

Town of Shelburne  
Public Works Specifications

Adopted by Shelburne Selectboard  
March 26, 2002  
(Revised February 12, 2008)



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These Specifications are applicable to all projects which are constructed within the Town right-of-way or those projects where the infrastructure will be turned over to the Town as public facilities.

These Specifications do not apply to projects occurring on private property where the infrastructure will not become part of the Town infrastructure.

## **GENERAL CONDITIONS AND REQUIREMENTS**

### **1.1 WORK TO CONFORM**

All materials, design, and workmanship must meet with nationally accepted standards and practices and, when applicable, those of the State of Vermont or the Town of Shelburne. Where a conflict arises between the published standards established in this manual and other published standards, the published standards of the Town of Shelburne shall take precedence. In cases where the design of a facility is not governed by these standards, the latest design and permitting methods shall be used and included on the plans for acceptance by the Officials of the Town. It shall be policy that all engineering design shall be based on the latest methods and technology when determining sizes, strength, and amounts.

During the progress of construction and upon completion, all work shall conform to these standards and the lines, levels and grades as indicated on the plans approved by the Town of Shelburne. The work shall be performed in a thoroughly substantial and workmanlike manner.

### **1.2 PROTECTION OF WORKERS AND THE PUBLIC**

The workers and public shall be protected by the Contractor from any and all hazards connected with the construction work. Open trenches, materials, or equipment within the working limits are to be guarded by the use of adequate barricades or flag persons. All barricades left in position overnight are to be properly lighted. When normal traffic patterns are modified or when work narrows the useable pavement, flag persons shall be employed to aid the flow of traffic so that there will be no undue delays. The Contractor shall be held responsible for the safety of all work persons and the general public and all damages to property occurring from or upon the work occasioned by negligence or otherwise growing out of a failure on the part of the Contractor to protect persons or property from hazard of open trenches, materials, or equipment at any time of the day or night within the working area. All work shall be in conformance to OSHA regulations, Title 19, Parts 1926.651 and 1926.652, and applicable to VOSHA regulations.

### **1.3 PROTECTION AND REPAIR OF EXISTING UTILITIES**

The Contractor shall notify Dig-Safe (1-888-344-7233) prior to any excavation in the public right-of-way or utility easement limits except in the case of emergencies. In emergency situations, the Contractor shall notify the appropriate Town department during regular office hours and the Town of Shelburne Police Department Dispatcher during off hours. In addition, the appropriate Town department shall be contacted forty-eight (48) hours prior to any scheduled work within the limits of the public right-of-way. Wherever culverts, sewers, drains, manholes, catch basin connections, water mains, valve chambers, electric conduits, telephone conduits, utility poles, overhead lines, or other existing facilities are encountered they shall be protected and firmly

supported by the Contractor at his/her own expense, by methods approved by the design/project engineer, until excavation is backfilled and the existing structures are made secure.

Injury to any such structures caused by or resulting from the Contractor's operations shall be repaired at the Contractor's expense within a time period that will not place an unreasonable burden on the users. The authority having charge of any particular underground structure shall be notified promptly of injury to its structure.

Pipes and underground structures encountered in excavating or trenching shall be permanently supported by methods acceptable to the Town of Shelburne.

#### **1.4 RECONSTRUCTION OF EXISTING UTILITIES**

In case it shall become necessary to remove or reconstruct any water main, sewer main, electric conduit, telephone conduit, and any connections thereto, or any appurtenant structures, approval for the relocation shall be obtained from the appropriate party prior to relocation. The Contractor shall be responsible for the work and for providing notice to users before interrupting service. Unless specifically provided for by written agreement, reconstruction of the utilities shall be at the Contractor's expense. In no case shall the Contractor move, change or repair any water main, sewer main, electric conduit, telephone conduit or any underground cables, conduits or structures, without permission from the Town of Shelburne and/or the utility owner and until they are satisfied that adequate warning to the users has been provided.

#### **1.5 PERMITS**

It shall be the Contractor's responsibility, in conjunction with the Developer, to obtain all federal, state, local or utility company permits necessary for the construction of the project prior to initiation of construction. The Contractor and Developer are also responsible for maintaining these permits in force during the length of the contract and for taking all required actions to comply with the content of the permits.

#### **1.6 WORK OUTSIDE THE OWNED PROPERTY LIMITS OR WITHIN PUBLIC RIGHTS-OF-WAY**

The Contractor shall not, without written consent of a property owner, enter or occupy with persons, tools, materials, or equipment, any private land, other than their own. In a similar manner, no excavation shall take place within the public right-of-way without first obtaining authorization for the Town or State, as applicable.

#### **1.7 SUPERVISORS ON THE JOB SITE**

The Contractor shall be responsible for ensuring that there is a supervisor or responsible individual under his/her direct employ and with the authority to make decisions for the Contractor on the job site at all times that construction is underway, whether or not the construction is being accomplished by a prime contractor or subcontractors hired by a prime contractor. The Contractor shall provide an emergency contact list to the Town prior to the start of construction.

## **1.8 CONSTRUCTION/WARNING SIGNS**

Construction approach signs shall appear at each end of the highway under construction and on all intersecting public highways. The exact placement of any sign will depend upon the alignment of the highway and the character of the roadsides. The location, measurements, and minimum spacing are to be observed by the Project Engineer in determining exact locations. All sign placements shall be submitted to the Shelburne Highway Department for approval. The Contractor shall be responsible for the erection and maintenance of all construction signs.

The design of the signs shall conform to the standards prescribed in the Manual on Uniform Traffic Control Devices prepared by the National Joint Committee on Uniform Traffic Control Devices.

The signs shall be of metal, wood, plywood, hardboard, or any other material satisfactory to the Shelburne Highway Department (Engineer). No material shall be approved that will deteriorate by exposure to the weather during the required life of the sign.

The signs shall be in place at the time the project officially commences. Each sign shall be erected in a neat and workmanlike manner on wood or metal posts set securely in the ground.

## **1.9 MAINTENANCE AND PROTECTION OF TRAFFIC**

The Contractor shall provide uniformed traffic police or flag persons if deemed necessary by the Town of Shelburne.

The Contractor shall, as conditions warrant, employ flag persons at any location on the project where his/her equipment or construction operations are such that they will in any manner interfere with the movement or safety of the traveling public within the public right-of-way.

The cost of traffic police services shall be paid by the Contractor.

The Contractor shall notify the Shelburne Highway Department, Police, Fire, and Rescue Departments at least forty-eight (48) hours in advance of any need to close streets. The Contractor shall work with the Town to establish a suitable alternate route, and shall, at his/her own expense, provide and maintain suitably marked and well-lighted detour signs.

The employment or presence of traffic flag persons or uniformed police does not relieve the Contractor of responsibility or liability.

## **1.10 EROSION PREVENTION AND SEDIMENT CONTROL**

It shall be the Contractor's responsibility, in conjunction with the Developer, to control runoff, stabilize soil, and contain sediment to adequately prevent erosion and control sediment from leaving the project site during construction. The discharge of any sediment from land disturbance activities approved by the Town to any other property, the MS4 and/or surface waters is prohibited except in the case of an emergency activity that is immediately necessary for the protection of life, property or natural resources. All Erosion and Sediment Control practices shall follow *The Vermont Standards and Specifications for Erosion Prevention and Sediment Control* (2006). The Contractor/Developer shall prepare an Erosion Prevention and Sediment Control Plan, file Notices of Intent (NOI) and obtain a Construction Stormwater Permit as required by Vermont Agency of Natural Resources regulation and guidance.

### **PROCEDURES**

#### **2.1 POLICY**

##### **A. PRIOR TO COMMENCING CONSTRUCTION**

Before commencing construction on the infrastructure of the subdivision or site plan the following steps must be taken:

1. All pertinent conditions of approval must be met.
2. All legal documents and the signed mylar must be recorded in the Land Records.
3. A preconstruction meeting must be held between the developer, his/her contractor and engineer, representatives of the Town departments involved (i.e. Water, Wastewater, Highway, Town Manager, Planning and Zoning), the Public Works Director, and any others deemed necessary. Four complete sets of construction drawings and specifications for the proposed work shall be prepared and furnished to the Director of Public Works prior to the meeting. The Developer shall provide an emergency contact list effective throughout the duration of the construction period. At this meeting Town departments shall submit a numbering system for each infrastructure item (manholes, hydrants, valves, etc.) on the project.
4. A letter of credit must be established with the Town, at no cost to the Town, in an amount to cover 100% of the estimated construction cost of the water and sewer utilities, road and stormwater management facilities, landscaping and any other items as may be applicable. This amount can be reduced, upon written request by the Developer to the Zoning Coordinator, as the work is completed and accepted.

Phased developments can bond by the phase to be built unless some part of the infrastructure must be installed as a whole in which case that part of the infrastructure must be bonded in its entirety.

The amount of the letter of credit will be determined from the Project Cost Estimate

Form, provided by the Town, or other approved form, which the Developer completes and submits to the Town for review and acceptance.

## **B. DURING CONSTRUCTION**

Periodic inspections of the progress of construction will be conducted by Town staff in addition to those inspections requested by and required of the Developer. Any inspections requested by the Developer must be scheduled so as to allow for the required two (2) day notice to the Town staff. Notice shall be given to the Director of Public Works who will coordinate the inspections. See Inspection Schedule, Section 2.2, of these specifications, for a detailed list of required inspections for water, sewer, roads and stormwater management systems.

Should a change in the approved plans be desired by the Developer or Contractor, a Project Modification Form must be submitted to the Director of Public Works for Town review and approval. A copy of the form can be found in Forms and Schedules, Section 2.4B. No changes to the plans shall be made without prior written approval of the Town.

## **C. PRIOR TO ISSUANCE OF A CERTIFICATE OF OCCUPANCY**

No certificates of occupancy will be issued for any structure until sewer and water connections are made and approved by the Town and until any other conditions imposed by the Town are met. No connections will be allowed until sewer and water systems are completed, tested and deemed acceptable by the Town.

## **D. COMPLETION OF PROJECT**

**Final Inspections:** Upon completion of the infrastructure of a project, the Developer or Contractor shall contact the Director of Public Works to schedule a final inspection of the project. Any repairs or corrections required by the Town to bring the project into conformance with the approved plans and these specifications shall be made at the Contractor's expense and another final inspection scheduled once the necessary work is complete.

**Release of Letter of Credit:** Once the water and sewer utilities, road and stormwater management facilities and any other items covered by the letter of credit are completed to the satisfaction of the Town, and as-builts have been approved by the Town, the Developer may request, in writing, a reduction of the letter of credit. The entire letter of credit will not be released until the end of the warranty period specified in the letter of credit.

**Town Assumption of Public Improvements:** The Town will not take over any public improvements such as water and sewer lines or roads until the warranty period specified in the letter of credit has expired. This warranty period shall be a minimum of one (1) year. All applicable conditions of final Town approval of a project must be met and all outstanding bills due the Town must be paid before assumption of public improvements by the Town. Requests for the Town to take over any or all public improvements must be made in writing to the Town Manager.

## **2.2 INSPECTION SCHEDULE**

## **A. EROSION AND SEDIMENT CONTROL**

The Department of Public Works shall make inspections as hereinafter required and either shall approve that portion of the work completed or shall notify the permittee wherein the work fails to comply with the Erosion and Sediment Control Plan as approved. To obtain inspections, the applicant or their agent shall notify the Department of Public Works at least two working days before the following:

1. Start of construction.
2. Installation of sediment and erosion control measures.
3. Completion of site clearing.
4. Completion of rough grading.
5. Completion of final grading.
6. Close of construction season.
7. Completion of final landscaping.

## **B. ROADS**

1. Two (2) days notice for all inspections shall be given to the Public Works Director, Highway Superintendent, or authorized representative.
2. A sample of all subbase and base materials will be tested by a testing lab approved by the Town in accordance with Note #3 of Figure 1, Type 1 Road (Street Details for the Subgrade), and sieve analysis to the 200 sieve for base materials for all changes in subgrade or base materials as required by the Shelburne Highway Department in conjunction with the Public Works Director, at the Developer's expense. The subbase and base compaction will be tested by AASHTO-T-99, Method A (Standard Proctor) test in fill sections at minimum intervals of every 500 to 1000 square feet of area and two feet (2') of depth and changes in material as required by the Shelburne Highway Department in conjunction with the Public Works Director at the Developer's expense. The responsibility for testing shall be the Developer's.
3. The Public Works Director, Highway Superintendent, or authorized representative will be notified forty-eight (48) hours in advance to inspect the construction of any and all roads at the following phases of construction:
  - a. Preparation of subbase;
  - b. Installation of base material;
  - c. Completion of finish grading;
  - d. Before and during the placement of the base coat of asphalt;
  - e. Before and during the placement of the top coat of asphalt.
4. The Shelburne Highway Superintendent and Public Works Director, as needed, or other authorized representative will inspect work during the placement of curbs, sidewalks, and driveway aprons.
5. Grades will be shot and verified by the Developer's engineer after the finished grading of

the road base, the placement of the base coat, and the placement of the top coat. The Shelburne Highway Superintendent, Public Works Director or authorized representative will be given 24 hours advance notice so they may be present during the taking of grade readings.

6. A final inspection will be taken after the completion of all roads, curbs, driveways, sidewalks, and/or bicycle paths. The following roadway general checklist will be used at final inspection:
  - a. Settlement, depression, or imperfections in finish surface;
  - b. Seeding and erosion control on cut and fill slopes;
  - c. Surface drainage (during a rainstorm);
  - d. General appearance;
  - e. Material testing results, lab reports, and record drawings complete and on file.
7. An inspection schedule for each project will be determined at the preconstruction meeting.

### **C. STORMWATER MANAGEMENT SYSTEMS**

1. Two (2) days notice for all inspections shall be given to the Public Works Director or authorized representative.
2. No backfilling shall occur until the installation of stormwater treatment practices, pipes for stormwater conveyance and culverts are inspected and approved by the Shelburne Highway Superintendent, Public Works Director or authorized representative.
3. The Shelburne Highway Superintendent, Public Works Director or authorized representative shall inspect and approve all pipes for stormwater conveyance and culvert joints and connections to catch basins.
4. The Shelburne Highway Superintendent, Public Works Director or authorized representative shall inspect all catch basins during installation.
5. Other stormwater management facilities, such as grass channels, infiltration trenches, detention basins and ponds, shall be inspected during construction and upon completion.
6. All stormwater management facilities will be inspected upon completion of the project using the following general checklist:
  - a. Catch basins, manholes, and pipelines clean;
  - b. Ditches and outlets clean;
  - c. Erosion control measures completed per the approved plan;
  - d. General appearance;
  - e. Material testing results, lab reports, manufacturer's certificates, and record drawings complete and on file.
  - f. Global positioning system points have been documented for each structure

7. An inspection schedule for each project will be determined at the preconstruction meeting.

#### **D. WATER DISTRIBUTION SYSTEMS**

1. Two (2) days notice for all inspections and testing will be given to the Public Works Director, Water Superintendent, or authorized representative.
2. Two (2) days notice shall be given to the Public Works Director, Water Superintendent, or authorized representative so they may be able to inspect all materials on the site before construction begins.
3. The Shelburne Water Superintendent, Public Works Director or authorized representative shall be present when any connection to the existing water system is made and during the testing, flushing, disinfecting, and sampling of new mains.
4. The following water main general checklist will be used at the final inspection:
  - a. Valves, hydrants, and curb stops operating properly;
  - b. Valve box covers set at proper elevations;
  - c. General appearance;
  - d. Tie information and record drawings complete;
  - e. Material testing results, lab reports, manufacturer's certificates, pressure and leakage test results, disinfection test results, record drawings, and hydraulic analysis are complete and on file.
  - f. Global positioning system points have been documented for each structure
5. An inspection schedule for each project will be determined at the preconstruction meeting.

#### **E. SANITARY SEWER SYSTEMS**

1. Two (2) days notice for all inspections and testing will be given to the Public Works Director, Wastewater Superintendent, or authorized representative.
2. Two (2) days notice shall be given to the Public Works Director, Wastewater Superintendent, or authorized representative in order for them to inspect all materials on site before construction begins.
3. The Chief Operator of the Shelburne Wastewater Department, Public Works Director or authorized representative shall visit the site at least four (4) times during the construction of the project, not including material inspection or final air test and visual inspection.
4. The (project) Contractor shall make available all grade readings at the project site. A copy of complete grade readings and air test results shall be submitted to the Shelburne Wastewater Treatment Department.
5. The following sanitary sewer system general checklist will be used at the final inspection:

- a. Manholes, pipelines, and appurtenances clean;
  - b. Inverts and shelves completed to plans with smooth transitions;
  - c. Manhole frames and covers set at proper elevation;
  - d. General appearance;
  - e. Material testing results, lab reports, manufacturer's certificates, leakage and pump test results and record drawings complete and on file.
  - f. Global positioning system points have been documented for each structure
6. An inspection schedule for each project will be determined at the preconstruction meeting.
  7. All piping shall be videoed at least 30 days after installation using a closed-circuit television (CCTV) system capable of recording in digital format. The CCTV software must be capable of documenting attributes of the pipe and give a rating of each attribute, and the line as a whole, based on Pipeline Assessment and Certification Program (PACP) standards. A copy of the video and all relevant reports shall be submitted to the Wastewater Department. Any defects found in design or workmanship shall be excavated and repaired at the contractor's expense.

(Two days notice shall be given both the Shelburne Wastewater Treatment Department or the Public Works Director before air testing of the pipe and manholes.)

## **2.3 SUBMITTAL OF AS-BUILTS**

Upon completion of all improvements, 5 complete sets of as-built drawings should be submitted to the Town. Drawings shall be detailed prints, drawn to scale and shall include a location map, site plan, and locations in plan and profile of all utilities, in addition to the following information.

### **A. ROADS**

1. Accurate locations of all streets and storm lines, culverts, and other facilities.
2. For streets the following shall be shown:
  - a. Width of pavement from curb to curb or shoulder to shoulder;
  - b. Right-of-way dimensions for streets;
  - c. Width of sidewalks and bike paths;
  - d. Location of street lights;
  - e. Location of driveways;
  - f. Location and size of planter islands, if any;
  - g. Typical cross-section of streets installed;
  - h. Location of all underground electric, telephone, and television lines.

### **B. STORMWATER MANAGEMENT SYSTEMS**

For stormwater management systems the following shall be shown:

1. Depth, size, location and type of all stormwater treatment practices, storm drain lines and

- culverts, including underdrains and services;
2. GPS location of all catch basins and outfalls;
  3. Location and details for all stormwater management system components including stormwater treatment practices such as detention ponds;
  4. Location of all drainage ways, watercourses, etc.;
  5. Location and width of drainage easements.

**C. WATER**

1. Accurate locations of all water lines in both plan and profile.
2. Accurate measurements and GPS coordinates to all valves, tees, elbows, curb stops, thrust blocks, air relief valves, and any other fittings from permanent fixtures such as telephone poles, hydrants, buildings, transformers, etc., along with depths of waterlines.
3. All curb boxes will be marked with stakes so contractors can easily locate them before building services are connected.
4. Location and width of water line easements.

All specifications are subject to change with AWWA Specification changes and by order of the Shelburne Board of Water Commissioners.

**D. WASTEWATER**

1. Accurate location of all sewer lines.
2. Accurate location of all tees and/or wyes for building connections.
3. Accurate location of building connections at property lines and depth and location of all manholes.
4. Invert and manhole cover readings, distances between manholes, and pitch of pipe.
5. Results of air tests on pipe and manholes.
6. Accurate location and width of sewer line easements.
7. A complete video inspection of all gravity sewer lines is to be submitted in digital format along with a printed report of the inspection.

The accurate location of structures is to be accomplished using a Global Positioning System Technology with accurate coordinates including elevations. The coordinates shall reference a

structure number provided at the preconstruction meeting by each Town department

After the initial set of as-builts has been submitted, there will be a field inspection by the appropriate department(s) to verify that the hydrants, valve boxes, curb stops, etc., are properly raised to ground level. Signatures of approval from the appropriate department heads on the Planning and Zoning copy of the as-builts or letters from the departments heads approving the as-builts (A letter of approval of the as-builts by the Town Engineer) are prerequisite to issuance of a certificate of occupancy.

Five (5) sets of prints of the final set of as-built drawings, (including one set of mylar reproducibles and four sets of prints,) one (1) copy of as-built drawings in digital format, and GPS coordinates of all structures shall be submitted to the Zoning Coordinator within thirty (30) days of the completion of the project. The final set of the project as-built drawings shall be stamped by the Developer's Professional Engineer with a signed and dated statement by the engineer that the construction materials were installed and the work was performed substantially in accordance with the approved plans and specifications. The as-built drawings shall also contain a stamped and signed statement by a licensed Land Surveyor that all property corner markers have been set in accordance with the approved property plat.

**2.4 FORMS AND SCHEDULES**

**2.4A PROJECT COST ESTIMATE FORM**

TOWN OF SHELBURNE

PROJECT COST ESTIMATES

PROJECT NAME: \_\_\_\_\_

PROJECT DESCRIPTION: \_\_\_\_\_

BETWEEN TOWN OF SHELBURNE AND \_\_\_\_\_

DATE SIGNED: \_\_\_\_\_ FIRST RELEASE DATE: \_\_\_\_\_

SECOND RELEASE DATE: \_\_\_\_\_ FINAL RELEASE DATE: \_\_\_\_\_

SURETY AMOUNT: \$ \_\_\_\_\_

TYPE (cash, letter of credit, other): \_\_\_\_\_

APPROVED BY: \_\_\_\_\_

(Administrative Officer)

DENIED BY: \_\_\_\_\_

**TOWN OF SHELBURNE  
PROJECT COST ESTIMATE FORM**

\_\_\_\_\_  
(Date)

ITEM	COST
Clearing & Grubbing	
Rough Grading	
Subbase Gravel	
Crusher Run (Bank Run)	
Paving: Base Course	
Top Course	
Driveway Aprons	
Sidewalks	
Bicycle Paths	
Bicycle Lanes	
Curbs	
Stormwater Management System	
Pipe	
Catch Basins	
Dry Wells	
Slope Pipes	
Outfall Pipes	
Slope Protection	
Headwalls	
End Sections	
Boring	
Earthwork	
Underdrains	
Detention Pond	
Other Stormwater Treatment Practices	

ITEM	COST
Water: Mains	
Hydrants	
Valves & Shutoffs	
Air Release Valves	
Boring	
Sewer: Mains	
Manholes	
Boring	
Sheathing	
Pump Station	
Landscaping	
Traffic Improvements:	
Striping	
Signs	
Other	
Utilities:	
Electric	
Gas	
Other	
Miscellaneous	
As-builts	
10% Holdback	
TOTAL	

**2.4B PROJECT MODIFICATION FORM**

**TOWN OF SHELBURNE  
PROJECT MODIFICATION FORM**

PROJECT TITLE: \_\_\_\_\_

DEVELOPER: \_\_\_\_\_

ENGINEER: \_\_\_\_\_

CONTRACTOR: \_\_\_\_\_

DESCRIPTION OF PROPOSED MODIFICATION:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

REASON FOR CHANGE FROM ORIGINAL PLANS:

\_\_\_\_\_  
\_\_\_\_\_

CHANGE ON COST ESTIMATE:

\_\_\_\_\_  
\_\_\_\_\_

REQUESTED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

APPROVED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

(Administrative Officer or Representative)

CONDITIONS OF APPROVAL:

\_\_\_\_\_  
\_\_\_\_\_

## TECHNICAL SPECIFICATIONS

### 3.0 STREET SPECIFICATIONS

#### 3.1 GENERAL REQUIREMENTS FOR PUBLIC STREETS

The minimum width of right-of-way, measured from lot line to lot line, shall not be less than sixty feet (60') unless a wider right-of-way is deemed necessary by the Shelburne Planning Commission.

Street grades shall not exceed eight percent (8%), unless approval is granted by the Planning Commission after consultation with the Public Works Director to exceed eight percent (8%). In no case may they exceed ten percent (10%) and in no case shall a grade between eight and ten percent (8% and 10%) be longer than 300 feet (300'). The minimum grade shall not be less than one-half percent (0.5%). The maximum positive or negative grade within one hundred feet (100') of the centerline intersection of two streets shall not be greater than three percent (3%) and no vertical curves may be introduced within one hundred feet (100') of the intersection.

Any street lines within a block deflecting from each other at any one point shall be connected with a curve the radius of which at the centerline shall not be less than two hundred and fifty feet (250').

Street corners shall have a minimum curb or edge of pavement radius of not less than twenty-five feet (25'). Type I roads shall have a minimum curb or edge of pavement radius of not less than thirty feet (30').

Minimum sight distances shall be based upon the latest edition of the AASHTO standards (minimum corner sight distance).

A tangent of at least one hundred feet (100') in length shall be introduced between reverse curves on all proposed streets.

Street intersections with centerline offsets of less than two hundred feet (200') shall not be allowed. Street intersections shall be at right angles, unless agreed to by the Town; and no intersection shall be at an angle of less than eighty (80) degrees.

A cul-de-sac is a street terminating in a turn-around at one end. The turn-around on a cul-de-sac shall have a minimum diameter of right-of-way of one hundred and twenty feet (120') and a minimum outside diameter of traveled way of one hundred feet (100'). As stated in the Shelburne Subdivision Regulations, the number of dwelling units served by a cul-de-sac or by a system of street sharing a common, single access to a major or secondary street shall not exceed thirty (30) unless additional connections to other streets are approved by the Planning Commission after consultation with the Public Works Director and Planning Department. Islands in the center of turn-arounds shall not be permitted.

No street shall be approved unless its elevation is above the elevation of the historic flood of record. The location of the 100 year flood plain shall be scaled from Federal Emergency Management Agency (FEMA) floodway maps or determined by ground survey of flood plain elevations.

Plans for the location and construction of all new driveways, including those for single-family

houses, shall be reviewed and approved by the Shelburne Public Works Staff as part of the plan review process. Each single-family residence driveway should have a minimum sight distance in both directions based upon the latest edition of the AASHTO standards. If safety, sight distances, excessive road speed, or congestions are a concern, the Town may require the applicant to hire a qualified consultant to assess the impact of the proposed driveway. Curb cuts for a single-family residence shall be fourteen feet (14') wide, eighteen feet (18') for a double driveway and between twenty-four (24') and forty feet (40') for a commercial or industrial driveway. A maximum of two (2) dwelling, commercial or industrial units may be served by a single driveway with the exception of planned residential developments (PRDs) and planned unit developments (PUDs). Curb openings for State highways will be determined by the Vermont Agency of Transportation.

Driveway culverts at a minimum diameter of fifteen inches (15") shall be required unless the Highway Superintendent feels they are not needed. The minimum driveway culvert length for a single-family residence shall be twenty feet (20'), forty feet (40') for a shared residential driveway and sixty feet (60') for commercial and industrial driveways. Each application for a Zoning permit shall show the location of the proposed driveway including any culverts, and shall not be issued a permit until reviewed and approved by the Highway Superintendent. The maintenance of driveways and culverts shall be the responsibility of individual property owners or a homeowner's association.

All road cuts, if allowed by the Town, shall be subject to the "Road Cut Standards" outlined herein. All road cuts shall be restored to original or better condition within one week of the initial cut. The repair work shall be approved by the Highway Superintendent prior to release of any deposits by the Town. Restored road cuts shall be guaranteed by the applicant for a period of one year after work has been deemed complete by the Highway Superintendent.

## **3.2 STREET TYPES**

### **A. Type I Roads**

Type I roads shall serve all industrial and commercial developments, and residential developments serving more than 20 units, as the primary roadways for commerce, commuting and access to emergency services. Type I roads shall always be public roads (except those serving as access ways to single purpose commercial lots and circulation corridors for approved planned unit developments and planned residential developments which have been deemed by the Planning Commission to be adequate as private roads). The following is an outline of the major characteristics of a Type I roadway. These items, along with the specific design criteria and details provided in the Shelburne Development Specifications, shall be included in the design of a Type I road.

1. The right-of-way width shall be sixty feet (60') unless a wider right-of-way is deemed necessary by the Shelburne Planning Commission.
2. Stormwater Management shall be provided by means of a closed drainage system with curbs and catch basins, unless an alternative stormwater management approach is proposed and approved by the Town Director of Public Works and the Vermont Agency of Natural Resources. In all instances, systems shall comply with the Agency of Natural Resources' "The Vermont Stormwater Management Handbook".

3. The road width shall have a minimum paved surface of twenty-eight feet (28'). Travel lanes shall be demarcated with fog lines.
4. Sidewalks and streetlights shall be required unless the Planning Commission determines that these are unnecessary.

Type I roads will require modification if soil conditions or high ground waters have the potential for creating an unstable subbase. If a soil has a plasticity index of more than six (6) and a liquid limit of more than twenty-five (25), or a sieve analysis, which shows more than 8% passing the #200 sieve, or the seasonal ground water table is within three feet (3') of finish grade, then a Type I modified road design shall be used. The Type I modified road serves the same function as the Type I road with the following changes:

1. The crushed gravel base is deepened from eighteen inches (18") to twenty-four inches (24").
2. Ground stabilization fabric is used on the subgrade.
3. Underdrain is required on both sides of the road. The underdrain shall be of sufficient size and depth to lower the water table two feet (2') below the road subgrade.

Type I roads have been developed to provide the Town of Shelburne with durable, safe and low maintenance arterial and collector roads. The twenty-eight (28') road width, sidewalks and streetlights provide space and illumination for traffic flow, parking and pedestrian movements. The enclosed stormwater management system with catch basins and curbs provides efficient stormwater collection without the high maintenance costs and safety hazards associated with ditches. Alternatives to the enclosed drainage system with catch basins and curbs may be proposed to the Public Works Director along with documentation that (1) it provides efficient stormwater collection without the high maintenance costs and safety hazards; and (2) it provides more effective stormwater treatment than a closed drainage system. The pavement and gravel thickness is sufficient to withstand heavy truck and car traffic without premature deterioration.

## **B. Type II Roads**

Type II roads serve low density residential developments with less than 20 residences. They provide access links to Type I roads. The traffic volume on Type II roads consists mainly of trips to and from single family residences and agricultural commerce. Type II roads shall always be public roads.

The following is an outline of the major characteristics of a Type II road. These items, along with the specific design criteria provided in the Shelburne Development Specifications shall be included in the design of a Type II road.

1. The right-of-way width shall be sixty feet (60') unless a wider right-of-way is deemed necessary by the Shelburne Planning Commission.
2. Stormwater Management shall be provided by means of a closed drainage system with catch basins, unless an alternative stormwater management approach is proposed and

approved by the Public Works Director. The method by which drainage is directed to the catch basins will be reviewed on a case-by-case basis.

3. The road width shall be twenty-four feet (24') of pavement with two foot (2') gravel shoulders each side. Curbs with a twenty-eight feet (28') wide paved road width are an acceptable substitute.
4. Sidewalks and streetlights may be required and will be evaluated on a case-by-case basis by the Shelburne Planning Commission.

Type II roads will require modification if soil conditions or high ground water have the potential for creating an unstable subbase. The criteria for road subbase modification are the same as for Type I road base modification. A Type II modified road base will be the same as a Type II road base with the following exceptions:

1. The gravel base is deepened from eighteen inches (18") to twenty-four inches (24").
2. Ground stabilization fabric is used on the subgrade.
3. Underdrain is required on both sides of the subgrade. The underdrain shall be of sufficient size and depth to lower the water table two feet (2') below the road subgrade.

Type II roads have been developed to provide a standard for existing and proposed highways which will have low traffic volumes now and in the future. The twenty-four foot (24') paved width will be adequate for automobile traffic and the two foot (2') gravel shoulder width to either side will accommodate the occasional truck with safety. The enclosed stormwater management system with catch basins provides efficient stormwater collection without the high maintenance costs and safety hazards associated with ditches. Alternatives to the enclosed drainage system with catch basins may be proposed to the Public Works Director along with documentation that (1) it provides efficient stormwater collection without the high maintenance costs and safety hazards; and (2) it provides more effective stormwater treatment than a closed drainage system. The pavement and gravel thickness will withstand heavy agricultural trucks without premature deterioration.

### **3.3 SIDE SLOPES**

Side slopes in street embankments shall descend one foot (1') vertically for at least three feet (3') horizontally (3 on 1). Side slopes in excavation in rock shall ascend six feet (6') vertically for at least one foot (1') horizontally (6 on 1). Where rock cuts have a face higher than ten feet (10') vertically, a three foot (3') berm shall be provided at each ten foot (10') level above the grade at the edge of the pavement.

Side slopes shall not be graded so as to extend beyond the limits of the road right-of-way onto land not part of the subdivision unless a suitable side slope easement has been properly established and granted by the affected property owner.

### **3.4 SOIL TESTS**

Prior to submittal of a preliminary plan application, soil borings and/or test pits shall be made to

depth of six feet (6') below final road grade surface on the basis of at least one representative test every 500'. Soil tests shall be performed by a soils laboratory acceptable to the Town. The tests shall be submitted to the Director of Public Works and consist of:

1. Standard sieve analysis and grain size distribution curve for each representative soil in the cross sections.
2. Plasticity index and liquid limit for each representative soil in the cross sections.

The consultant shall also submit a map showing the location of all test holes and sample points, soils logs for each hole and the depth of high seasonal ground water table.

The Shelburne Highway Superintendent, in conjunction with the Public Works Director, may waive the necessity for soil borings altogether or modify spacing or depth requirements depending upon the specific groundwater and soil characteristics at each proposed roadway.

The sampling and testing of all materials to be used in construction of the project is the responsibility of the design/project engineer. No materials shall be placed on a project without prior approval of the Town of Shelburne. Sufficient lead time must be established for acquiring the approvals of materials prior to placement.

### **3.5 EXCAVATION FOR STREETS**

Sufficient topsoil shall be stripped from the areas to be filled or excavated to provide a minimum of four inches (4") of cover over all finished slopes. This material shall be stored in stockpiles on the site until completion of grading operations and then shall be spread uniformly over all finished slopes.

All excavating and filling required for construction of pavements, curbs gutters, headwalls, drainage structures, and installation of pipe drains shall be specified herein and shown on the construction standards. The entire area of work shall be brought to the required lines and grades by excavation or filling. Excavated material, if suitable, shall be used in making embankments, in filling the low areas of work, and at such places as may be required.

All earthwork shall be performed in accordance with Division 200 of the Vermont Standard Specifications for Construction.

### **3.6 EMBANKMENTS**

Embankments shall be constructed by the Contractor with either approved surplus excavated material or with approved material obtained elsewhere.

All material resulting from clearing and grubbing shall be satisfactorily disposed of in a manner approved by the Shelburne Highway Department and in compliance with local ordinances. Under no conditions will this material be buried below the seasonal high groundwater.

When embankments are to be made on a hillside, the slope of the original ground on which the embankments are to be constructed shall be stepped and properly drained as the fill is constructed so that adverse movements of the slopes do not occur.

The excavated rock, ledge, boulders, and stone, except where required in the construction of other items or otherwise directed, shall be used in the construction of embankments to the extent of the project requirements and generally shall be placed so as to form the base of an embankment.

Frozen material shall not be used in the construction of embankments, nor shall the embankments or successive layers of the embankments be placed upon frozen material. Placement of material other than rock shall stop when the sustained air temperature, below 32 degrees Fahrenheit, prohibits the obtaining of the required compaction. If the material is otherwise acceptable, it shall be stockpiled and reserved for future use when its condition is acceptable for use in embankments.

When an embankment is to be constructed across a swamp, muck, or areas of unstable soils, the unsuitable materials shall be excavated to reach soils of adequate bearing capacity and the embankment begun. Alternative methods, such as use of a stabilization fabric in place of excavation and backfill, may be utilized only after approval of same by the Shelburne Highway Superintendent in conjunction with the Public Works Director.

Material being placed in embankments shall be placed in horizontal layers of uniform thickness across the full width of the embankment. Stumps, trees, rubbish, and other unsuitable material shall not be placed in embankments.

The layers shall begin at the deepest part of the fill. Material shall be placed in six inch (6") lifts with 95 percent maximum dry density by the AASHTO-T-99, Method A (Standard Proctor) test. Effective spreading equipment shall be used on each layer to obtain uniform thickness prior to compaction. Each layer shall be kept crowned to shed water to the outside edge of the embankment and continuous leveling and manipulation will be required to assure uniform density.

The entire area of each layer shall be uniformly compacted to at least the required minimum density by use of compaction equipment consisting of rollers, compactors, or a combination thereof. Earthmoving and other equipment not specifically manufactures for compaction purposes will not be considered as compaction equipment.

All fill material shall be compacted at a moisture content suitable for obtaining the required density. In no case shall the moisture content in each layer under construction be more than three percent above the optimum moisture content and shall be less than that quantity that will cause the embankment to become unstable during compaction. Sponginess, shoving, or other facie evidence for an engineering determination of lack of stability under this requirement, and further placement of material in the area affected shall be stopped or retarded to allow the material to stabilize.

When the moisture content of the material in the layer under construction is less than the amount necessary to obtain satisfactory compaction by mechanical compaction methods, water shall be added by pressure distributors or other approved equipment. Water may also be added in excavation or borrow pits. The water shall be uniformly and thoroughly incorporated into the soil by disc, harrowing, blading, or by other approved methods. The manipulation may be omitted for sands and gravel. When the moisture content of the material is in excess of three percent above the optimum moisture content, dry material shall be thoroughly incorporated into the wet material, or the wet material shall be aerated by disking, harrowing, blading, rotary mixing, or by other approved methods.

Compaction of the layer of wet material shall be deferred until the layer has dried to the required moisture content by evaporation.

Upon completion of filling and excavating, the subgrade shall be formed to the required grade and contour; and the entire surface again rolled as specified above. High spots shall be removed and low spots filled with acceptable material, and the process of leveling and rolling continued until no further depression results. Approval of the Shelburne Highway Department shall be necessary prior to placing the gravel bottom course.

### 3.7 GEOTEXTILE FABRIC

#### A. Stabilization Fabric

Where required on the plans or where directed by the Highway Superintendent, the Contractor shall install stabilization fabric, such as Mirafi 500X or an approved equal, over the subgrade prior to placement of fill, the gravel base, or around drains. The fabric shall be installed in accordance with the manufacturer's instructions.

#### B. Filter Fabric

Where required on the approved plans or directed by the Town, the Contractor shall install filter fabric such as Mirafi 140NS or 140NSL, or an approved equal, around all underdrains and curtain drainage systems. The fabric shall be installed in accordance with the manufacturer's instructions.

### 3.8 UNDERDRAINS

#### A. Description

This item shall consist of constructing underdrains using pipe, stone, filter fabric, underdrain outlets, cleanouts, and risers in accordance with these specifications and as shown on the accepted drawings or as necessary to lower the ground water two feet (2') below the road subgrade.

#### B. Materials

**Perforated Polyvinyl Chloride (PVC):** PVC SDR 35 pipe shall conform to ASTM F75B or AASHTO M278. Spiral wrap PVC pipe is not acceptable.

**Perforated Corrugated Steel Pipe:** Pipe shall conform to AASHTO M36. Minimum sheet metal thickness required is 0.052 inches for six inch (6") diameter underdrain and 0.064 inches for eight inch (8") diameter or larger. Other types of pipe may be used upon approval.

**Corrugated Polyethylene Pipe:** Corrugated Polyethylene pipe shall conform to AASHTO M294-90 Type S.

**Stone:** Stone fill shall be clean, washed, durable, three-fourths inch to one and a half inch (3/4" to 1 1/2") stone. Limestone shall not be acceptable.

**Filter Fabric:** The fabric shall be Mirafi 140NS or equal.

## **C. Construction Methods**

Trenches for underdrain shall be excavated to the dimensions and grade shown on the plans (or as ordered by the Engineer). Stone fill shall be placed to a depth of six inches (6") below the bottom of the pipe in conformity with the lines and grades shown on the plans (or as directed by the Engineer). Underdrain shall be placed in the center of the trench and firmly embedded in the material. The underdrain trench shall be backfilled to the gravel road base with three-fourths inch to one and a half inch (3/4" to 1 1/2") clean stone. Placing shall begin at the outlet end and proceed with perforations down unless otherwise ordered by the Shelburne Highway Department.

The joints between sections shall be made by fitting the ends as tightly as practicable. Corrugated steel or aluminum alloy underdrain shall be joined with an approved coupling. PVC plastic underdrain shall be suitably joined with approved fittings by the same manufacturer.

Upgrade ends of all underdrain pipe installations shall be closed with suitable plugs to prevent entry of soil material.

Underdrain cleanouts of the length shown on the plans and cast iron covers shall be installed at locations shown on the plans or as directed by the Shelburne Highway Department.

Pipes used in an underdrain system placed at road crossings or outlets (or as directed by the Engineer) shall be placed on a firm bed and joined in the same manner as underdrain. Unless otherwise directed, non-perforated pipe shall be used.

Backfill material shall not be placed directly in the trench by dumping haul vehicles or by pushing material into trenches by bulldozers, graders, or other equipment. Placing shall be limited to the use of hand shovels, backhoes, front-end loaders, or other similar types of equipment.

Filter fabric shall be placed in the trench around the stone fill with a six inch (6") fabric overlap at the top. (See underdrain detail, Appendix 5, Figures 1 and 2.)

### **3.9 SAND**

#### **A. Description**

This item shall consist of a subbase course of sand and be constructed on a prepared subgrade in accordance with the sections as shown on the accepted drawings.

#### **B. Materials**

Sand shall consist of material free from silt, loam, clay, or organic matter. It shall conform to the Vermont Standard Specifications for Construction for Sand Borrow, #703.03. It shall be obtained from approved sources and shall meet the requirements set forth in this table:

Percentage by Weight

Sieve Designation	Passing Square Mesh Sieve
2"	100
1 1/2"	90 - 100
1/2"	70 - 100
No. 4	60 - 100
No. 100	0 - 20
No. 200	0 - 8

### 3.10 CRUSHED GRAVEL BASE

#### A. Description

This item shall consist of a base course composed of crushed gravel to be constructed on a prepared subgrade in accordance with the sections shown on the accepted drawings.

#### B. Materials

All materials shall be secured from approved sources. Such aggregate shall consist of hard, durable stones, which show uniform resistance to abrasion and which are intermixed with sand or other approved binding material. It shall meet the requirement of Vermont Standard Specification for Construction, #704.05 A Course, Crushed Gravel for Subbase. The crushed gravel shall be uniformly graded from course to fine and shall meet the grading requirements set forth in this table:

Sieve Designation	Percentage by Weight Passing Square Mesh Sieve
4"	95 - 100
No. 4	25 - 50
No. 100	0 - 12
No. 200	0 - 6

All bottom course material shall be deposited and spread so as to distribute the material in uniform layers, compacted at optimum moisture content; and the maximum size stone particles shall not exceed two-thirds (2/3) of the thickness of the layer being placed. Crushed gravel base as manufactured by Shelburne Limestone is considered an equivalent material by the Shelburne Highway Department.

#### C. Preparation of Subgrade

The subbase material shall be placed on a prepared surface with an approved spreader box or by some other approved mechanical spreading equipment. The material shall be deposited so as to meet the requirements of the Vermont Standard Specifications for Construction, Section 301, and compacted to 95 percent dry density by the AASHTO-T-99 Method A (Standard Proctor) test.

If necessary where there is high ground water or frost susceptible soils, subbase fabric and underdrains shall be installed beneath the roadway as specified by the Shelburne Highway Department or as shown on the street details of these specifications.

### 3.11 CRUSHER RUN - TOP COURSE

#### A. Description

This item shall consist of an upper course of fine crusher run gravel to be placed over the bottom course of coarse crusher run gravel, which will have been prepared in accordance with these specifications. This upper course shall conform to the following specifications and be placed in accordance with the lines, grades, and typical cross-sections as shown in the accepted drawings. Material shall meet Vermont Standard Specifications for Construction, #704.05 A Fine, Crushed Gravel for Subbase.

#### B. Materials

All materials shall be secured from approved sources. This aggregate shall consist of angular and round fragments of hard durable rock of uniform quality throughout, reasonably free from thin, elongated pieces, soft or disintegrated stone, dirt, or other objectionable matter. The grading requirements shall conform to the following table:

Sieve Designation	Percentage by Weight Passing Square Mesh Sieve
2"	100
1 1/2"	90 - 100
No. 4	30 - 60
No. 100	0 - 12
No. 200	0 - 6

This upper course of crusher run gravel shall be deposited and spread in a uniform layer and compacted to a 95 percent dry density by the AASHTO-T-99 Method A (Standard Proctor) test. Top course crusher run gravel as manufactured by Shelburne Limestone is considered an equivalent material by the Shelburne Highway Department.

### 3.12 BITUMINOUS CONCRETE (ASPHALT) PAVEMENT

#### A. Description

This type of pavement shall be composed of mineral aggregate, mineral filler if required, and bituminous material, plant-mixed and laid hot. This pavement shall be constructed in two courses on the prepared or existing base in accordance with these specifications and in conformity with the

lines, grades, thickness and typical cross-sections shown on the drawings. The pavement shall conform to Section 406 of the Vermont Agency of Transportation specifications.

## **B. Materials**

The course aggregate shall consist of clean, hard-crushed rock or screen-crushed gravel free from dirt or foreign matter. It shall be reasonably free from soft and elongated pieces.

The fine mineral aggregate shall consist of sand or a mixture of sand and stone screenings of which at least fifty percent (50%) by weight shall be sand. The sand shall consist of clean, hard, durable grains free from injurious amounts of vegetable matter or other harmful substances.

The asphalt cement shall conform to all the requirements as set forth in Section 702 (and 704.10) of the Vermont Standard Specifications for Construction.

## **C. Construction Methods**

Equipment for spreading and finishing the mixture shall be a mechanical spreading and finishing machine provided with an activated screed and heated, if required. The machine shall be capable of spreading the mixture without segregation and shall be approved by the Shelburne Highway Department prior to use.

Application of bituminous concrete pavement shall meet all the requirements of the Vermont Standard Specifications for Construction, Section 406, including, but not limited to, the following:

**Weather Limitations:** Bituminous base material shall not be placed between November 1 and May 1. Material shall not be placed when the air temperature at the paving site in the shade and away from artificial heat is 40 degrees Fahrenheit or below.

Bituminous top material shall not be placed between September 15 and May 1. Material shall not be placed when the air temperature at the paving site in the shade away from artificial heat is 60 degrees Fahrenheit or below.

**Conditioning:** Prior to placing the bituminous material, the existing surface shall be cleaned, and then sprayed with a coat of Emulsified Asphalt, RS1. This shall apply to overlays on existing pavement or on base course as directed by the Shelburne Highway Department.

**Compaction:** Immediately after the bituminous mixture has been spread, struck off, and surface irregularities adjusted, it shall be thoroughly and uniformly compacted by rolling. Along forms, curbs, headers, walls, and other places not accessible to the rollers, the mixture shall be thoroughly compacted with hot or lightly oiled hand tampers, smoothing irons, or mechanical tampers. On depressed areas, a trench roller may be used; or cleated compression strips may be used under the roller to transmit compression to the depressed areas.

**Surface Tolerances:** The surface will be tested by the Shelburne Highway Department using a sixteen foot (16') straightedge at selected locations parallel with the centerline. Any variations exceeding three-sixteenths of an inch (3/16") between any two contacts shall be satisfactorily eliminated. A ten foot (10') straightedge may be used on a vertical curve. The straightedges shall

be provided by the Contractor. The finish surface shall also be of uniform texture and evenness showing no aggregate tearing, shoving, or pulling.

**Matching Surfaces:** When a new pavement is to match an existing bituminous pavement for a roadway or trench, the Contractor shall vertically smooth cut the existing pavement along a straight line a minimum of one foot (1') into the existing pavement over the existing gravel base. The smooth cut shall be thoroughly cleaned and coated with Emulsified Asphalt, RS1, just prior to paving.

**Base Course/Top Course Time Sequence:** There shall be a minimum of one (1) year between the application of base course and top course on newly constructed roads, unless otherwise permitted by the Shelburne Highway Department. Top course shall not be applied until the Shelburne Highway Department, in conjunction with the Public Works Director, has determined that the base course has been constructed in accordance with the Shelburne Development Specifications. Any defects noted by the Shelburne Highway Department shall be corrected before the top course is applied.

### 3.13 CEMENT CONCRETE CURB

#### A. Description

This item shall consist of a Portland cement concrete curb constructed on a prepared subgrade in accordance with these specifications and the cross-section shown on the drawings.

#### B. Materials

All concrete used in the construction of roadway curbs shall be Air Entrained not less than five percent (5%) nor more than seven percent (7%) so determined by an air meter approved by the Shelburne Highway Department. This concrete shall have a twenty-eight (28) day compressive strength of 3,500 psi and shall meet Section 501 of the State of Vermont Standard Specifications for Construction for Class B Concrete.

#### C. Construction Methods

**Preparation of subgrade:** All boulders, organic material, soft clay, spongy material, and any other objectionable material shall be removed and replaced with approved material. The concrete curbing shall be built to required line and grade on a bed of crusher run gravel a minimum of six inches (6") in depth, which shall be fully compacted.

**Forms for concrete:** The forms shall be of metal or acceptable planed and matched lumber and of such construction that a smooth surface will be produced. All forms shall be oiled. Slipforming shall not be allowed.

**Placing and finishing concrete:** Just prior to placing the concrete, the subgrade shall be moistened. The concrete, mixed to the proper consistency, shall be placed in the forms and thoroughly tamped in place so that all honeycombs will be eliminated and sufficient mortar will be brought to the surface. The use of vibrators and other compaction equipment to move the

concrete within the forms is not approved. Immediately upon removal of the forms, the curbing shall be rubbed down to a smooth and uniform finish. No plastering or patching will be allowed. After the forms have been removed, the trench shall be backfilled with approved gravel and fill as needed and thoroughly tamped, care being taken not to affect the alignment or grade of the curbing.

**Expansion and contraction joints:** One-half inch (1/2") expansion joints shall be placed at intervals of twenty feet (20'). At intervals not greater than ten feet (10') nor less than five feet (5'), the concrete curbs shall be scored for a depth equal to one-third (1/3) the total depth of the concrete.

**Curing the concrete:** When completed, the concrete shall be kept moist for a period of not less than three (3) days, and longer if (the Engineer) deemed necessary, and shall be protected from the elements in an approved manner. If the Contractor elects, he may apply an approved curing compound according to directions of the manufacturer.

**Seasonal limits:** No concrete shall be poured on a frozen or thawing subgrade, during unseasonable weather conditions, or when the temperature is 38 degrees Fahrenheit and falling. The Contractor shall record the temperature daily as outlined in Proposed Recommended Practice for Cold Weather Concreting, ACI 306. In hot weather, temperature of freshly placed concrete shall not be allowed to exceed 85 degrees Fahrenheit, conforming to ACI 305.

**Anti-spalling compound:** When the initial curbing period is over (approximately 28 days after placement), all exposed surfaces shall receive two (2) coats of anti-spalling compound. The surfaces shall be cleaned, and then the compound shall be applied; the first coat at a rate of .025 gallons per square yard, and the second at a rate of .015 gallons per square yard. Anti-spalling compound shall only be applied when the air temperature is above 50 degrees Fahrenheit.

**Curb cuts:** Each house shall be allowed one curb cut, which shall be constructed as outlined in Sections 1.15 and 1.16 and as in the Details section of this manual. A curb cut for a single-family dwelling shall be fifteen feet (15') in width, a double driveway curb cut shall be twenty feet (20') in width and a commercial or industrial curb cut shall be forty-five feet (45') in width.

### 3.14 CEMENT CONCRETE SIDEWALK

#### A. Description

This item shall consist of sidewalk made of one course Portland cement concrete not less than five inches (5") thick and with a width of not less than five feet (5'). Where the sidewalk crosses a driveway, the depth of concrete shall not be less than six inches (6") for residential driveways and eight inches (8") for commercial and industrial driveways. The sidewalk shall be constructed in accordance with these specifications and the cross-sections as shown on the accepted drawings. All sidewalks shall have ramps where they intersect with streets to provide handicap access.

#### B. Materials

Same as Cement Concrete Curbs.

#### C. Construction Methods

**Preparation of subgrade:** All boulders, organic material, soft clay, spongy material, and any other objectionable material shall be removed and replaced with approved material. The subgrade shall be properly shaped, rolled, and uniformly compacted to conform to the accepted cross-sections and grades.

**Base:** A minimum depth of six inches (6") of compacted, crusher run gravel shall be constructed on the subgrade to accepted cross-sections and grades.

**Forms for concrete:** The forms for the concrete shall be of wood or metal, well-oiled, straight, free from warps or kinks, and of sufficient strength. They shall be staked securely enough to resist the pressure of the concrete without spring. When ready for the concrete to be deposited, they shall not vary from the approved line and grade and shall be kept so until the concrete has set.

**Placing and finishing concrete:** Just prior to placing the concrete, the subgrade shall be moistened. The concrete mixed to the proper consistency shall be placed in the forms and thoroughly tamped in place so that all honeycombs will be eliminated and sufficient mortar will be brought to the surface. After this, the surface shall be brought to a smooth, even finish by means of a float. The surface shall be broom finished. All faces adjacent to the forms shall be spaded so that after the forms are stripped, the surface of the faces will be smooth, even, and free of honeycombs. All edges shall be tool rounded with an edge having a quarter inch (1/4") radius.

**Expansion joints and scoring concrete:** One-half inch (1/2") transverse expansion joints shall be placed at intervals not exceeding twenty feet (20'). Sidewalks shall be scored to a depth of one inch (1") every five feet (5').

**Curing concrete:** Same as for Cement Concrete Curb.

**Backfilling:** Backfill shall be of crusher run gravel (suitable bank run gravel) and shall be placed and tamped until firm and solid. Backfilling shall follow immediately after concrete forms have been removed.

**Seasonal limits:** Same as for Cement Concrete Curb.

### 3.15 BITUMINOUS CONCRETE DRIVEWAY APRONS

#### A. Description

Same as for Bituminous Concrete Pavement.

#### B. Materials

Same as for Bituminous Concrete Pavement.

### **C. Construction Methods**

**Preparation of subgrade:** Same as for Cement Concrete Sidewalk.

### **3.16 STREET SIDELINE MONUMENTS**

#### **A. Description**

This item shall consist of installing street property sideline monuments at all street intersections and at all points of curve and/or tangency or other critical points in the street lines as will enable a land surveyor to correctly stake out any lot in the subdivision.

#### **B. Materials**

Reinforced concrete monuments shall be those as manufactured by S.T. Griswold, or equivalent, and shall be 4" x 4" x 36". The top shall have a marked center, which shall be the point of reference.

#### **C. Construction Methods**

The monuments shall be set vertically and to a depth so that the top of the monument will project one-half inch (1/2") above the surrounding ground surface. The monuments shall be set in place after all other street improvements are completed. The monument's location shall be established by a surveyor licensed to practice in the State of Vermont.

### **3.17 PLANTING OF TREES**

The Planning Commission of the Town of Shelburne may require the planting of new trees in areas where no trees presently exist, within the area disturbed by new construction, or in an area in which substantial loss of trees has or will occur in the process of road construction.

Such trees shall be preferably of a type indigenous to the neighborhood. Such trees shall be planted in fertile or fertilized ground and shall be watered and nurtured after planting until growth is assured.

Trees shall have a minimum diameter of trunk at a point four feet (4') above the ground level of at least two inches (2"). They shall be planted at intervals of no more than sixty feet (60') on both sides of the street. Such trees shall be clear of any branches from a point of ground level to a point six feet (6') above ground level. All new trees shall be planted outside of the street right-of-way and utility, drainage, or other public easements.

### **3.18 STREET GUARD RAILS**

This item shall consist of the construction of twelve gauge standard steel beam and post guard rail, conforming to the design indicated on the accepted drawings, Sections 621 and 728 of the Vermont Standard Specifications for Construction, and pages G-1 and G-1d of the Vermont Design Standards. A guardrail shall be erected when the height of fill at the shoulder point is more than ten feet (10') with a slope steeper than 1 on 3 or as ordered by the Town.

### **3.19 STREET NAME SIGNS**

#### **A. Description**

This item shall consist of a street name sign with a 3lb/ft galvanized channel, installed in accordance with these specifications and as shown on the accepted drawings. The developer is responsible for the purchase and installation of street signs and poles.

#### **B. Materials**

The post shall consist of 3 lb/foot galvanized channel post.

#### **C. Construction**

The signpost shall have a total length of ten feet, six inches (10'6") with an approximate exposed length of eight feet, zero inches (8'0").

#### **D. Erection**

The sign post shall be set two feet, six inches (2'6") in the ground, and the backfill material shall be tamped to maximum density so that the post shall be plumb and rigid. The signpost shall be located in the mall between the sidewalk and the curb at a point, which will not interfere with pedestrian or vehicular traffic.

### **3.20 ROAD CUTS**

All requests for road cuts for utility connections must be approved by the Highway Superintendent after application had been made on approved Town forms. Road cuts are only to be used where no other feasible alternative exists for connecting utilities to a development.

The Contractor shall notify the Highway Superintendent forty-eight (48) hours in advance of commencement of the work. The Highway Superintendent will inspect the work at various stages, including the initial cut, preparation of the sand base, installation of gravel base, and paving of the cut. All restored road cuts shall be guaranteed by the Contractor for two (2) years.

All other requirements notwithstanding, no road cuts will be allowed between October 15 and April 15.

### **3.21 UTILITY CUTS**

In order to minimize the number of open cuts, which result in disturbances in the road base, all utilities crossing a Town road shall be installed in a sleeve.

In areas where there is no ledge, pipes six inches (6") in size or less shall be driven or bored under the road. If ground conditions make boring or driving impossible, then an open cut may be considered on a case-by-case basis. Pipes greater than six inches (6") in size may be installed in an

open cut. All road crossings, open cut, bored, or driven, shall be approved in advance by the Shelburne Highway Department. Construction methods and materials shall conform to the Shelburne Development Specifications. All pipes shall be sleeved unless the Shelburne Highway Superintendent feels it is not necessary.

### **3.22 STREET LIGHTING**

Streets and roadways shall be illuminated by standard streetlights, approved by the Town, a maximum of three hundred feet (300') apart and at all street intersections. The streetlights will be installed on the sidewalk side of the street where applicable. The light shall be of a downshielded luminaire type. Poles, brackets, and lights for street lighting are to be approved as to size, type, and location by the Planning Commission. They shall be complete and fully energized.

### **3.23 STREET NAMES**

No duplicate, or near duplicate, names for streets or developments will be allowed. When a developer chooses names for any development, subdivision, street, or road, the proposed names shall be submitted in writing to the Town's Public Safety Agencies for review of any possible duplication with existing developments, subdivisions, streets, roads, or businesses within the Town of Shelburne. The final street names shall be submitted in writing to the Shelburne Police Dispatch Center at least one month prior to anyone taking occupancy on a new street or road.

### **3.24 STREET NUMBERS**

Homes within single family subdivisions shall be numbered by the Contractor prior to occupancy in accordance with the U.S. Post Office, Town, and E-911 street-numbering system.

The numbers shall be placed both on a United States Post Office approved mailbox at curbside and on the structure of the house at a point no more than two feet (2') away from the frame of the front door. The numbers shall be in the form of a minimum of two inch (2") high Arabic numerals and shall be of a color contrasting to the surface on which they are placed or on a self-contained contrasting background. Curbside mailboxes shall conform to the Town Development Specifications for the placement of such mailboxes.

### **3.25 EMERGENCY VEHICLE ACCESS**

In order to provide adequate fire protection, any plans submitted for consideration to the Town of Shelburne for any type of commercial or industrial building may be required to provide an access road at least fourteen feet (14') wide completely around the building. Determination of the need for such an emergency access road will be based on building construction and the types of fire protection measures to be provided.

The road must be able to support the weight of a two-axle, forty thousand pound (40,000#) truck. Preferred construction should be bituminous concrete, as per the specifications for paved public roadways, although gravel roadways will be accepted if they conform to the weight specification above.

Any such access road shall be lit in accordance with the lighting specifications of public roadways.

Access roads must be passable year round. The Town of Shelburne shall not own or maintain emergency vehicle access roads on private property. Maintenance shall be the responsibility of the individual owners. In the event of a subdivision, it must be shown that a homeowners association will be established to provide this maintenance.

### 3.26 LANDSCAPING

At completion of grading, slopes, ditches, and all disturbed areas shall be smooth and free of pockets with sufficient slope to ensure drainage.

All disturbed areas shall receive a minimum of four inches (4") of topsoil and shall be seeded, fertilized, limed, and mulched in accordance with the following:

1. Seed mixture in all areas shall be urban mix conforming to the table below. For seeding between September 1 and October 1, winter rye shall be used at an application rate of 100 pounds per acre.
2. Fertilizer shall be standard commercial grade conforming to the State Fertilizer Law and to the Standards of the Association of Official Agricultural Chemists. Dry fertilizer, if used, shall be applied at the rate of 500 pounds per acre. Liquid fertilizer, if used, shall be applied in a 1-2-1 ratio with the minimum rate to include 100 pounds of nitrogen, 200 pounds of phosphate, and 100 pounds of potash per acre.
3. Limestone shall conform to all State and Federal regulations and to the Standards of the Association of Official Agricultural Chemists. The limestone shall be applied at a rate of one ton per acre as directed.
4. Within twenty-four (24) hours of application of fertilizer, lime, and seed, the surface shall be mulched with a hay mulch. Mulch shall be spread uniformly over the area at a rate of two (2) tons per acre.
5. All turf establishment shall be performed in accordance with the Vermont Standard Specifications for Construction, Section 651.

#### URBAN MIX GRASS SEED

Percentage By Weight	Pounds Live Seed Per Acre	Type of Seed
37.50%	45.0	Creeping Red Fescue
37.25%	37.5	Kentucky Blue Grass
		Winter Hardy, Perennial Rye

31.25%	37.5	(variety Pennfine, Manhattan, or similar varieties)
100%	120 pounds live seed per acre	

### 3.27 STUMP DISPOSAL

On any project in which site development requires the removal of tree stumps, the disposal of the stumps may be accomplished on site. On-site stump disposal plans shall be submitted to and approved by the Planning and Zoning Department.

Such plans shall show that the on-site disposal can be safely and effectively accomplished and will meet the following minimum guidelines:

1. Disposal sites shall be located on nearly level to moderately sloping lands (slopes less than 12 percent).
2. Disposal sites will not be located in or within 100 feet of flowing watercourses or streams or in actively eroding gullies or high seasonal ground water table.
3. Disposal sites shall not be located in flooded or flood-prone lands, marshes, or other aquifer recharge areas.
4. Stumps will be placed on the site in a single lift prior to backfilling. When additional stumps are to be deposited on the same site, each successive layer or lift of stumps will be backfilled.
5. Stumps deposited in drainage ways or depressions shall be backfilled and bermed so as to divert overland flows from the disposal area.
6. A minimum of two feet (2') of overburden will be placed over all disposal sites.
7. Disposal sites shall be located outside any planned development area of structures, utilities, parking areas, streets, rights-of-way or utility easements.
8. All disturbed surfaces shall be properly limed, fertilized, seeded, and mulched to provide stable, non-erosive, vegetated cover. Specific seeding recommendations and lime or nutrient requirements will be based on soil tests and site conditions on that location.

## 4.0 STORMWATER MANAGEMENT SYSTEM SPECIFICATIONS

### 4.1 DESCRIPTION

This item shall consist of catch basins, manholes, and pipe, meeting the specifications for the diameter of pipe required and installed as indicated on the approved drawings. Except where approved by the Planning Commission, stormwater management systems for new developments shall be underground. The sizing of stormwater management systems shall be based on detailed calculations of stormwater flows and shall be prepared under the direction of an Engineer registered in the State of Vermont.

For developments proposing more than one acre of impervious area (roofs, and all other areas covered by gravel, asphalt, concrete or other impervious materials), the Town will require calculations as part of the site plan or preliminary subdivision plan submittals. For developments proposing less than one acre of impervious area, the Town may also require calculations if stormwater discharge or sizing of the proposed stormwater system is a concern.

Stormwater calculations and stormwater management systems design shall conform with the most recent rules of the Vermont Agency of Natural Resources Department of Environmental Conservation Water Quality Division. Treatment of stormwater runoff shall be in accordance with The Vermont Stormwater Management Manual. The stormwater calculations shall also include, but may not be limited to, the following:

1. Determination of the pre-development and post-development stormwater discharges for the two (2) year and twenty-five (25) year twenty-four (24) hour storm events. The preferred methods of calculation are the Soil Conservation TR55 or TR20 stormwater models. Other methods may be acceptable and will be reviewed on a case-by-case basis by the Shelburne Highway Department in conjunction with the Town Engineer.
2. The calculations shall demonstrate that all elements of the stormwater collection system are sized to handle the twenty-five (25) year twenty-four (24) hour storm event without overflow or flooding. If detention basins are needed, the calculations shall demonstrate that the basin can limit the stormwater discharges from the twenty-five (25) year twenty-four (24) hour post-development storm to the level of the twenty-five (25) year twenty-four (24) hour pre-development storm. The calculations shall also demonstrate that the detention basin has an emergency outlet capable of transmitting the discharges from the twenty-five (25) year post-development storm without exceeding the capacity of the emergency spillway.
3. The calculations shall show that the twenty-five (25) year twenty-four (24) hour post-development stormwater discharge will not adversely impact the existing stormwater drainage facilities. If the twenty-five (25) year stormwater discharge adversely impacts existing storm drainage facilities, the Developer will be expected to eliminate the adverse impact or upgrade the existing facilities as part of the development.

### 4.2 MATERIALS

**Types of pipe:** Types of pipe that may be used for conveyance of stormwater are High-Density Polyethylene Pipe (H.D.P.E.), Reinforced Concrete Pipe (R.C.P.), Corrugated Galvanized Metal Pipe (C.G.M.P.), Polyethylene, Polyvinyl Chloride Pipe (P.V.C.), or an approved equal. Types of pipe that may be used for culverts are High-Density Polyethylene Pipe (H.D.P.E.), Corrugated Galvanized Metal Pipe (C.G.M.P.), or an approved equal. The Shelburne Highway Department will approve the types of pipe used.

**Size:** The minimum size of stormwater lines and culverts shall be fifteen inches (15"), including driveway culverts. The minimum depth of cover over the crown of a drainage pipe shall be three feet (3') except driveway culverts that may have twelve inches (12") minimum cover. Special considerations shall be made on a case-by-case basis for shallow ditches.

Catch basins shall have a minimum 36" diameter, but for structures with more than two (2) pipe penetrations, the catch basin diameter shall be a minimum of 48".

**Corrugated galvanized metal pipe:** Pipe shall conform to standard specification for C.G.M.P. pipe, to AASHTO, M190. Spiral metal pipe will not be allowed.

**Corrugated Polyethylene Pipe:** Corrugated Polyethylene pipe shall conform to AASHTO M294-90 type S.

**Polyvinyl chloride pipe:** Pipe shall conform to ASTM Specifications D3034 or F679, (PVC) sewer pipe and fittings, SDR35. Spiral wrap PVC will not be allowed. Rubber gaskets for PVC pipe shall conform to ASTM D-3212 and F-477.

**Catch basins:** Catch basins shall be constructed of reinforced concrete and shall be provided with cast iron frames and grates. For curbside installation, frames and grates shall be LeBaron LK120, LK120A (for grades exceeding 5%), or an approved equal. For areas outside curbing, frames and grates shall be LeBaron LK121. Precast risers and base sections shall conform to the Vermont Standard Specifications for Construction, Section 604 and shall conform to ASTM C913. There shall be a two foot (2') sump below the outlet invert in all storm manholes.

Frames shall be brought to grade with solid concrete risers at least 3", and no more than 10", thick with no more than 1 layer of shim brick allowed. Frames set higher than the top course of paving shall be removed and reset.

Joints between pipes and catch basin sections shall be caulked with oakum and sealed with cement mortar, smoothed on the inside, and built up with a heavy bead of excess mortar on the outside. All brickwork shall be constructed in accordance with the masonry specifications for sanitary sewers in these specifications.

The grating frames shall be set to final grade only after the base course paving has been completed.

**Manholes:** Manholes shall be constructed of reinforced concrete and shall be provided with cast iron frames and covers. Manhole covers and frames shall be 24" diameter Type C as manufactured by Lebaron or approved equal. Precast risers and base sections shall conform to the VTrans Standard Specifications for Construction, Section 604 and shall conform to ASTM C913. There

shall be a two foot (2') sump below the outlet invert in all storm manholes.

Frames shall be brought to grade with solid concrete risers at least 3", and no more than 10", thick with no more than 1 layer of shim brick allowed. Frames set higher than the top course of paving shall be removed and reset.

Joints between less than or equal to six inch (6") diameter pipes and manhole sections shall be either (1) caulked with oakum and sealed with cement mortar, smoothed on the inside, and built up with a heavy bead of excess mortar on the outside; or (2) utilize flexible manhole sleeves manufactured by Lock Joint or approved equal. Flexible manhole sleeves manufactured by Lock Joint or approved equal shall be provided at all mainline inlet and outlet pipe penetrations greater than six inch (6") diameter. All brickwork shall be constructed in accordance with the masonry specifications for sanitary sewers in these specifications.

The cover frames shall be set to final grade only after the base course paving has been completed.

**Inlet and outlet control materials:** At each stormwater pipe inlet and outlet, a combination of stone fill within the drainageway and riprap above the sides may be required for sufficient distance from the outlet to prevent scouring and erosion of the drainageway.

Stone fill and riprap shall conform to the materials specifications of the VTRANS Standards for Construction for stone fill (Section 706.04), and riprap (Section 706.03). The exact type of stone fill shall be determined by the Project Engineer based on the hydraulic conditions.

#### 4.3 CONSTRUCTION METHODS

**Erosion and Sediment Control:** The Contractor shall take all practicable and necessary effort to control and prevent erosion and sediment transport during the construction of a project to surface waters of the State or to adjoining properties. No clearing, grading, cutting or filling shall commence until erosion and sedimentation control devices have been properly installed, in accordance with an approved plan between the area to be disturbed and adjacent property, water bodies, water courses and wetlands. Clearing and excavation required for installation of erosion and sedimentation control devices is allowed provided no activity occurs beyond five (5) feet of the control devices as specified on the approved plan.

Once properly installed erosion and sediment controls must be maintained until a permanent vegetative ground cover is established. Any site or portion thereof where work is not being performed as part of the current phase of development and which remains cleared for over thirty (30) days, shall be stabilized. All disturbed areas shall be permanently stabilized through the establishment of appropriate vegetative ground cover upon completion of development activities on the site.

**Laying pipe:** Stormwater piping and culverts shall be constructed in accordance with the Vermont Standard Specifications for Construction, Section 601, and on a trench bottom, prepared and bedded as shown on the drawings. Each pipe shall be checked just prior to laying to ensure that it is clear of all dirt and debris and shall be laid true to line and grade as indicated on the contract drawings. All joints shall be tight and inverts shall be continuous.

Metal pipe shall be firmly joined with coupling bands, concrete pipe joints shall be rubber gasket-type, and PVC pipe shall be joined with the standard push-on type using elastomeric gaskets.

Stormwater piping and culverts with water flow velocities greater than twelve feet (12') per second shall require special design that must be approved by the Shelburne Highway Department in conjunction with the Town Engineer.

**Backfilling:** All material for backfilling shall be free of roots, stumps, and frost. Backfill for all pipe lines shall be placed in six inch (6") layers, each layer being thoroughly compacted to not less than 95 percent of maximum dry density as determined by the AASHTO-T-99, Method A, Standard Proctor (by means approved by the Engineer). PVC pipe shall have a minimum of three feet (3') of cover over the crown of the pipe.

**Pipe bedding:** (asphalt-coated) corrugated galvanized metal pipe shall be bedded from the trench bottom to the centerline of the pipe to a height of two feet (2') above the top of the pipe with material excavated from the trench having no stones larger than two and a half inches (2 1/2") in the longest dimension. Should no excavated material be suitable, sand or gravel shall be used.

PVC pipe and HDPE shall be bedded with #2 pea stone and backfilled with material excavated from the trench (having no stones larger than three inches (3") in the longest dimension). Sand or gravel shall be used if no excavated material is suitable.

PVC pipe shall not be installed when the temperature drops below 32 degrees Fahrenheit or goes above 100 degrees Fahrenheit. During cold weather, the flexibility and impact resistance of PVC pipe is reduced. Extra care is required when handling PVC pipe during cold weather.

**Flared End Sections:** The Contractor shall construct flared end sections at the outfall end of all stormwater piping as shown on the approved plans. Rubble masonry headwalls may be used with approval of the Shelburne Highway Department and shall be constructed to conform to the Vermont Standard Specifications for Construction, Section 602.

Flared end sections shall conform to the Vermont Standard Specifications for Construction, Sections 710-711.

**Stormwater Treatment Practices:** Stormwater Treatment Practices (STP), if deemed necessary, shall be designed and constructed under the supervision of an Engineer registered in the State of Vermont. All STP shall meet the design criteria set forth in The Vermont Stormwater Management Manual, (Volumes I and II) latest version, and shall be adequate to achieve the required stormwater treatment standards contained therein. The Town of Shelburne will not own or maintain STP, unless a specific STP maintenance agreement has been negotiated and signed. If a STP is proposed, the Town will require that a Stormwater Management Plan containing both narrative and map(s) that clearly provide the following information be submitted as part of the site plan or preliminary subdivision plan review.

- (1) Contact Information - The name, address, and telephone number of all persons having a legal interest in the property and the tax reference number and parcel number of the property or properties affected.

- (2) Site Plan - A map indicating the location of existing and proposed buildings, roads, parking areas, utilities, structural stormwater management and sediment control facilities. The map will also clearly show proposed land use with tabulation of total lot size in acres, percentage of surface areas to be disturbed, percentage of both existing and proposed impervious surfaces, drainage patterns, locations of utilities, limits of clearing and grading, and all easements, including those easements necessary for required maintenance of all stormwater treatment practices. Detailing of outlet structures, erosion control, and a six foot (6') high chainlink fence around the perimeter of any detention basin the structure.
- (3) Base Map - A 1" = 200' topographic base map of the site which extends a minimum of 100' beyond the limits of the proposed development and indicates existing surface water drainage including streams, ponds, culverts, ditches, and wetlands and current land use including all existing buildings, utilities, roads, and significant natural and manmade features not otherwise shown.
- (4) Calculations - Sufficient engineering analysis to show that the proposed stormwater treatment practices are capable of controlling runoff from the site in compliance with the stormwater design manual. The analysis shall also include hydrologic and hydraulic design calculations for the pre-development and post-development conditions for the design storms specified in the Vermont Stormwater Management Manual. Calculations that show the basin is capable of limiting the stormwater discharges from the ten (10) year twenty-four (24) hour post-development storm event to the ten (10) year twenty-four (24) hour pre-development storm event. The calculations shall also show the basin has an overflow outlet capable of discharging the stormwater from the twenty-five (25) year twenty-four (24) hour storm event.
- (5) Soils Report - If a stormwater treatment practice depends on the hydrologic properties of soils, such as infiltration basins, then a soils report shall be submitted. The soils report shall be based on on-site boring logs or soil pit profiles.
- (6) Specifications for basin earthwork conforming with Section 200 of the Vermont AOT Standard Specifications for Construction with maximum embankment slopes of 3:1.
- (7) The Developer shall submit proof that a proposed STP will be maintained. A statement to this effect shall be placed in the covenants of an individually owned lot. In the case of a subdivision, a landowners association shall be created to maintain the STP, unless a specific STP maintenance agreement has been negotiated and signed with the Town. The design and planning of all stormwater management facilities shall include detailed maintenance and repair procedures to ensure their continued function. These plans will identify the parts or components of a stormwater management facility that needs to be maintained. The maintenance and repair plan shall also include:
  - a) A Landscape Plan - The applicant must present a detailed plan for the management of vegetation at the site after construction is finished, including who will be responsible for the maintenance of vegetation at the site and what practices will be employed to ensure that adequate vegetation cover is preserved.
  - b) Maintenance Easements - The applicant must ensure access to all stormwater

treatment practices at the site for the purpose of inspection and repair by securing all of the maintenance easements needed on a permanent basis. These easements shall be recorded in the land records before the issuance of a Building Permit and will remain in effect even with transfer of title to the property. Access easement granted to the Town of Shelburne to the STP, if the STP will be impacting stormwater facilities owned or dedicated to the Town of Shelburne.

- c) Maintenance Agreement - The applicant must execute a maintenance agreement binding on all subsequent owners of land served by an on-site stormwater management measure. The maintenance agreement shall specify the required maintenance for all stormwater treatment practices, along with a maintenance schedule specifying when and how often maintenance is performed on the stormwater treatment practices.
- d) Maintenance Records - The applicant shall be required to maintain records that verify that all required maintenance was performed in conformance to the approved Stormwater Management Plan. The records shall be maintained by the applicant and subsequent owner(s), and shall be made available to the Department of Public Works upon request.

Before a Certificate of Occupancy is issued, the Project Engineer shall submit to the Zoning Coordinator, certification that the STP has been constructed in accordance with the approved plans and is functioning properly.

#### **4.4 TESTING AND INSPECTION OF STORMWATER MANAGEMENT SYSTEMS AND CATCH BASINS**

Before testing and inspection, the Contractor shall clean all storm drains, manholes, and catch basins with a sewer vacuum. All other stormwater management systems shall be appropriately cleaned. After cleaning, all sumps shall be pumped dry. The Shelburne Highway Superintendent, in conjunction with the Town Engineer, shall visually inspect all pipes and structures for compliance with the Shelburne Development Specifications. Defects, if noted, shall be corrected by the Contractor at no expense to the Town of Shelburne.

Before inspection, the Contractor shall grade, stabilize, and seed (as necessary) all stormwater management system components.

The construction of crushed gravel subbase and base paving shall not be allowed until the stormwater system meets the requirements of the Shelburne Development Specifications.

### **5.0 WATER DISTRIBUTION SPECIFICATIONS**

#### **5.1 DESCRIPTION**

This item shall consist of the work required for the complete construction of water mains and shall include valves, tees, hydrants, elbows, reducers, and all other appurtenances necessary for a complete water main system as indicated in the accepted drawings. All material and installations shall be approved by the Shelburne Water Department.

## **5.2 COMPLIANCE**

All water line installations shall be constructed in accordance with the requirements established in the Department of Environmental Conservation Water Supply Rule 21 and the Town of Shelburne Development Specifications.

## **5.3 APPLICATIONS**

Applications for water service shall be made on printed forms furnished by the Water Department, and the applicant shall agree to conform to any and all Water Department regulations concerning use of the service and of the water provided. A fee designated as a hook-on fee shall be paid in full at the time an application is made for service. The hook-on fee shall be such an amount as is designated from time to time in the "Schedule of Rates, Fees and Charges". Approval of a water service application does not relieve the applicant from attaining all necessary State and Federal permits.

Prior to any service connection being made to the water main, the Shelburne Water Superintendent or his/her designee shall be given at least two (2) working days notice in order that the work can be scheduled for inspection. All service connections will be made during normal working hours and no connection shall be allowed on Saturdays, Sundays, or legal Town holidays. If the Superintendent or his/her designee has not been properly notified and the work has proceeded, the Superintendent or his/her designee may require the completed work to be uncovered for examination at the owner's expense.

The property owner/agent shall agree, as a condition of receiving approval for connection to the Shelburne water system, to restore the streets, sidewalks, curbs, electrical lines, grassed or open areas or other features to their original condition after the installation of said water line.

## **5.4 MATERIALS**

**Piping materials:** Piping materials proposed for construction shall be pre-approved by the Shelburne Water Department.

- A. Ductile Iron Pipe: Tyton Ductile Iron Class 52 meeting AWWA Specifications C151 and ANSI Specification A 21.51 or latest revision; cement-lined, tar-coated. All ductile iron pipe shall be protected against corrosion by installing polyethylene encasement in accordance with the Ductile Iron Pipe Research Association (DIPRA) requirements and the American National Standard for Polyethylene Encasement for Ductile Iron Pipe Systems ANSI/AWWA C105/A21.5.
- B. Polyvinyl Chloride (PVC) Plastic Piping: PVC Pressure Class 200 (DR 14) meeting AWWA Specifications C900 or latest revision; with cast-iron-pipe equivalent OD; with plain or gasket bell end. Bare copper or aluminum tracer wire not less than 0.10 inch in

diameter in sufficient length to be continuous over each separate run of pipe shall be provided for all PVC pipe installations. Attach the wire to the top of the pipe in such a manner that it will not be displaced during construction operation.

**Gate valves:** Valves shall be manufactured to meet all requirements of AWWA Specification C509 (latest version). Valves shall have non-rising stems, open counterclockwise, and be provided with a 2 inch square operating nut with arrow cast in metal to indicate direction of opening. Each valve shall have maker's name, pressure rating and year in which manufactured cast on the body. Prior to shipment from the factory, each valve shall be tested by hydrostatic pressure equal to twice the specified working pressure. Gate valves shall be Mueller or equal as approved by the Shelburne Water Department. All valves shall be ordered with stainless steel bolts and nuts.

**Fittings:** Ductile iron fittings for ductile iron and PVC piping shall conform to AWWA C153 and ANSI Specification A21.10, 350 PSI working pressure.

All M.J. fittings shall have mega-lug glands for additional joint restraint.

Joints for PVC and connections of PVC to metal fittings and valves shall be compression/mechanical joints conforming to ASTM D3139 and AWWA C111/ANSI 21.11.

Bolts shall conform to ANSI Specification A21.11/AWWA C111.

**Hydrants:** Hydrants shall be Mueller or Kennedy M/JI Shoe N 53 A, 24015 I.M.P. with 6 foot minimum bury or as site conditions require and as approved by the Shelburne Water Department. All hydrants shall have the drain holes plugged.

Other requirements:

There shall be two 2 1/2" hose nozzles and one 4 1/2" pump nozzle. National Fire Protection Association (NFPA) Standard Thread connections shall be used. Hydrants shall be set to allow for 2' minimum clearance from ground level to the bottom of the 4 1/2" connection. Hydrant tees and valves shall be used for all hydrant branch connections. All branch connections shall be 6" minimum.

Hydrants shall be enameled red unless otherwise approved.

The break away flange shall be set to match ground line.

Hydrants shall meet the requirements of AWWA C502.

Winter marking flags (spring supports) shall be provided for all new hydrants.

In high traffic areas, concrete filled 6" diameter steel bollards may be required for protection.

**Tapping Sleeves:** Tapping sleeves shall be of the split sleeve design, constructed with two solid half-sleeves bolted together. Sleeves shall be ductile iron with mechanical joint ends and side gasket seals and shall have a working pressure of at least 200 psi.

All iron body tapping sleeves shall be provided with a 3/4" NPT test plug, or other provisions must be made for air testing the valve and sleeve at maximum working pressure, prior to tapping.

All exterior bolts and nuts used for tapping or valves shall be stainless steel.

All bolts and nuts for flanged joints of tapping sleeves shall be of AISC Type 304 stainless steel.

All bolts and nuts shall be sound, clean, and coated with a rust-resistant lubricant. Their surfaces shall be free of objectionable protrusions that would interfere with their fit in the made-up mechanical or flanged joint.

All bolts and nuts used with all pipe sleeves shall, upon final tightening and testing, be brush coated heavily with bitumastic cold-applied material to thoroughly cover all exposed surfaces of the bolts and nuts.

**Tapping Valves:** Tapping valves shall conform to ANSI/AWWA C509 (latest revision) Standard for Resilient-Seated Gate Valves for Water systems, except as modified herein. Valves shall open counterclockwise and shall have a minimum working pressure of 200 psi. Inlet flanges shall be Class 125 conforming to ANSI Specification B16.1 or ANSI/AWWA C110/A21.10, and outlet connection shall be Standardized Mechanical Joint unless specified otherwise on the Contract Plans for the type of pipe required for the branch or lateral pipeline.

Buried tapping valves shall be provided with a 2 inch square wrench nut and shall be installed with a cast iron valve box as required to allow positive access to the valve operating nut at all times. In installations where the depth from grade to top of valve operating nut is greater than 6'0", a valve stem riser shall be provided and installed such that the depth from valve stem riser nut to grade is from 4'0" to 6'0" (minimum length of valve stem riser is 2'0"). Valve stem riser shall be of high strength steel and of welded construction.

**Valve Boxes:** Valve boxes are to be installed on all buried valves. The boxes shall be cast iron with a minimum five and one quarter inch (5 1/4") diameter and long enough to extend from the valve to the finished grade. The boxes shall enclose the operating nut and the stuffing box of the valve. Valve boxes shall not transfer loads onto the valve.

Covers shall be close fitting and dirt-tight with the top of the cover flush with the top of the rim box. Covers shall be marked "water" with an arrow indicating the direction of opening.

Valve boxes shall be five inch by six foot (5" x 6') New England style slide-type.

**Services:** All services will be copper tubing, Type K, from a ductile iron main to the residence. The standard services shall be 3/4" unless otherwise required for pressure or flow limitations.

The size, depth, alignment, materials of construction of the building water service connection, and methods to be used in excavating, placing pipe, jointing, testing, and backfilling the trench shall all conform to the requirements of the Water Distribution Specifications or other applicable rules and regulations of the Shelburne Water Department. In the absence of code provisions or in amplification thereof, the materials and procedures set forth in appropriate specifications of the Department of Environmental Conservation Water Supply Rule 21. Furthermore, the following additional standards shall apply.

- A. New Type K copper shall be used for all service lines up to two inch (2") diameter pipe from the corporation stop and from the curb stop to inside the structure.
- B. New service connections for residential or commercial use larger than two inch (2") pipe

diameter shall be Ductile Iron Class 52.

- C. All service connections shall be laid at a minimum depth of five and a half feet (5 1/2') unless specifically waived by the Shelburne Water Department.
- D. Service connection taps to the main water line shall only be performed by firms as approved by the Water Department and qualified to perform the service connection tap. The qualification of a firm to perform this tap shall be determined by the Shelburne Water Department.

**Installation:** All water line installation shall be completed in accordance with AWWA C600 for ductile iron pipe. PVC pipe shall be installed in conformance with AWWA M23 and C605.

Prior to beginning work, the Contractor shall contact Dig Safe at 1-888-344-7233.

All piping and appurtenances connected to the system shall be supported so that no strain will be imposed on the system.

The owner or his/her agent shall not block any driveway, street, road, or railroad at any time without permission of the governing agency or other controlling agencies. Every effort shall be made to permit the movement of vehicular traffic at all times. Whenever it becomes necessary to cross or interfere with roads, walks, or drives, whether public or private, the owner or his/her agent shall maintain, at their own expense and subject to the approval of the Water Department, safe bridges, or other means of ingress and egress.

Concrete thrust blocks shall be installed on all plugs, tees, and bends deflecting 1 1/4 degrees or more. Care shall be taken to ensure that concrete will not come in contact with flanges, joints, or bolts. The required area of thrust blocks is indicated on the plans or shall be approved by the Shelburne Water Superintendent. Thrust blocks shall be placed against undisturbed soil and shall be sized appropriately for the bearing capacity of the existing soils.

Whenever sewers cross under water mains, the water main shall be laid at such an elevation that the bottom of the water main is at least eighteen inches (18") above the top of the sewer. This vertical separation shall be maintained for that portion of the water main located within ten feet (10') horizontally of any sewer it crosses. When it is impossible to obtain horizontal and vertical separation, the sewer line, for ten feet (10') outside the water line, shall be sleeved (see detail for stream crossings). In the case of projects which require review by the Department of Environmental Conservation Water Supply Division and which cannot maintain the required separation, an alternative acceptable to all parties shall be agreed upon by the State, Town and Developer. No water main shall pass through, or come in contact with, any part of a sewer manhole.

There shall be no connections with any independent water systems such as wells or lake intake systems.

For the construction of new water lines, repair clamps will not be accepted. Alignments of any water lines shall not exceed the manufacturer's limitations for deflections.

All trenching safety standards shall be in conformance with all applicable State and Federal guidelines and as specified on the plans. Compliance with trench or other safety requirements

rests solely with the Contractor.

The Contractor shall, at all times, keep the trenches entirely free of water until all work is finished and ready for backfilling.

After various pipelines have been installed, the trenches and other areas to be filled shall be backfilled to subgrade with, wherever possible, material excavated from the trench. Backfilling in Roadways shall meet the specifications for roadway embankments, subgrade, and base. No backfilling will be allowed until any concrete supports or thrust blocks have set sufficiently, as determined by the Shelburne Water Department. All material for backfilling shall be free of roots, stumps, and frost. Materials used for backfilling trenches shall be free of stones weighing over thirty (30) pounds. No stones measuring over one inch (1") in the longest dimension shall be placed within one foot (1') of the pipeline being backfilled.

Backfill for all pipelines shall be placed in six inch (6") layers, each layer being thoroughly compacted to not less than 95 percent (95%) of maximum dry density as determined by the AASHTO-T-95 Standard Proctor. Particular precautions shall be taken in the placement and compaction of backfill material in order not to damage the pipe or structure. The backfill shall be brought up evenly.

The installation of all water lines that have the potential to be incorporated into the Town Distribution System shall be placed within the existing or proposed road right of way or acceptable easements. Within two weeks of project completion, the Contractor shall provide complete as-built drawings (with ties) to the Shelburne Water Department.

## **5.5 DISINFECTION**

Chlorination of the water main shall be conducted only after the main has been flushed and a clear stream obtained as determined by the Shelburne Water Department. All testing and disinfection of water mains will be conducted by a qualified third party company that has been pre-approved by the Shelburne Water Department. Disinfection shall be repeated when and where required at no expense to the Owner until final acceptance by the Owner.

The Contractor shall furnish all labor, equipment, materials, and tools necessary to disinfect the pipe and appurtenances in accordance with the AWWA Standard for Disinfecting Water Mains, C651-86 or latest revision. The method of disinfection shall be by continuous feed method unless otherwise approved by the Shelburne Water Department. Tablet disinfection is not an acceptable method.

After filling, flushing, and addition of chlorine solution, chlorine concentration within the pipe shall be at least 10mg/l. All disinfection shall be performed under the supervision of the Project Engineer.

The disinfection process shall be deemed acceptable only after samples of water from the flushed disinfected main show no evidence of bacteriological contamination. The pipeline and appurtenances shall be maintained in an uncontaminated condition until final acceptance.

## **5.6 PRESSURE AND LEAKAGE TESTING**

Except as otherwise directed, all pipelines shall be tested. Pipelines laid in excavation or bedded in concrete shall be tested prior to backfilling or placing of concrete, and any exposed piping shall be tested prior to field painting. All testing shall be done by a third party approved by the Town.

The testing company shall furnish all gauges, testing plugs, caps, and all other necessary equipment and labor to perform leakage and pressure tests in sections of an approved length. All water required for testing shall be potable. All testing shall be conducted in the presence of the Project Engineer.

For the pressure test, the testing company shall fill lines slowly with potable water at a maximum velocity of 1 ft/sec while venting all air and develop and maintain for two (2) hours 150% of the working pressure measured in pounds per square inch or 200 pounds per square inch, whichever is greater.

The leakage test shall be performed concurrently with the pressure test. During the test, the testing company shall measure the quantity of water required to maintain the test pressure. Leakage should not exceed the quantity given by:

$$L = SD (\text{square root of } P) / 148,000$$

where: L = leakage in gallons per hour  
D = diameter of pipe in inches  
P = average test pressure in psi  
S = length of pipe tested in feet

Test pressure shall be maintained within +/- 5 psi for the two (2) hour duration.

All testing shall be conducted in accordance with AWWA C600 for ductile iron and AWWA C605 for PVC or latest revision.

Should any section of pipe fail either the pressure or leakage tests, the Contractor shall do everything necessary to locate and repair or replace the defective pipe, fittings, or joints.

If, for any reason, the Shelburne Water Department should alter the foregoing procedures, the Contractor shall remain responsible for the tightness of the line with the above requirements.

## **5.7 FROST PROTECTION OF SHALLOW WATER LINES**

Water lines with less than five feet six inches (5' 6") of cover over the crown, or where indicated on the plans, shall be protected against freezing by installation of three inch (3") thick Styrofoam SM insulating sheets with a width of three feet (3') or twice the pipe diameter, whichever is greater. The sheets shall be placed six inches (6") above the crown of the main after compaction of the six inch (6") lift immediately above the crown. The Contractor shall exercise care during backfill and compaction over the styrofoam sheets to prevent damage to the sheets. Styrofoam SM sheets shall meet the compressive strength requirements of ASTM D1621-73 and shall be as manufactured by Dow Chemical Company, Midland, Michigan.

In areas where the waterline is passing adjacent to a catch basin or culverts, contact the Shelburne Water Department and the Town Engineer to determine how best to address the situation.

## 5.8 HOUSE SERVICES

### A. Description

This item shall consist of the installation of individual services from water main to the meter with the necessary corporations, curb stops, curb boxes, angle meter valves, meter spacers with spuds, and pipe as indicated on the accepted drawings. Curb stops shall be located in the road right-of-way as approved by the Shelburne Water Department.

### B. Materials

**Pipe:** Service pipe shall be three-fourths inch (3/4") Type K copper tubing manufactured according to ASTM Specifications B.88-62 or an approved equal.

**Corporation stops:** All corporation stops shall be Mueller 110 compression and constructed of brass according to AWWA Standard C800 and be three-fourths inch (3/4"). Any request for corporation stops greater than 3/4" shall be subject to approval of the Shelburne Water Department.

**Curb box:** Erie style with stainless steel rods.

**Curb stops:** All curb stops shall be constructed of brass according to AWWA Standard C800 and be three-fourths inch (3/4") inverted key curb stop, compression fitting Mueller oriseal III.

**Cellar stops:** All cellar stops shall be Mueller Angle Meter Valves.

**Meter spacers and spuds:** As furnished by the Shelburne Water Department.

### Meters required:

1. Buildings without meters shall be charged on the basis of estimated user fees rather than minimum billing user fees.
2. The property owner of all buildings shall be required to perform all interior or exterior plumbing necessary to accommodate required meters.
3. The Shelburne Water Department will provide meter spacers on a loan basis for use in providing the proper plumbing gap for the meter to be installed. Failure to return the loaned spacer bar when requested shall require the owner to reimburse the Water Department for the cost of the spacer bar(s).
4. The Shelburne Water Department will provide a meter with outside reader in one of the following sizes for each structure:

Meter Size	Operating Ranges
5/8 x 3/4	1 - 20 gpm (residential)
1"	1 - 50 gpm
1 1/2"	2 - 100 gpm
2"	2 1/2 - 160 gpm

A compound meter will be required for any installation requiring a meter 2" or larger.

The Shelburne Water Department will provide a meter 5/8 x 3/4 in size. Any building requiring a meter larger than 5/8 x 3/4 will have the difference in cost billed back to the Owner.

5. The provision and requirement for the number of meters provided by the Water Department in a building is as follows:
  - a. Single family residence - one meter
  - b. Single building with multiple living units - each living unit will have a separate meter
  - c. Commercial buildings, non-retail - one meter per building
  - d. Commercial building, retail - one meter for each separate retail business
  - e. Industrial building - one meter per building
  
6. Buildings existing at the time of enactment of this ordinance may be waived from the requirement to provide multiple meters within one building. The requirement to install at least one meter per structure applies to all users with no exceptions.
  
7. It is the responsibility of the Shelburne Water Department to repair, check or replace defective or non-working meters within the water system. It is the responsibility of the Owner to provide the Water Department access to the building, upon request by the Water Department, to check, repair, or replace the non-working meter. The Owner shall take reasonable measures to protect the inside meter and the outside reader from damage.
  
8. **Non-sewer Metering**  
 An owner shall make application for separate metering in writing, and the meter installation shall be in accordance with the Town requirements (a detail installation diagram is available at the Water Department office).

A back-flow prevention assembly approved by the Shelburne Water Department shall be required at the point immediately downstream of the water meter. The water meter providing water to non-sewer usage shall be placed in the same location as the water meter providing domestic water.

The owner shall be responsible for all costs incurred in installing the water meter, back-flow prevention assembly, or changes needed in the internal plumbing. The owner shall pay the full cost of the meter. Meters are to remain in place year round

and it is the owner's responsibility to protect them from freezing or other damages. Removal of the meter at the owner's request, and reconnection, shall be subject to water on/off fees. Meters shall be purchased from the Shelburne Water Department.

The installation of secondary meters will be considered a separate account, subject to the same minimum charges, penalties and interest as domestic accounts.

### **C. Construction Methods**

**House services:** The Contractor shall make all necessary taps into the water main and, for each lot, install an approved brass corporation stop. The Contractor shall also connect the three-fourths inch (3/4") Type K copper service pipe to the compression joint, which shall be connected to the 3/4" type brass curb stop with inlet and outlet for 3/4" Type K copper service pipe.

Such curb stop shall be installed within the road right-of-way as approved by the Shelburne Water Department. The corporation stop shall be left open and the curb stop closed. Such curb stop shall be located not less than five feet (5') below the ground surface and shall be accessible from the surface through an approved valve box.

Each building shall have a separate and independent corporation stop except where one building stands at the rear of another or on an interior lot and no water system is available or can be constructed to the rear building through an adjoining alley, court, yard, or driveway. The Shelburne Water Department may then allow two services from a single corporation stop, providing each building has a separate curb stop and valve box.

All excavations for building water service connections shall be adequately guarded with barricades and lights so as to protect the public from hazard. A permit shall be obtained from the governing agency for all construction within the road right-of-way, which permit shall specify the times and dates of construction, the type and manner of construction, any guarantee thereof and any special safety requirements. Construction within the State Highway right-of-way shall require that a permit be obtained from the Vermont Agency of Transportation.

**House connections:** The house connections shall be made by installing three-fourths inch (3/4") Type K copper pipe on the end of the approved brass curb stop and proceeding through the cellar wall to an approved 3/4" meter valve. A 3/4" meter spacer with spuds is to be furnished by the Shelburne Water Department (Town of Shelburne) and installed by the Contractor in accordance with good plumbing practices. (See House Services Detail sheet.)

### **5.9 UTILITY ROAD CUTS**

For any work to be done in the right-of-way of an existing road, refer to Chapter III, Section 1.21, Utility Cuts.

### **6.0 SANITARY SEWER SPECIFICATIONS**

## 6.1 DESCRIPTION

This item shall consist of the work required for the complete construction of gravity sanitary sewers, force mains, and all appurtenant construction related thereto, including chimneys, service connections, thrust blocks, and other items necessary for a complete sanitary sewer system as indicated on the drawings. The work shall also include testing and placing the system into satisfactory operation.

All sanitary sewer plans submitted for review, with the exception of detached single-family dwellings that do not require the extension of a gravity sewer main or the installation of a pump station and force main, shall be prepared by a licensed professional civil engineer registered in the State of Vermont. All submittals shall contain the plan and profile, invert elevations at a manhole (in and out elevation with a minimum .1' drop at each manhole), pipe slope and type of pipe to be used. Pipe slope shall be as specified in the State of Vermont Environmental Protection Rules for the recommended slope based on pipe diameter. In no instance shall the slope be less than .0075 feet per foot. Details of construction shall be provided for those ancillary items not covered in this document.

All sanitary sewer mains shall be a minimum of eight inches (8") in diameter unless a waiver is granted by the Shelburne Wastewater Department. Each dwelling, commercial or industrial unit shall have a separate service connection to the sewer main.

No sanitary sewer shall be placed in service until such time as the Town has given final approval to the sewer installation, including satisfactory completion of all required tests. Service connections shall not be made until all receiving sewer mains have been completed and approved and as-builts received along with GPS coordinates and approved by the Shelburne Wastewater Department.

All material and installations shall be approved by the Shelburne Wastewater Department. This section of these specifications supplements the Shelburne Wastewater Department ordinances.

## 6.2 MATERIALS

- A. Gravity sewers and Forced Mains** shall be PVC solid wall pipe meeting ASTM Specifications D-3034 or F679, ductile iron pipe, with push on joints, or an approved equal.

### 1. PVC Sewer Pipe

PVC sewer pipe shall conform in all respects to the latest revision of ASTM Specifications D-3034 or F679, Type PSM, Polyvinyl Chloride (PVC) Sewer Pipe and Fittings, **SDR35**. Wall thickness of all PVC pipe shall meet ASTM Specifications for SDR35 pipe.

All pipe and fittings shall be clearly marked as follows:

Manufacturer's Name and Trademark  
Nominal Pipe Size  
Material Designation 1245C PVC  
Legend "Type PSM SDR35 PVC Sewer Pipe" or  
"PS 46 PVC Sewer Pipe"  
Designation ASTM D-3034 or F679

Joints shall be push-on type using elastomeric gaskets and shall conform to ASTM D-3212. The gaskets shall be factory installed.

The pipe shall be furnished in nominal thirteen foot (13') lengths. Sufficient numbers of short lengths and full machine fittings shall be provided for use at manholes, chimneys, and connections. All connections will require the use of manufactured fittings. Field fabricated, saddle-type connections will not be considered acceptable.

Any pipe or fitting having a crack or other defect or which has received a severe blow shall be marked rejected and removed at once from the work site.

All field cuts are to be made with saw and 90 degree miter box. Bevel the cut end to the same as the factory bevel and remove all interior burrs. Measure and place a homing mark on the pipe before assembling. The pipe installed under this specification shall be installed so that the initial deflection, measured as described below, shall be less than five percent (5%).

The manhole water stop gasket and stainless steel clamp assembly must be approved by the Shelburne Wastewater Treatment Department prior to the installation of any pipe.

The Contractor will submit certification that the materials of construction have been sampled, tested, inspected, and meet all the requirements including wall thickness in accordance with ASTM D-3034 or ASTM F679 for all pipe and fittings to be included in project work.

PVC pipe shall not be installed when the temperature drops below 32 degrees Fahrenheit or goes above 100 degrees Fahrenheit. During cold weather, the flexibility and impact resistance of PVC pipe is reduced. Extra care is required when handling PVC pipe during cold weather.

PVC pipe shall not be stored outside and exposed to prolonged periods of sunlight, as pipe discoloration and reduction in pipe impact strength will occur. Canvas and other opaque material shall be used to cover PVC pipe when stored outside.

## **2. Ductile Iron Pipe**

Ductile iron pipe shall be the thickness class designated on the plans. All ductile iron pipe shall be centrifugally cast in molds and shall conform to the latest revision of ANSI Standard A21.51 (AWWA C151); ANSI Standard A21.11 (AWWA C111), Rubber Gasket Joints for Cast Iron and Ductile Iron Pressure Pipe and Fittings; and ANSI Standard A21.10 (AWWA C110), Gray-Iron and Ductile Iron Fittings Two Inch Through 48 Inch of Water and Other Liquids. All ductile iron pipe shall be cement-lined and shall conform to ANSI Standard A21.4 (AWWA C104), Cement-Mortar Lining for Cast Iron and Ductile Iron Pipe and Fittings for Water.

All fittings shall be push-on joint fittings unless noted otherwise on the plans with body thickness and radius in accordance with Sections 11-2 through 11-5 and 11-7 through 11-8 of ANSI A21.11. Mechanical joint, ductile iron pipe, shall be the thickness class designated on the plans and shall be installed where specified on the plans.

Mechanical joint ductile iron pipe shall conform to the specifications of ductile iron pipe, except for fittings which shall be mechanical joint with body thickness and radius of curvature conforming to ANSI A21.10 and mechanical joints which shall be in accordance with Section 11-2 through 11-6 of ANSI A21.1.

**B. Structures- Manholes, valve pits, blowoffs, and appurtenances**

The Contractor shall install precast reinforced concrete manholes and drop manholes to the dimensions at the locations shown on the contract drawings. All precast reinforced concrete manhole sections shall conform to the latest version of the ASTM Specification C478. The footing may be with cast-in-place with Class B concrete or precast and shall conform to the dimensions indicated on the plans.

Shelves shall be constructed With Class B concrete as defined in Section 501 of the Vermont Agency of Transportation Standard Specifications for Construction. Inverts for sewer manholes shall be as shown on the plans and details and shall be constructed with Class B concrete, or for straight runs, segments of pipe cut in half longitudinally; however, the invert must be formed to the entire height of the pipe. Inverts shall have the exact shape of the sewer to which they are connected, and any change in size or direction shall be gradual and even. All construction of sewer manholes must be carried out to ensure watertight work. Any leaks in manholes shall be (caulked and) completely repaired to the satisfaction of the Engineer and the Shelburne Wastewater Treatment Department or the entire structure shall be removed and rebuilt.

All manholes are to be provided with extruded aluminum steps or copolymer polypropylene plastic rungs with steel reinforced eight inches (8") on center. All manholes shall be provided with tough, gray, cast iron manhole frames and covers. All iron castings shall be thoroughly cleaned and then coated with hot tar before being delivered. Frames and covers shall be LeBaron LC 266 Type C, or an approved equal, and have a minimum weight of 400 pounds.

Precast risers and bases for manholes shall conform to ASTM Specifications C-478. The pipe opening in the precast manhole riser shall have a cast-in-place flexible gasket or an equivalent system for pipe installation as approved by the Shelburne Wastewater Treatment Department. Joints between manhole risers shall be cleaned to provide a smooth surface and use rubber "O" ring seals of soft Butyl Joint sealer to provide a water-tight seal.

Manhole covers shall be thirty (30") inches in size and shall be set to final grade only after the base course paving has been completed. Manholes shall be constructed to grade with solid cement risers at least 3" and no more than 10" thick and all manhole lift holes shall be grouted inside and out with expandable grout.

Manholes shall be placed at all changes in slope, size, alignment of pipe, at the ends of each line, and at least every three hundred feet (300'). Where manholes are located more than 10' off the paved surface an access road shall be constructed to each structure for future maintenance.

## **6.3 CONSTRUCTION METHODS**

### **A. Excavations**

Excavations shall be made to a point at least six inches (6") below the pipe invert to accommodate the bedding material. All excavations are to be kept dry while pipe is being laid and until each joint and pipe has been inspected by the Shelburne Wastewater Department and approval given to commence backfilling operations.

### **B. Laying Sewer Pipe**

The bell end of the pipe shall face upgrade at all times and be placed in such a position as to make the invert even when the succeeding section is inserted. Where required by adverse grading conditions, the Contractor shall fill any depression to make a suitable bedding for the sewer pipe. The fill shall be mechanically compacted to a 95 percent (95%) dry density by the AASHTO-T-99, Method A (Standard Proctor) test, upon which the six inches (6") of bedding material shall be placed.

Any pipe that is not laid to grade and alignment shall be re-laid to the satisfaction of the Shelburne Wastewater Department. The bedding material shall be placed and compacted on each side of the pipe to a height equal to one-half (1/2) the pipe diameter and for the full width of the excavated trench and as shown on the accepted plans. Bedding shall be #2 pea stone from Shelburne Limestone or an equivalent approved by the Shelburne Wastewater Department and the Engineer.

All sewer pipes shall be marked with magnetic marking tape. The marking tape shall be installed one (1) foot directly over the pipe and shall be labeled "sewer".

Concrete thrust blocks or anchors shall be placed at bends, tees, fittings, and other locations on the force main as shown on the contract drawings or as directed by the Shelburne Wastewater Department. Concrete for thrust blocks and anchors shall be Class B concrete. Steel rods and clamps as required shall be galvanized and rust proofed or painted.

Thrust blocks and anchors shall be placed between the fitting and the trench wall with bearing on undistributed earth. Bearing area shall be as shown on the contract drawings or as required by the Shelburne Wastewater Department.

The horizontal and vertical separation for sewer and waterlines shall be designed and installed in accordance with the latest edition of the "Ten States Standards - Recommended Standards for Sewage Works". Refer to Chapter III, Section 3.3, Materials, of these specifications for additional details.

Where required on the plans or as directed by the Shelburne Wastewater Department, a concrete cradle shall be used to bolster and strengthen the pipe. Where required on the plans or as directed by the Shelburne Wastewater Department, concrete encasement of the sewer line will be made to protect nearby wells or waterlines, for stream crossings or for similar purposes. All concrete will be Class B as defined in the State of Vermont Standard Specifications for Construction, Section 501, and will meet the requirements of that section.

Sewers with less than five and a half feet (5 1/2') of cover over the crown or where indicated on the plans shall be protected against freezing by installation of three inch (3") thick Styrofoam SM insulating sheets with a width of three feet (3') or twice the pipe diameter, whichever is greater. The sheets shall be placed six inches (6") above the crown of the sewer after compaction of the six inch (6") lift immediately above the crown. Care shall be exercised by the Contractor during backfill, and compaction over the styrofoam SM sheets shall meet the compressive strength requirements of ASTM D1621-73 and shall be as manufactured by Dow Chemical Company, Midland, Michigan, or equal. Under no circumstances shall there be less than 4 feet of cover over a sewer line in unpaved areas and no less than 5 feet of cover over sewer lines in paved areas.

Upon completion of construction, all dirt and other foreign material shall be removed from pipelines and their appurtenant constructions. No materials shall be left in the pipelines to impede normal flow through them.

### **C. Backfill**

Backfill shall consist of approved material (see typical trench detail for sanitary sewer) placed in six inch (6") layers with each layer being thoroughly compacted to not less than 95 percent (95%) of maximum dry density as determined by the AASHTO-T-99 Standard Proctor by means approved by the Shelburne Wastewater Department and the Engineer. No stones in excess of one and a half inch (1 1/2") diameter shall be placed within two feet (2') of the outside of the pipe. Particular precautions shall be taken in placement and compaction of the backfill

material in order not to damage and/or break the pipe. The backfill shall be brought up evenly on both sides of the pipe for its full length.

Walking or working on the completed pipeline, except as may be necessary in tamping and backfilling, shall not be permitted until the trench has been backfilled to a height of at least two feet (2') on top of the pipes. During construction, all openings to the pipelines shall be protected from the entering of earth and other materials.

All sewer pipes shall be marked with marking tape. The marking tape shall be installed one (1) foot directly over the pipe and shall be labeled "sewer".

## **6.4 LEAKAGE TESTS AND ALLOWANCES**

### **A. Gravity Sewers**

Shelburne Wastewater Department or a representative thereto shall be present during all testing. Two (2) days notice shall be given to the Shelburne Wastewater Treatment Department.

The low pressure air test will be used to simulate infiltration or exfiltration rates into or out of all gravity sewers. The Contractor will furnish all facilities and personnel for conducting the test.

Final acceptance of the sewer shall depend upon the satisfactory performance of the sewer under test conditions and certification of the tests results by the Town engineer or department head. The test shall be performed on pipe between adjacent manholes after backfilling has been completed and compacted.

All wyes, tees, laterals, or end-of-side sewer stubs shall be plugged with flexible-joint caps, or an acceptable alternate, securely fastened to withstand the internal pressure test. Such plugs or caps shall be readily removable, and their removal shall provide a socket suitable for making flexible-jointed lateral connection or extension.

Prior to testing for acceptance, the pipe should be cleaned by passing through the pipe a full-gauge squeegee. It shall be the responsibility of the Contractor to have the pipe cleaned.

Immediately following the pipe cleaning, the pipe installation shall be tested with low-pressure air. Air shall be slowly supplied to the plugged air installation until the internal air pressure reaches four (4.0) pounds per square inch greater than the average back pressure of any ground water that may submerge the pipe. At least two (2) minutes shall be allowed for temperature stabilization before proceeding further. All tests shall run for a minimum of three (3) minutes regardless of pipe length or diameter.

The pipeline shall be considered acceptable when tested at the average pressure of four (4.0) pounds per square inch greater than the average back pressure of any

ground water that may submerge the pipe if:

- a. The total rate of air loss from any section tested in its entirety between manhole and cleanout structures does not exceed two (2.0) cubic feet per minute; or,
- b. The section under test does not lose air at a rate greater than 0.0030 cubic feet per minute per square foot of internal pipe surface.

The requirements of this specification shall be considered satisfied if the time required in seconds for the pressure to decrease from 3.5 to 2.5 pounds per square greater than the average back pressure of any ground water that may submerge the pipe is not less than computed according to the following table:

Minimum Test Time for Various Pipe Sizes  
(All tests shall run for a minimum of 3 minutes.)

Diameter (inches)	Time (sec./100 ft.)
3	10
4	18
6	40
8	70
10	110
12	158
15	248
18	356
21	485
24	634
27	765
30	851
33	935
36	1,020
39	1,105
42	1,190

The table gives the required test time in seconds per 100 foot lengths of pipe for a given diameter. If there is more than one pipe size in the section of line being tested, compute the time for each diameter and sum the times to find the total required test time.

If the pipe installation fails to meet these requirements, the Contractor shall determine at his/her own expense the source or sources of leakage and shall repair (if the extent and type of repairs proposed by the Contractor appear reasonable to the Shelburne Wastewater Department) or replace all defective materials or workmanship. The completed pipe installation shall meet the requirements of this test before being considered acceptable.

## **B. Manholes**

### **1. Hydraulic test**

The exfiltration leakage allowance out of manholes shall be no greater than one (1) gallon per day per vertical foot of depth. The manhole shall be filled with water to a point one foot (1') above the highest point between manhole sections. In areas of high ground water, there shall be no visible leakage due to infiltration.

### **2. Vacuum Test**

This alternative method of testing manholes for leakage involves the use of a device for sealing the top of the manhole cone section and pumping air out of the manhole, creating a vacuum, and holding this vacuum for a prescribed period of time. The procedure for this test is as follows:

- a. All lifting holes and exterior joints shall be filled and pointed with an approved non-shrinking mortar. The completed manhole shall not be backfilled prior to testing. Manholes that have been backfilled shall be excavated to expose the entire exterior prior to vacuum testing or the manhole shall be tested for leakage by means of hydrostatic test.
- b. All pipes and other openings into the manhole shall be suitably plugged in a manner to prevent displacement.
- c. A plate with an inflatable rubber ring the size of the top of the manhole shall be installed by inflating the ring with air to pressure adequate to prevent leakage of air between the rubber ring and manhole wall.
- d. Air shall then be pumped out of the manhole through an opening in the plate until a vacuum is created inside of the manhole equal to ten inches (10") of mercury on an approved vacuum gauge. The removal of air shall then be stopped and the test time begun.
- e. The vacuum must not drop below nine inches (9") of mercury with a two (2) minute test period. If more than one inch (1") drop in vacuum occurs within the two (2) minute test period, the manhole has failed the test and shall be repaired or reconstructed and retested. Any repairs or reconstruction must be approved by the Wastewater Department.
- f. Following satisfactory test results, the manhole may be backfilled.

It is noted that all existing sanitary sewers shall be kept operational until new work has been tested and approved by the Shelburne Wastewater Department. At such time, existing sewers and sewer services shall be connected to the new sewers.

## **C. Force Main**

After force mains have been laid and the trench backfilled, the pipe shall be

subjected to a hydrostatic pressure test in accordance with AWWA Standard for Installation of Cast Iron Water Main, AWWA C600 (latest issue), Section 13. The hydrostatic pressure shall be 150 percent (150%) of normal operational pressure. After the pressure test has been satisfactorily completed, a leakage test shall be conducted in accordance with AWWA C600 (latest issue), Section 13. The minimum test pressure shall be 75 pounds per square inch at the high point in the system.

#### **D. Wetwell**

The pre-cast concrete wetwell shall be externally coated with an asphaltic sealant and tested for water tightness using an approved vacuum or water testing procedure.

### **6.5. SEWER SERVICE CONNECTIONS**

#### **A. Laterals**

Where required on the plans, sewer service connections for one house shall be constructed of four inch (4") pipe, unless otherwise noted on the plans, of the type material specified under this section. The pipe shall be laid and its joints made as required for sewer construction in this specification.

Open ends of pipes shall be properly sealed to prevent damage and intrusion of foreign matter where hookup to the building sewer is not coincident with sewer main construction. Additionally, the Contractor will provide a stable, temporary marker approved by the Shelburne Wastewater Department from the sewer service invert up to six inches (6") above the finish grade and seated securely into the ground for ease in relocating the end of sewer service connection for hooking up the building sewer. Two (2) tie points to permanent objects shall be documented. The tie points shall be submitted to the homeowner and to the Wastewater Department.

In the case of reconnection of existing services, such reconnection will be made only after the new sewer main has been completed, tested, and accepted. The excavation, bedding material, installation, and backfill for service connections shall be the same as for sewer mains.

#### **B. Cleanouts for Sewers**

Cleanouts for gravity sewers and force mains shall be provided at locations indicated on the plans or as directed by the Shelburne Wastewater Department. Cleanout frames and covers against each other shall be machined to give continuous contact throughout their circumference. All iron castings shall be thoroughly cleaned and then coated with hot coal tar before being delivered. Individual laterals shall have cleanouts every one hundred feet (100'). Cleanouts shall also be installed in laterals with changes of alignment of 45 degrees or greater.

#### **C. Chimneys**

Chimneys shall be built of four inch (4") pipe and/or as indicated on the contract drawings. Each chimney shall be plugged or capped at end until ready to connect to existing services. Chimneys are required where the vertical drop between the finished grade surface and the main sewer line exceeds fifteen feet (15') at the wye for a service connection.

## **6.6. INDIVIDUAL RESIDENTIAL PUMP STATIONS**

All plans for residential sewer pump stations shall be reviewed and approved by the Shelburne Wastewater Department.

Up to 10 individual residential pump stations are allowed in a development. The design and installation of individual residential pump stations shall meet all applicable local and state standards. The Town of Shelburne shall not own or maintain individual residential pump stations.

Pump stations serving 5 or more residential units shall be designed and constructed to Shelburne Wastewater Department standards.

The applicant's engineer shall submit calculations that show the basis of force main and pump station design, plans, materials, and construction specifications sufficient for construction of the pump station and force main. The submission shall also include all invert elevations, final grades, details of the pump station, buildings, pipelines, sewer lines, pumps, the make, size and model numbers of all equipment to be used and any other information necessary for adequate construction and operation of the system. The design shall also address the following criteria:

- a. There shall be an audio and visual high level alarm in the Residential pump stations. All pump stations shall be installed with the rim elevation above the 100 year flood level.
- b. The pump station shall be precast concrete with a minimum volume of 1,000 gallons.
- c. If the pump station is pumping effluent, a single effluent pump will be sufficient. The minimum diameter of force main shall be two inch (2") PVC SDR 26. The pump shall be sized for a minimum force main velocity of two feet (2') per second.
- d. If the pump station is pumping sewage, a single sewage pump will be sufficient. The minimum diameter force main shall be three inch (3") Ductile Iron. The use of sewage grinder pumps and smaller force mains will be considered on a case-by-case basis.
- e. The pump shall be installed in such a way that it can be removed when the station is full.

Prior to issuance of a Certificate of Occupancy, the Project Engineer shall submit

certification that the pump station has been constructed in accordance with the approved plans and is functioning properly.

## 6.7 MAIN WASTEWATER PUMPING STATIONS

### A. General

Whenever possible, sewer transmission lines shall be gravity. Before proposing a development or site plan with a sewer pump station, the Developer shall contact the Chief Operator of the Shelburne Wastewater Department to determine that a pump station is appropriate at the proposed location.

The Town may require the Developer to pay for studies of downstream facilities to determine existing and projected flows and the potential impact of the new development. If the proposed pump station adversely affects the existing sewer collection system, the Developer will be expected to upgrade the existing sewer collection system as part of the development.

All pump stations shall be designed and constructed under the supervision of an Engineer registered in the State of Vermont. The pump station design shall conform to applicable standards of the Vermont Environmental Protection Rules and the Ten States Recommended Standards for Sewage Works.

The Town's pressure sewer system has been standardized on the basis of factory-built pumping stations of similar quality to those manufactured by Smith & Loveless Inc. of Lenexa, Kansas or Pumping Systems Inc. of East Weymouth, Massachusetts. Wetwell/drywell designs are required for wastewater pumping stations which are projected to serve the equivalent of one hundred (100) or more dwelling units (greater than 45,000 gpd). Wetwell/drywell or recessed wetwell-mounted designs will be considered for installations which will serve between fifty (50) and one hundred (100) dwelling units (between 22,500 gpd and 45,000 gpd at full build-out) and surface-mounted wetwell systems will be considered for installations which will serve less than fifty (50) dwelling units (less than 22,500 gpd at full build-out). Wetwell designs (with submersible pumps on slide rails) are unacceptable and will only be approved for situations where ownership and maintenance responsibilities remain with the Applicant and the use is commercial.

The design of all pumping stations must be reviewed and approved by the Shelburne Wastewater Department prior to construction.

3-phase power shall be used for all pump stations, wherever feasible.

Prior to completion of a preliminary design for any new pumping station, the designer shall submit a basis of design report for approval by the Shelburne Wastewater Department. The report shall include as a minimum:

- a. Service area map.

- b. Design flow including average daily flow, maximum daily flow, and peak hourly flow for the initial year, 10 year and 20 year design conditions. The basis for the projected flows must be clearly defined along with associated peaking factors.
- c. A description of the proposed wet well including minimum volume requirements, configuration and depth.
- d. Force main design parameters including pipe material, diameter, estimated length, and minimum flow velocity to achieve solids scouring.
- e. Computations to establish the emergency storage volume requirements.
- f. Results of preliminary soils investigations including test pit logs, soil borings, or ledge soundings.

Multiple pumps or ejector units shall be provided with each raw wastewater pumping station. For duplex stations, each pumping unit shall be identical, and with sufficient capacity to handle the design peak hour effluent flow with one pump off-line. For triplex or quadraplex stations, pumping units shall have capacity such that, with any one unit out of service, the remaining units will have capacity to handle the design peak hourly flow.

Wastewater pumping station structures and electrical and mechanical equipment shall be protected from physical damage as the result of a flood of 100 year recurrence interval. All pumping stations shall be designed to be fully operational and accessible during a flood of 25 year recurrence.

All pumping station sites shall be fully accessible by maintenance vehicles during all weather conditions. Gravel access roads and associated easements must be conveyed with the pumping station.

Water supply for wash down and maintenance shall be provided at a yard hydrant to be located within 10 feet of the wetwell access hatch.

The Town is not obligated to take ownership of any pump station that serves developments. If ownership is transferred to the Town it must meet the requirements of these specifications in full.

## **B. Wet Wells**

1. A reinforced concrete foundation shall be provided for the wet well and pump chamber, designed by a structural engineer licensed in the State of Vermont.
2. The foundation and structure shall be designed to prevent flotation of the dry well and wetwell under worst case conditions. Flotation computations shall be submitted as part of the design for review by the Town.

3. The effective volume of the wetwell shall be established such that the filling time shall not exceed 30 minutes under design average flow conditions (unless equalization is incorporated in the design). When the anticipated initial flow tributary to the pumping station is less than the design average flow, provisions shall be made such that a 30 minute fill time is not exceeded for initial flows.
4. Suitable and safe means of access for persons wearing self-contained breathing apparatus shall be provided to both the dry well and to the wet well.
5. Pre-cast concrete wetwells shall be of steel reinforced design with a documented compressive strength of 4000 psi at 28 days. Butyl rubber gaskets shall be specified at all joints.
6. All pipe penetrations shall be pre-cast openings with flexible rubber boots or compression fittings to create watertight connections.
7. The top of the wetwell shall be designed with a 30" x 30" wetwell access hatch of 1/4" diamond plate aluminum suitable for concrete embedment. The hatch shall include a lockable latching device.
8. The pre-cast concrete wetwell shall be externally coated with an asphaltic sealant and tested for water tightness using an approved vacuum or water testing procedure.
9. The wet well suction inlets shall be designed in accord with the standards set in ASCE Manual #37, Design and Construction of Sanitary and Storm Sewers, to minimize the deposition of solids.

### **C. Dry Pit/Recessed Pumping Station**

The station may be prefabricated and factory-built or built on the site.

The foundation and structure shall be designed to prevent flotation of the dry well and wetwell under worst case conditions. Flotation computations shall be submitted as part of the design for review by the Town.

As a minimum, the station shall include two vertical dry-pit submersible, non-clog sewage pumps, 3 phase motors (for pump motors over 5 HP in size), valves, internal piping, control panel with circuit breakers, variable frequency drives and automatic level controls, lighting, sump pump, ventilator, dehumidifier, heater with adjustable thermostat, wiring, elapsed time meters for each pump and a remote alarm system tied into the Town's radio telemetry system. The pumping system shall be designed to pass 3" solids without clogging. Lifting equipment shall be provided capable of lifting pumps and motors in and out of the dry well for maintenance.

A dehumidifier assembly with a hermetically sealed Freon compressor, expansion coil, fan, and condenser coil shall be furnished which shall maintain the relative humidity of the air in the pump chamber low enough to prevent condensation on

the walls. The dehumidifier shall be controlled automatically by an adjustable humidistat and low air temperature cutout. The condensate shall be drained to the sump.

The station shall be provided with a 36" wide x 6'-10" insulated metal door hinged at one side to provide access to the equipment chamber. The equipment chamber access cover shall be designed with a lockable latching device. The fiberglass cover shall be formed with a drip-lip around the edge to prevent rainwater from entering the equipment chamber or wetwell. Aluminum stairs shall be located in the equipment chamber to provide ready access from the surface.

A heavy synthetic rubber mat shall be cemented to the station floor in the walkway area after the final coat of paint has been applied.

Light fixture(s) shall be installed in the pump chamber to provide adequate illumination for the control panel and other areas. Lights shall be turned on automatically when the entrance lid is raised, and a manual switch shall be provided to maintain the lighting when the lid is closed.

Lifting points shall be installed for lifting pumps directly above each pump.

The design shall have provision for a sump pump with minimum 100 gph capacity operating off a float switch in the dry pit sump. Two check valves and a gate valve shall be installed on the discharge line. The pipe shall enter the wet well at an elevation of 6 feet or more below final grade and above alarm level.

A ventilating blower shall provide air circulation to the floor of the pump chamber. The exhaust outlet shall be screened to prevent the entrance of foreign matter and insects and shall have a suitable cover to prevent the entrance of rain and snow. Fresh air to the pump chamber shall be drawn from the surface. The air inlet shall be screened to prevent the entrance of foreign matter and insects and shall have a suitable cover to prevent the entrance of rain and snow. The blower shall be sized to exchange the air in the station once every two minutes. The ventilating blower and station lights shall be turned on automatically when the entrance tube cover is raised and shall have a manual switch located on the inside of the entrance cover.

A dual range thermostatically controlled electric heater shall be provided within the pump station to keep the temperature within the pump chamber above freezing. The heater will be provided with an automatic circulating fan, thermostatic control and an ON-OFF switch. The heater will be operated by connection to the convenience receptacle located on the control panel.

A mercury float switch shall be provided in the dry well that will create an alarm condition if infiltration, leakage or condensation were to reach a predetermined high liquid level. Float switches shall each have two normally open and two normally closed contacts. Float switches will be wired to the local alarm system that will automatically activate the alarm at the main pumping station via a radio

#### 1. Dry Pit

Dry wells, including the associated superstructure, shall be completely separated from the wet well. Common walls and pipe penetrations shall be gas tight.

Secondary pump H-O-A- switches, run lights and alarm silencer shall be located in an auxiliary panel located near the top of the dry well. The panel shall be located to allow access by maintenance personnel without entering the dry well.

The dry well shall be constructed with entry stairs, automated ventilation and shall not be constructed in a way to be considered a confined space under OSHA regulations.

#### 1. Recessed Unit

The equipment chamber shall be provided with a split fiberglass cover hinged at the partition wall separating the equipment chamber from the access manway to the wetwell. Both the equipment chamber and wetwell access covers shall be designed with lockable latching devices. The fiberglass cover shall be formed with a drip-lip around the edge to prevent rainwater from entering the equipment chamber or wetwell. Brackets shall be provided to support the cover in the open position and to restrain it under load. An aluminum ladder shall be located in the equipment chamber to provide ready access from the surface.

The station shall be prefabricated and factory-built in one complete assembly. The pumping chamber shall be designed to mount directly on top of the pre-cast concrete wetwell with a watertight seal. The supporting floor plate shall be minimum 3/8" thick steel plate with reinforcing as required to prevent deflection and to ensure rigidity. The station shell shall be a minimum of 1/4" inch or heavier, ASTM-A36 steel plate. All outside surfaces shall be ground smooth, blasted with steel grit, and coated with two coats of coal tar epoxy polyamide coating.

Factory-built, recessed-mounted and surface mounted stations, including the associated superstructure, shall be completely separated from the wet well.

Common walls and pipe penetrations shall be gas tight.

Two 17-pound magnesium anodes shall be provided as cathodic protection and shall include 30" long insulated copper leads. Copper lugs shall be provided by the Manufacturer on opposite sides of the station for anode connections.

A heavy synthetic rubber mat shall be cemented to the station floor in the walkway area after the final coat of paint has been applied.

### **D. Sewage Pumps**

The sewage pumps shall be designed such that, with any one pump out of service, the remaining unit(s) will have capacity to handle the design peak hourly flow.

The pumps shall be **new** vertical submersible dry-pit, non-clog type specifically designed for raw sewage applications.

The pumps shall be 4", 6" or 8" non-clog solids handling pumps designed specifically for handling sanitary sewage

Each pump shall be of heavy cast iron construction. The shaft shall be of solid stainless steel construction sealed against leakage by a double mechanical seal.

Impellers shall be of the enclosed type made of close-grained cast iron. All impellers less than full diameter shall be trimmed, to prevent the buildup of foreign particles.

The pump shall be designed such that the rotating element can be easily removed from the volute, without disconnecting the seal system, electrical wiring or removal of the motor from the backhead and seal.

The pump shall be supported via a floor-mounted cast iron base with four legs to provide rigidity and balance.

The motor shall be fitted with heavy lifting eyes or lugs, each capable of supporting the entire weight of the pump and motor.

1. Submersible

The Town will not accept submersible pump stations.

2. Dry Pit

3. Vacuum primed/self primed

A separate and independent priming system shall be furnished for each main pump, providing complete standby operation.

Each priming system shall be complete with vacuum pump, vacuum control solenoid valve, prime level sensing probe, and a float operated check valve installed in the system to prevent liquid entry into the vacuum pump head.

Vacuum pumps shall be constructed of corrosion resistant components and shall be capable of priming the main pump and suction piping in not greater than 60 seconds under rated static lift conditions.

Unless self-priming sewage pumps are specified, multiple vacuum priming pumps shall be provided. For duplex stations, two priming pumps shall be specified with associated piping to allow use with either sewage pump.

Each pump shall be of heavy cast iron construction specifically designed for vacuum priming and use of mechanical seals. The shaft shall be of solid stainless steel construction through the mechanical seal for corrosion and abrasion resistance.

## **E. Interior Piping and Valves**

Pump suction and discharge piping shall be drilled and tapped for 125 pound American Standard flanges. All flanged ductile iron pipe shall meet the requirements of ANSI A21.51 (AWWA C151) latest version.

All suction and discharge pipes shall be equipped with the appropriate gauges for reading mg/Hg and psi and shall be scaled to read within 1 unit or less.

Pump suction lines protruding through the equipment chamber wall shall be sealed with multiple link seals or welded to create a gas-tight seal.

Suction and discharge valves shall be **new** non-lubricated eccentric type plug valves with resilient facings and hand-wheel operators. All valves shall be supplied with ANSI 125 pound flange end connections.

**New** check valves shall be placed on the discharge lines between the pumps and the plug valves. Check valves shall be non-slamming, bronze mounted swing type valves with bolted covers and outside levers. Check valves shall have ANSI 125 pound flanged ends.

## **F. Emergency Storage and Pumping Requirements**

All wastewater pumping stations shall include provision for emergency power to prevent flooding in the event of a power outage. Manual transfer switches shall be required for all stations. A cord and cap connection shall be installed to connect the generator to the transfer switch. The cord end shall be of the style and size required for connection to the Wastewater Department's portable generator.

On a case-by-case basis, emergency storage tanks may be considered by the Shelburne Wastewater Treatment Department. The designer should insure that a minimum emergency storage volume of 25% of the design average daily flow (or 4 hours storage based on a 16 hour operating day) is provided for each pumping station if requested by the Shelburne Wastewater Treatment Department.

Emergency storage tanks shall have at least one manhole access to grade with aluminum or copolymer plastic ladder rungs at 8" on center. The manhole access shall have a cast iron frame and cover (LeBaron LC266 type C or equal) or a 30" x 30" hinged, diamond plate hatch (Bilco or equal).

The emergency storage system shall be free-draining toward the wetwell with the fill/drain pipe invert elevation above the high water alarm level.

The emergency storage tanks shall not be used as part of the normal pump dose volume.

An emergency pumping connection shall be made to allow maintenance personnel to pump into the force main with a portable pump in the event of an emergency. The force main connection shall include a four (4), or six (6) inch quick connect hose fitting and associated valves.

On a case-by-case basis, the Shelburne Wastewater Treatment Department may require an emergency generator. (For example, environmentally sensitive locations)

## **G. Electrical**

Variable Frequency Drives shall be used for all pumps. The Shelburne Wastewater Department may request a particular brand for maintenance and repair reasons.

When permitted PVC piping shall be used in all areas that meet the requirements of the National Electric Code.

Electrical systems and components (i.e. motors, lights, conduits, switchboxes, control circuits, etc.) shall not be installed in raw sewage wetwells. Electrical systems and components in enclosed or partially enclosed spaces where hazardous concentrations of flammable gases or vapors may be present, shall comply with the National Electric Code requirements for Class I Group D, Division 1 locations and shall be corrosion resistant. Each flexible cable shall be provided with a watertight seal and separate strain relief. A fused disconnect switch located above ground shall be provided for the main power feed for all pumping stations. When such equipment is exposed to weather, it shall meet the requirements of weatherproof equipment NEMA 4. A 110 volt power receptacle to facilitate maintenance shall be provided inside the control panel for lift stations that have control panels outdoors. Ground fault interruption protection shall be provided for all outdoor outlets.

All wiring shall meet the requirements of the National Electric Code and shall be color-coded as indicated on the wiring diagram. All wiring outside the panel shall be in conduit, except for the 115 volt accessory items that are provided with insulated service cord. Conduit shall be provided from the control panel across the ceiling, and up the entrance tube to receive the feeder lines, and shall terminate in a threaded conduit connection through the wall of the entrance tube. All receptacles

shall be of the ground fault type.

Accessory items such as the sump pump, heater, dehumidifier and air compressors shall be plugged into polarized grounded convenience outlets located close to their installed position so that such items can be readily removed and serviced if necessary.

The **package** pump station shall be completely pre-wired at the factory, except for the power feeder lines. All wires shall meet the requirements of the National Electrical Code and shall be color-coded as indicated on the wiring diagram. All wiring outside the panel shall be in conduit, except for the 115 volt accessory items that are provided with insulated service cord. Conduit shall be provided from the control panel across the ceiling, and up the entrance tube to receive the feeder lines, and shall terminate in a threaded conduit connection through the wall of the entrance tube. All receptacles shall be of the ground fault type.

All material and equipment necessary for a complete and workable electrical system shall be furnished and installed including: conduit and fittings, wire and cable, service panel, grounding, alarm system, connections to pump station, power company connection fees, telephone service fees.

The above grade panel and signal communicator shall be provided by the pump station manufacturer and shall be PVC , fiberglass, aluminum, or stainless steel construction.

All materials and equipment shall meet the standards of the National Electrical Manufacturers' Association and Underwriters Laboratories, Inc., and shall bear their label whenever standards have been established and label service is available.

Installation of electric systems and controls shall be in conformance with the latest edition of the National Electric Code, local ordinances and regulations prescribed by the local Power Company.

Completed electric work performed shall comply with the latest edition of the National Electric Code Underwriters Laboratories regulations and all Municipal, State and other public or private authorities having jurisdiction. The developer is responsible for acquiring all necessary permits.

All equipment and workmanship shall be guaranteed to be free from mechanical and electrical defects for a period of one year from the day of final acceptance. Any replacement of parts or adjustments, including labor made necessary by such defects and adjustments, shall be rectified without cost to the Town.

Required Testing:

1. All mechanical, control and alarm functions shall be tested in the presence of the Town representative to demonstrate that all equipment is fully operational.

2. Any grounds, opens, shorts or other defects shall be rectified at no cost to the Town before acceptance.

## H. Controls

Pumping sequence shall be arranged in an alternating lead/lag configuration. When liquid level reaches the predetermined lead pump on elevation, the designated lead pump shall start automatically. This pump shall continue to operate until such time as the liquid level falls below the designated pump off elevation. If flow into the wet well exceeds the capacity of the lead pump, and liquid level rises to the lag pump on elevation, then the designated lag pump shall be automatically activated. Both the lag pump and the lead pump shall continue to operate until liquid level falls to the pump off elevation. A high level alarm condition shall occur if liquid level rises above the predetermined alarm level (typically established at an elevation 6" above the lag pump on elevation). The alarm condition shall remain in affect until manually reset from the control panel.

The main equipment control system shall be mounted internally within the pump station in a NEMA 4 panel, complete with suitable latching devices. All circuit breakers, pump control switches shall be mounted so that they are operable without opening the cabinet. The low voltage, automatic pump control section shall be separate from the high voltage circuit breaker motor section and shall be provided with a hinged access door and latch. The control switches shall be mounted on the face of the automatic pump control section door. A grounding-type convenience duplex outlet shall be provided for 115 volt AC operation.

An auxiliary control panel shall be provided immediately adjacent to the access door in the drywell and shall contain: pump control switches for each pump, runtime meters, and pump run lights.

Thermal magnetic circuit breakers shall be provided for branch-circuit and over-current protection of all motor, control and auxiliary circuits. All pump motors shall be provided with VFD control. Each VFD shall be capable of an alarm condition in the case of malfunction and the pump cannot run. All switches shall be labeled and a coded wiring diagram shall be provided.

An automatic alternator with manual ON-OFF switch shall be provided to change the sequence of operation of the pumps on the completion of each pumping cycle. Provisions shall also be made for the pumps to operate in parallel, should the level in the wet well continue to rise above the starting level for a low-level pump. The panel shall include a time delay to prevent the simultaneous start-up of both pumps.

A running time meter shall be supplied for each pump to record the hours of operation. The meter shall be enclosed in a dust and moisture proof molded plastic case. The flush mounted dial shall register in hours and tenths of hours up to 99999.9 hours before repeating. The meter shall be suitable for operation from a 115 volt, 60 cycle supply and be mounted on the surface of the control cabinet. An automated generator start, alarm and transfer switch adequate for normal

operation of the pump station.

All pump stations shall include a level sensing unit capable of providing a 4-20mA signal.

All pump stations shall be equipped with a back-up control system in the event of a primary control failure.

Any of the following primary devices shall be considered acceptable for control of the pumps and for activating alarms based on sewage level in the wet well:

- a. Ultrasonic level sensors (Badger Meter Model 2100 or equal).
- b. Submersible level transducers (Consolidated Electric Model 157GSC or equal).
- c. Direct acting non-mercury float switches (Consolidated Electric Model 9G or equal).

The following secondary devices shall be considered acceptable for back-up control of the pumps and for activating alarms based on sewage level in the event of a level sensor failure:

1. Direct acting non-mercury float switches (Consolidated Electric Model 9G or equal).

#### **I. Radio Telemetry system**

Each pump station shall be equipped with a radio telemetry unit (RTU) that is capable of being integrated with the Wastewater Department's current system.

Each RTU shall be wired to the pump station's control panel and shall input:

- Sewage pump status
- Sewage pump fail
- Power failure
- Wetwell level (continuous)
- Wetwell high level
- Wetwell low level
- Station flood alarm
- Pump 1 and 2 run times

#### **J. Supervisory Control and Data Acquisition (SCADA)**

All Town owned pump stations shall be integrated into the Wastewater Department's SCADA system. All costs associated with the integration shall be at the expense of the developer or owner. The Town shall not be liable for any costs

#### **K. Spare Parts**

1. A complete replacement pump shaft seal assembly shall be furnished with each lift station. The spare seal shall be securely fastened to the control panel and shall include complete installation instructions.

2. Two (2) spare volute gasket shall be provided.
3. A spare filter cone for the seal filter shall be provided in the same container as the pump shaft seal.
4. Provide 100% spare lamps and fuses for control panel.
5. Provide all lubricants required for initial operation.
6. Provide one (1) spare input and output card, processor, and power supply for the Programmable logic controller (PLC) system.
7. Provide one (1) spare level transducer.

### **L. O & M Manuals**

Installation of all mechanical equipment shall be done in accordance with written instructions provided by the manufacturer. Installation instructions shall be delivered with the station.

The manufacturer shall provide 5 copies of a complete and detailed operating and maintenance manual. This manual shall provide all design criteria, general operating procedures, maintenance and servicing procedures for all major components, and as-built drawings of the contributory gravity sewer system, the pumping station and force main. All instructions and parts lists shall be prepared for the specific equipment furnished and shall not refer to similar equipment. Operating manuals must be submitted to the Town prior to final acceptance of the station.

### **6.8 UTILITY ROAD CUTS**

For any work to be done in the right-of-way of an existing road, refer to Chapter III, Section 1.22, Utility Cuts.

### **7.0 ADDITIONAL REQUIREMENTS; MODIFICATION OF SPECIFICATIONS**

Any items not expressly covered in these Specifications shall require review and approval by the Town of Shelburne. The Town also reserves the right to modify these specifications if believed to be in its best interest or in the interest of future users.