitled “Backfilling Pipe Trenches” shall not be used for this purpose.

b. The quantity of rock used as backfill in any location shall not be so great as to result in the formation of voids.

c. Rock backfill shall not be placed within 18 inches of the surface of the finished grade.

d. Surplus excavated rock shall be disposed of as specified for surplus excavated earth.

103.11 Backfilling Rock Excavations: Where the rock has been excavated and the excavation is to be backfilled, the backfilling above normal depth shall be done as specified under EARTH EXCAVATION BACKFILL. If material suitable for backfilling is not available in sufficient quantity from other excavations, the Contractor shall, at his own expense, furnish suitable material from outside sources.

103.12 Compaction of Backfill Material: Consolidation of backfill material in a trench where rock has been blasted shall be obtained through the use of a water-jetting method, or as approved by the Engineer.

## 104.0 TEMPORARY PAVEMENT REPAIR

104.1 General: Wherever sections of existing bituminous pavement are to be removed and new temporary pavement abutted, the Contractor shall make such removals to neat lines. At the line of delineation, the Contractor shall cut the bituminous pavement with a saw or asphalt cutting wheel so as to form a straight line where new pavement will be placed against old. Care shall be exercised in removing the existing pavement to avoid "break-backs" beyond the cut line.

104.2 Description: Work under this item shall be the construction of temporary pavement within the limits of excavation in the roadway or where ordered by the Engineer. Such work shall be performed as ordered by the Engineer. Temporary pavement shall be installed as shown in the Standard Details.

104.3 Materials: Material for the surface course shall conform to the requirements of Bituminous Concrete Class 2. Only if bituminous plants are closed and it is not possible to obtain hot bituminous concrete may "cold patch" be used, with the approval of the Engineer. Process Stone Base and Gravel Subbase shall conform with the applicable sections of these specifications.

104.4 Construction Methods: Construction methods shall comply with the applicable sections of Form 816 for Bituminous Concrete Pavement, and applicable sections of these specifications for Process Stone Base, and Gravel Subbase.

## 105.0 PERMANENT PAVEMENT REPAIR

105.1 General: The Contractor shall furnish all labor, materials, tools, and equipment necessary and shall construct all permanent pavement to replace pavement removed or damaged by his operations, as herein specified and as directed.

Temporary pavement shall be placed over all trenches in paved areas where directed by the Engineer and as described in Section 104. The Contractor shall maintain all temporary pavement until the permanent pavement is placed. Permanent pavement repair shall take place between 60 and 90 days after completion of the temporary pavement repair.

Prior to excavation in paved areas, the Contractor shall cut the surface of the existing pavement with a pneumatic cutter or its equal. The pavement shall be cut in as straight a line as possible on both sides of the proposed trench for the entire length of the job.

The reinforced concrete base shall be cut neatly with a masonry saw. The existing reinforcement shall be left projecting out twelve (12) inches from the concrete and the new reinforcement shall be tied to it. Existing reinforcement shall be cut by a mechanical method, and shall not be burned off. It shall be saved by bending it out of the way during construction.

In the replacement of pavement, the Contractor shall not feather the edges between the new and existing pavement.

105.2 Gravel and Process Stone Base Course: The Contractor shall furnish and place a pavement base course on compacted backfill material. The base shall be laid in two courses. The first course shall be not less than ten (10) inches compacted thickness of an acceptable gravel subbase installed in accordance with Section 108.0 GRAVEL SUBBASE. The uppermost course shall be not less than four (4) inches compacted thickness of an acceptable processed stone as described in Section 109.0 PROCESSED STONE BASE. Care should be taken to prevent the separation of the fines from the aggregate during dumping and grading operations. The Contractor shall apply water to the gravel base, as needed, to obtain the desired compaction.

The Contractor shall maintain this gravel in such condition as to provide a good roadway surface until the permanent surfacing is applied.

105.3 Preparation for Permanent Resurfacing: If temporary pavement has been placed, it shall be removed by the Contractor at no cost, and the gravel and process stone base course restored as hereinafter specified.

Prior to placing pavement, all backfill shall have been properly compacted as required to eliminate settling or backfill. No pavement shall be placed over poorly compacted backfill. Backfill and rolled gravel base course shall have been compacted, brought to the proper elevation, and dressed so that new pavement construction shall be at the required grade. The Contractor shall maintain the surfaces of all excavated and disturbed areas until the pavement is placed. If there is a time lapse of more than 24 hours between completion of preparation of subgrade, or placing of rolled gravel base course, and placing of pavement, or if subgrade or rolled gravel base course has been eroded or disturbed by traffic, the subgrade or rolled gravel base course shall be restored before placing pavement.

105.4 Concrete Base Course: In areas where an existing concrete base exists, a new concrete base shall be installed in the area of the pavement repair. The concrete base shall be an

eight (8) inch slab of reinforced concrete placed over the previously prepared gravel base so that the top of new concrete base shall be level with the existing concrete base. The reinforcing bars shall be 3/8" bars. Reinforcing steel shall be tied onto the existing steel reinforcement and placed to equal the reinforcement of the original concrete slab. The concrete base with reinforcing shall conform to the Form 816, Section 3.03 CONCRETE BASE, and Articles M.03.01 for Concrete Pavement and M.06.01 for Reinforcing Steel.

After the concrete has set for 24 hours, and before application of the permanent bituminous pavement, the edges of the adjoining pavement and the new concrete surface shall be cleaned of all dust and dirt and painted sufficiently with a cut-back asphalt so as to form a tight bond between the old and new paving.

105.5 Permanent Paving:

BITUMINOUS STREETS WITHOUT CONCRETE BASE:

Permanent pavement for streets without a concrete base shall be a bituminous concrete surface **with a thickness to match the existing pavement thickness**, but no less than one and one-half (1 ½) inch top course and one and one-half (1 ½) inch binder course over the previously prepared gravel and process stone base so that the total compacted thickness of the bituminous concrete is not less than three (3) inches. Where the entire road surface is to be overlaid as directed by the Engineer, the top course shall be applied in widths of at least ten (10) feet by suitable spreaders.

The following procedure shall be followed when making a permanent patch:

a. The temporary patch shall be removed.

b. The trench shall be fully compacted by a method acceptable to the Engineer.

c. The compacted subsurface shall be brought to a grade of five () inches below the grade of the existing road surface.

d. Two (2) inches of processed stone or processed gravel shall be placed in the trench and rolled to full compaction with a seven (7) to ten (10) ton roller or vibratory roller of equal compaction to within three (3) inches of the existing road surface.

e. The existing pavement shall then be cut back a minimum of twelve (12) inches from the edges of the original trench in straight lines.

f. The area immediately adjacent to the edges of the trench must be swept clean so that no loose sand, temporary patch, or other debris remains, and the exposed edges of the pavement cuts coated with a tack coat approved by the Engineer.

g. An approved bituminous concrete binder shall be placed and compacted with the specified roller to within one and one-half (1 ½) inches of the existing road surface.

h. An approved bituminous surface course shall be placed and compacted with the specified roller so that the completed surface shall be flush with the adjoining surfaces and finished to match them.

i. All joints shall be sealed with a hot bituminous asphalt sealer approved by the Engineer.

j. When there is two (2) feet or less between a curb or edge of pavement and the edge of the trench excavation, restoration of the pavement shall be extended to include the curb or edge of pavement.

BITUMINOUS STREETS WITH CONCRETE BASE:
The temporary pavement and base courses shall be removed to a depth level with the bottom of the existing concrete base. The edges of the existing concrete base shall be cut back eighteen (18) inches or more, if required, from the trench excavation wall so that the reinforced concrete slab to be placed will rest on undisturbed material at least eighteen (18) inches wide on each side of the trench. All loose or damaged material in the existing concrete slab shall be removed to assure continuous bonding to the new slab. All loose or damaged bituminous in the existing pavement shall be removed and the existing top course trimmed square and straight so that new surfacing can be placed on an undisturbed concrete base course at least six (6) inches wide on each side of the trench.

Permanent pavement overlaying concrete base shall be a bituminous concrete surface **with a thickness to match the existing pavement thickness**, but no less than one and one-half (1 ½) inch binder course, and a one and one-half (1 ½) wearing course placed to meet flush with the existing pavement. At the sides of the roadway where there is no existing concrete base, the gravel course shall be brought level to the concrete pavement. The binder course shall then be placed over the concrete base and the gravel base.

All binder courses shall conform to the Form 816, Section 4.06, and all top courses shall conform to the Form 816, Section 4.06.

STREETS WITH CONCRETE PAVEMENT: Where it is determined by the Engineer that a trench patch being made in a concrete pavement need not be made with concrete, then the following replacement procedure shall be followed, unless further amended by the Engineer:

a. Ten (10) inches of gravel subbase will be installed and compacted to meet the grade of the bottom of the adjacent concrete pavement.

b. Premixed bituminous concrete base course shall be installed six (6) inches in depth or to a level two (2) inches below the grade of the surrounding pavement.

c. The remaining two (2) inches shall be installed in one lift and shall be composed of Class 1 bituminous concrete.

d. In those areas where the trench opening is located within five (5) feet of a transverse joint or a pavement crack that would serve to leave a loose slab of concrete between the bituminous patch and the stable concrete pavement, the loose slab section shall be removed and repaired according to the above information.

All depth measurements shall be considered to be compacted depths. Bituminous material shall be compacted to 90% density.

The bituminous base course may be installed in two equal lifts of three-inches (3”) thick and the top course in one lift of two-inches (2”) thick unless the method of compaction of the bituminous base course can achieve compaction to the desired density of one lift. The determination shall be made by the Engineer.

The Contractor shall remove and acceptably dispose of all excavated material before proceeding with the remainder of the work.

Permanent pavement, in all cases, shall be applied so that the whole roadway or paved area shall have a true and uniform surface, and the pavement shall conform to the proper grade and cross-section with a smooth transition to existing pavement.

105.7 Surface Maintenance: Until the expiration of the guarantee period, the Contractor shall maintain surfacing placed under this Contract and shall promptly correct any defect such as cracks, depressions, and holes that may occur. At all times, the surfacing shall be kept in a safe and satisfactory condition for traffic. If defects occur in surfacing constructed by the Contractor, the Contractor shall remove all bituminous concrete and base course as necessary to properly correct the defect. The Contractor shall replace the base course and bituminous concrete as specified herein.

## 106.0 EARTH EXCAVATION

106.1 General: This item shall conform to Section 2.02 ROADWAY EXCAVATION, FORMATION OF EMBANKMENT AND DISPOSAL OF SURPLUS MATERIAL, of the Form 816.

## 107.0 FORMATION OF SUBGRADE

107.1 General: This item shall conform to Section 2.09 SUBGRADE, of the Form 816.

## 108.0 GRAVEL SUBBASE

108.1 General: This item shall conform to Section 2.12 SUBBASE, of the Form 816, amended as follows:

108.2 Materials: The material for this item shall conform to the requirements of Article M.02.01-Granular Fill, except that reclaimed miscellaneous aggregate shall not be used.

## 109.0 PROCESSED STONE BASE

109.1 General: This item shall conform to Section 3.04 PROCESSED AGGREGATE BASE, of the Form 816, amended as follows:

109.2 Materials: The material for this item shall conform to the requirements of Article M.05.01, except that coarse aggregate shall be broken stone, and fine aggregate shall be stone sand, screenings, or a combination thereof.

## 112.0 BITUMINOUS CONCRETE

112.1 General: This item shall conform to Section 4.06 BITUMINOUS CONCRETE, of the Form 816.

## 113.0 BITUMINOUS CONCRETE LIP CURBING

113.1 General: This item shall conform to Section 8.15 BITUMINOUS CONCRETE LIP CURBING, of the Form 816.

## 201.0 CONCRETE SIDEWALKS

201.1 General: The Contractor is to construct sidewalks to lines and grades as shown on the drawings or at locations as directed by the Engineer. The sidewalks shall be of monolithic construction and five inches thick, except at industrial and commercial driveways where it shall be eight inches thick and reinforced with 6" x 6" 10/10 steel mesh. Sidewalk construction shall include the removal of existing and construction of new house lateral walks where new sidewalk grades make it necessary. At street corners where the intersection is rounded with a radius of less than 25 feet to the curb, the sidewalk slabs will be a minimum of five feet in length and constructed of five-inch thick concrete. The sidewalk shall pitch to the street at a slope of ¼-inch per foot or as directed by the Engineer.

Pedestrian sidewalk ramps are to be constructed to the lines and grades shown on the plans at locations directed by the Engineer, and shall be a minimum of five inches thick. This work shall also include furnishing and installing Detectable Warning Strips in the locations and to the dimensions and details shown on the plans or as ordered by the Engineer.

201.2 Forms: The forms used shall be five-inch steel or 2" x 6" wood firmly supported and staked to the line and grade given by the Engineer. The forms shall be free from warp and shall be of sufficient strength to resist springing out of shape. All forms shall be cleaned and oiled before use.

201.3 Concrete: The concrete furnished shall conform with respect to composition, transportation, mixing and placing, to Class F Cement Concrete 4,000 PSI, as specified by the State of Connecticut Department of Transportation in its latest specification and revisions. An approved air-entraining admixture shall be used to entrain 5% to 7% air in the concrete.

201.4 Detectable Warning Strips: The Detectable Warning Strip shall be a prefabricated detectable warning surface tile as manufactured from Engineered Plastics Inc. 300 International Drive, Suite 100 Williamsville, NY 14221, telephone number (800) 682-2525 or the approved equal from ADA Fabricators, INC. P.O Box 179 North Billerica, MA 01862 telephone number (978) 262-9900. The tile shall conform to the dimensions shown on the plans and have a brick red homogeneous color throughout in compliance with Federal Standard 595A Color #22144 or approved equal.

The Detectable Warning Strip shall be set directly in poured concrete according to the plans and the manufacturer's specifications or as directed by the Engineer. The Contractor shall place two 11.34 Kg concrete blocks or sandbags on each tile to prevent the tile from floating after installation in wet concrete.

201.5 Dowels: Smooth dowels, 5/8-inch in diameter, measuring 24 inches in length shall be installed within all expansion and contraction joints, concrete driveway aprons and the last end section of each sidewalk slab poured at the end of each working day.

Dowels are also to be installed between new and existing concrete slabs. Where new or repaired walks abut up against existing concrete sidewalks, the Contractor shall drill two holes measuring ¾-inches in diameter and 12 inches in depth into the existing concrete slab. The dowels, dipped in a liquid asphalt or grease and wrapped in aluminum foil, 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 details of these specifications.

Smooth metal dowels shall be 5/8-inch in diameter and 24 inches in length. All metal dowels shall conform to the requirements of ASTM A615 Grade 60.

201.6 Expansion Joints: At maximum intervals of 15 feet, an expansion joint shall be placed. The material for expansion joints shall be either ¼-inch thick cork asphalt or $^{3}/_{8}$-inch thick Ceremar closed cell flexible foam filler, or approved equal. Expansion joints of the same material shall also be placed at points abutting existing structures.

201.7 Surface Finish: The surface finish shall be struck off, forcing coarse aggregate below mortar surface. After strike-off, the surface shall be worked and floated with a wooded, aluminum, or magnesium float followed by steel troweling. The slab shall then be broomed cross-wise with a fine hair broom. The outside edges of the slab shall be edged with a ¼-inch radius tool. All edging lines shall be removed.

201.8 Curing: The Contractor shall use a liquid membrane-forming curing compound. The curing compound shall be similar or equal to Demicon "Cure Hard" with fugitive dye and shall meet the latest ASTM Specification C-156. Waterproof paper or plastic membrane are acceptable alternatives.

Newly constructed sidewalk surfaces shall be protected from all foot or vehicular traffic for a period of seven days. 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.

201.9 Temperature: No concrete is to be placed when air temperature is below 40°F, or at 45°F and falling, unless prior approval is given by the Engineer. In the event weather conditions may be such that concrete that is not completely cured is subject to freezing, the Contractor shall provide a minimum of a six-inch layer of hay, straw, or thermal blankets for protection. Any concrete laid during cold weather that is damaged by freezing shall be the responsibility of the Contractor and shall be replaced at his expense.

## 204.0 GRADING AND TOPSOILING

204.1 Description: This work shall consist of furnishing, placing, and shaping topsoil in areas shown on the plans where directed by the Engineer. The topsoil shall be placed to the depth stated in the Contract or specifications.

204.2 Material: The material shall conform to the requirements of Article M.13.01.1 of the Form 816.

204.3 Construction Methods: The areas on which topsoil is to be placed shall be graded to a reasonably true surface and cleaned of all stones, brickbats, and other unsuitable materials. After areas have been brought to proper subgrade and approved by the Engineer or his agent, loam shall be spread to a depth as indicated in the Contract, or to a depth of no less than four inches, with due allowance made for settlement. All stones, roots, debris, sod, weeds, and other undesirable material shall be removed from the topsoil. After shaping and grading, all trucks and other equipment shall be excluded from the topsoiled area to prevent excessive compaction. The Contractor shall perform such work as required to provide a friable surface for seed germination and plant growth prior to seeding.

During hauling and spreading operations, the Contractor shall immediately remove any material dumped or spilled on the shoulders or pavement.

It shall be the Contractor's responsibility to restore to 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.

Wherever subgrade material is sand, gravel, or other previous material, and elsewhere as required by the Engineer, the Contractor shall place a four-inch layer of clay or other impervious material on the subgrade material before placing loam.

## 205.0 TURF ESTABLISHMENT

205.1 Description: The work included under this item shall consist of furnishing and placing pre-emergent fertilizer, seed, and mulch on all areas to be seeded as shown on the plans, or where directed by the Engineer.

205.2 Materials: The seeding materials for this work shall conform to the requirements of Section M.13 of the Form 816, and Table 205.1.

Pre-emergent fertilizer shall be comparable to Tupersan Seed Starter 11-23-10, plus Crabgrass Control.

205.3 Construction Methods: Construction methods shall be those established as agronomically acceptable and feasible, and that are approved by the Engineer.

205.4 Preparation: Areas shall be made friable and receptive to seeding by methods approved by the Engineer. In all cases, the final prepared area shall meet the lines and grades for such surface as shown on the plans, or as directed by the Engineer. In no event will seeding be allowed on a hard or crusted soil surface.

All areas shall be reasonably free from weeds taller than three inches. Removal of weed growth from the slope areas shall be by approved methods, including hand mowing, which does not rut or scar the slope surface or cause disruption of the slope line and grade. Seeding on level areas shall not be permitted until substantially all weed growth is removed. Seeding on slope areas shall not be permitted without removal or cutting of weed growth except by written permission of the Engineer.

205.5 Seeding Season: The normal seasonal dates for seeding shall be as follows:

Spring: March 15th to June 15th
Fall: August 15th to October 15th

If the Contactor seeds outside the seasonal periods, any additional materials furnished and placed to establish growth shall be done at the Contractor's expense. The Contractor must also reseed, mulch, and repair any areas seeded, whether out-of-season or not, that are damaged by fire, erosion, or any other cause, as directed by the Engineer at no expense to the Town.

Areas of disturbed soil that will contribute to air and stream pollution shall be established to the designated vegetation cover as soon as feasible or when directed by the Engineer.

205.6 Seeding Methods: Seed shall be uniformly applied by any agronomically acceptable and feasible method approved by the Engineer.

Seed for lawn areas shall be fresh and clean and free from weed seed, seed of grasses other than those specified, and free from chaff and other extraneous material. Seed shall be raked in with a fine tooth rake. After seed is sown, the surface of the ground shall be thoroughly rolled with a light roller suitable for sown seed. All seeded areas shall be watered and maintained to the satisfaction of the Engineer. Within two weeks after grass seed has come up, any areas where grass seed has not germinated properly, or where the surface has been washed or damaged in any way, shall be reseeded as before.

Normal seed mixtures shall be applied at the rate of 200 pounds per acre. Fertilizer shall be uniformly placed at the rate of 600 pounds per acre.

205.7 Mulching: Areas seeded shall be mulched unless otherwise ordered by the Engineer. Wood chip mulch shall not be used on seeded areas. Unless otherwise shown on the plans or called for in the Special Provisions, mulch will be applied according to Table 205-2. The mulch will be anchored according to Table 205-3.

205.8 Compaction: The Contractor shall keep all equipment and vehicular and pedestrian traffic off areas that have been seeded to prevent excessive compaction and damage to young plants. Where such compaction has occurred, the Contractor shall rework the soil to make a suitable seed bed, then reseed and mulch such areas with the full amount of the specified materials at no extra charge to the Town.

205.9 Cleanup: This work will not be considered complete until all clean-up operations are complete. This shall include the removal of all debris resulting from the seeding operations on shoulders, pavement, or adjacent property, public and private. The Contractor shall be required to shape, grade, and establish vegetative cover in accordance with the specifications on all areas disturbed outside the normal limits of construction.

Any area in the project where ground cover is destroyed due to the construction operations must have a new ground cover established by means of seeding, fertilizing, and mulching, if necessary, as directed by the Engineer.

205.10 Warranties and Certificates: The Contractor shall supply the Engineer with all warranties or certificates furnished with the seed mixture or fertilizer prior to use of the material.

TABLE 205-1

SEED MIXTURES, RATES AND DATES

| SEED MIXTURE 4/ | PERCENT BY WT. | SEEDING RATES | | SEEDING DATES | SPECIAL ADAPTATION |
|---|---|---|---|---|---|
| | | LBS. PER 1,000 SQ. FT. | LBS. PER PER ACRE | | |
| Red Fescue 3/<br>Perennial Ryegrass | 60<br>40 | 1 | 40 | April 1 – June 15<br>Aug. 1 – Sept. 30 | No Mow Areas<br>Droughty Areas |
| Reed Canary Grass<br>Redtop | 80<br>20 | 1 | 50 | April 1 – June 15<br>Aug. 15 – Sept. 15 | Wildlife or<br>Wet Area |
| Red Fescue 2/<br>Kentucky Bluegrass<br>Perennial Bluegrass | 70<br>20<br>10 | 2 | 80 | April 1 – June 15<br>Aug. 15 – Oct 15 | High Maintenance<br>Lawn Areas |
| Ky 31 Tall Fescue<br>Birdsfoot Trefoil | 70<br>30 | 1 | 40 | April 1 – June 1 | No Mow Areas<br>Wet Areas |

1/ These are minimum seeding rates and should be increased if adverse conditions exist.
2/ 10 lbs. of Birdsfoot Trefoil may be added to this mixture.
3/ Ky 31 Tall Fescue may be used in place of Red Fescue.
4/ May add 5 lbs. of Perennial Ryegrass for quick fall cover.

TABLE 205-2

GUIDE TO MULCH MATERIAL

| MULCH MATERIAL | QUALITY | APPLICATION RATES | | REMARKS |
|---|---|---|---|---|
| | | Per 1,000 sq. ft. | Per Acre | |
| Hay or Straw | Air dried, free from undesirable seeds | 75-100 lbs.<br>or<br>2-3 bales | 1.5-2 tons<br>90-110 bales | Use straw where mulch effect is to be maintained for more than three months. Subject to wind blowing unless kept moist or tied down. Good for critical area erosion control. Spread uniformly, leave 10-20% of ground exposed. Excellent for seedbed protection until vegetation is established. Salt marsh hay where available is usually free of weed seeds. |

TABLE 205-3

MULCH ANCHORING GUIDE

| ANCHORING METHOD OR MATERIAL | REMARKS AND HOW TO APPLY |
|---|---|
| Jute Netting, Twisted | Good for watering or critical erosion area seedbed stabilization. Use pegs or special stables to anchor netting and prevent blowing. Generally available in 4-foot wide rolls and up to 300-foot long. |
| Peg and Twine | Used to anchor hay, straw, or other mulch which may be subject to blowing.<br>Drive 8 to 10 inch long wooden pegs into soil on 3 or 4 foot centers.<br>Secure mulch to soil surface by stretching twine between the pegs in a criss-cross and square pattern on each. Make two or more turns with twine around each stake. Drive pegs flush with soil if mowing and maintenance is planned. |

## 206.0 SEDIMENTATION CONTROL SYSTEM

206.1 General: This item shall conform to Section 2.19 of the Form 816.

## 207.0 EROSION CONTROL MATTING

207.1 General: This item shall conform to Section M.13.09 of the Form 816. Erosion control matting shall be from the CONNDOT Qualified Products List as published by the CONNDOT Division of Research and available from the CONNDOT website for the application indicated. Staples shall conform to the Manufacturer's requirements. Material which shows signs of degradation shall not be used and shall be removed from the project.

## 208.0 METAL BEAM RAIL

208.1 General: This item shall conform to Section 9.10 METAL BEAM RAIL, of the Form 816, amended as follows:

208.2 Materials: Weathering Steel shall be used for rail elements, terminal sections, and posts as described Article M.10.02 of the Form 816, unless otherwise directed by the Engineer.

## 213.0 EARTHWORK AND GRADING FOR SIDEWALK CONSTRUCTION

213.1 General: The Contractor is to exercise caution to prevent unnecessary damage to lawns, trees, bushes, or any other existing improvements. If, in the opinion of the Engineer, existing improvements are damaged due to the carelessness of the Contractor, the same shall be repaired or replaced at the Contractor's expense.

213.2 Earthwork: The Contractor shall remove and dispose of grass, rubbish, and other objectionable materials within the limits of the sidewalk construction. The Contractor shall perform all excavation necessary to construct sidewalks to the grades as shown on the construction plans. Excavation shall include the saw cutting, removal, and disposal of bituminous concrete and concrete sidewalks, driveways, and pavements, including curbing and tree roots, where necessary, due to the new sidewalk grade and as shown on the plans or as directed by the Engineer. Existing house lateral walks and driveways adjacent to the sidewalk shall be removed and base graded and prepared for a smooth connection. The Contractor shall remove and dispose of all excess material.

213.3 Grading Existing Topsoil: Upon completion of sidewalk construction, the Contractor is to grade the areas between sidewalks and curbs, if the typical section indicates a grass plot, and disturbed areas back of the sidewalk. The Contractor shall backfill and compact these areas so as to conform to the typical cross-section. The upper four inches of the backfill shall be loam or topsoil, loose and friable and free of sticks, rocks, roots, weeds, or other unsuitable material.

213.4 Lawn Restoration: This work will consist of restoring grass areas disturbed in the Contract work. All work will be in conformance with Section 205.0 PRE-EMERGENT, SEEDING AND MULCHING.

## 214.0 BASE COURSE UNDERNEATH SIDEWALKS

214.1 Description: The Contractor shall make the necessary excavation and furnish material for base construction under sidewalks.

214.2 Material: The material used for base course construction shall conform to the requirements of Section M.02.01 of the Form 816 for broken or crushed stone. It shall consist of sound, tough, and durable stone and shall be free of thin or elongated pieces, lumps of clay, soil, loam, or vegetative matter. All material shall be approved by the Engineer prior to its use.

214.3 Construction Method: The material for the base course shall be spread upon the prepared subgrade to such depth as to give a compacted thickness of eight inches. The material shall be uniformly spread in two layers of equal depth in the entire base course excavation and each layer shall be wetted and compacted to a firm even surface with a roller weighing not less than 500 pounds or by use of pneumatic tampers or vibratory compactors..

## 215.0 PERMANENT DRIVEWAY REPAIRS

215.1 Description: The Contractor shall furnish all labor, tools, material, and equipment to replace all driveway pavement damaged due to associated construction. This shall also include the installation of bituminous concrete lip curbing within the limits of the driveway apron to match preconstruction conditions.

215.2 Materials: The base course shall be processed stone of a quality satisfactory to the Engineer.

Hot laid bituminous concrete for driveway repairs shall be Bituminous Class 2 per Section M.04 of the Form 816.

Bituminous Concrete Lip Curbing shall be Bituminous Class 3 per Section M.04 of the Form 816.

215.3 Construction Methods: Portions of driveway aprons to be replaced shall be saw cut. The eight inches of trench immediately below the bottom of the proposed pavement shall be backfilled with processed stone and compacted in four-inch layers. The upper two inches shall be topped by the Contractor with two inches of hot bituminous concrete and maintained at grade. The edges shall be painted with an asphalt emulsion prior to the placement of permanent pavement. Hot laid bituminous concrete shall be placed so as to give a two-inch compacted surface, or a surface that has a depth equal to the existing driveway surface, whichever is greater. Compaction shall be made with a power-driven roller. The finished surface shall be free from waves or depressions.

Bituminous concrete curbing shall be installed according to Section 8.15.03 of the Form 816.

## 230.0 TREES, SHRUBS, AND GROUND COVER PLANTS

230.1 General: This item shall conform to Section 9.49 FURNISHING, PLANTING and MULCHING TREES, SHRUBS, VINES and GROUND COVER PLANTS of the Form 816.

## 233.0 CHAIN LINK FENCE

233.1 General: This item shall conform to Section 9.13 CHAIN LINK FENCE of the Form 816.

## 301.0 MAINTENANCE AND PROTECTION OF TRAFFIC

301.1 Description: Unless other provisions are made on the plans or in the Special Conditions, the Contractor shall keep the roadway open to traffic for the full length of the project and shall provide a sufficient number of travel lanes and pedestrian pathways to move that traffic ordinarily using the roadway. The travel lanes and pedestrian pathways shall be drained and kept reasonably smooth and in suitable condition at all times in order to provide minimum interference with traffic and consistent with proper execution of the work.

Suitable ingress and egress shall be provided at all times where required for all intersecting roads and for all abutting properties have legal access.

301.2 Construction Methods: When a scheme for maintenance of traffic that may include detours is shown on the plans or approved by the Legal Traffic Authority, this shall govern unless an alternate scheme acceptable to the Engineer is offered by the Contractor at no additional cost. If no scheme is shown on the plans or described in the Special Conditions of the Contract and the Contractor wishes to deviate from the provisions of maintaining traffic as described in this Section, the Contractor must submit, and the Engineer may approve, a schedule showing a proposed sequence of operations and a compatible method of maintaining traffic.

301.3 Traffic Signs and Barricades: The Contractor will furnish signs, barricades, traffic cones, and traffic delineators to forewarn traffic of the construction. The Contractor will also provide such safety measures, pavement markings, warning devices, and signs as deemed necessary to safeguard and guide the traveling public through detours ordered by the Engineer or included in the approved scheme for maintenance of traffic. Signs and barricades will be delivered adjacent to the project and traffic cones and delineators will be provided when required, at no cost to the Town. The Contractor shall erect, maintain, move, adjust, relocate and store these signs, barricades, traffic cones, and delineators when, where, and in accordance with the "Manual on Uniform Traffic Control Devices", or as directed by the Engineer. The use of unauthorized or unapproved signs, barricades, traffic cones, or traffic delineators will not be permitted.

The Contractor shall keep all signs in proper position and clean and legible at all times. Care shall be taken so that weeds, shrubbery, construction materials or equipment, and soil are not allowed to obscure any sign, light, or barricade. Signs that do not apply to existing conditions shall be removed or adjusted so that the legend is not visible to approaching traffic.

301.4 Snow Removal: The Contractor, when order by the Engineer, shall remove snow and take care of icy conditions on temporary, new, and existing sidewalks on any part of the right-of-way within the limits of the project. Snow removal and correction of icy conditions other than those resulting from the Contractor's operations, and snow removal on uncompleted contracts under traffic, will remain the obligation of the Town.

301.5 Failure to Provide: Should the Contractor fail to perform any of the work required under this Section, the Town may perform, or arrange for others to perform, such work. In such cases, the Town will deduct from monies due or to become due the Contractor, all expenses connected therewith.

NOTE: The Town of Glastonbury **CHIEF OF POLICE**, acting in the capacity of the **LEGAL TRAFFIC AUTHORITY**, shall be the sole and final authority for the Maintenance and Protection of Traffic.

## 302.0 TRAFFICPERSON

302.1 General: This item shall conform to Section 9.70 TRAFFICPERSON, of the Form 816.

302.3 Description: Add the following to the first paragraph of Section 9.70.01

"Trafficperson may consist of extra duty officers of the Glastonbury Police Department or uniformed flagmen meeting acceptable criteria. The Police Chief, as the Legal Traffic Authority, shall determine which is acceptable based on location, traffic volumes, and traffic conditions.

## 318.0 PAVEMENT MARKINGS

318.1 General: This item shall conform to Section 12.10 EPOXY RESIN PAVEMENT MARKINGS, SYMBOLS AND LEGENDS, CONNECTICUT SUPPLEMENTAL SPECIFICATION and Section 12.11 REMOVAL OF PAVEMENT MARKINGS, of the Form 816.

## 320.0 TRAFFIC SIGNS

320.1 General: This item shall conform to Section 12.08 SIGN FACE - SHEET ALUMINUM, of the Form 816, amended as noted below.

All traffic and parking signs shall be conventional road size conforming to the latest revision of the "Manual on Uniform Traffic Control Devices", the "Standard Highway Signs" book and the "Connecticut Department of Transportation Catalog of Signs".

All signs shall be sheet aluminum, 0.08 inches thick.

All signs except shall be retroreflective sheeting, high intensity grade, ASTM Type III.

Sign posts shall meet the requirements of the Connecticut Department of Transportation galvanized Type II, 3 lbs/ft breakaway channel posts.

320.2 Method of Measurement: This work will be measured for payment by the number of each sign of the type specified, installed and accepted.

## 403.0 EARTH TRENCH EXCAVATION

403.01 General: The Contractor shall make excavations of normal depth in earth for trenches and structures; shall backfill such excavations to the extent necessary; shall furnish the necessary material and construct embankments and fills; and shall make miscellaneous earth excavations and do miscellaneous grading. All such work shall be done as indicated on the drawings and as herein specified.

The program of excavation, dewatering, sheeting and bracing shall be carried out in such manner as to eliminate all possibility of undermining or disturbing the foundations of existing structures or of work previously completed under this contract.

Excavation in general shall be in open trenches. Tunneling shall be done only to pass under obstructions such as pipes or duct or only as indicated on contract drawings, or in Special Provisions, or on written permission of the Engineer, and then only in accordance with those sections hereof which describe tunnel excavation, and subject to such further conditions as may have been described by drawings, Special Provisions, or as the Engineer may specify.

The Contractor shall make excavations in such manner and to such widths as will give suitable room for building the structures or laying and jointing the piping; shall furnish and place all sheeting, bracing, and supports; shall do all coffer damming, pumping and draining; and shall render the bottom of the excavations firm and dry and acceptable in all respects.

403.02 Trench Excavation: Where pipe is to be laid in gravel bedding or concrete cradle, the trench may be excavated by machinery to or to just below, the designated subgrade, provided that the material remaining at the bottom of the trench is no more than slightly disturbed.

Where pipe is to be laid directly on the trench bottom, the lower part of trenches in earth shall not be excavated to subgrade by machinery, but, just before the pipe is to be placed, the last of the material to be excavated shall be removed by means of hand tools to form a flat or shaped bottom, true to grade, so that the pipe will have a uniform and continuous bearing and support on firm and undisturbed material between joints except for limited areas where the use of pipe slings may have disturbed the bottom.

403.03 Depth of Trench: Trenches shall be excavated to such depths as will permit the pipe to be laid at the elevations, slopes or depths of cover indicated on the drawings, and at uniform slopes between indicated elevations.

403.04 Width of Trench: The methods and equipment used for excavation must be adapted to the conditions at the site and the dimensions of the required trench. The width of ground or street surfaces cut or disturbed shall, in general, be kept as small as practicable to accommodate the work and shall not be widened by scraping or loosening materials from the sides. Every effort shall be made to keep the sides of the trenches firm and undisturbed until backfilling has been completed and consolidated.

Width of pipe trenches shall be wide enough to provide sufficient space for shoring, for foundations, for drainage, for laying, jointing, inspecting, and backfilling of sides of pipe, or for building the required structures, and as near as feasible to the above described minimums, in order to reduce the load of backfill upon the top of the sewer; to provide lateral support for the fill and haunching on the sides of the pipe, and to insure that the pipe will not be pushed out of line while placing backfill.

The maximum permissible trench width to be paid by the Town varies with the diameter of the pipe (see table 403-1). Where the Contractor chooses not to use trench supports, the Contractor will still be paid as per maximum trench widths or actual trench width, whichever is the least.

403.05 Excavation for Special Foundations: Where concrete, stone or underdrain is required or ordered, excavation shall be carried down to the depth and lines required for such foundation or underdrain. If required by contract drawings or Special Provisions as part of the structure and included in the price, no additional payment for this additional excavation, as excavation, will be made. If the foundation is paid by the cubic yard or other specific item of proposal, such price for foundation shall include excavation therefore. Excavation for underdrain is included in price for underdrain.

Where the plans, Proposal or Special Provisions indicate certain foundations, they will be constructed and paid for as indicated.

Where the soil in subgrade is found to be soft, loose or freshly-filled earth, or unstable or unsuitable as a base for the proposed sewer or structure, the Engineer may, in his discretion, order it excavated to such depth and width as he may deem proper and replaced with gravel, crushed stone, concrete, plank or similar materials as he may direct.

If the excavation for foundation is made wider or deeper than required or ordered, or if excavation for concrete on sides of pipe is made wider than required or ordered, then no additional payment for the additional quantities of excavation or for additional foundation or side filling materials will be made, if being assumed that the added space was excavated for the convenience of, or by error of, the contractor.

403.06 Length of Trench and Space Occupied: Trenches must be constructed with a minimum of inconvenience and danger to the public and all other parties. To that end, the length of trench opened at any time, from point where ground is being broken to completed backfill and temporary surfacing, and also the amount of space in streets or public and private lands occupied by trench soil banks, equipment and supplies, shall to exceed the space or spaces considered reasonably necessary and expedient by the Engineer. In determining the length of open trench, the space for equipment, materials, supplies, etc. needed, the Engineer will consider the nature of the street or land where work is being done, depth and width of trench, types and methods of construction and equipment being used, inconvenience to the public or to private parties, possible dangers, limits or rights-of-way and other proper matters.

The Contractor must keep streets and premises near the work free from unnecessary obstructions, debris, etc. The Engineer may, at any time order all equipment, materials, surplus from excavations, debris, etc., lying outside reasonable limits of space, promptly removed; and should the Contractor fail to remove such materials within three days after notice to remove same, the Engineer may cause any part or all of such materials to be removed by such persons as he may employ, at the Contractor's expense, and may deduct the costs thereof from payment which may be or may become due to the contractor under this Contract. In any cases when public safety urgently demands it, the Engineer may cause such materials to be removed without prior notice.

Trenches shall be excavated with approximately vertical sides between the elevation of the center of the pipe and an elevation one foot above the top of the pipe.

403.07 Dimensions of Trenches: Trenches shall be excavated to the lines indicated on contract drawings or as described for any particular structure by any contract document. In general, room shall be allowed for installing the pipe or other structure, for making and

inspecting joints in pipe, for placing and compacting fill around and on both sides of pipe, for draining and pumping as needed, for removal of unsuitable materials, and for any other purpose incidental to the fulfillment of the Contract and these specifications.

Care must be taken to excavate to correct line, grade and width at all points.

In general, sides of trenches must be not less than four inches from outside of barrel of all pipe eight inches or less in size, six inches from outside of barrel of pipe ten inches or larger in size, or as shown by contract drawings. Except as otherwise provided, excavation shall conform closely to the form and grade of the bottom of the pipe or foundation required. To accomplish this, the Engineer may require that no earth shall be excavated by machinery nearer than six inches to the finished subgrade, and the last six inches of excavation in earth shall be carefully removed by hand labor to the exact lines and grade required, immediately prior to laying pipe or underdrain or building bottom of structure.

403.08 Extent of Open Excavation: The extent of excavation open at any one time will be controlled by the conditions, but shall always be confined to the limits prescribed by the Engineer. At no time shall the extend of the open excavation go beyond two structures.

403.09 Trench Excavation in Fill: If pipe is to be laid in embankments or other recently filled material, the material shall first be placed to the top of the fill or to a height of at least one foot above the top of the pipe, whichever is the lesser. Particular care shall be taken to ensure maximum consolidation of material under the pipe location. The pipe trench shall be excavated as though in undisturbed material.

403.10 Unauthorized Excavation: If the bottom of any excavation is taken out beyond the limits indicated or prescribed, the resulting void shall be backfilled at the Contractor's expense with ¾" crushed stone if the excavation was for a pipeline not having a concrete cradle or encasement, or with Class B concrete if the excavation was for a masonry structure.

403.11 Cutting of Pavement: When the trench lies within a paved area, the trench shall be cut with an approved tool. All cuts shall be made to straight lines and shall be parallel and/or perpendicular to the center line of the trench.

403.12 Bridging Trenches: The Contractor shall, at no cost, provide suitable and safe bridges and other crossings where required for the accommodation of travel, and to provide access to private property during construction, and shall remove said structures thereafter.

403.13 Obstacles: Some obstructions, obstacles, or difficulties in the path of the work anticipated, or in the performance of the work, may have been indicated by drawings, Special Provisions, or in other contract documents. The omission of any indication or mention of any obstruction, obstacle or difficulty which a reasonable and careful contractor, bidder, or estimator might have anticipated, or any question as to adequacy of such indication as given, shall not entitle the Contractor to any extra or additional compensation for any loss or expense occasioned directly or indirectly by such obstruction, etc., not to any extension of time or waiver of any requirement of the Contract and Specifications. The Contractor shall be understood to have entered into the Contract with full knowledge that in any work involving excavation, operation in public highways or adjacent to other developments, some unforeseen obstacle, difficulties, unforeseen soil or ground water conditions, etc., may be encountered, and that the Contractor has included in the bid and contract obligations the assumptions of the risks and cost to which such obstacles, etc. may subject the bid.

The Town will make arrangements for clearance or avoidance of permanent obstruction by pipes and structures of public utilities and of public bodies, except as otherwise indicated on drawings or contract documents, where such obstruction is found in the space to be occupied by the pipe or structure to be built under the Contract. The Town will not assume the cost of temporary removal, support, protection, etc. of pipes, poles, and other structures which do not occupy the space to be occupied by the pipe or structure to be built for the Town, where removal, support, protection, etc. of such pipes, poles or structures is desired for the convenience of, or to save expense to, or to accommodate the equipment of the Contractor.

403.14 Ends of Certain Pipes to be Sealed: If any pipe, drain, culvert, connection or similar conduit is encountered and cut off or cut through incidental to the construction of the work, and if the said drain, etc. is not to continue to function or be used, the open end or ends of such pipes shall be securely and tightly closed by an adequate cover or bulkhead as directed by the Engineer. Except as a specific price for such closings was fixed in the Proposal, the cost of such covers, bulkheads, and the setting of them shall have been included in the price of prices bid for various other portions of the work in the Proposal and no additional payment will be made therefore.

In removing existing pipes or other structures, the Contractor shall use care to avoid damage to materials, and the Engineer shall include for payment only those new materials which are necessary to replace those unavoidably damaged.

The structures to which the provisions of the preceding three paragraphs shall apply include pipes, wires, and other structures which (a) are not indicated on the drawings or otherwise provided for, (b) encroach upon or are encountered near the substantially parallel to the edge of the excavation, and (c) in the opinion of the Engineer will impede progress to such an extent that satisfactory construction cannot proceed until they have been changed in location, removed (to be later restored), or replaced.

When fences interfere with the Contractor's operations, the Contractor shall remove and (unless otherwise specified) later restore them to at least as good condition as that in which they were found immediately before the work was begun, all without additional compensation. The restoration of fences shall be done as promptly as possible and not left until the end of the construction period.

403.15 Excavation Near Existing Structures: Attention is directed to the fact that there are pipes, drains, and other utilities in certain locations. Some of these have been indicated on the drawings, but no attempt has been made to show all of the services, and the completeness or accuracy of the information given is not guaranteed.

As the excavation approaches pipes, conduits, or other underground structures, digging by machinery shall be discontinued and the excavation shall be done by means of hand tools, as directed. Such manual excavation, when incidental to normal excavation, shall be included in the work to be done under items involving normal excavation.

Where determination of the exact location of a pipe or other underground structure is necessary for doing the work properly, the Contractor may be required to excavate test pits to determine such locations. When such test pits may be properly considered as incidental to other excavation, the Contractor shall receive no additional compensation, the work being understood to be included as a part of the excavation. When the Engineer orders test pits beyond the limits of excavation considered as part of the work, such test pits shall be paid for as specified under MEASUREMENT AND PAYMENT.

403.16 Protection of Existing Structures: All existing pipes, poles, wires, fences, curbing, property-line markers, and other structures which the Engineer decides must be

preserved in place without being temporarily or permanently relocated shall be carefully supported and protected from injury by the Contractor. Should such items be injured, they shall be restored by the Contractor, without compensation therefore, to at least as good condition as that in which they were found immediately before the work was begun.

403.17 Relocation and Replacement of Existing Structures: Whenever the Contractor encounters certain existing structures as described below and is so ordered in writing, the Contractor shall do the whole or such portions of the work as he may be directed, to change the location of, remove and later restore, replace such structures, or to assist the owner thereof in so doing. For all such work, the Contractor shall be paid under such items of work as may be applicable, otherwise as Extra Work.

TABLE 403-1

TRENCH WIDTHS

---

Maximum pay limits for trench widths are as follows:

Where the Contractor chooses not to use trench supports the Contractor will still be paid as per maximum trench widths.

| Size Pipe Nominal Inside Diameter | Maximum Width of Trench |
|---|---|
| 6” | 2.5 Feet |
| 8” | 4.0 Feet |
| 10” | 4.0 Feet |
| 12” | 4.0 Feet |
| 15” | 4.0 Feet |
| 18” | 4.0 Feet |
| 21” | 4.3 Feet |
| 24” | 4.5 Feet |
| 27” | 4.8 Feet |
| 30” | 5.1 Feet |
| 33” | 5.4 Feet |
| 36” | 5.7 Feet |
| 39” | 5.9 Feet |
| 42” | 6.3 Feet |

## 404.0 TRENCH DEWATERING

404.01 General: To ensure proper conditions at all time during construction, the Contractor shall provide and maintain ample means and devices (including spare units kept ready for immediate use in case of breakdown) with which to intercept and/or remove promptly and dispose properly of all water entering trenches and other excavations. Such excavations shall be kept dry until the structures, pipes, and appurtenances to be built therein have been completed to such extent that they will not be floated or otherwise damaged.

All water pumped or drained from the work shall be disposed of in a suitable manner without undue interference with other work, damage to pavements, other surfaces, or property. Suitable temporary pipes, flumes, or channels shall be provided for water that may flow along or across the site of the work.

404.02 Temporary Underdrains: Temporary Underdrains, if used, shall be laid in trenches beneath the grade of the structure. Trenches shall be of suitable dimensions to provide room for the chosen size of underdrain and its surrounding gravel. Underdrain pipe shall be acceptable PVC or ADS pipe of standard thickness. Sewer pipe of the quality known as “seconds” will be acceptable.

Underdrains, if used, shall be laid at an approved distance below the bottom of the normal excavation wrapped in Mirafi 140 or equal as outlined in Section 409.05 of these specifications, and entirely surrounded by graded gravel or crushed stone to prevent the admission of sand or other soil into the underdrains. The distance between the top of the bell of the underdrain pipe shall be at least three (3) inches unless otherwise permitted. The space between the underdrain and the pipe or structure shall be filled and crushed stone which shall be rammed, if necessary, and left with a surface suitable for laying the pipe or building the structure.

404.03 Drainage Wellpoint System: If required, the Contractor shall dewater the excavations by means of an efficient drainage system which will drain the soil and prevent saturated soil from flowing into the excavation. The wellpoints shall be designed especially for this type of service. The pumping unit shall be designed for use with the wellpoints and shall be capable of maintaining a high vacuum and of handling large volumes of air and water at the same time.

If required, the installation of the wellpoints and pump shall be done under the supervision of a competent representative of the manufacturer. The Contractor shall do all special work such as surrounding the wellpoints with sand or gravel or other work which is necessary for the wellpoint system to operate for the successful dewatering of the excavations.

## 405.0 BACKFILLING AND CONSOLIDATION

405.1 General: In general, and unless other material is indicated on the drawings or specified, material used for backfilling trenches and excavations around structures shall be suitable material which was removed in the course of making the construction excavations.

Frozen materials shall not be placed in the backfill nor shall backfill be placed upon frozen material. Previously frozen material shall be removed, or shall be otherwise treated a required before new backfill is placed.

405.2 Backfilling around Structures: The Contractor shall not place backfill against or on structures until they have attained sufficient strength to support the loads (including construction loads) to which they will be subjected without distortion, cracking, or other damage. As soon as practical after the structures are structurally adequate and other necessary work has been done, special leakage tests, if required, shall be made. Promptly after the completion of such tests, the backfilling shall be started and then shall proceed until its completion. The best of the excavated materials shall be used in backfilling within two feet of the structure. Unequal soil pressures shall be avoided by depositing the material evenly around the structure.

405.3 Backfilling Pipe Trenches: As soon as practicable after the pipes have been laid and the joints have acquired a suitable degree of hardness, if applicable, or the structures have been built and are structurally adequate to support the loads, including construction loads to which they will be subjected, the backfilling shall be started, and thereafter it shall proceed until its completion in accordance with pipe manufacturer recommendations.

With the exception mentioned below in this paragraph, trenches shall not be backfilled at pipe joints until after that section of the pipeline has successfully passed any specified tests required. Should the contractor wish to minimize the maintenance of lights and barricades and the obstruction of traffic, the contractor may, at his own risk, backfill the entire trench, omitting or including backfill at joints as soon as practicable after the joints have acquired a suitable degree of hardness, if applicable, and the related structures have acquired a suitable degree of strength. The contractor shall, however, be responsible for removing and later replacing such backfill at no cost should the contractor be ordered to do so in order to locate and repair or replace leaking or defective joints or pipe.

a. Materials: The nature of the materials will govern both their acceptability for backfill and the methods best suited for their placement and compaction in the backfill. The materials and methods shall both be subject to the approval and direction of the Engineer. No stone or rock fragment larger than 12 inches in greatest dimension shall be placed in the backfill nor shall large masses of backfill material be dropped into the trench in such a manner as to endanger the pipeline. If necessary, a timber grillage shall be used to break the fall of material dropped from a height of more than five feet. Pieces of bituminous pavement shall be excluded from the backfill unless their use is expressly permitted, in which case they shall be broken up as directed.

b. Ho Pac Trench Consolidation: Where the trench backfill is consolidated by the "Ho Pac" method and the depth of the trench from the road or ground surface to the top of the pipe exceeds ten feet, the trench backfill shall be placed and consolidated in two lifts of equal depth.

The approved backfill material shall be placed and compacted at a moisture content between four and eight percent (based on dry density, by weight), or with two percent of

the optimum moisture content as determined by the moisture density relationship test specified in ASTM D 1557, at the option of the Engineer. Compaction shall be by a "Ho Pac" vibratory compactor or approved equal, operating at a frequency between ten and 40 Hertz, placed directly on the backfill surface, and applied with the maximum practical force applicable by the backhoe to which it is attached. Compaction effort shall be continued until no further visible settlement occurs.

c. Miscellaneous Requirements: Whatever method of compacting backfill is used, care shall be taken that stones and lumps shall not become nested and that all voids between stones shall be completely filled with fine material. Only approved quantities of stone and rock fragments shall be used in the backfill. The Contractor shall, as part of the work done under the items involving earth excavation and rock excavation as appropriate, furnish and place all other necessary backfill material.

All voids left by the removal of sheeting shall be completely backfilled with suitable materials, thoroughly compacted.

Where required, excavated material which is acceptable to the Engineer for surfacing or pavement sub base shall be placed at the top of the backfill to such depths as may be specified elsewhere or as directed. The surface shall be brought to the required grade and stones raked out and removed.

405.4 Embankments Over Pipe: Where the top of the pipe is less than three feet below the surface of the ground, additional fill shall be placed to form an embankment to cover and protect the pipe. The top of such embankment shall not be less than three feet above the top of the pipe and not less than one foot wider than the outside diameter of the pipe, with side slopes no steeper than one and one half horizontal to vertical, or of such section as may have been indicated by drawings. Such embankments shall be made of suitable dry earth, well compacted. Embankments must be maintained to the full required dimensions during the maintenance period of the Contract, and any settlement, washout, or deficiency occurring or found during that time shall be rectified and embankments brought up to the required height, width and slopes.

In general, such embankments may be made with materials excavated on the job and not used for backfill elsewhere. Should there not be sufficient surplus material for embankments, or should it be unsuitable or inconveniently located, the Contractor shall secure and provide sufficient suitable material. In any case, where the Town has provided borrow pits from which the Contractor may obtain filling material, the Contractor must conform to the conditions for excavating and moving such material as established by acts of the Town in obtaining such rights, and by indications on drawings or in other contract documents.

Openings through embankments for the passage of water and other purposes will be provided as indicated on drawings or elsewhere, or as ordered.

Grass shall be seeded or turf placed on embankments if, where, and as provided in contract documents. In general, if grassing is not required, the Contractor may, at his option, grass embankments to facilitate his maintenance. The Engineer may order grassing where not otherwise required under the general provisions for additional work if he deems proper.

Care shall be taken that sewer and appurtenances are not damaged by equipment or methods used for making and maintaining embankments.

Except as specific provisions may have been made in the Proposal for a particular contract, no payment other than prices bid for pipe will be paid for building and maintaining embankments or securing material therefore.

If, however, a price per cubic yard was established by the Proposal for filling material placed in embankments and/or in fills at side of embankment to avoid the formation of depressions there, the quantity of such filling material will be estimated and paid as the actual quantity placed, up to, but not exceeding the lines or sections required, measured after the embankment or fill has been made.

405.5 Material for Filling and Embankments: Approved selected materials available from the excavations and not required for backfill around pipes or against structures may be used for filling and building embankments, except as otherwise specified. Material needed in addition to that available from construction operations shall be obtained from approved gravel banks or other approved deposits. The Contractor shall furnish, at no cost, all borrowed material needed on the work.

All material, whether from the excavations of from borrow, shall be of such nature that after it has been placed and properly compacted it will make a dense, stable fill. It shall not contain vegetation, masses of roots, individual roots more than 18 inches long or more than one half inch in diameter, stones over six inches in diameter, or porous matter. Organic matter shall not exceed minor quantities and shall be well distributed.

405.6 Preparation of Subgrade: The Contractor shall remove loam and topsoil, loose vegetable matter, stumps, large roots, etc. from areas upon which embankments will be built or material will be placed for grading. The subgrade shall be shaped as indicated on the drawings and shall be so prepared by forking, furrowing, or plowing so that the first layer of the new material placed thereon will be well bonded to it.

405.7 Placing and Compacting Material: After the subgrade has been prepared as hereinbefore specified, the material shall be placed thereon and built up in successive layers until it has reached the required elevation.

Layers shall not exceed 12 inches in thickness before compaction. In embankments at structures, the layers shall have a slight downward slope away from the structure. In other embankments, the layers shall be slightly dished toward the center. In general, the finer and less pervious materials shall be placed against the structures or in the center, and the coarser and more pervious materials, upon the outer parts of embankments.

Each layer of material shall be compacted by the use of approved rollers or other approved means so as to secure a dense, stable and thoroughly compacted mass. At such points as cannot be reached by mobile mechanical equipment, the materials shall be thoroughly compacted by the use of suitable power driven tampers.

Previously placed or new materials shall be moistened by sprinkling, if required, to ensure proper bond and compaction. No compacting shall be done when the material is too wet, from either rain or too great an application of water, to compact it properly. At such times, the work shall be suspended until the previously placed and new materials have dried out sufficiently to permit proper compaction.

405.8 Compaction Test: When, in the opinion of the Engineer, such tests are necessary, the Contractor shall have compaction density tests taken by an approved independent laboratory. Ninety five percent of the maximum density determined in accordance with AASHTO 180 Method D shall be achieved.

## 406.0 PIPES AND CULVERTS

406.1 General: These items shall conform to Section 6.51 CULVERTS of the Form 816, modified as follows.

Trench excavation, dewatering, and backfill for these items shall be according to Section 403.0 EARTH TRENCH EXCAVATION, Section 404.0 TRENCH DEWATERING, and Section 405.0 BACKFILLING AND CONSOLIDATION of these specifications.

## 407.0 CATCH BASINS AND DROP INLETS

407.1 General: These items shall conform to Section 5.07 CATCH BASINS, MANHOLES, AND DROP INLETS of the Form 816, modified as follows.

Trench excavation, dewatering, and backfill for these items shall be according to Section 403.0 EARTH TRENCH EXCAVATION, Section 404.0 TRENCH DEWATERING, and Section 405.0 BACKFILLING AND CONSOLIDATION of these specifications.

Manholes shall not be included under this item, but shall conform to Section 508.0 MANHOLES of these specifications.

**408.0 RIPRAP**

408.1 General: This item shall conform to Section 7.03 RIPRAP, of the Form 816.

## 411.0 CULVERT ENDS

411.1 General: These items shall conform to Section 6.52 CULVERT ENDS of the Form 816 modified as follows:

Trench excavation, dewatering, and backfill for these items shall be according to Section 403.0 EARTH TRENCH EXCAVATION, Section 404.0 TRENCH DEWATERING, and Section 405.0 BACKFILLING AND CONSOLIDATION of these specifications.

## 412.0 GEOTEXTILE FABRIC

412.1 General: This item shall conform to Section 7.55 GEOTEXTILE of the Form 816, modified as follows:

Geotextile shall be of the type appearing on the CONNDOT Qualified Products List as published by the CONNDOT Division of Research and available on the CONNDOT Website for the application indicated.

## 501.0 CRUSHED STONE SEWER PIPE BEDDING

501.01 General: The Contractor shall lay and cover all sanitary sewer pipe in a bedding of compacted crushed stone or as directed by the Engineer.

501.02 Crushed Stone Foundation Bedding: Unless otherwise provided or directed by the Engineer for a particular portion of a project, all pipe used for main sewers, laterals, connected thereto, or for catch basin drains shall be laid on a foundation of six inches of ¾-inch crushed stone as required by the Engineer.

Crushed stone shall be placed in the trench to a sufficient height so that upon completion of compaction, as required in the specifications, the entire upper surface of the crushed stone shall be no lower than the bottom of the barrel of the pipe to be laid thereon. The upper surface of the crushed stone shall be shaped as necessary to provide proper grade for the pipe to be laid thereon, bell holes shall be made in the crushed stone so that the pipe shall be supported on its barrel portion only, and the pipe laid thereon to line and grade in the manner described in the specifications.

When the pipe is properly positioned, crushed stone, unless otherwise required by the Engineer, shall be pulled or scraped up against the pipe suitably rammed into place along the barrel of the pipe only to firmly hold the pipe in position. Care shall be taken during these operations to assure that the pipe shall not be disturbed.

501.03 Crushed Stone Haunching: Unless otherwise provided for a particular portion of a project, all pipe used for main sewers, laterals connected thereto, or for catch basin drains in sizes up to and including 12-inch and plastic pipe larger than 12-inch size shall be haunched with crushed stone from the crushed stone foundation to a point at least half-way up the side of the pipe and to this same elevation out to the trench wall. The size of the crushed stone shall be ¾-inch. Care shall be taken when placing this crushed stone haunching to assure that the pipe shall not be disturbed. The Contractor shall use any means necessary to assure firm compaction of this crushed stone haunching and adequate side support for the pipe.

501.04 Pipe Laid in Rock Trench: In trenches excavated through rock, the rock shall be removed so that on projecting points or spurs of rock project within the limits described elsewhere herein as minimum clearances for rock excavation. The average clearances on sides of pipe shall be not less than six inches for pipe 18 inches or less in size, eight inches for larger pipe. The bottom of the trench will then be filled with crushed stone, as required or ordered.

In filling under, around, and directly over pipe laid in rock cuts, no fragments of broken rock more than three inches in longest dimension will be allowed to be placed within four inches of any part of the pipe. No fill of larger rock fragments will be allowed on sides of pipe or until pipe has been covered to a depth of at least one foot with fine, compacted material.

501.05 Crushed Stone Bedding on a Synthetic Drainage Fabric: At locations indicated on the plans and as directed by the Engineer, the Contractor shall furnish and place crushed stone bedding on a synthetic drainage fabric. The synthetic drainage fabric shall be Mirafi 140 Fabric as manufactured by Fiber Industries, Inc., subsidiary of Celanese Corporation, or it shall be an approved equal product.

Mirafi 140 or any material proposed as an equal shall conform to the following requirements: (1) The fabric shall be constructed from two types of continuous filament fibers, one being a polypropylene fiber and the other being a fiber with polypropylene

core and nylon sheath. Further, the fabric shall be a random mixture of these fibers formed into a sheet by heating bonding. (2) The fabric shall be rot-proof. (3) The fabric shall not be significantly affected by alkalies and weak acids with PH equal to or greater than 3.0 store fabric prior to use where it will not be exposed to sunlight.

The Contractor shall furnish specifications for, and a sample of, any material proposed as an alternate to Mirafi 140. The Engineer will make comparisons to the specifications for the sample of Mirafi 140 fabric and will make the final decision on the equality.

The Contractor shall provide notarized certification that any alternative material does meet the requirements of these specifications.

The synthetic drainage fabric shall be installed in a trench with a smooth surface bottom, and any sharp object shall be removed to avoid fabric punctures. The fabric shall not be placed until the Engineer has approved the surface upon which it will be placed.

The laying of fabric shall be scheduled such that the lengthy exposure of the fabric to sunlight will be avoided. The fabric shall be placed in double layers on the bottom of trench and turned up at trench sides to the height shown on the plans, or as directed by the Engineer. Fabric shall be laid smoothly. At joints, fabric shall be overlapped at least three feet. Inadvertent tears or punctures in the fabric may be repaired by placing an additional layer of fabric over tear or puncture with an overlap of three feet from the damaged area.

After the fabric has been placed and approved by the Engineer, crushed stone bedding shall be placed and compacted to dimensions as shown on the plans or as directed by the Engineer. If the fabric is punctured during placing of the stone, fabric shall be repaired to the satisfaction of the Engineer at the expense of the Contractor.

## 502.0 POLYVINYL CHLORIDE SEWERS

502.01 General: The Contractor shall furnish all materials, labor, tools and equipment and shall construct the polyvinyl chloride pipe sewers as indicated on the drawings and as herein specified.

502.02 Pipe: The requirements of this specification are to provide pipe and fittings suitable for non-pressure drainage or sewage and certain other liquid wastes where toughness, resistance to deterioration from the action of water and chemicals, dimensional stability, resistance to aging and tight joints are required.

502.03 Materials: The pipe and fittings shall be made from Virgin Type 1, Grade 1 polyvinyl chloride compounds as defined and described in ASTM Specification D-1784 for "Rigid Poly (Vinyl Chloride) Compounds and Chlorinated Poly (Vinyl Chloride) Compounds".

Clean rework material, generated from the manufacturer's own pipe or fitting production, may be used by the same manufacturer provided the pipe and fittings so produced meet the requirements of this specification.

502.04 Physical and Chemical Properties: The physical and chemical properties shall conform to those minimums specified for Type 1, Grade 1 polyvinyl chloride compound designated in ASTM Specification D-1784 noted above.

502.05 Dimensions: The standard length of pipe used in house connections and/or laterals shall not exceed 6.5 feet in length unless otherwise approved by the Engineer.

The pipe shall be manufactured to the following dimensions:

| NOMINAL SIZE | OUTSIDE DIAMETER | MINIMUM WALL THICKNESS DR-42 | DR-35 |
|---|---|---|---|
| 6 | 6.275 | 0.180 | 0.180 |
| 8 | 8.400 | 0.200 | 0.240 |
| 10 | 10.500 | 0.250 | 0.300 |
| 12 | 12.500 | 0.300 | 0.360 |
| 15 | 15.300 | 0.375 | ASTM 3033 |

All dimensions to inches.

Fittings shall be made in sizes, and to the dimensions of standard pipe, as shown above. If dimensions, structural design, or materials from which they are manufactured vary from other provisions of this specification, it shall be done so with the approval of the Engineer.

502.06 Joints: Joints shall be the bell and spigot type subject to the approval of the Engineer.

All joints shall meet the requirements of ASTM D 3212 Standard Specifications for "Joint and Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals". Joints shall be sealed with a rubber compression gasket, approved by the Engineer and shall be of a composition and texture which is resistant to common ingredients of sewage, industrial wastes, including oils and ground water, and which will endure permanently under the conditions likely to be imposed by this use. The tensile strength shall be at least 1,300 psi. The elongation at rupture shall be such that two-inch gauge marks shall stretch to not less than ten inches. Hardness shall be between 40 and 50, as measured with a Shore Durometer. The compression set (constant deflection) shall not exceed 25 percent

of the original deflection. The tensile strength after accelerated aging joint, when assembled, must be able to withstand a hydraulic pressure internally of at least 10 psi.

502.07 Fittings: Wyes, tees, bends, and adapters, and any other fittings required by the Engineer shall be provided. Plans for such fittings showing cross-sectional views with dimensions shall be provided, and such plans and fittings shall be approved by the Engineer prior to their use. The materials used in the manufacture of fittings shall conform with the requirements for the pipe with which they shall be used and any variation of such requirements shall be subject to the approval of the Engineer.

502.08 Testing: Pipe shall be tested when requested by the Engineer, and all sizes of pipe so designated shall be tested as follows:

Pipe shall be tested in accordance with ASTM D-2412-68 Standard Method of "Test for External Loading Properties of Plastic Pipe by Parallel-Plate Loading".

The minimum value of pipe stiffness at five percent deflection computed from data obtained from the above testing procedure shall be indicated in Table 1.

TABLE 1

Minimum Value of Pipe Stiffness at 5% Deflection

| NOMINAL PIPE SIZE | PIPE STIFFNESS |
|---|---|
| 6 Inch | 32 PSI |
| 8 Inch | 28 PSI |
| 10 Inch | 17 PSI |
| 12 Inch | 17 PSI |
| 15 Inch | 17 PSI |

502.09 Marking: Pipe shall be marked along the outside of the barrel in bold type and shall indicate the manufacturer's name, pipe size, PVC compound used, i.e. PVC Type 1, Grade 1 and the ASTM material specification for the PVC compound used, i.e. ASTM D-1784.

502.10 Workmanship: The pipe and fittings shall be homogeneous throughout and free from visible cracks, holes, foreign inclusions or other injurious defects. The pipe shall be as uniform as commercially practical in color, opacity, density and other physical properties.

502.11 Waterstops: The manufacturer shall provide waterstops acceptable to the Engineer which shall be applied to the outside of plastic pipe when the pipe is to be enclosed in a structure where concrete or mortar is used which will prevent leakage along the outer wall of the barrel of the pipe.

502.12 Allowable Pipe Deflection: Plastic pipe provided under this specification shall be so installed in the ground that a deflection of no more than five percent can be anticipated. Such deflection shall be computed by dividing the amount of deflection (nominal diameter less minimum diameter when measured) by the nominal diameter of the pipe.

However, between any two adjacent manholes, the average deflection shall not exceed six percent and no deflection at any point in the pipe shall exceed seven percent, computed in the manner described herein.

After an initial inspection and, if in the opinion of the Engineer the deflection may be excessive, the Engineer may order the Contractor to arrange for and take accurate measurements of the pipe at whatever intervals and at whatever locations between such adjacent manholes the Engineer deems advisable.

All costs involved in taking measurements ordered by the Engineer following the initial inspection shall be borne by the Contractor if the deflection in the pipe exceeds either of the maximum limits specified herein. If neither of the maximum limits are exceeded, all costs shall be borne by the Town.

502.13 Pipe Straightness: No single piece of pipe shall be laid on any project covered by these detailed specifications unless it is found to be generally straight. Such pipe shall have a maximum ordinate as measured from the concave side of the pipe not to exceed 1/16-inches per foot of length. If the deviation from straightness exceeds this requirement, then the particular piece of pipe shall be rejected for use until it can comply with this provision. This molded bell of each pipe section shall be concentric and true with the wall and theoretical center lien axis of the pipe barrel. If the deviation from straightness exceeds these requirements and/or the molded configuration of the bell with respect to the pipe axis is questionable, then the particular piece of pipe shall be rejected for use.

502.14 Certification: At the time of shipment, a copy of the manufacturer's test report or a statement by the seller accompanied by a copy of the test report shall be included with the pipe. The seller's statement or the manufacturer's report shall state that the material has been sampled, tested, and inspected in accordance with ASTM Specification D-3033 and that the pipe conforms with these specifications.

502.15 Handling Pipe: All pipe shall be stored at the site until installation in a manner acceptable to the Engineer which will keep the pipe at ambient outdoor temperatures. Temporary shading shall be provided as required to meet this requirement. Simply covering the pipe or structures which allows temperature build-up when exposed to direct sunlight will not be permitted.

Each pipe unit shall be handled into its position in the trench only in such manner and by such means as acceptable to the Engineer. Care shall be taken to avoid damaging the pipe and fittings.

502.16 Installation: Each pipe unit shall be inspected before being installed. No single piece of pipe shall be laid unless it is generally straight. The centerline of the pipe shall not deviate from a straight line drawn between the centers of the openings at the ends of the pipe by more than 1/16-inch per foot of length. If a piece of pipe fails to meet this requirement for straightness, it shall be rejected and removed from the site. Any pipe unit or fitting discovered to be defective either before or after installation shall be removed and replaced with a sound unit.

Except as otherwise indicated on the drawings, the pipe shall be supported by compacted crushed stone. No pipe or fitting shall be permanently supported on saddles, blocking, or stones. Crushed stone shall be as specified under CRUSHED STONE SEWER PIPE BEDDING.

Suitable bell holes shall be provided so that after placement, only the barrel of the pipe receives bearing pressure from the supporting material.

All pipe and fittings shall be cleared of all debris, dirt, etc. before being installed and shall be kept clean until accepted in the complete work.

Pipe and fittings shall be installed to the lines and grades indicated on the drawings or as required by the Engineer. Care shall be taken to ensure true alignments and gradients.

Before any joint is made, the previously installed unit shall be checked to assure that a close joint with the adjoining unit has been maintained and that the inverts are matched and conform to the required grade. The pipe shall not be driven down to the required grade by striking it with a shovel handle, timber, or other unyielding object.

All joint surfaces shall be cleaned. Immediately before jointing the pipe, the bell or groove shall be lubricated in accordance with the manufacturer's recommendation. Each pipe unit shall then be carefully pushed into place without damage to pipe or gasket. Suitable devices shall be used to force the pipe units together so that they will fit with a minimum open recess inside and outside and have tightly sealed joints. Care shall be taken not to use such force as to wedge apart and split the bell or groove ends.

Joints shall not be "pulled" or "cramped" unless permitted by the Engineer.

Where any two pipe units do not fit each other closely enough to enable them to be properly jointed, they shall be removed and replaced with suitable units and new gaskets.

Details of gasket installation and joint assembly shall follow the direction of the manufacturers of the joint material and of the pipe, all subject to review by the Engineer. The resulting joints shall be water tight and flexible.

All pre-molded gasket joint polyvinyl chloride pipe of a particular manufacturer may be rejected if there are more than five unsatisfactory joint assembly operations or "bell breaks" in 100 consecutive joints, even though the pipe and joint conform to the appropriate ASTM Specifications as hereinbefore specified. If the pipe is unsatisfactory as determined above, the Contractor shall, if required, remove all pipe of that manufacturer of the same shipment from the work and shall furnish pipe from another manufacturer which will conform to all of the requirements of these specifications.

Open ends of pipe and branches shall be closed with polyvinyl chloride stoppers secured in place in an acceptable manner.

After each pipe has been properly bedded, enough crushed stone shall be placed between the pipe and the sides of the trench and thoroughly compacted to hold the pipe in correct alignment. Bell holes provided for jointing shall be filled with crushed stone and compacted and then crushed stone shall be placed and compacted to complete the pipe bedding as indicated on the drawings.

The Contractor shall take all necessary precautions to prevent flotation of the pipe in the trench. At all times when pipe installation is not in progress, the open ends of the pipe shall be closed with temporary watertight plugs, or by other acceptable means.

If water is in trench when work is to be resumed, the plug shall not be removed until suitable provisions have been made to prevent water, earth, or other substances from entering the pipe. Pipelines shall not be used as conductors for trench drainage during construction.

502.17 Cleaning: Care shall be taken to prevent earth, water, and other materials from entering the pipeline. As soon as possible after the pipe and manholes are completed, the Contractor shall cleanout the pipeline and manholes, being careful to prevent soil, water, and debris from entering any existing sewer.

## 504.0 CAST IRON AND DUCTILE IRON PIPE AND FITTINGS

504.1 General: The Contractor shall furnish, lay, joint and test all cast iron pressure pipe, fittings (including special castings), and appurtenant materials and equipment, all as indicated on the drawings and as herein specified.

Wherever a pressure classification (e.g. Class 150) is indicated or specified, it shall mean that working pressure for laying Condition B under five feet (5') of cover as defined by the applicable standard specification for the type of pipe to which it pertains.

Wherever flanged pipe inside of structures is indicated on the drawings, the Contractor may, at his option, substitute split couplings of the rigid joint type.

Wherever cast iron pipe is indicated, the Contractor may, at his option, use either gray cast iron or ductile iron for pipe and fittings.

At the Contractor's option, joints in buried exterior pipelines shall be either push-on joints or mechanical joints.

504.2 Shop and Working Drawings: As required by the General Specifications, the Contractor shall submit completely detailed shop and working drawings of the piping. Such drawings shall show the piping layouts in full detail, the location of pipe hangers and supports, large-scale details of all special castings, and location and type of back-up block or device to prevent joints from pulling apart. The drawings shall be fully dimensioned and contain schedules of all pipe, fittings, special castings and other appurtenances.

504.3 Standard Specifications: All pipe, fittings and accessories shall conform to the requirements of the following standard specifications, as applicable:

a. ANSI Standard for Thickness Design of Cast Iron Pipe (A21.1-1967).

b. ANSI Standard for Cast Iron Pipe Centrifugally Cast in Metal Molds for Water or Other Liquids (A21.6-1975).

c. ANSI Standard for Cast Iron Pipe Centrifugally Cast in Sand-Lined Molds for Water or Other Liquids (A21.8-1975).

d. ANSI Standard for Gray Iron and Ductile Iron Fittings, 2-Inch through 48-Inch for Water and Other Liquids (A21.10-1971) and Supplement (A21.10a-1972).

e. ANSI Standard for Rubber Gasket Joints for Cast Iron and Ductile Iron Pressure Pipe and Fittings (A21.11-1972.

f. ANSI Standard for Flanged Cast Iron and Ductile Iron Pipe with Threaded Flanges (A21.15-1975).

g. ANSI Standard for Thickness Design of Ductile Iron Pipe (A21.50-1976).

h. ANSI Standard for Ductile Iron Pipe Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids (A21.51-1976).

i. ANSI Standard for Cast Iron Pipe Flanges and Flanged Fittings, 25, 125, 250 and 800-pound (B16.1-1975).

504.4 Cast Iron Pipe: All cast iron pipe shall be designed in accordance with the above-mentioned ANSI A21.1 and shall be manufactured in accordance with ANSI A21.6, ANSI A21.8, or ANSI A21.15.

Unless otherwise indicated or specified, all cast iron pipe shall be Class 150. Joints shall be as indicated and as herein specified.

504.5 Ductile Iron Pipe: All ductile iron pipe shall be designed in accordance with the above-mentioned ANSI A21.51.

Unless otherwise indicated or specified, ductile iron pipe shall be at least thickness Class 51 for pipe four inches (4") and smaller and at least thickness Class 50 for pipe six inches (6") and larger. Joints shall be as indicated and as herein specified.

504.6 Pipe for Use With Couplings: Pipe for use with sleeve-type couplings shall be as specified above except that the ends shall be plain (without bells or beads). The ends shall be cast or machined at right angles to the axis.

504.7 Fittings: Fittings shall conform to the requirements of the above-mentioned ANSI 21.10 and shall be of a pressure classification at least equal to that of the pipe with which they are used. Unless otherwise indicated or specified, fittings shall be all bell fittings.

Flanged fittings shall be faced and drilled in accordance with the above-mentioned ANSI A21.10 except that special drilling or tapping shall be provided as necessary to ensure correct alignment and bolting.

Flanged fittings that are not available under ANSI A21.10 (e.g. laterals or reducing ells) shall be furnished to conform to the requirements of the above-mentioned ANSI B16.1 in the 125-pound pressure class.

Fittings shall be provided with standard bases where so indicated.

504.8 Non-Standard Fittings and Wall Castings: Fittings having non-standard dimensions and cast especially for this project shall be manufactured to meet the requirements of the same specifications and shall have the same diameter and thickness as standard fittings, but their laying lengths and types of ends shall be determined by their positions in the pipelines and by the particular piping to which they connect.

Wall castings shall be of the sizes and types indicated on the drawings. Flanges, facing and drilling shall conform to ANSI A21.10 except where required, as where a flange is substantially flush with the face of a masonry wall, flanges shall be drilled and tapped for studs. Other dimensions shall be substantially equal to corresponding parts of standard fittings. A central fin not less than one-half inch (½") thick and of the same diameter as a flange shall be cast on the barrel at a point that will locate it midway through the wall to form a water stop.

504.9 Adapters: Where it is necessary to joint pipe of different type, the Contractor shall furnish and install the necessary adapters unless solid sleeves are indicated on the drawings or permitted. Adapters shall have ends conforming to the above specifications for the appropriate type of joint to receive the adjoining pipe. Adapters joining two classes of pipe may be of the lighter class provided that the annular space in bell-and-spigot type joints will be sufficient for proper jointing.

504.10 Types of Joints: Joints for cast iron pipe shall be as hereinafter specified.

Where so indicated, pipe and fittings shall be furnished with approved lugs or hocks cast integrally for use with bolts or bridle rods and socket clamps to keep the piping from pulling apart under pressure.

Joints for push-on and mechanical joint pipe shall conform to ANSI A21.11. The plain end of push-on pipe shall be factory machined to a true circle and chamfered to facilitate fitting the gasket.

Push-on and mechanical joint pipe and fittings shall be provided with sufficient quantities of accessories conforming to ANSI A21.11.

Gasket shall be of a composition suitable for exposure to the liquid within the pipe.

Flanges for flanged pipe shall conform to ANSI A21.15 except that special drilling or tapping shall be as necessary to ensure correct alignment and bolting.

504.11 Flexible Connections: Where flexible connections in the piping are specified or indicated on the drawings, they shall be obtained by the use of sleeve-type couplings, split couplings, or mechanical joint pipe and/or fittings as herein specified.

504.12 Sleeve-Type Couplings: To ensure correct fitting of pipe and couplings, all sleeve-type couplings and accessories shall be furnished by the supplier of the pipe and shall be of a pressure rating at least equal to that of the pipeline in which they are to be installed. Sleeve-type couplings shall be made by Dresser Mfg. Div., Bradford, PA; Smith-Blair, Inc., San Francisco, CA; R.H. Baker & Co., Inc., Huntington Park, CA; or be acceptable equivalent products.

Couplings for buried pipe shall be of cast iron and shall be Dresser Style 53 or 153, Smith-Blair Style 431, Baker Allcast, or acceptable equivalent products. The couplings shall be provided with galvanized steel bolts and nuts.

Couplings for exposed pipe shall be of steel and shall be Dresser Style 38, Smith-Blair Style 411, Baker Allsteel, or acceptable equivalent products. The couplings shall be provided with steel bolts and nuts.

All couplings shall be furnished with the pipe stop removed. Couplings shall be provided with gaskets of a composition suitable for exposure to the liquid within the pipe.

504.13 Filling Rings: The Contractor shall provide suitable filling rings where the layout of the flanged piping is such as to necessitate their use. In materials, workmanship, facing and drilling, such rings shall conform to the 125-pound ANSI Standards. Filling rings shall be of suitable length with non-parallel faces and corresponding drilling, if necessary, to ensure correct assembly of the adjoining piping or equipment.

504.14 Coating: Unless otherwise specified, pipe shall be double cement lined inside and then asphalt seal coated on the outside and inside approximately 1 mil. thick. The cement lining shall conform to ANSI A21.4. The pipe shall be furnished along with necessary materials and equipment recommended by the manufacturer for use in joining pipe lengths and fittings.

The outside of pipe and fittings within structures shall not be coated with the bituminous coating, but shall be thoroughly cleaned and given one shop coat of Inertol Rust-inhibitive Primer 621 made by Koppers Co., Inc., Pittsburgh, PA; Multiprime made by PPG Industries, Inc., Pittburgh, PA; Chromox 13R50 Primer made by Mobil Chemical Co., Edison, NJ; or an acceptable equivalent product.

Castings to be encased in concrete shall not have an exterior coating. Machined surfaces shall be cleaned and coated with a suitable rust-preventative coating at the shop immediately after being machined.

504.15 Inspection and Testing: All pipe and fittings shall be inspected and tested at the foundry as required by the standard specifications to which the material is manufactured. The Contractor shall furnish, in duplicate to the Engineer, sworn certificates of such tests.

In addition, the Town reserves the right to have any or all pipe, fittings and special castings inspected and/or tested by an independent service at either the manufacturer's plant or elsewhere. Such inspection and/or tests shall be at the Town's expense.

Pipes and fittings shall be subjected to a careful inspection and a hammer test just before being laid or installed.

504.16 Gaskets, Bolts and Nuts: For flanged joints, gaskets shall be ring gaskets of rubber with cloth insertion. Gaskets twelve inches (12") in diameter and smaller shall be 1/16-inch thick. Gaskets larger than twelve inches (12") shall be 1/8-inch thick.

Flanged joints shall be made with bolts, bolt studs with a nut on each end, or studs with nuts where the flange is tapped. The number and size of bolts shall conform to the same American National Standard as the flanges. Bolts and nuts shall be Grade B, except as otherwise specified or noted on the drawings, conforming to the ASTM Standard Specification for Carbon Steel, Externally and Internally Threaded Standard Fasteners, Designation A307-74. Bolt studs and studs shall be of the same quality as machine bolts.

504.17 Handling and Cutting Pipe: The Contractor's attention is directed to the fact that cast iron used for pipe and fittings is comparatively brittle. Every care shall be taken in handling and laying pipe and fittings to avoid damaging the pipe, scratching or marring machined surfaces, and abrasion of the pipe coating.

Any fitting showing a crack and any fitting or pipe that has received a severe blow that may have caused an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work.

In any pipe showing a distinct crack and in which it is believed there is no incipient fracture beyond the limits of the visible crack, the cracked portions, if so approved, may be cut off by and at the expense of the Contractor before the pipe is laid so that the pipe used is perfectly sound. The cut shall be made in the sound barrel at a point at least 12 inches from the visible limits of the crack.

Except as otherwise approved, all cutting shall be done with a machine having rolling wheel cutters, knives, or saws adapted to the purpose. Hammer and chisel or so-called wheel snap cutters shall not be used to cut pipe. All cut ends shall be examined for possible cracks caused by cutting.

Cut ends to be used with push-on joints shall be carefully chamfered to prevent cutting the gasket when the pipe is laid or installed.

504.18 Installing Pipe and Fittings: No defective pipe or fittings shall be laid or placed in the piping, and any piece discovered to be defective after having been laid or placed shall be removed and replaced by a sound and satisfactory piece.

Each pipe and fitting shall be cleared of all debris, dirt, etc. before being laid and shall be kept clean until accepted in the complete work.

Pipe and fittings shall be laid accurately to the lines and grades indicated on the drawings or as required. Care shall be taken to ensure a good alignment both horizontally and vertically. In buried pipelines, each pipe shall have a firm bearing along its entire length.

The deflection of alignment at a joint shall not exceed the appropriate permissible deflection as specified in the tabulation entitled “Pipe Deflection Allowances”.

When mechanical joint, push-on joint, or similar pipe is laid, the bell of the pipe shall be cleaned of excess tar or other obstruction and wiped out before the cleaned and prepared spigot of the next pipe is inserted into it. The new pipe shall be shoved firmly into place until properly seated and held securely until the joint has been completed.

Casting to be encased in masonry shall be accurately set with the bolt holes, if any, carefully aligned. Immediately prior to being set, castings shall be thoroughly cleaned of all rust, scale, and other foreign material.

PIPE DEFLECTION ALLOWANCE FOR FORCE MAIN

Maximum Permissible Deflection in.*

| Size of Pipe, in. | Push-On Joint | Mechanical Joint |
|---|---|---|
| 4 | 17 | 28 |
| 6 | 17 | 24 |
| 8 | 17 | 18 |
| 10 | 17 | 18 |
| 12 | 17 | 18 |
| 14 | 10 | 12 |
| 16 | 10 | 12 |
| 18 | 10 | 10 |
| 20 | 10 | 10 |
| 24 | 10 | 8 |
| 30 | 10 | 8 |

PIPE DEFLECTION ALLOWANCE FOR FORCE MAIN

Maximum Permissible Deflection in.*

| Size of Pipe, in. | Push-On Joint | Mechanical Joint |
|---|---|---|
| 36 | 10 | 7 |
| 42 | 6 | 6 |
| 48 | 6 | 6 |

*Maximum permissible deflection for 16-foot length; maximum permissible deflections for other lengths shall be in proportion to such lengths to 16 feet.

504.19 Temporary Plugs: At all times when pipe laying is not actually in progress, the open ends of pipe shall be closed by temporary watertight plugs or by other approved means. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe has passed.

504.20 Assembling Push-On Joints: Push-on joints shall be made up by first inserting the gasket into the groove of the bell and applying a thin film of special non-toxic gasket lubricant uniformly over the inner surface of the gasket that will be in contact with the spigot end of the pipe. The chamfered end of the plain pipe shall be inserted into the gasket and then forced past it until it seats against the bottom of the socket.

504.21 Bolted Joints: Materials for bolted joints shall be as hereinbefore specified. Before the pieces are assembled, rust-preventive coatings shall be removed from machined surfaces. Pipe ends, sockets, sleeves, housings, and gaskets shall be thoroughly cleaned and all burrs and other defects shall be carefully smoothed.

504.22 Assembling Flanged Joints: Flanged joints shall be made up tight, care being taken to prevent undue strain upon pump nozzles, valves, and other pieces of equipment.

504.23 Assembling Mechanical Joints: Surfaces against which the gasket will come in contact shall be thoroughly brushed with a wire brush prior to assembly of the joint. The gasket shall be cleaned. The gasket, bell and spigot shall be lubricated by being washed with soapy water. The gland and gasket, in that order, shall be slipped over the spigot, and the spigot shall be inserted into the bell until it is correctly seated. The gasket shall then be seated evenly in the bell at all points, centering the spigot, and the gland shall be pressed firmly against the gasket. After all bolts have been inserted and the nuts have been made finger-tight, diametrically opposite nuts shall be progressively and uniformly tightened all around the joint to the proper tension, preferably by means of a torque wrench.

The correct torque as indicated by a torque wrench and the length wrench (if not a torque wrench) used by an average man to produce such range of torque shall not exceed the values specified in the tabulation entitled “Torque Range Values”.

TORQUE RANGE VALUES

| Nominal Pipe Size, in. | Bolt Diameter, in. | Range of Torque, Ft. – Lb. | Length of Wrench, in. |
|---|---|---|---|
| 3 | 5/8 | 40-60 | 8 |
| 4-24, incl. | 3/4 | 60-90 | 10 |
| 30, 36 | 1 | 70-100 | 12 |
| 42, 48 | 1-1/4 | 90-120 | 14 |

If effective sealing of the joint is not attained at the maximum torque indicated above, the joint shall be disassembled and thoroughly cleaned, then reassembled. Bolts shall not be over stressed to tighten a leaking joint.

504.24 Assembling Sleeve-Type Couplings: Prior to the installation of sleeve-type couplings, the pipe ends shall be cleaned thoroughly for a distance of eight inches (8”). Soapy water may be used as a gasket lubricant. A follower and gasket, in that order, shall be slipped over each pipe to a distance of about six inches (6”) from the end, and the middle ring shall be placed on the already laid pipe end until it is properly centered over the joint.

The other pipe end shall be inserted into the middle ring and brought to proper position in relation to the pipe already laid. The gaskets and followers shall then be pressed evenly and firmly into the middle ring flares. After the bolts have been inserted and all nuts have been made up finger-tight, diametrically opposite nuts shall be progressively and uniformly tightened all around the joint, preferably by use of a torque wrench of the appropriate size and torque for the bolts.

TORQUE

| Nominal Pipe Size, in. | Bolt Diameter, in. | Maximum Torque Ft. – Lb. |
|---|---|---|
| 3-24 | 5/8 | 75 |
| 30-36 (1/2 in. mid. ring) | 5/8 | 65 |
| 30-36 (3/8 in. mid. ring) | 5/8 | 70 |
| 30-48 | 3/4 | 80 |
| 48-72 | 3/4 | 70 |

After assembly and inspection and before being backfilled, all exterior surfaces of buried sleeve-type couplings, including the middle and follower rings, bolts and nuts, shall be thoroughly coated with an approved heavy-bodied bituminous mastic. Care shall be taken and appropriate devices used to ensure that the undersides, as well as the more readily accessible parts, are well coated.

504.25 Setting Appurtenances: All valves, fittings and appurtenances shall be set and jointed as indicated on the drawings.

504.26 Socket Pipe Clamps, Tierods and Bridles: Where indicated or necessary to prevent joints or sleeve couplings from pulling apart under pressure, suitable socket pipe clamps, tierods and bridles shall be provided. Bridles and tierods shall be at least 3/4-inch in diameter except where they replace flange bolts of smaller size, in which case they shall be fitted with a nut on each side of the pair of flanges. The socket clamps and tierods or bridles shall be coated with an approved bituminous paint after assembly or, if necessary, prior to assembly.

504.27 Piping Support: The Contractor shall furnish and install all supports necessary to hold the piping and appurtenances in a firm, substantial manner at the lines and grades indicated on the drawings or as specified.

All pipe and appurtenances connected to equipment shall be supported in such a manner as to prevent any strain being imposed on the equipment. When manufacturers have indicated requirements that piping loads shall not be transmitted to their equipment, the Contractor shall submit a certification from the manufacturer stating that such requirements have been complied with.

Where necessary, bends, tees and other fittings in pipelines buried in the ground shall be backed up with Class B concrete placed against undisturbed earth where firm support can be obtained. If the soil does not provide firm support, then suitable bridle rods, clamps and accessories to brace the fitting properly shall be provided. Such bridle rods, etc. shall be coated thoroughly and heavily with an approved bituminous paint after assembly or, if necessary, prior to assembly.

504.28 Cleaning: Prior to the pressure and leakage tests, the piping shall be thoroughly cleaned of all dirt, dust, oil, grease and other foreign material. This work shall be done with care to avoid damage to linings and coatings.

## 506.0 POLYVINYL CHLORIDE SEWER LATERALS

506.01 General: The work under this item shall consist of the construction of building connection laterals in accordance with details as shown on the plans and as specified herein. Construction shall be at locations shown on the plans or as determined by the Engineer.

506.02 Material: Pipe material for building lateral connections shall be that which is approved by the Engineer and in most instances it would be the same material as that used for the main sewer line. When reinforced concrete pipe is used for main sewer line, a pipe of an acceptable material as specified in the contract documents or as approved by the Engineer shall be used for the lateral connections. The size of pipe shall be six inches, unless otherwise specified on the plans or directed by the Engineer. The Contractor shall furnish stoppers for plugging the unconnected ends of laterals. Stopper configuration shall be as recommended by the manufacturer of the lateral pipe as approved by the Engineer. Stoppers shall be watertight once installed.

506.03 Construction Methods: Lateral connections shall be of six-inch or larger pipe laid to the grade and to the points ordered. They will not be laid on a grade flatter than one percent, and will usually have eight feet of cover at the curb or street line in most residential streets or zones. On business streets, or streets adjacent to the business section of the city, or where the adjacent land is low, they will have not less than ten feet of cover at the curb, if possible. If so directed, the whole of the trench shall be dug to the required grade before any pipe is laid herein, and the pipe shall be laid closely to line and grade, using a grade line, hand level, or straight edge as may be ordered.

House lateral connections will generally be laid at right angles to the main sewer from Y-branches on sewers by means of 45-degree bends of approved form, or from inlets built into other sewers. The Contractor shall take proper means to temporarily locate all wyes, etc. in the main sewer before connections are laid and will be responsible for finding wyes, etc. from which the Contractor is to lay connections or laterals.

Extra care shall be taken to make smooth, close-fitting joints at all bends. Pipes shall be trimmed or extra bends used when ordered to accomplish this, without extra charge. So far as possible, every pipe shall be swabbed out inside after being installed. All requirements for laying pipe of this size, as described elsewhere herein, shall be observed in laying lateral connections so far as those requirements apply. The end of each lateral connection shall be closed with an approved stopper.

Stoppers shall be watertight and yet be installed in a manner which would allow them to be removed with reasonable ease without causing damage to any portion of the lateral.

A stout stake to mark the location and elevation of the end of each lateral will be driven as directed by the inspector near the end of each lateral.

This stake will be protected and maintained undisturbed until the Engineer has completed all his measurements and, if so ordered, will thereafter be removed by the Contractor.

Except where otherwise indicated or ordered, house lateral connections will be of six-inch pipe. If pipe larger than six inches is ordered in a lateral or connection where such larger size had not previously been indicated, and where the price for lateral or connection was based on use of six-inch pipe, the Contractor will be paid the additional cost of the larger size pipe over and above what would have been the cost of equivalent six-inch pipe and fittings.

506.04 Sheeting at Branches: Sheeting shall be cut away and removed from in front of capped wyes and other branches or inlets in sewer for future connections to permit conveniently

finding them and making future connections with them. If required by drawings or directed by the Engineer, a 45-degree bend will be set in Y-branches or a short piece of pipe set into inlets left in the sewer, the end of the bend or pipe stub being capped in the manner described previously so that a future connection can be made thereto without excavating against the side of the main sewer.

506.05 Markers at Branches: A piece of lumber not less than two-inch by four-inch will be set vertically and left in place, extending from a point directly in front of, but not in contact with, the capped end of the lateral connection to a point about two feet below the ground surface or finished street grade to guide persons who in future years may have occasion to excavate to find the connections, and to protect the end of the lateral connection from damage when making such excavation.

506.06 Existing House or Catch Basin Drains Relayed: When connections or laterals are indicated to be connected to existing drains at the side of the road, they shall be of the same size as that drain. Whenever the Engineer shall consider it necessary in order to maintain the flow of the old drain or to properly drain the connection trench while relaying the drain, the Contractor shall place a six-inch Y-branch near the main sewer to provide temporary drainage. Any such wye shall be closed and capped when the connection is complete.

Drains re-laid and connected to existing house drain or catch basin at the side of the road will be measured as described for new lateral connections.

506.07 Drains Connected at Trench: Where existing drains are encountered and are to be reconnected to the new sewer at the side of the main trench, they shall be connected as directed by the Engineer, either by means of a chimney with suitable pipe and fittings at the top to make connection to the old drain, or by cutting slightly into the bank at the side of the trench, setting a Y-branch, or suitable fitting in the new line, and installing such pipe, bends and fittings as may be needed to make a satisfactory connection. Pipe and fittings set into the bank of the trench must be supported and secured in place by concrete or selected, well-compacted fill, as may be directed.

Pipe and fittings used for such work shall, so far as possible, be of the same size as the old drain to be connected, but in no case less than six inches in size. Special care must be exercised to be sure that all joints are smooth inside, and tight, and that all pipes, bends, etc. are well-fitted and securely held in place and supported. Connections to the sanitary sewer shall not be made for pipe lines which carry storm or ground water.

## 507.0 PIPE TESTS

507.01 General: The pipeline shall be made as nearly watertight as practicable, and pipe tests and measurements shall be made after the pipeline has been backfilled.

Where the groundwater level is more than one foot above the top of the pipe at its upper end, the Contractor shall conduct an infiltration test. However, if the groundwater level is four feet or less at this point, a low pressure air test may be performed instead. Where the groundwater is less than one foot above the top of the pipe at its upper end, the contractor shall conduct either exfiltration or low pressure air tests as determined by the Engineer.

Tests will be made after the pipe installation is complete including all laterals as indicated on the plan, manholes are installed, and backfill in the trench has been placed and compacted or consolidated as required by the Engineer.

507.02 Visual Alignment Test: Upon completion of a section of pipe, a visual inspection will be made by the Engineer. All associated appurtenances installed in conjunction with the installation of the pipeline will also be examined for compliance with these specifications.

Prior to the visual inspection, the contractor shall ensure that the line has been properly cleaned of all foreign materials that might have entered the pipeline.

The visual alignment test will include the mirroring of all pipelines, and if, in the opinion of the Engineer, the installed pipe does not conform to the alignment indicated on the drawings, or does not satisfy the requirements outlined under “Allowable Pipe Deflection”, the Contractor shall take accurate measurements as outlined elsewhere within these specifications. All pipeline determined to be outside the noted tolerances shall be corrected to the satisfaction of the Engineer at no cost to the Town.

507.03 Low Pressure Air Test:

a. General:

When the Engineer specifies or directs that pipe tests shall be made using the low pressure air test method, the Contractor will be required to provide all equipment, test plugs in the required sizes, appurtenances, connecting hose or pipe, labor, and materials necessary to conduct and control the test as herein specified.

The tests may be conducted by the Contractor using the contractor’s equipment, or a subcontractor approved by the Engineer. All equipment proposed for use in conducting the low pressure air test shall be subject to the approval of the Engineer. The Contractor shall submit shop drawings on the proposed equipment for review by the Engineer. These shop drawings must be in sufficient detail to show the details, set-up, and proposed operation of the low pressure air test equipment, and no testing will be permitted without prior approval of the proposed equipment by the Engineer.

b. Procedure:

The Contractor shall determine the elevation of the groundwater table in the area of the pipeline being subjected to the low pressure air test in a manner approved by the Engineer.

After cleaning and flushing the line, test plugs will be installed in the pipeline being subjected to the low pressure air test, and braced as necessary to secure the plugs in place.

Utilizing the approved equipment, air at low pressure will be slowly introduced into the pipeline until the pressure within the pipeline being tested increases to 4 PSIG greater than the back pressure exerted by the groundwater table over the pipe being tested (back pressure = 1 PSIG per 2.31 feet of water), as determined above. If the water table is not a level above the pipe, the test pressure should be brought up to 4 PSIG. Allow at least two minutes to elapse prior to starting the test. If necessary, allow a small amount of air to slowly enter into the pipeline in order to maintain a pressure of 4 PSIG above the back pressure due to the water table, or 4 PSIG if there is no back pressure to compensate for.

At this point, start measuring the time for the pressure in the pipeline to drop 1 PSIG.

The time necessary to drop 1 PSIG shall not be less than that indicated in Table 507-1 for the size and length of pipeline being tested. If the time is less than that indicated in Table 507-1, the line will be considered as having failed the test.

Any section of pipeline which fails to meet this test will be repaired or replaced as necessary by the Contractor, and retested at no additional expense to the Town.

No pipeline will be considered acceptable until it successfully passes the requirements of this test.

All testing will be conducted by the Contractor or his approved subcontractor in the presence of the Town's inspector. The contractor or subcontractor shall keep a written record which will show the results of the tests conducted. The records should include sufficient data on length of line, pressure levels, time for pressure drop, and related features noted during the testing of each segment of the line. A copy of this record shall be given to the Town.

507.04 Infiltration Test:

a. Reinforced Concrete Pipe:

For making the infiltration tests, the Contractor shall furnish suitable test plugs, water pumps, and appurtenances, and all labor required to properly conduct the test.

The infiltration tests shall be made at a time when the groundwater is at least one foot above the top of the pipe of the highest section of work being tested.

Leakage into the reinforced concrete pipeline shall not exceed 500 gallons per inch diameter in 24 hours per mile of pipeline.

b. Other Sewer Pipe:

The Contractor shall furnish suitable test plugs, water pumps, and appurtenances, and all labor required to properly conduct the pipe tests on the pipeline.

For making the infiltration tests, underdrains, if used, shall be plugged and other groundwater drainage shall be stopped to permit the groundwater to return to its normal level insofar as practicable.

507.05 Exfiltration Tests: For making the exfiltration tests, the pipe shall be subjected to an internal pressure by plugging the pipe at the lower end and then filling the pipelines and

manholes with clean water to a height of two feet above the top of the pipe at its upper end. Where conditions between manholes may result in test pressures which would cause leakage at the stoppers in branches, provisions shall be made by suitable ties, braces, and wedges to secure the stoppers against leakage resulting from the test pressure.

The rate of leakage from the pipe shall be determined by measuring the amount of water required to maintain the level two feet above the top of the pipe.

Leakage from the pipes under test shall not exceed the requirements for leakage into pipes as hereinbefore specified.

The equipment used to introduce the low pressure air into the pipeline shall include a safety valve or release device located in the equipment at a point which will ensure that during the build-up of test pressure, the pipeline being tested will not be subjected to an internal pressure that could damage a properly installed pipe.

All tests shall be conducted on the completed pipeline between manholes. Testing of shorter sections of pipeline will only be permitted with the approval of the Engineer.

Immediately prior to testing, all lines will be cleaned and flushed with water. Pipe manufactured in accordance with ASTM Specifications C-76, C-428, C-644 and/or C-700 shall be soaked for a period of 12 hours to saturate the pipe wall prior to testing with low pressure air.

All gages, controls, and appurtenances for equipment used to conduct the test will be located out of manholes. Connections to the line under test, test plugs, and other equipment will be made with hose or pipe extensions which will safely contain the pressures necessary to conduct and control the test.

The gage used to measure the drop in pressure shall have a four-inch diameter face with a scale of 0 to 15 PSI in 0.1 PSI increments, or as approved by the Engineer.

The Contractor is cautioned of the importance of properly installing the end caps used to plug hubs, wyes, bends, ends of laterals, and other inlets, and securing them against movement during the installation of pipe. Failure to take this precaution can cause a properly installed pipeline to fail the low pressure air test.

The Contractor is cautioned further regarding the safety of personnel during the test. Low pressure air can exert a substantial force on a test plug, even on small diameter pipe plugs. The Contractor will be responsible to ensure that all test plugs utilized are in good condition and that they will not be pressurized beyond the limits recommended by their manufacturer.

No one will be permitted in a manhole containing a test plug while air is under pressure in the pipeline being subjected to the test.

The pipes shall be tested before any connections are made to buildings.

The Contractor shall construct weirs or other means of measurements as may be required.

Suitable bulkheads shall be installed, as required, to permit the test of the pipe.

Should the sections under test fail to meet the requirements, the Contractor shall do all work of locating and repairing the leaks and retesting as the Engineer may require without additional compensation.

The water used to conduct an exfiltration test shall not be allowed to enter any active sewer.

If, in the judgment of the Engineer, it is impracticable to follow the foregoing procedures for any reason, acceptable modifications in the procedures shall be made as required, but in any event, the Contractor shall be responsible for the ultimate tightness of the line within the above test requirements.

Where water for the test is to be obtained from the Metropolitan District's water system or the Manchester water system, proper notification must be given them prior to any drawing of water from a hydrant. Refer to Section 406.03e entitled, "Puddling" for further information on the proper procedure to follow when using a fire hydrant as a source of water.

507.06 High Pressure Water Test: Except as otherwise directed, all pipelines shall be given combined pressure and leakage tests in sections of approved length. The Contractor shall furnish and install suitable temporary testing plugs or caps, all necessary pressure pumps, pipe connections, meters, gages, and other necessary equipment, and all labor required.

Subject to approval, and provided that the tests are made within a reasonable time considering the progress of the project as a whole, and the need to put the section into service, the Contractor may make the tests when the Contractor desires.

However, pipelines in excavation or embedded in concrete shall be tested prior to the backfilling of the excavation or placing of the concrete, and exposed piping shall be tested prior to field painting.

Unless it has already been done, the section of the pipe to be tested shall be filled with water of approved quality, and all air shall be expelled from the pipe. If blow-offs are not available at high points for releasing air, the Contractor shall make the necessary excavations and do the necessary backfilling and make the necessary taps at such points and shall plug said holes after completion of the test.

The section under test shall be maintained full of water for a period of 24 hours prior to the combined pressure and leakage test being applied.

The pressure and leakage test shall consist of first raising the water pressure (based on the elevation of the lowest point of the section under test and corrected to the gage location) to a pressure in pounds per square inch numerically equal to the pressure rating of the pipe, but not to exceed 150 PSI.

While maintaining this pressure, the Contractor shall make a leakage test by metering the flow of water into the pipe. If the average leakage during a two hour period exceeds a rate of ten gallons per inch of diameter per 24 hours per mile of pipeline, the section shall be considered as having failed the test. All joints within chambers and all flanged joints shall have no visible leakage.

**TABLE 507-1**

LOW PRESSURE AIR TEST SPECIFICATIONS

MINIMUM TIME REQUIRED (MINUTES:SECONDS)
FOR A PRESSURE DROP OF 1 PSIG
(BASED ON 0.003 CFM/SQ.FT. AND 2.0 CFM)

| | **PIPE DIAMETER D IN INCHES** | | | | | |
|---|---|---|---|---|---|---|
| **LENGTH OF SECTION BEING TESTED IN FEET** | 6" | 8" | 10" | 12" | 15" | 18" |
| 25 | 0:10 | 0:18 | 0:28 | 0:40 | 1:02 | 1:29 |
| 50 | 0:20 | 0:35 | 0:55 | 1:19 | 2:04 | 2:58 |
| 75 | 0:30 | 0:53 | 1:23 | 1:59 | 3:06 | 4:27 |
| 100 | 0:40 | 1:11 | 1:50 | 2:38 | 4:08 | 5:56 |
| 125 | 0:50 | 1:28 | 2:18 | 3:18 | 5:09 | 7:26 |
| 150 | 0:59 | 1:46 | 2:45 | 3:58 | 6:11 | 8:30 |
| 175 | 1:09 | 2:03 | 3:13 | 4:37 | 7:05 | ↓ |
| 200 | 1:19 | 2:21 | 3:40 | 5:17 | ↓ | ↓ |
| 225 | 1:29 | 2:38 | 4:08 | 5:40 | ↓ | ↓ |
| 250 | 1:39 | 2:56 | 4:35 | ↓ | ↓ | ↓ |
| 275 | 1:49 | 3:14 | 4:43 | ↓ | ↓ | ↓ |
| 300 | 1:59 | 3:31 | ↓ | ↓ | ↓ | ↓ |
| 350 | 2:19 | 3:47 | ↓ | ↓ | ↓ | ↓ |
| 400 | 2:38 | ↓ | ↓ | ↓ | ↓ | ↓ |
| 450 | 2:50 | ↓ | ↓ | ↓ | ↓ | ↓ |
| 500 | 2:50 | 3:47 | 4:43 | 5:40 | 7:05 | 8:30 |

Note: if the section of pipe to be tested is composed of both main line and more than a total of 100 feet of laterals, 1 minute 30 seconds must be added to the length of time indicated above for the test required for the main pipe.

## 508.0 MANHOLES

508.01 General: The Contractor shall furnish all materials and shall construct all the sanitary or storm drain manholes required as part of this Contract, including the frames, covers, steps, inverts, and materials necessary for fastening the frame to the concrete manhole structure.

508.02 Description: Manholes shall conform in shape, size, dimensions, materials, and other respects to the details indicated on the drawings, or as ordered by the Engineer.

All manholes shall have concrete bases. Invert channels will be formed of brick and mortar at the base unless otherwise specified by the Engineer.

Manhole walls (barrels) shall be either of Class A concrete or pre-cast concrete sections. The top three feet of manholes (the dome) shall be built of either Class A concrete or a precast concrete section. Should the Contractor elect to build the domes of manholes in streets with Class A concrete or a precast concrete section, the top six inches of the dome shall be built of brick to permit adjustment of the frame to meet the street surface.

The inverts shall conform accurately to the size of the adjoining pipes. Side inverts shall be curved and main inverts (where direction changes) shall be laid out in smooth curves of the longest possible radius which is tangent to the centerlines of adjoining sewers.

The cast-iron frames and covers shall be the standard frame and cover as indicated on the drawings. The frames and covers shall be set by the Contractor to conform accurately to the grade of the finished pavement, existing ground surface, or as shown on the drawings.

Class A concrete shall conform to the requirements specified under CONCRETE MASONRY.

508.03 Precast Concrete Sections and Bases:

a. Precast concrete sections, if used, shall conform to the ASTM Tentative Specifications for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe Designation C76-63T, Class III, with the following exceptions and additional requirements:

b. There shall be one line of circular reinforcement having an area of at least 0.25 square inches per linear foot of barrel.

c. The barrel shall be not less than five inches thick.

d. Type II cement shall be used except as otherwise approved.

e. Manhole steps shall be as specified under “Manhole Steps”. Steps shall be cast into the section as it is made.

f. Sections shall be steam cured and shall not be shipped until at least seven days after having been cast.

g. Precast manhole bases will have precast rubber boots designed to conform to the changes in the line as specified by the plans.

h. No more than two lift holes may be cast or drilled in each section.

i. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on the inside of the barrel.

j. Acceptance of the sections will be on the basis of material tests and inspection of the completed product.

k. All precast units shall have O-ring rubber of mastic gasket joints.

l. Domes may be precast eccentric sections of similar construction. If precast concrete sections are used, the tops of the bases shall be suitable shaped by means of accurate bell-ring forms to receive the barrel sections.

508.04 Setting Precast Manhole Sections: Precast reinforced concrete manhole sections shall be set so as to be vertical and with sections and steps in true alignment. Joint surfaces of the base or previously set section shall be covered with lubricant and an O-ring installed before the new section is placed or an equivalent.

All holes in sections used for their handling shall be thoroughly plugged with non-shrink mortar. The non-shrink mortar shall be one part cement to one and one-half parts sand/mixed slightly damp to the touch (just short of "balling"); hammered into the holes until it is dense and an excess of paste appears on the surface; and then finished smooth and flush with the adjoining surfaces.

The non-shrink mortar for the above-noted use and for use in sealing of sewer pipe at manholes can be Embeco Mortar (premixed) as manufactured by Master Builders or an approved equal product.

508.05 Brick: The brick shall be sound, hard, and uniformly burned brick, regular and uniform in shape and size of compact texture and satisfactory to the Engineer.

Brick intended for use below ground level shall conform to ASTM Specifications for sewer brick, Serial Number C-32.

Rejected brick shall be immediately removed from the work and brick satisfactory to the Engineer substituted.

508.06 Mortar for Brickwork: The mortar shall be composed of Portland cement, hydrated lime, non-shrink agent, and sand in which the volume of sand shall not exceed three times the sum of the volumes of cement and lime. The proportions of cement and lime shall be as directed and may vary from 1:1/4 for dense, hard-burned brick to 1:3/4 for softer brick. In general, mortar for Grade SA Brick shall be mixed in the proportions of 1:1/2:4-1/2.

Cement shall be Type II Portland cement as specified for concrete masonry.

Hydrated lime shall be type S conforming to the ASTM Standard Specification for Hydrated Lime for Masonry Purposes, Designation C207-49. 4X Hydrate made by the New England Lime Co. will meet this specification.

The sand shall comply with the specifications for "Fine Aggregate" for concrete masonry except that all of the sand shall pass a No. 8 sieve.

508.07 Laying Brickwork: Only clean bricks shall be used in brickwork for manholes. The brick shall be moistened by suitable means as directed until they are neither so dry as to absorb water from the mortar nor so wet as to be slippery when laid.

Each brick shall be laid in a full bed and joint of mortar without requiring subsequent grouting, flushing, or filling and shall be thoroughly bonded as directed. All exposed interior brickwork shall be wiped clean once installed.
Manhole water tables are to be slightly sloped toward the invert (3/4-inch per foot).

508.08 Plastering and Curing Brick Masonry: Outside faces of brick masonry shall be plastered with mortar from ¼-inch to 3/8-inch thick. If required, the masonry shall be properly moistened prior to application of the mortar. The plaster shall be carefully spread and troweled so that all cracks are thoroughly worked out. After hardening, the plaster shall be carefully checked by being tapped for bond and soundness. Unbonded or unsound plaster shall be removed and replaced.

Brick masonry and plaster shall be protected from too rapid drying by the use of burlaps kept moist, or by other approved methods, and shall be protected from the weather and frost, all as required.

508.09 Coating: The exterior surfaces of all manholes shall be given two coats of bituminous waterproofing material. The material shall be Minwax Fibrous Brush Coat made by the Minwax Co., Inc., New York, NY: Tremco 121 Foundation Coating made by the Tremco Manufacturing Co., Cleveland, OH: Inertol No. 7 made by the Inertol Co., Inc., Newark 5, NJ: or approved equal products. The waterproofing material shall be applied by brush or spray and in accordance with the instruction of the manufacturer. Time shall be allowed between coats to permit sufficient drying so that the application of the second coat has no effect on the first coat.

508.10 Alterations of Existing Manholes or Pipe: Where called for on the plans, directed by the Engineer, or necessary for the new construction, existing manholes and pipes shall be altered as required. Alterations shall include, but not be limited to, cutting new entrances into manhole for pipe, cutting or plugging existing pipe, making necessary changes in invert or steps, adjusting frames by raising or lowering, and proper control of waste material in active lines. Payment for this item will be made at the contract unit price. Payment shall include all costs and labor incidental to altering the structure to the required end result.

508.11 Manhole Frames and Covers: The Contractor shall furnish all cast-iron manhole frames and covers conforming to the details shown on the drawings, or as herein specified. The castings shall be of good quality, strong, tough, even-grained cast iron, smooth, free from scale, lumps, blisters, sand holes, and defects of every nature which would render them unfit for the service for which they are intended.

Contact surfaces of covers and frames seats shall be machined to prevent rocking of covers.

All castings shall be thoroughly cleaned and subject to a careful hammer inspection.

Sanitary sewer manhole covers shall have the word “SEWER” embossed in three-inch letters as shown on the standard details.

Storm drainage manhole covers shall have the word “STORM” or “DRAIN” embossed in three-inch letters as shown on the standard details.

Castings shall be at least Class 25 Conforming to the ASTM Specification for gray Iron Castings, Designation A48 as amended to date.

508.12 Setting Manhole Frames and Covers: Manhole frames shall be set with the tops conforming accurately to the grade of the pavement or finished ground surface or as

indicated on the drawings as directed. Frames shall be set concentric with the top of the masonry and in a full bed of mortar so that the space between the top of the manhole masonry and the bottom flange of the frame shall be completely filled and made watertight. A thick ring of mortar extending to the outer edge of the masonry shall be placed all around the bottom and over the top of the flange. The mortar shall be smoothly finished and have a slight slope to shed water away from the frame.

Manhole covers shall be left in place in the frames on completion of other work at the manholes. Manholes located off of the traveled roadway shall have their frames lagged to the manhole wall.

508.13 Stubs in Manholes: Stubs placed as specified and indicated on the drawings shall be either short pieces cut from the bell ends or shall be four feet, zero inch-length of reinforced concrete pipe with bulkheads. Stubs shall be set accurately to the required line and elevation and encased in the manhole masonry as shown on the drawings. Where booted-type manholes are used, no stub will be necessary. The boot shall be properly plugged. Any uncalled for boot shall be removed and the hole properly sealed with brick or a boot may be plugged if the Engineer so directs.

508.14 Drop Inlet to Manhole: Drops for sanitary sewer manholes shall be accomplished in conformity with the details found elsewhere within these documents and in accordance with the provisions of these specifications for the various materials and work which constitute the complete structure.

508.15 Manhole Steps: Unless otherwise indicated, manhole steps shall be installed as shown within the Town of Glastonbury details for plastic manhole steps or an approved equal product. The steps shall be thoroughly clean and dry before being built into the masonry.

## 509.0 RESET MANHOLE

509.1 General: Under this item shall be included the alteration or reconstruction of existing manholes in conformity with the lines, grades, dimensions, and details shown on the plans, or as ordered, and in accordance with the provisions of these specifications for the various materials and work which constitute the completed structure.

509.2 Construction Methods: Frames, covers and tops which are to be reset shall be removed from their present beds, the walls or sides shall be rebuilt to conform to the requirements of the new construction and the tops, frames and covers reset, or the grates or covers may be raised by extensions of suitable height approved by the Engineer.

Resetting tops, frames and covers will be measured as units. When resetting tops, frames and covers, there will be no measurement for excavation; cutting, removal and replacement of pavement; pervious material and backfill.

# 9.0 STANDARD DETAILS

### *9.1 Reference to CONNDOT Standard Details*

In general, the Town of Glastonbury Standard Details follow those of the CONNDOT/FHWA Approved English Standard Drawings for Roadway Design , and CONNDOT Division of Traffic Engineering Typical Details for Traffic Construction and Traffic Signal Electrical installations, as available on the CONNDOT web site and amended to date, except as otherwise described in the Standard Details included in this manual. Any details not listed in this manual shall be constructed as specified in the applicable CONNDOT Standard Details. In the case of any discrepancy the matter shall immediately be submitted to the Town Engineer for a determination. The Town Engineer shall have sole authority in resolving any discrepancies.

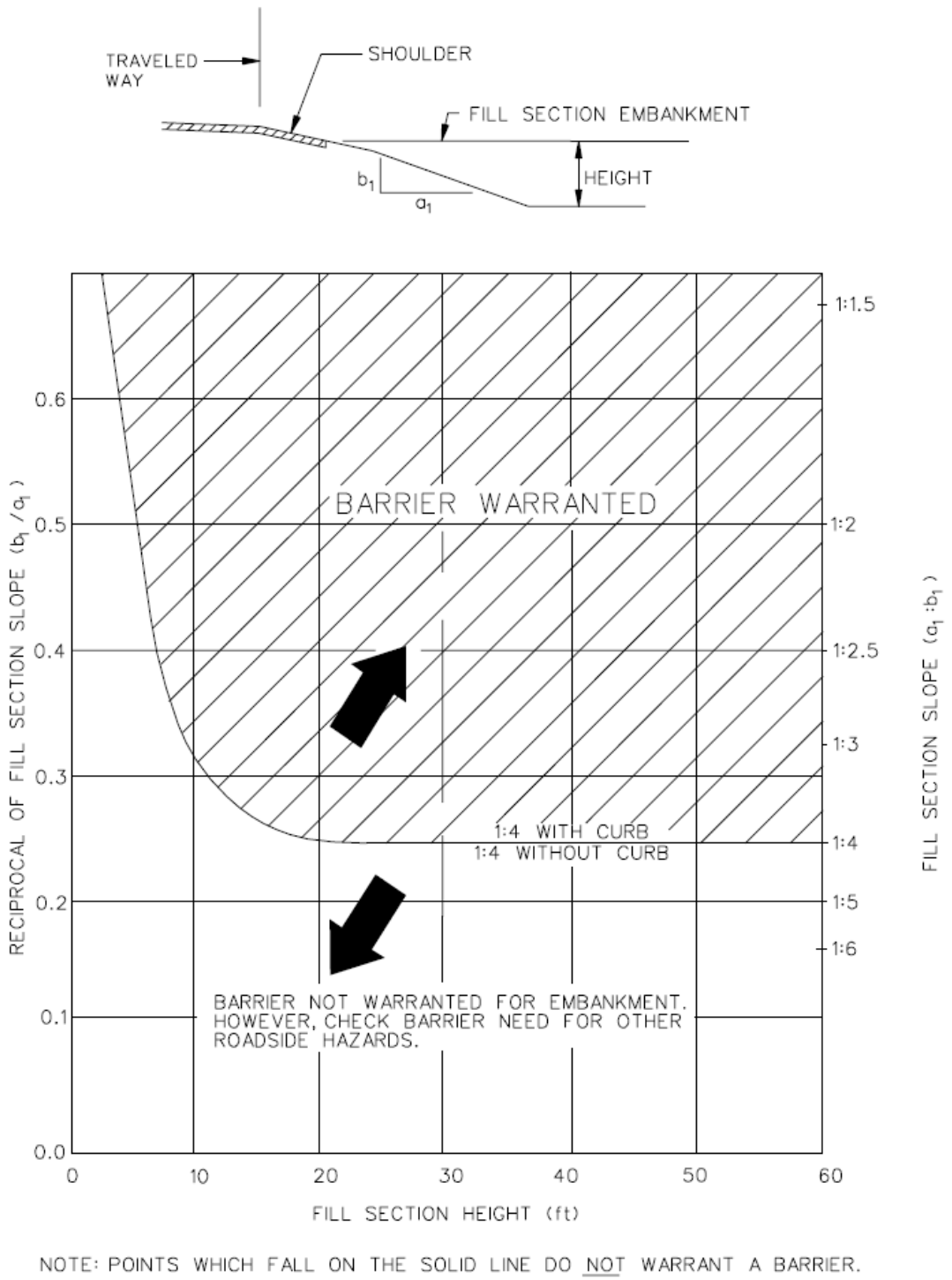
*See Town Website for current version of Standard Details.

### *9.2 List of Standard Details*

| **Plate #** | ***Roadway and Roadside Details*** |
|---|---|
| 1A | Typical Section Limited Local Street |
| 1B | Typical Section Light Local Street |
| 1C | Typical Section Local Street |
| 1D | Typical Section Collector Street |
| 1E | Typical Section Arterial Street |
| 2 | Temporary and Permanent Cul-de-sac Layouts |
| 3 | Temporary and Permanent Pavement Repairs |
| 4 | Temporary Pavement Shims |
| 5 | Curbing Details |
| 6 | Concrete Sidewalks |
| 7 | Concrete Sidewalk Ramps |
| 8 | Bituminous Concrete Driveways |
| 9 | Street Name Sign and Post Details |
| 10 | Traffic Sign Post with Breakaway Base |
| 11 | Object Marker Sign and Post Details |
| 12 | Temporary Subdivision Road Sign |
| 13 | Stop Bar and Cross Walk Details |
| 14 | Boundary Monuments |
| 15 | Fire Tank Detail |
| 16 | Dry Hydrant Detail |
| 17 | Typical Mailbox Installation |

| *Plate #* | *Storm Drainage Details* |
|---|---|
| 20 | Trench Detail for Storm Drains and Underdrains |
| 21 | Catch Basin |
| 22 | Sedimentation Structure |
| 23 | Precast Concrete Drywell |
| 24 | Footing for Flared End Section |
| 25 | Riprap Apron Type A and B |
| 26 | Riprap Apron Type C |
| 27 | Preformed Scour Hole Types 1 and 2 |
| | |
| | ***Sanitary Sewer Details*** |
| 30 | Trench Detail for Sanitary Sewers |
| 31 | Precast Concrete Manhole (Storm and Sanitary) |
| 32 | Precast Concrete Manhole Over Existing Pipe |
| 33 | Manhole Frame and Cover |
| 34 | Bolted Manhole Frame and Cover |
| 35 | Manhole Inverts (Storm and Sanitary) |
| 36 | Inside Drop for Sanitary Sewer Manholes |
| 37 | Inlet Details for Sanitary Sewers |
| 38 | Precast Concrete Sewer Chimney |
| 39 | Concrete Encasement for Sanitary Sewers |
| 40 | Impervious Clay Barrier for Sanitary Sewers |
| 41 | Dead End Manhole for Force Sewer Lines |
| 42 | Air Release Valve Manhole for Force Sewer Lines |
| 43 | Inline Access Manhole for Force Sewer lines |
| 44 | Force Lateral Connection to Gravity Sewer |
| 45 | Force Lateral Connection to Sewer Force Main |
| 46 | Typical Duplex Grinder Pump |
| 47 | Typical Residential Grinder |
| 48 | Typical Sanitary Curb Box |
| 49 | Outside Grease Separator |

# APPENDIX 1 – FIGURES FROM CONNDOT HIGHWAY DESIGN MANUAL




NOTE: POINTS WHICH FALL ON THE SOLID LINE DO NOT WARRANT A BARRIER.

**COMPARATIVE RISK WARRANTS FOR EMBANKMENTS**

**Figure 13-3A**

| Design Element | Design Speed (mph) | Traffic Control | Upper | Lower |
|---|---|---|---|---|
| Taper Rate | 30 - 45<br>50 - 60 | All | 1:8<br>1:15 | 1:8<br>1:8 |
| Storage Length (Full Width) | All | Unsignalized | Based on number and type of vehicles likely to arrive in an average 2-minute period during the design hour.<br><br>(See Notes 1, 5, 6) | Based on number and type of vehicles likely to arrive in an average 1-minute period during the design hour.<br>(See Notes 1, 2, 5, 6) |
| | | Signalized | Based on 2.0 times the average number of cars that will store in the turning lane during the design hour.<br>(See Notes 3, 4, 5, 6) | Based on 1.5 times the average number of cars that will store in the turning lane during the design hour.<br>(See Notes 2, 3, 4, 5, 6) |

1. *Vehicular Lengths. Use the following design lengths per vehicle for calculating storage length: :* *P: 25 ft* *BUS: 40 ft* *SU: 30 ft* *Semi-Trailer: 55 ft*

2. *Minimum Storage Length. For all intersections where traffic volumes are too low to govern, the minimum storage length will be 50 ft (T ≤ 10%) or 80 ft (T > 10%), where T is the % of trucks turning. These minimum lengths may also apply to right-turn lanes at unsignalized intersections if there is little likelihood of the turning vehicle having to wait.*

3. *Queue Length of Through Traffic. In addition to the table criteria, the length of the turning lane should exceed the calculated queue length in the through travel lane adjacent to the turning lane for the design hour.*

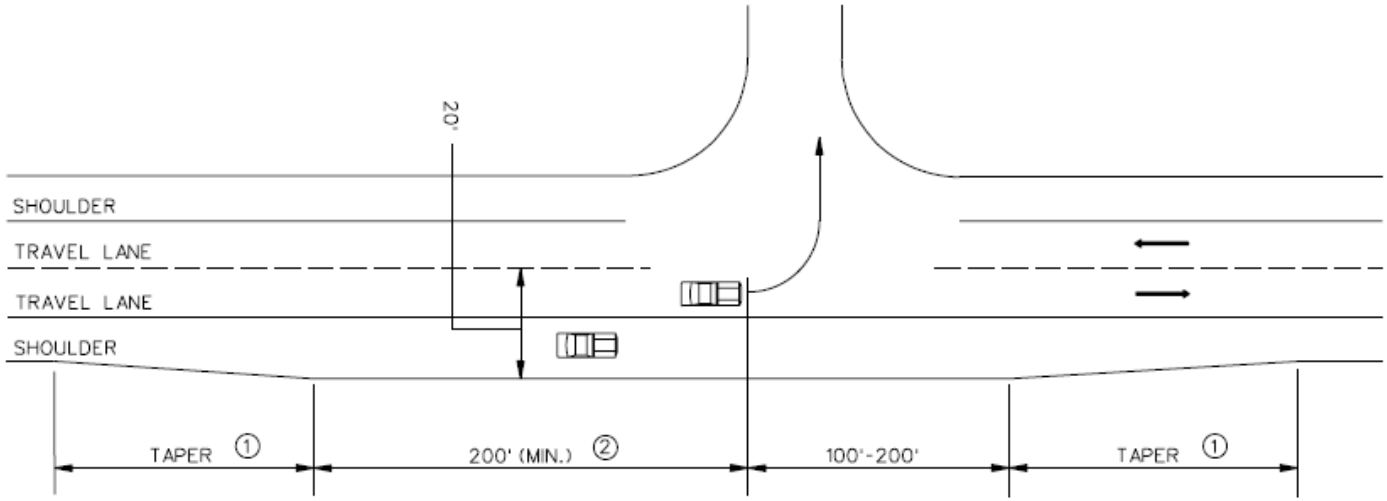
4. Highway Capacity Manual. *The designer should use the criteria in the* HCM *to calculate storage length.*

5. *Overall Length. The length of the auxiliary lane should include consideration of the number of vehicles expected to be stored and the extent to which deceleration should take place in the auxiliary lane.*

6. *Division of Traffic Engineering. The designer should coordinate with the Division of Traffic Engineering to determine the design length of the turning lane.*

**LENGTH OF AUXILIARY TURNING LANES**

**Figure 11-5G**




*Notes: 1. The taper distance is calculated from:*

*L = WS (S ≥ 45 mph) or L = $WS^2$/60 (S < 45 mph)*
*L = taper length, ft*
*W = transition width, ft*
*S = design speed, mph*

*Choose formula based on the posted speed limit. Then use 85th percentile speed or design speed in formula.*

*2. See Figure 11-5G.*

**TYPICAL BY-PASS AREA ON A 2-LANE HIGHWAY**

**Figure 11-5K**

# APPENDIX 2 – WAIVER FORMS

**PRIVATE DRAINAGE PERMISSION**
**AND**
**RELEASE OF CLAIM**

In consideration of the Town of Glastonbury, Connecticut (hereinafter called "Town") granting to

_____
Property Owner(s) Name (PLEASE PRINT)

(hereinafter called "Owner") permission to connect a private drain to the storm drain system owned by the Town for the purpose of draining surface and/or subsurface water from the property located at

_____
Property Address

in Glastonbury, Connecticut, the said Owner hereby assumes all responsibility and liability for said private drain, including, but not limited to, the construction, repair, and maintenance of said private drain; all responsibility and liability for any damage caused by the existence, location, and operation of said private storm drain to any person or property; and further agrees to indemnify and save the Town harmless from such claims. Said Owner further waives any claim against the Town for any damage caused to himself/herself or any person or property as a result of the malfunctioning of the Town-owned storm drain system to which the private drain is connected. The Owner further agrees to abide by all Federal, State, and local laws and regulations pertaining to the use of such private drains. The private drain shall be as shown on

_____
Map Reference, if applicable

on file with the Town. This permission and release shall be binding upon all successors and assigns while such private drain remains connected to the Town-owned storm drain system.

WITNESSED BY: SIGNED BY OWNER(S):

_____ _____

_____ _____

DATE: _____

**PRIVATE IRRIGATION SYSTEM PERMISSION**
**AND**
**RELEASE OF CLAIM**

In consideration of the Town of Glastonbury, Connecticut (hereinafter called "Town") granting to

_____

Property Owner(s) Name (PLEASE PRINT)

(hereinafter called "Owner") permission to install a lawn irrigation system within the Town right-of-way adjacent to property located at

_____

Property Address (PLEASE PRINT)

in Glastonbury, Connecticut, the said Owner hereby assumes all responsibility and liability for said irrigation system, including, but not limited to, the construction, repair, and maintenance of said irrigation system; all responsibility and liability for any damage, injury, or loss caused by the existence, location, and operation of said irrigation system to any person or property; and further agrees to indemnify and save the Town harmless from such claims. Said owner understands and acknowledges that irrigation systems installed within twelve inches (12") of the edge of pavement or curb are at significant risk of damage due to snow plowing operations, and that repair of such damage is the responsibility of the Owner.

This permission and release shall be binding upon all heirs, representatives, successors and assigns while such irrigation system remains installed within the Town right-of-way.

WITNESSED BY: SIGNED BY OWNER(S):

_____ _____

_____ _____

DATE: _____

**SUBSURFACE SEWAGE DISPOSAL SYSTEM**
**ABANDONMENT SIGN-OFF SHEET**

The Town of Glastonbury Code of Ordinances, Section 19-167 requires that, after a connection is made to the Town sanitary sewer system, any septic tanks, cesspools, and similar private sewage disposal facilities shall thereafter be promptly abandoned and filled with suitable material.

Also, under the Connecticut Public Health Code Regulation and Technical Standards for Subsurface Sewage Disposal Systems, Section II Location of Subsurface Sewage Disposal Systems, Section D entitled "System Abandonment", it states:

> "Abandonment of subsurface sewage disposal system components (i.e. septic tank, hollow leaching structures) or cesspools shall be performed in such a manner as to eliminate the danger of the system components or structure inadvertently collapsing. The responsibility for abandonment lies with the property owner. Structures that are to be abandoned shall be emptied of all sewage/wastewater prior to abandonment. Structures shall be filled with sand, gravel, or crushed, and the area backfilled with clean soil."

Therefore, let it be known that I (we), _____,
Print Property Owner's Name(s)

owners of property known as _____, to my
Property Address

(our) best knowledge and belief, has (have) abandoned all of the subsurface systems in accordance with the above-noted laws and regulations. Town staff shall be called to witness the abandonment of all known facilities.

_____ _____
Date Property Owner Signature

_____ _____
Date Property Owner Signature

# APPENDIX 3 - DOCUMENT TEMPLATES

TOWN OF GLASTONBURY, CONNECTICUT

# DRAINAGE EASEMENT

KNOW ALL MEN BY THESE PRESENTS, That I,
of the Town of Glastonbury, County of Hartford and State of Connecticut, for the consideration of One Dollar ($1.00) and other valuable consideration, received to my full satisfaction of the TOWN OF GLASTONBURY, a municipal corporation having its territorial limits within said County and State, do hereby give, grant, bargain, sell, and confirm unto the said Town of Glastonbury, its successors and assigns forever, a right of way and easement, to design, construct, lay, maintain, inspect, use, operate, repair, alter, replace, and protect drainage facilities and appurtenances thereto, in, through, on and over a strip of land feet in width, within or upon a certain piece or parcel of land situated on the (easterly) side of (First) Street, so-called and known as (100 First) Street in the Town of Glastonbury, County of Hartford and State of Connecticut. Said premises and Said easement are more particularly shown on a map entitled,

which map is on file or to be filed with the Town Clerk of the Town of Glastonbury.

Said right of way and easement above-described includes the right to enter in and upon said land of the Grantor and said parcel and easement and to pass and repass over the same and excavate therein for said purposes hereinabove and hereinafter described. Said Grantee shall have the right within said easement on said parcel to cut trees and bushes, disturb the soil and ground cover located therein, and to perform other work necessary or convenient for the design, construction, maintenance, inspection, use, operation, repair, alteration, replacement or protection of said drainage facilities and appurtenances thereto.

The Grantee agrees that any damage caused by present or future construction, to the land or property of the Grantor, will be corrected and restored to a condition substantially equal to that existing at the time such damage occurred, commensurate, however, with the above-described uses of said land.

The Grantor herein reserves to him/herself, his/her heirs and assigns, the right to continue to use the land within which the aforesaid easement has been granted for any uses and purposes which shall not in any way interfere with the use thereof by the Grantee, its successors and assigns, in fulfilling the purposes for which this easement is granted.

TO HAVE AND TO HOLD the above-granted right of way, easement, rights, privileges and authority unto the said Grantee and its successors and assigns forever, to it and their own proper use and behoof.

IN WITNESS WHEREOF, I, , have hereunto set my hand and seal this day of , 20 .

Signed, Sealed, and Delivered
in the presence of:

_____ _____ (L.S.)

_____

_____ _____ (L.S.)

_____

STATE OF CONNECTICUT)
) ss.
COUNTY OF HARTFORD )

Personally appeared signer and sealer of the foregoing instrument and acknowledged the same to be his/her free act and deed before me.

_____
Notary Public/Commissioner of the
Superior Court

TOWN OF GLASTONBURY
GLASTONBURY, CONNECTICUT

# SANITARY SEWER EASEMENT

KNOW ALL MEN BY THESE PRESENTS, That I (We),
of the Town of Glastonbury, County of Hartford, and State of Connecticut (hereinafter referred to as the "Grantor(s)"), for the consideration of
and other valuable considerations received to
full satisfaction of the TOWN OF GLASTONBURY, a municipal corporation organized and existing under the laws of the State of Connecticut, and having its territorial limits within the State of Connecticut (hereinafter referred to as the "Grantee"), do hereby give, grant, bargain, sell, and confirm unto the said TOWN OF GLASTONBURY, its successors and assigns forever, an easement for the purposes set forth below (hereinafter referred to as the "Permanent Easement"), in, through, on, and over a certain piece or parcel of land situated in the Town of Glastonbury, County of Hartford, State of Connecticut, and being in width and running from land now or formerly of to land now or formerly of
all as shown on a map entitled,

which map is on file in the Glastonbury Town Clerk's Office and to which reference may be had for a more particular description thereof. Said easement is more particularly bounded and described as follows:

Within said Permanent Easement, the Grantee shall have the right to construct, maintain, inspect, protect, use, operate, alter, modify, repair, reconstruct and replace a sanitary sewer and any and all appurtenances thereto or modifications thereof (collectively hereinafter referred to as the "Sewer") including, but not by way of limitation, manholes, siphons, embankments, and sewage tanks and valves, and to enter in and upon said parcel, to excavate, fill, operate equipment, install material, pass and repass over said parcel for any and all of said purposes, whether or not said purposes or functions are required to be performed within said parcel or adjoining parcels, and to perform any other activities incidental to the foregoing purposes or functions.

The Grantor(s) reserve(s) the right at any time on or before
to remove any and all structures and to remove trees, shrubs, plants and bushes, within said Permanent Easement. After above-said date, the Grantee shall have the right within said Permanent Easement to remove any and all structures, to cut and remove any trees, shrubs, plants and bushes, to alter any existing water course and inland-wetlands in accordance with Glastonbury's Inland-Wetland and Water Courses Regulations, and to perform any other work necessary for the construction, maintenance, inspection, protection, use, operation alteration, modification, repair, reconstruction or replacement of said Sewer.

The Grantor(s) shall not erect or allow to be erected, any building or structures on, plant or allow to be planted any trees or large bushes on, place or store any material on, grade, excavate, fill or flood on, or perform or fail to perform any activity with respect to said Permanent Easement (which may endanger or interfere, with the performance of any of the rights or functions granted under the Permanent Easement,) unless written permission is given by the Grantee.

The Grantee covenants and agrees with the Grantor(s) that it will, subsequent to any present or future construction, maintenance, inspection, protection, use, operation, alteration, modification, repair or replacement of said Sewer, restore the land or property, exclusive of any structures, trees, shrubs, plants and bushes, of the Grantor(s) herein, to substantially the same condition as existed prior to the commencement of any such activities commensurate, however, with the rights herein conveyed to the Grantee.

This Agreement shall not be modified unless agreed to by the parties in writing.

TO HAVE AND TO HOLD the above-granted right, privilege, and authority unto said Grantee and its successors and assigns forever, to it and their own proper use and behoof.

IN WITNESS WHEREOF, I (We) have hereunto set my (our) hand(s) and seal(s) this
day of , 20 .

Signed, Sealed and Delivered
in the Presence of:

_____ _____ (L.S.)

_____

_____ _____ (L.S.)

_____

STATE OF CONNECTICUT )
) ss. Glastonbury , 20 .
COUNTY OF HARTFORD )

Personally appeared
, Signer(s) and Sealer(s) of the foregoing easement, and acknowledged the same to be his/her (their) free act and deed before me.

_____
Notary Public
Commissioner of Superior Court

TEMPLATE FOR PERMANENT AND
TEMPORARY CONSTRUCTION EASEMENT FOR SEWERS

\

TOWN OF GLASTONBURY
GLASTONBURY, CONNECTICUT

**SANITARY SEWER EASEMENT**

KNOW ALL MEN BY THESE PRESENTS, That I (We),

of the Town of Glastonbury, County of Hartford, and State of Connecticut (hereinafter referred to as the "Grantor(s)"), for the consideration of and other valuable considerations received to the full satisfaction of the TOWN OF GLASTONBURY, a municipal corporation organized and existing under the laws of the State of Connecticut, and having its territorial limits within the State of Connecticut (hereinafter referred to as the "Grantee"), do hereby give, grant, bargain, sell, and confirm unto the said TOWN OF GLASTONBURY, its successors and assigns forever, an easement for the purposes set forth below (hereinafter referred to as the "Permanent Easement"), in, through, on, and over a certain piece or parcel of land situated in the Town of Glastonbury, County of Hartford, State of Connecticut, and being in width and running from land now or formerly of to land now or formerly of all as shown on a map entitled,

which map is on file in the Glastonbury Town Clerk's Office and to which reference may be had for a more particular description thereof. Said easement is more particularly bounded and described as follows:

Within said Permanent Easement, the Grantee shall have the right to construct, maintain, inspect, protect, use, operate, alter, modify, repair, reconstruct and replace a sanitary sewer and any and all appurtenances thereto or modifications thereof (collectively hereinafter referred to as the "Sewer") including, but not by way of limitation, manholes, siphons, embankments, and sewage tanks and valves, and to enter in and upon said parcel, to excavate, fill, operate equipment, install material, pass and repass over said parcel for any and all of said purposes, whether or not said purposes or functions are required to be performed within said parcel or adjoining parcels, and to perform any other activities incidental to the foregoing purposes or functions.

The Grantor(s) reserve(s) the right at any time on or before to remove any and all structures and to remove trees, shrubs, plants and bushes, within said Permanent Easement or

within the easement for construction purposes (hereinafter referred to as the "Construction Easement"). After above-said date, the Grantee shall have the right, both within said Permanent and Construction Easements, to remove any and all structures, to cut and remove any trees, shrubs, plants and bushes, to alter any existing water course and inland-wetlands in accordance with Glastonbury's Inland-Wetland and Water Courses Regulations, and to perform any other work necessary for the construction, maintenance, inspection, protection, use, operation, alteration, modification, repair, reconstruction or replacement of said Sewer.

The Grantor(s) shall not erect or allow to be erected, any building or structures on, plant or allow to be planted any trees or large bushes on, place or store any material on, grade, excavate, fill or flood on, or perform or fail to perform any activity with respect to said Permanent Easement which may endanger or interfere with the performance of any of the rights or functions granted under said Permanent Easement, unless written permission is given by the Grantee.

The Grantor(s) does (do) also grant to the Grantee the right to use, during the original construction of said Sewer until such time as said Sewer is accepted by the Town of Glastonbury, an additional strip or strips of land, referred to as the Construction Easement. Said strip or strips being a total of in width, and said strip or strips taken together with said Permanent Easement area, being in all in width and running from land now or formerly of to land now or formerly of

all as more particularly shown on a map entitled,

which map is one file in the Glastonbury Town Clerk's Office and to which reference may be had for a more particular description thereof.

Within said Construction Easement, in addition to the rights and privileges set forth above, the Grantee shall have the right to pass and repass with men and equipment, to operate equipment and install material incidental to the construction of said Sewer, to excavate and fill, and to perform any other activities incidental to the construction of said Sewer and its appurtenances until such time as said Sewer is accepted by the Town of Glastonbury.

The Grantee covenants and agrees with the Grantor(s) that it will, subsequent to any present or future construction, maintenance, inspection, protection, use, operation, alteration, modification, repair or replacement of said Sewer, restore the land or property, exclusive of any structures, trees, shrubs, plants and bushes, of the Grantor(s) herein, to substantially the same condition as existed prior to the commencement of any such activities commensurate, however, with the rights herein conveyed to the Grantee.

This Agreement shall not be modified unless agreed to by the parties in writing.

TO HAVE AND TO HOLD the above-granted right, privilege, and authority unto the said Grantee and its successors and assigns forever, to it and their own proper use and behoof.

IN WITNESS WHEREOF, I (We) have hereunto set my (our) hand(s) and seal(s) this day of , 20 .

Signed, Sealed and Delivered
in the Presence of:

_____ _____ (L.S.)

_____ _____ (L.S.)

STATE OF CONNECTICUT )
) SS. Glastonbury , 20 .
COUNTY OF HARTFORD )

Personally appeared
, Signer(s) and Sealer(s) of the foregoing easement, and acknowledged the same to be his/her (their) free act and deed before me.

_____
Notary Public
Commissioner of Superior Court

**DEVELOPER'S PERMIT AGREEMENT #_____**

**THE TOWN OF GLASTONBURY** **STANDARD AGREEMENT**
**WATER POLLUTION CONTROL AUTHORITY**

This STANDARD AGREEMENT, made this _____ day of _____, 20____, by and between the TOWN OF GLASTONBURY, a municipal corporation chartered by the State of Connecticut, acting herein by its Water Pollution Control Authority, duly authorized under the provisions of an "ORDINANCE AUTHORIZING THE CONSTRUCTION OF SEWERS BY AND AT THE EXPENSE OF DEVELOPERS", adopted November 14, 1960, and amendments thereto, hereinafter referred to as the "TOWN", and _____, owner of property to be served in whole or in part by the sanitary sewers herein described and the heirs, executors, administrators, successors and assigns of said owners, hereinafter referred to as the "DEVELOPER".

WITNESSETH, That the DEVELOPER and the TOWN, for the consideration hereinafter named, agree as follows:

That the DEVELOPER hereby agrees to furnish all of the materials, equipment, and labor necessary, and to perform all of the work shown on the construction plans for the project entitled _____, hereinafter referred to as the "PROJECT".

That this Developer's Permit Agreement #_____ is entered into under authority of a vote of the Water Pollution Control Authority passed on _____, in accordance with Resolution _____, hereinafter referred to as the "RESOLUTION".

That this Developer's Permit Agreement #_____ shall consist of: STANDARD AGREEMENT, GENERAL CONDITIONS, RESOLUTION, SPECIAL CONDITIONS, CONSTRUCTION PLANS, and such other addenda as may pertain to this Developer's Permit Agreement, or to any part thereof, copies of which addenda, if any, shall be attached hereto.

All of the above-referenced to items are hereby incorporated into, and made a part of, this Agreement as though more fully set forth herein. The DEVELOPER acknowledges that it has reviewed copies of all of the above-referenced items.

IN WITNESS WHEREOF, the Parties hereto have executed this Standard Agreement, the day and year first above written.

SIGNED, SEALED AND DELIVERED
IN THE PRESENCE OF:

_____

_____

_____

_____

TOWN OF GLASTONBURY
BY ITS WATER POLLUTION
CONTROL AUTHORITY

By: _____

By: _____
DEVELOPER
TITLE

**TOWN OF GLASTONBURY**
**WATER POLLUTION CONTROL AUTHORITY**

**DEVELOPER'S PERMIT AGREEMENT #_____**

**GENERAL CONDITIONS**

1. The TOWN agrees to permit the DEVELOPER, through a licensed drain layer employed by the DEVELOPER, to construct the sanitary sewer at the DEVELOPER'S own expense. The TOWN further agrees, subject to the terms and conditions herein contained, to accept the sanitary sewer and incorporate the same into the TOWN'S public sanitary sewer system.

2. The DEVELOPER agrees, in consideration thereof, to have the sanitary sewer construction completed in every detail within the time stipulated in the Special Conditions and in a good and proper manner in accordance with construction plans referred to herein, which plans are made a part hereof, and approved by the Town Manager of the TOWN, or an authorized agent thereof, and in accordance with the standard specifications and practices of the TOWN and, furthermore, in accordance with the terms of an Ordinance adopted December 20, 1960 entitled, "AN ORDINANCE OF THE TOWN OF GLASTONBURY REGULATING THE CONSTRUCTION OF, USE OF, DISCHARGE OF SUBSTANCE INTO AND CONNECTIONS TO THE PUBLIC SEWERS AND DRAINS OF THE TOWN OF GLASTONBURY AND THE INSTALLATION OF DRAINS AND OTHER PIPES AND FIXTURES INTENDED TO DISCHARGE WASTES INTO SAID SEWERS AND DRAINS", and amendments thereto, all without expense to the TOWN.

3. The DEVELOPER shall provide the TOWN with the following plans at no cost to the TOWN:

   a. Two (2) sets of construction plans.
   b. Preparation of one (1) set of as-built mylars.

4. The DEVELOPER shall, before commencing any work, arrange a preconstruction meeting with the Engineering staff of the TOWN and all affected Public Utility Companies to define the construction procedure and inspection schedule.

5. The DEVELOPER shall, before commencing any work, secure all necessary permits from the TOWN, State of Connecticut, and/or other governmental authority, to construct the sanitary sewer shown on the construction plans herein described.

6. The DEVELOPER agrees to reimburse the TOWN for all costs of preliminary engineering, preparation of designs and plans, and all other expenses of engineering, including, but not limited to, construction inspection, supervisory engineering, grade staking, measuring, testing, and all other expenses of any kind incurred by the TOWN prior to or during construction, or during the warranty period stipulated herein, including, but not limited to, allowances for pension, insurance, and similar costs related to payroll.

7. The DEVELOPER agrees, before commencing any work, to deposit with the Treasurer of the TOWN a sum determined by the Town Manager of the TOWN, or an authorized agent thereof, to be sufficient to defray the TOWN costs. The DEVELOPER further agrees that, in case said deposit proves to be insufficient at any time during the progress of the work, further deposit shall be made upon notification by the Treasurer of the TOWN. Upon completion of the one-year warranty period, provided that all obligations of the DEVELOPER under this Developer's Permit Agreement have been fulfilled, the TOWN shall return any unexpended portion of said deposit to the DEVELOPER.

**TOWN OF GLASTONBURY**
**WATER POLLUTION CONTROL AUTHORITY**

**DEVELOPER'S PERMIT AGREEMENT #_____**

**GENERAL CONDITIONS**

8. The DEVELOPER agrees, at all times, to indemnify and save harmless the TOWN, the State of Connecticut, and their respective officers, agents, and servants, on account of any and all claims, damages, losses, litigations, expenses, counsel fees, and compensations arising out of injuries (including death) sustained by, or alleged to have been sustained by, the servants, employees, or agents of the TOWN, or of the State of Connecticut, or of the DEVELOPER, any contractors employed by the DEVELOPER, or any subcontractor or material man, and from injuries (including death) sustained by, or alleged to have been sustained by, the public, any or all persons on or near the work, or by any other person or property, real or personal (including property of the TOWN), caused in whole or in part by the acts or omissions of the DEVELOPER, any contractor employed by the DEVELOPER, or any subcontractor or material man, or anyone directly or indirectly employed by them or any of them while engaged in the performance of any work covered by this Developer's Permit Agreement and during any warranty period specified therein, or by any other governmental authority.

9. The DEVELOPER shall, before commencing any work, furnish Certificates of Insurance to the TOWN, including automobile, property damage liability, bodily injury liability, and Workmen's Compensation Insurance in the following amounts:

PUBLIC LIABILITY, BODILY INJURY, AND PROPERTY DAMAGE:

| | | |
|---|---|---|
| (1) | Injury or death of one person …… | $ 500,000 |
| (2) | Injury to more than one person in a single accident ……. | $1,000,000 |
| (3) | Property Damage …… | $ 100,000 |

AUTOMOBILE AND TRUCK PUBLIC LIABILITY BODILY INJURY:

| | | |
|---|---|---|
| (1) | Injury or death of one person …….. | $ 500,000 |
| (2) | Injury to more than one person in a single accident …… | $1,000,000 |
| (3) | Property Damage …….. | $ 100,000 |

WORKMEN'S COMPENSATION AS REQUIRED BY LAW.

The mentioned insurance requirements shall also apply to all contractors and subcontractors, and the DEVELOPER shall not allow any contractor or subcontractor to commence work until the contractor's or subcontractor's insurance has been so obtained and approved.

Such policies shall contain a special endorsement providing as follows:

a. The Town of Glastonbury and its respective officers, agents, and employees are hereby declared to be additional named insured under the terms of this policy, both as to the activities of the insured and as to the activities of the Town of Glastonbury, its officers, agents, and employees as related to the activity described in this policy.

Such policy shall also contain contractual liability coverage underwriting the obligations of the DEVELOPER to hold harmless, indemnify and defend in each of the respects provided above in this item.

Such policy shall also contain special endorsements providing substantially as follows:

a. "Cross Liability" or "Severability of Interest" coverage for all named insured.

b. That such insurance is primary; and that any other insurance maintained by the additional named insured is excess and not contributing insurance with respect to the subject insurance policy.

c. That the insurer waives the right of subrogation against the additional named insured.

d. That coverage afforded by such policy to the additional named insured shall not be prejudiced in any way by any failure of the principal insured to comply with any notice requirements of such policy.

e. That such policy may not be canceled or coverage reduced or terms altered in any manner detrimental to the coverage for the life of this Developer's Permit Agreement. Work shall not be continued after expiration of the above insurance requirements until the same has been renewed.

10. The DEVELOPER agrees, prior to the start of construction, to furnish a Performance Bond in favor of, and in an amount and form acceptable to the TOWN, to ensure completion and warranty of the sanitary sewer in accordance with Section 17 herein; said Bond being in an amount not less than the estimated construction cost of the sanitary sewer as set forth in the Special Conditions. Upon completion of the PROJECT, provided that all obligations of the DEVELOPER under this Developer's Permit Agreement have been fulfilled, the TOWN shall return any unexpended portion of the Performance Bond to the DEVELOPER.

11. The DEVELOPER agrees, if the vote of the Water Pollution Control Authority granting permission to construct the sanitary sewer so provides, to pay the TOWN before starting construction of the sanitary sewer, as a charge in lieu of assessment, an amount of money stipulated in the RESOLUTION that might have been assessed as an outlet charge if the sanitary sewer to be constructed under this Developer's Permit Agreement had instead been laid out and assessed by the TOWN in the construction of previously built sanitary sewers that provided an outlet for the sanitary sewer to be constructed under this Developer's Permit Agreement.

12. The DEVELOPER agrees to complete the construction of the sanitary sewer within the time stipulated in the Special Conditions, after the date hereof, and further agrees that no construction work shall be done thereafter except that, at the option of the TOWN and upon application of the DEVELOPER (with approval of Surety if Surety has been required), this limit may be extended by the TOWN.

13. It is mutually agreed that the TOWN may, at any time, permit persons or entities other than the DEVELOPER to connect to and regularly use the sanitary sewer.

14. The DEVELOPER agrees that the obligations and privileges herein assumed by the DEVELOPER and granted to the DEVELOPER shall be obligations and privileges running with the land concerned or served by the sanitary sewer shown on the plans contained herein and resting on or granted to the succeeding owners of said land, as well as on or to the DEVELOPER.

**TOWN OF GLASTONBURY**
**WATER POLLUTION CONTROL AUTHORITY**

**DEVELOPER'S PERMIT AGREEMENT #_____**

**GENERAL CONDITIONS**

15. The TOWN agrees, by appropriate RESOLUTION of the Water Pollution Control Authority, to accept, acquire title to, and incorporate into the Town's public sanitary sewer system such part or parts of the sanitary sewer built hereunder as are designated in the vote of the Water Pollution Control Authority as set forth within the RESOLUTION, said acceptance to become effective as specified in the acceptance RESOLUTION. Such Water Pollution Control Authority acceptance RESOLUTION may be voted upon recommendation of the Town Manager of the TOWN, or an authorized agent thereof, that the sanitary sewer is in acceptable condition and that all roadways, curbs, walks, and other surfaces and appurtenances disturbed by the work have been acceptably restored or the adequate security, by bond or otherwise, has been furnished to assure such restoration, and that all necessary rights-of-way and/or easements have been conveyed to the TOWN.

16. In the event that the TOWN does not accept any portion of the sanitary sewer built hereunder pursuant to Section 15 herein, the DEVELOPER agrees to obtain necessary State permits for, and to maintain and operate forever, any such portion of the sanitary sewers, sewage pumping stations, force mains, or other sewer appurtenances.

17. The DEVELOPER warrants, for the period of one year after the acceptance of the sanitary sewer by the Water Pollution Control Authority, that the quality of the labor and materials supplied in the construction of the sanitary sewer by the DEVELOPER, as well as all labor and materials provided by any subcontractor or material man, will comply with all standards of the Town of Glastonbury, State of Connecticut and United States of America, as well as commonly accepted practices in the industry. The DEVELOPER agrees, for the period of one year following the acceptance of the sanitary sewer by the Water Pollution Control Authority, that it will repair any defect in the sanitary sewer discovered during the one-year period and/or damage to any public street, highway, grounds or structure caused during construction or during the one-year warranty period, or both, regardless of cause. The DEVELOPER further agrees to maintain the roadway, curbs, walks, and other surfaces and appurtenances within the highway limit that have been disturbed by the construction, repair, or by any defect in or failure of the sanitary sewer for any additional period that may be required by other governmental authorities having jurisdiction. In the event the DEVELOPER fails to make any other repairs, or fails in any way to carry out any obligations of this Agreement, the DEVELOPER shall be liable to the TOWN for all costs in connection therewith, and the TOWN is authorized to charge said expenses against the DEVELOPER'S Performance Bond or any deposit with the TOWN, or both, and in the event said bond or deposit, or both, is insufficient to reimburse the TOWN, the DEVELOPER agrees to make payment to the TOWN for the balance upon demand.

ADOPTED: March 11, 1981
EFFECTIVE: March 11, 1981

# APPENDIX 4 - WPCA POLICY STATEMENTS

**TOWN OF GLASTONBURY**
**WATER POLLUTION CONTROL AUTHORITY (WPCA)**

**SPECIAL PERMIT APPLICATION**
**PROCEDURE GUIDELINE**

| NEW FACILITIES | EXPANSION OF EXISTING FACILITIES |
|---|---|
| 1. Review preliminary plans on staff level. Incorporate comments into plans. | 1. Review preliminary plans on staff level. Incorporate comments into plans. |
| 2. *Present a Sanitary Sewer Impact Report to the WPCA (if applicable). | 2. *Present a Sanitary Sewer Impact Report to the WPCA (if applicable). |
| 3. Request connection approval from the WPCA (if applicable). | 3. Request connection approval from the WPCA (if applicable). |
| 4. Upon final approval of facility by the Town Plan and Zoning Commission, applicant shall finalize plans for filing with the Town Clerk. | 4. Upon final approval of facility by the Town Plan and Zoning Commission, applicant shall finalize plans for filing with the Town Clerk. |
| 5. Applicant shall submit copies of final site and architectural plans signed by the Community Development Department or other appropriate Town departments to the WPCA for Engineering Division final evaluation of the sewer assessment. | 5. Applicant shall submit copies of final site and architectural plans signed by the Community Development Department or other appropriate Town departments to the Engineering Division for final evaluation of the sewer assessment. |
| 6. *The WPCA conducts a Public Hearing on the assessment. | 6. Engineering Division notifies the Building Department that building permit can be issued. |
| 7. The WPCA approves the assessment. | 7. *The WPCA conducts a Public Hearing on the supplemental assessment (if applicable). |
| 8. Applicant resolves assessment through full or installment payment (30-day payment period). | 8. The WPCA approves the supplemental assessment. |
| 9. Applicant executes Voluntary Sewer Lien prepared by the Engineering Division (if applicable). | 9. Applicant resolves the supplemental assessment through full or installment payment (30-day payment period). |
| 10. Engineering Division notifies the Building Department that building permits can be issued. | 10. Applicant executes Voluntary Sewer Lien prepared by the Engineering Division (if applicable). |

*Requires meeting of the Water Pollution Control Authority.

**TOWN OF GLASTONBURY**
**WATER POLLUTION CONTROL AUTHORITY (WPCA)**

**SUBDIVISION APPLICATION**
**PROCEDURE GUIDELINES**

| LIVE SEWERS | ON-SITE DISPOSAL |
|---|---|
| 1. *Review preliminary plans with WPCA (informal discussion).<br><br>2. *WPCA approves preliminary plans, advises applicant to finalize design.<br><br>3. *WPCA schedules, advertises, and conducts Public Hearing for the construction of sanitary sewers together with notifying affected property owners submitted by Engineering Division other than Developer.<br><br>4. *WPCA takes action on the Public Hearing. Action taken no sooner than 10 days and no later than 30 days following Public Hearing.<br><br>5. Upon final approval of facility by Town Plan and Zoning Commission, applicant shall file plans with the Town Clerk and, if applicable, submit drafts and final documents (after review by Engineering Division) of sanitary sewer easements on WPCA standard easement form.<br><br>6. Applicant shall submit copies of signed filed plans and, if applicable, architectural plans signed by the Community Development Department or other appropriate Town departments, to the Engineering Division for final evaluation of sewer assessment.<br><br>7. Engineering Division prepares Developer's Permit Agreement.<br><br>8. *WPCA approves Developer's Permit Agreement. | 1. *Review preliminary plans with WPCA (informal discussion).<br><br>2. WPCA receives recommendations from the Director of Health for on-site disposal.<br><br>3. WPCA receives recommendations from the Conservation Commission for on-site disposal.<br><br>4. *Applicant requests waiver of capped sewers and/or design from WPCA. However, if applicable, the WPCA may request sanitary sewer easements.<br><br>5. WPCA acts on applicant's request for waiver of capped sewers and design.<br><br>6. Upon final approval of facility by Town Plan and Zoning Commission, applicant shall file plans with the Town Clerk and, if applicable, submit drafts and final documents (after review by Engineering Division) of sanitary sewer easements on WPCA standard easement form. |

**TOWN OF GLASTONBURY**
**WATER POLLUTION CONTROL AUTHORITY (WPCA)**

**SUBDIVISION APPLICATION**
**PROCEDURE GUIDELINES**
**(Continued)**

LIVE SEWERS

| | |
|---|---|
| 9. Applicant resolves payment per Developer's Permit Agreement and, if applicable, submits final sanitary sewer easements approved by Engineering Division.<br><br>10. Applicant executes Developer's Permit Agreement.<br><br>11. Preconstruction meeting held.<br><br>12. Sewer construction begins. | |

* Requires meeting of Water Pollution Control Authority.

**TOWN OF GLASTONBURY**
**GLASTONBURY, CONNECTICUT**

**WATER POLLUTION CONTROL AUTHORITY**
**STATEMENT OF POLICY**

# SANITARY SEWER IMPACT REPORT

It is the responsibility of the Water Pollution Control Authority (WPCA) to see that an overloaded condition does not result in the sanitary sewer lines, pumping stations, and treatment plant. Therefore, the WPCA has determined the need to analyze further impact on the sanitary sewer system that results from a proposed development.

It is the purpose of this policy to allow the WPCA to accurately assess the impact produced by a proposed development. Therefore, the WPCA may require the applicant(s) of any proposed development, where the average daily sewage flow to be generated is 3,000 or more gallons per day (including infiltration), to submit a sanitary sewer impact report. If the average daily flow is less than 3,000 gallons per day (including infiltration), the applicant(s) shall submit written confirmation of such flows to the WPCA for review and approval. All flow computations shall be based on the values assigned herein.

In order to assure that all sanitary sewer impact reports are based on similar design criteria, the following values will be assigned:

1. Peak Factor = 2.7

2. Infiltration Rate (if applicable)

    a. Reinforced Concrete Pipe (RCP)
    Length of Pipe x 500 gal. x inch dia. X 1 day = gal/day
    5,280

    b. Polyvinylchloride Pipe (PVC)
    Length of Pipe x 100 gal. x inch dia. X 1 day = gal/day
    5,280

3. People Per Unit (based on CRCOG study)

    a. Single Family Dwelling – 3.8

    b. Duplex Dwellings – 5.4

    c. Apartments or Condominiums

        (1) One Bedroom – 1.6
        (2) Two Bedroom – 2.7
        (3) Three Bedroom – 3.2

4. Sanitary Sewage Flows Generated

    a. 72 gallons per person per day for residential developments (based on actual study)

b. *2,000 gallons per acre per day commercial developments

c. *2,000 gallons per acre per day for industrial developments

*These values may be adjusted by the WPCA depending upon the type of the proposed development.

In addition, the following information must be included in the report:

1. Type of zone
2. Number of acres
3. Number of units
4. Bedrooms per unit
5. If there is a proposal to change the density from the existing underlying zone, a comparison of the flows generated from the proposed density to the existing density should be analyzed to determine the increase or decrease in the flows.
6. Such additional information as the WPCA may require, including updating of any sanitary sewer impact report filed previously.

When submitting a proposed development for review and approval, the following steps should be followed:

1. Preliminary review by the Town Plan and Zoning Commission of basic concept and density change, if any, of the proposed development.
2. Submittal of sanitary sewer impact report by the applicant(s) to the WPCA.
3. WPCA recommendation to the Town Plan and Zoning Commission

# CAPPED SEWER WAIVER REQUEST

**Purpose:**

All development proposed for subdivisions located within the Master Sewer Plan area where sewer service is not readily available must appear before the WPCA for guidance regarding the construction of capped sewers. (Reference: Glastonbury Code of Ordinances, Water, Sewers and Sewage Disposal, Chapter 19, Division 8, Sections 19-136 to 19-143.

**Procedure:**

1. Developer submits preliminary plans (100' scale) for review by the Engineering Division.

2. Engineering Division schedules proposal for informal discussion (review) before the WPCA.

3. WPCA reviews proposal (informal discussion), requests comments from Town Engineering staff. WPCA advises developer on how to proceed with project.

4. Director of Health performs soil testing on the site to determine adequacy of the soils to support on-site sewage disposal. Director of Health reports to the WPCA on the adequacy of on-site disposal.

5. The Conservation Commission reviews the proposal and reports to the WPCA on the potential for an adverse environmental impact (stream pollution, groundwater pollution, private well pollution) created by the construction of on-site sewage disposal systems.

6. Engineering Division reviews the proposal and reports to the WPCA in regard to the following:

    a. Site location and compatibility with the Master Sewer Plan. (Determine whether Master Plan depicts trunk lines, collector lines, etc. across the parcel.)

    b. Need to acquire easements to accommodate future sewer construction (as shown on Master Plan).

    c. Size of the proposed subdivision. (Guideline has been established that 2-4 lot subdivisions are considered negligible in size when considering capped sewer construction.)

    d. Its proximity to existing Town roadways. (Whether the subdivision is located entirely along existing Town roadways vs. along newly constructed roads.)

    e. Recommendations of both the Director of Health and the Conservation Commission as to the use of on-site sewage disposal systems.

    f. The availability of future gravity flow sewers. (Determine whether minimum serviceable elevations should be established.)

    g. The subdivision's proximity to existing sanitary sewers. (Guideline has been established that projects falling within 5,000 feet of an existing live sewer or sewer under construction may warrant sewer extension.)

h. Whether field conditions warrant capped sewer construction during initial construction to avoid excessive repetitive construction costs. (Warranted by poor field conditions, poor material, excessive cuts, ledge, etc.)

7. WPCA acts on the request for the waiver of the design and/or construction of capped sewers.

**TOWN OF GLASTONBURY**
**GLASTONBURY, CONNECTICUT**

# CAPPED SEWER GUIDELINES AND PROCEDURES

## Purpose:

One of the principal purposes of the Town's "Capped Sewer" Ordinance is to assure that whatever development occurs is undertaken with due regard for the future need for sanitary sewers. Where land is developed without consideration of future sewer needs, both the Town and individual property owners may have to bear the burden of the inadequate planning, often at considerable expense --- much of which may have been avoided by the proper advance "sewer sensitivity". Coupled with the need for prior planning is the fact that the construction of sewers contemporaneous with a property's development is generally simpler and more economical than subsequent construction, particularly where it is anticipated that live sewers will be extended to the development area within a reasonable period of time. With these purposes in mind, it should be understood that existing Ordinances require the design of sanitary sewers for all areas within the Master Sewer Plan area and the installation of all sewers within this area unless live sewers are not anticipated for more than ten years, except where such design and/or installations have been waived by the WPCA. To accomplish this purpose and to assist developers in complying with the applicable Ordinances, the following guidelines and procedures have been adopted.

## Procedure:

At the time any request for a waiver is made pursuant to the provisions of Section 19-140 of the Glastonbury Code of Ordinances, the developer must submit to the WPCA a "Compatibility Sketch" or other materials showing at least the following information:

1. Name and general outline of the development.
2. All sill elevations.
3. Existing roads and new road elevations.
4. Simple profile.
5. Unusual grades and gravity flow from sills in relation to lot and subdivision lines.
6. Any boring reports.
7. Percolation and subsurface evaluation reports.
8. Such other information as may have been specifically requested by the WPCA or Superintendent of Sanitation.

## Design Waiver:

Since design is critical to the accomplishment of the desired objectives, it is anticipated that design requirements will not be waived unless the "Compatibility Sketch" clearly demonstrates that no difficulty will be encountered in designing and building sewers within the development. Consequently, design waivers should only be requested where: (1) the subdivision is very small (2-4 lots, etc.) or located

entirely along existing Town roads to which lots may be gravity served, (2) the Sanitarian's reports or any Conservation reports are favorable, and (3) no easements across other lots or properties within the subdivision are required.

**Construction Waivers:**

A Permit Agreement between the developer and the Town calling for the construction of capped sewers will not normally be waived whenever:

1. The proposed development is within 5,000 feet of an existing live sewer or sewer under design or construction to which the developer might be connected.

2. The Sanitarian reports marginal conditions for on-site sewage disposal, i.e. marginal percolation, ledge conditions, or high water tables.

3. When the Conservation Commission reports that on-site sewage disposal may have adverse environmental impact, i.e. stream pollution, groundwater pollution, private well pollution.

4. Whenever conditions of slope, ledge, cuts, and road and lot layouts are such that future sewer extensions within the development would be difficult and costly.

**NOTE:** Where the facts do not warrant a design waiver, the WPCA will frequently need the proposed design before being able to act upon a request for a construction waiver.

The Engineering Division will have on file the location of those areas to which live sewers are not anticipated for a period of ten or more years.

# ASSESSMENT POLICIES

RESOLUTION ADOPTING RULE OF APPORTIONMENT OF SEWER ASSESSMENTS, CONNECTION CHARGES, AND OUTLET CHARGES AGAINST PROPERTIES BENEFITING FROM THE SEWERAGE SYSTEM

RESOLVED, That the Glastonbury Sewer Commission hereby adopts the following rule or method as a basis of apportionment of sewer assessments, connection charges, and outlet charges against properties benefiting from the construction or extension of a sanitary sewer system or connection to said system:

1. **Definition:** For the purpose of this rule or method, the following terms, phrases, and words shall have the meaning given herein:

    A. Sewerage System: Any device, equipment, appurtenance, facility, and method for collecting, transporting, receiving, treating, disposing of, or discharging sewage.

    B. Local Sewer: A sewer line, including the main pipe or conduit, manholes, laterals, and other structures, and equipment appurtenant thereto, generally located in a public street and installed to serve properties abutting or having access to said street.

    C. Trunk Sewers: Items of a capital nature including, but not limited to, interceptors, pumping stations, force main, and treatment plant that are designed and built so that areas beyond those immediately served may be served by future extensions of sanitary sewers.

    D. Outlet Charge: The charge whereby trunk sewer costs, either present or deferred, are distributed among and collected from properties benefiting from such trunk sewers.

    E. Building Lot: An unimproved parcel of land, either a lot of record or a lot capable of being subdivided from other land in accordance with minimum zoning requirements, that qualified or would qualify for the issuance of a building permit for a single-family residence under the Zoning Regulations.

    F. Gross Floor Area: The floor area of a building, or portions thereof, used other than as residences and calculated on the basis of outside measurements, such building to include, but not be limited to, all commercial, industrial, or business buildings and buildings used for other non-residential uses. Basement areas where used for office, storage, manufacturing, or other productive purposes shall be included in gross floor area.

    G. Other Non-Residential Uses: Uses such as schools, churches, clubs, offices, museums, convalescent homes, recreation developments, and day care centers that are not residential, but may be located in residential zones.

    H. Sewer Assessment: As assessment determined in accordance with the outlet charge method, front foot assessment method, and the unit assessment method, either singly or in combination, and levied against a property immediately benefited by the construction of a sewerage system.

I. Connection Charge: A charge determined in accordance with the outlet charge method, front foot assessment method, and the unit assessment method, either singly or in combination, and levied against a property where a condition has increased or made immediate the benefit of the sewerage system to the property.

J. Construct a Sewerage System: To acquire land, easements, rights-of-way, or any other real or personal property or any interests therein, plan, construct, reconstruct, equip, extend, and enlarge all or any part of a sewerage system.

K. Rear Lots: Any property so classified under the then applicable Building-Zone Regulations of the Town of Glastonbury or by action of the Town of Glastonbury through its agents, employees, boards, commissions, or legislative body.

L. Multiple Family Dwelling: Any structure by whatever name called containing two or more residential dwelling units including, but not limited to, single-family residences with apartments, two or more family houses, commercial apartments and condominiums.

2. **Three Methods:** Any property benefited by the sewerage system shall have levied against it a sewer assessment or connection charge determined in accordance with the front foot assessment method, the unit assessment method, and the outlet charge method, either singly or in combination, as provided herein.

3. **Front Foot Method:** For the purpose of applying the front foot assessment method, the frontage of properties benefited shall be divided into feet and adjusted for such factors as corner lots and odd-shaped lots in accordance with standard practices for the assessment and valuation of land.

   The frontage for rear lots for the purpose of applying the front foot assessment method shall equal the minimum frontage required for lots in the same zone not classified as rear lots and devoted to the same use or uses as such rear lots. Frontage shall be calculated in the foregoing manner when any rear lot is subdivided regardless of whether or not such rear lot has been assessed for frontage previously.

4. **Unit Assessment Method:** For the purpose of applying the unit assessment method, the number of units of property benefited shall be determined as follows:

   A. In residence zones, unimproved property shall be assigned one unit for each existing building lot or each potential lot of the minimum area, width, and depth permitted by the Building-Zone Regulations for the zone in which the property is located. One unit shall be assigned to each residential unit approved as a special exception by zoning agencies, as a part of a planned area development, or as otherwise approved under zoning regulations governing residential development.

   B. In any zone, property improved for residential use shall be assigned one unit for each residential unit thereon. The depth of such property shall be the rear lot line of any existing building lot or, if there is no existing building lot, a line drawn parallel to the street and 50 feet to the rear of any building in which a residential unit is located. Where a residential unit is approved or developed as part of or within a non-residential use, one unit shall be assigned to each such residential unit.

   C. Units shall be assigned to unimproved property in any business or industrial zone, or to property in any zone in which business, commercial or industrial uses, or other non-residential uses are located pursuant to that of the following two methods that result in the most units:

1) One unit for every 2,000 square feet of gross floor area of the buildings thereon, figured to the nearest ¼ unit.

2) One unit for every 2,000 square feet of lot area less 80% figured to the nearest ¼ unit, lot depth to be the rear lot line except that such depth shall not exceed the greater of 200 feet measured from and parallel to the street or a line drawn parallel to the street and coterminous with the rearmost portion of the rearmost building, parking lot, or other improvement found to be benefited on the property.

D. In any zone, the number of units in a multiple-family dwelling shall be determined on the basis of the gross floor area of the building or portions thereof devoted to residential uses and calculated on the basis of the outside measurements of such structure. Such calculations shall include, but not be limited to, hallways, staircases, recreation rooms, kitchen and bathroom facilities, and the like. Attic and basement areas used primarily for storage space may be excluded from these calculations. The number of units in a multiple-family dwelling shall be determined on the basis of one unit for every 2,000 square feet of gross floor area, figured to the nearest ¼ unit.

In any multiple-family dwelling, there shall be a minimum of 1-1/4 units with respect to the first two individual dwelling units within said structure. Additionally, there shall be a minimum of ¼ unit for each such dwelling unit beyond the first two.

The maximum number of units in any multiple-family dwelling shall not exceed the total number of individual dwelling units within said structure.

E. In any zone, the number of units in a hotel or motel shall be assigned on the basis of ¾ of one unit for each hotel and/or motel unit to be constructed plus one unit for each room or apartment occupied by a resident manager and one unit for every 2,000 square feet of gross floor area of the hotel/motel not used as a specific rental living unit, figured to the nearest ¼ unit.

5. **Unit Value:** The value of the unit assessment shall be established periodically by vote of the Sewer Commission, taking into account the benefit of the installation of a sewerage system to properties, the costs of such installation, changes in construction costs, increases in property values, sewer assessments levied by other jurisdictions, and any other factors deemed relevant by the Commission to the determination of such value.

6. **Outlet Charge Method:** For the purpose of applying the outlet charge method, property improved or capable of being improved for residential uses, property in industrial, business and commercial uses, property developed for non-conforming business and industrial uses, and property developed for other non-residential uses shall be assigned outlet charges on the basis of units as determined under the unit assessment method.

7. **Outlet Charge Value:** The value of the outlet charge shall be established periodically by vote of the Sewer Commission and based on present and projected trunk sewer costs, less Federal or State aid and other income, over the area covered by Master Sewer Plans divided by the total units, present and projected, within said areas. Such trunk sewer costs shall not include that portion of the treatment plant allocated to secondary or tertiary treatment.

8. **Construction of System:** Where the Sewer Commission constructs a sewer system, the sewer assessment levied against properties benefiting from such construction shall consist normally of the outlet charge, front foot assessment, and unit assessment at the rates in effect at the time the Sewer Commission votes a resolution to proceed with said construction following the public hearing on such proposed construction as required by State Statutes or

local ordinance provided, however, that the rates initially established after the date of adoption of this resolution shall apply to all sewer system construction previously completed or in progress and for which assessments have not been levied.

9. **Excess Land Deferral:** Section 8 herein to the contrary notwithstanding, assessments on certain lands specifically described in Section 7-249, Connecticut General Statutes, Revision of 1977, as amended, shall not be made until such time as the conditions or events set forth therein with respect to such lands shall occur, at which time the assessment shall consist of, either singly or in combination, the front foot assessment, unit assessment, and outlet charge currently in effect at such time as such conditions or events occur.

10. **Deferral of Assessment:** In cases where the Commission determines that the sewerage system would not be of any immediate benefit to a property because of its presently existing soil, topographical or physical conditions, its special use, or other good and sufficient reason, the right to assess shall be reserved and any assessment or charge against said property shall be deferred as provided in an Ordinance Providing for Connection Charges in Lieu of Assessments for Sanitary Sewers in Certain Cases until there is a change in such conditions or use and a connection is sought to the sewerage system at which time a connection charge shall be levied consisting of, either singly or in combination, the front foot assessment, unit assessment, and outlet charge currently in effect at the time such connection is sought.

11. **Increased Special Benefit:** Whenever an assessment or charge has been levied against a property and there is subsequent to such original assessment an increased benefit with respect to such property as provided in an Ordinance Providing for a Supplemental Sewer Assessment in Cases of Increased Special Benefits from the Sewer System, the connection charge resulting from such increased special benefit shall consist of, either singly or in combination, the front foot assessment, unit assessment, and outlet currently in effect at the time such increased special benefit accrues.

12. **Local and Trunk Sewer Connection:** Wherever a connection is sought to a local sewer or to a trunk sewer making unnecessary the construction of a local sewer, the connection charge shall consist of the front foot assessment, unit assessment, and outlet charge currently in effect at the time such connection is sought.

13. **Reimbursement Local Sewer:** Wherever a developer or other owner under a Developer's Permit Agreement has installed a local sewer to which other owners may connect, the Sewer Commission may provide in said Permit Agreement for reimbursement to the developer or owner, over a period not to exceed ten years, of that portion of the connection charge consisting of the front foot assessment and unit assessment, but not the outlet charge, provided said reimbursement does not exceed the installation cost of said local sewer serving the property to which connection is sought.

14. **Excess Trunk Sewer Costs Reimbursed:** Whenever a developer under a Permit Agreement proposes a sewer system on property owned by him, a portion of the costs of which are excess trunk sewer costs as defined in an Ordinance Providing for Deferred Assessments of Trunk Sewer Costs, the Sewer Commission shall determine the amount of said excess trunk sewer costs and shall provide for reimbursement to the developer of such costs or any portion thereof as collections of outlet charges are received from the area served presently or in the future by the sewers built under the Permit Agreement.

15. **Reimbursement of Trunk Sewer:** Whenever a developer under a Permit Agreement installs a trunk sewer passing through private lands not owned by him, the Sewer Commission may provide in said Permit Agreement for reimbursement to the developer, over a period not to exceed ten years, the costs, or any portion thereof, of such trunk sewer as collections of

outlet charges are received from the area served presently or in the future by the sewer built under the Permit Agreement.

16. **Variances:** If, in the opinion of the Sewer Commission, the size, shape, location, use of, or the improvements on the property subject to the front foot assessment, unit assessment, and/or capital outlet charge under the provisions hereof do not reflect the extent of the benefit, a factor or percentage or any other reasonable adjustment thereof may be used for determining the benefits which the Sewer Commission believes measures the extent to which said property is especially benefited.

Adopted: 10-26-77
Effective: 3-08-78

Amended: 9-27-78
Effective: 9-27-78

Amended: 3-23-88
Effective: 3-23-88

**POLICY RELATIVE TO SANITARY SEWER SERVICE**
**LATERAL INSTALLATIONS AND NEW LOT ASSESSMENTS**

It is the intent to continue following the rules set under the "RESOLUTION ADOPTING RULE OF APPORTIONMENT OF SEWER ASSESSMENTS, CONNECTION CHARGES, AND OUTLET CHARGES AGAINST PROPERTIES BENEFITING FROM THE SEWERAGE SYSTEM" with following supplement to it.

Installation of a trunk sewer by the Town of Glastonbury shall include the installation of a lateral to the property line for each existing lot.

If no lateral is available for an original lot that was assessed at the time of the sewer installation, the Water Pollution Control Authority would provide the service lateral to the property owner at no additional cost.

For newly created lots along an existing sanitary sewer line, a three-tier assessment shall be levied against each lot being served determined in accordance with the front foot assessment method, the unit assessment method, and the outlet charge method as defined in the Resolution adopting rule of apportionment.

Assessment amounts shall be at the current applicable uniform rates or at the rates previously established by this Authority.

If a developer installs the entire local sewer including, but not limited to, the street sewer, trunk sewer, and service laterals to all of the approved lots being served at his expense, then the Town shall assess a connection charge only represented by the Outlet Unit Charge.

If a developer creates new lots along an existing sanitary sewer line, the developer shall install the service laterals at his expense and the three-tier assessment shall apply at the applicable rates at the time of connection.

If a unique situation arises outside of the scope as set above, a review and recommendation by the Assessment Subcommittee may be brought before the full Authority for further consideration and action.

Adopted: 11-15-2006
Effective: 11-15-2006