Town of Shelburne Design Criteria
October 1, 2012
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SECTION A - GENERAL INFORMATION

A1.00 INTRODUCTION

The design of all municipal services in the municipality is to be based upon the specifications and standards in effect at the time of approval. All plans are to be approved before they are to be used for the construction of services. Such approval shall in no way relieve the Consulting Engineer from providing an adequate and safe design.

A1.01 FAMILIARIZATION

Prior to the commencement of the Engineering Design, the Consultant shall obtain copies of the municipality's "Design Criteria Manual" and "Standard Detailed Drawings" to familiarize himself/herself with the requirements of subdivision design in the municipality. Meetings shall be held with the Town Engineer and Director of Public Works and the Town Planning Department to discuss areas of preliminary concern and other data prior to commencement of the engineering design.

A1.02 ENGINEERING REQUIREMENTS FOR DRAFT PLAN APPROVAL

A preliminary Engineering Report must be submitted to the Town Engineer for approval. This report must be presented in a readable, comprehensive and professional manner. The Report must be signed and sealed by a Professional Engineer.

This Preliminary Report shall contain the following and be submitted in duplicate.

(a) The Draft Plan

The Draft Plan must be in a form acceptable to the Planning Department of the Town of Shelburne.

(b) Contour Plan

This plan must be at a scale of no larger than 1:1250 giving contour lines at sufficient intervals to permit assessment of existing surface drainage patterns. This plan is to extend to the limits of the drainage area to be served by proposed sanitary and storm sewer systems, including lands beyond the boundaries of the subdivision. For large external areas Contour plans at a larger scale may be provided. All elevations are to refer to Geodetic Datum. Contours established from air photo interpretation will not be permitted.

A1.02 ENGINEERING REQUIREMENTS FOR DRAFT PLAN APPROVAL (cont'd)

(c) General Plan of Services

This will be a plan based on the Draft Plan and must schematically show the proposed storm sewer systems and their connection to existing systems. Direction of flow must be indicated on all sewers. This plan is to be accompanied by preliminary engineering calculations indicating the quantity of stormwater flow at the connection to existing systems and/or at proposed outfalls. Consideration must be given to the whole catchment area to ultimately be developed. Blocks and easements for storm drainage systems shall also be shown.

Preliminary road profiles must also be identified in the Preliminary Report. Blocks of land for community mall centres must be identified on the Draft Plan and the General Plan of Services.

(d) Drainage Plan

When a natural drainage channel passes through and is affected by the subdivision, drawings must be submitted to indicate the location and typical cross-sections of the existing channel of any proposed changes.

An erosion-sediment control plan will be required. A preliminary stormwater management plan and report will be required by the Town of Shelburne in accordance with Section C 2.05 of the document. The Consulting Engineer must submit an outline of the erosion-sediment control plan in accordance with Section C 3.05.

(e) Soils Report

A preliminary soils investigation and report from an independent Soils Consultant will be required by the Town Engineer.

(f) Additional Reports

In addition to the Preliminary Engineering Report, the Town will require a study and report which evaluates the geographical and hydrogeological characteristics of an area. This study shall identify the suitability of the development area and its component sub-areas to safely accommodate water supply and sewage disposal systems. The study shall further evaluate any potential impacts on existing adjacent developments.

SECTION A - GENERAL INFORMATION

A1.03 FUNCTIONAL REPORT

A functional report and plan is required prior to commencement of the final design. Prior to the commencement of the functional report, the Developer's Consulting Engineer shall meet with the Town Engineer and Director of Public Works to discuss the Town's requirements. The functional report shall provide all details, calculations, costs, alternatives and recommendations necessary to evaluate the proposed development.

The functional report and plan shall include, but will not necessarily be limited to, the following considerations:

(a) major roadway alignments, cross-sections and intersections;
(b) roadway structures;
(c) watercourse improvements and channelizations;
(d) railway crossings;
(e) parkland development;
(f) major trunk sewers;
(g) storm drainage systems;
(h) water distribution systems;
(i) lot grading design; and
(j) pumping station locations.

In cases where the subdivision development under consideration forms part of a larger area set aside for future development, the functional report shall confirm that the servicing design does not limit the future development. The functional report shall be a definite requirement, when a subdivision is being phased and the engineering design is being undertaken for each phase separately.

The functional report shall be signed and sealed by a Professional Engineer.

SECTION A - GENERAL INFORMATION

A2.00 SUBMISSIONS

Engineering Drawings shall be submitted simultaneously to the Town Engineer and to the Town Director of Public Works. The Consulting Engineer is required to review the design criteria to determine the requirements for submission of Engineering Drawings.

A2.01 FIRST SUBMISSION

The initial submission of engineering drawings to the Town shall contain the following information:

(a) one copy of the approved Draft Plan;
(b) two copies of the proposed plan for registration showing all block and lot numbers;
(c) a declaration from the Consulting Engineer showing that he/she has been retained to design and supervise the construction of the works of the proposed subdivision according to the terms of the Subdivision Agreement;
(d) two copies of the General Plan of Services;
(e) two copies of the Lot Grading Plan;
(f) two copies of the Area Rough Grading Plan;
(g) two copies of the Storm Drainage Plan;
(h) two copies of the storm sewer design sheets, computer printouts, and detail calculations for pipe strength and bedding;
(i) two copies of the plan and profile drawings;
(j) two copies of all detail drawings other than Town of Shelburne Standard Drawings;
(k) two copies of any other drawing pertinent to the design; and
(l) one copy of a soils report for confirmation of the pavement design, prepared by a qualified Soils Consulting Engineer.

A2.02 SUBSEQUENT SUBMISSIONS

Subsequent submissions of items (d) through (k) inclusive shall be made until the Engineering Drawings and design is acceptable to the Town of Shelburne Engineer. The design of Bell Telephone System, Cable T.V. and gas systems shall be completed by the respective authority. The electrical distribution shall be approved by Ontario Hydro.

SECTION A - GENERAL INFORMATION

A2.03 MINISTRY OF ENVIRONMENTAL APPLICATIONS

After the engineering design and drawings are approved by the Town of Shelburne, three copies of the Ministry of Environment application forms for storm and sanitary sewer and watermains and one complete set of engineering drawings shall be submitted to the Town Engineer. These copies will be signed by the Town Clerk and the Town Engineer and then returned to the Consulting Engineer. The Consulting Engineer will then make application to the Ministry of the Environment for approval under the Ontario Water Resources Act.

A2.04 OTHER APPROVALS

The Consulting Engineer is required to make all submissions and representations necessary to obtain approvals from all other authorities affected (Ministry of Natural Resources, Ministry of Transportation, Conservation Authorities, Canada Post Corporation, Fire Marshall, Medical Officer of Health, etc.). The Town of Shelburne shall be kept informed of the progress of these submissions by copies of all correspondence.

A2.05 ORIGINAL TRACINGS

After all approvals have been received from all parties affected, the original tracings shall be submitted to the Town Engineer. These tracings shall be signed and dated by the Town Engineer and returned to the Consulting Engineer. A copy of the approved tracings shall be provided to the Town in electronic format - AutoCAD Version 14 or latest version required by the Town. Any subsequent changes must be formally submitted to the Town Engineer for approval.

If after one year the date of the signing of the drawings by the Town Engineer, the Developer fails to enter into a Subdivision Agreement with the Town, the Town Engineer reserves the right to revoke any or all approvals related to the engineering drawings.

A2.06 PREPARATION OF SUBDIVISION AGREEMENT

The draft of the Subdivision Agreement will be prepared by the Town's Engineer and Solicitor. The Developer's Engineer shall prepare the schedules for the agreement.

The Town Clerk must be in a position to clear <u>all</u> conditions of the Draft Plan Approval prior to the preparation of the draft Subdivision Agreement Schedules.

SECTION A - GENERAL INFORMATION

A2.06 PREPARATION OF SUBDIVISION AGREEMENT (cont'd)

The following information must be provided by the Developer's Consulting Engineer to the Town Engineer prior to the preparation of the Subdivision Agreement.

(a) Ministry of Environment certificates of approval for all the services to be constructed.

(b) The name of the person and/or company and Mortgagees with whom the Subdivision Agreement will be executed.

(c) The name, address and telephone number of the developer's lawyer.

(d) Four copies of the Reference Plan.

(e) Four copies of the Legal Description based on the Reference Plan.

(f) Four copies of the proposed final plan for registration (65M-Plan) complete with all the pertinent information as required by the registry office.

(g) Four copies of the reference (65R-) Plans for any easements to be granted to the Town.

(h) Four copies of the approved engineering drawings.

(i) A detailed cost estimate of all services to be constructed. This estimate shall include:

(i) detailed cost of services;
(ii) cost of underground electrical distribution system and street lighting;
(iii) all miscellaneous expenditures;
(iv) allowances for contingencies and engineering.

This estimate will be used as a basis for calculation of the security to be posted for the development.

(j) Proposed timetable for construction of services.

(k) Proposed landscaping plans where necessary or required.

(l) Proposed staging plans.

SECTION A - GENERAL INFORMATION

A2.07 REQUIREMENTS PRIOR TO COMMENCEMENT OF CONSTRUCTION

Prior to the commencement of construction, the Developer's Consulting Engineer shall submit the following information to the Town Engineer for approval (allow two weeks for approval):

- two sets of construction specifications
- the proposed contractor and subcontractors
- the contractor's list of suppliers
- a copy of the signed contract tender complete with prices
- all recommendations of the Erosion Control plan must be implemented
- the required Letter of Credit must be posted with the Town
- any other information as required by the Town Engineer or as specified in the Subdivision Agreement.

SECTION A - GENERAL INFORMATION

A3.00 ENGINEERING DRAWING REQUIREMENTS

A3.01 All drawings to be prepared in a neat and legible fashion. The design information presented shall be completed in ink.

A3.02 All drawings shall be prepared on 3 mil drafting film (mylar) with a matte surface on the working side.

A3.03 All plans shall be prepared on standard A1 sheets.

A3.04 All elevations shown on the drawings are to be of geodetic origin.

A3.05 Plan and profile drawings are to be prepared so that each street can be filed separately. The street names are to be identified on the plan portion of the drawings.

A3.06 When streets are of a length that requires more than one drawing, match lines are to be used with no overlapping of information.

A3.07 The reference drawing numbers for all intersecting streets and match lines shall be shown on all plan and profile drawings.

A3.08 A north arrow shall be referenced on all drawings.

A3.09 A key plan drawn to 1:10000 scale shall be shown on all plan and profile drawings as well as the General Plan of Services. The area covered by the drawing shall be clearly identified.

A3.10 A standard Title Block shall be used for all drawings. A title sheet is required for the drawings.

A3.11 All engineering drawings shall be stamped by a Professional Engineer. The Engineer's stamp must be signed and dated, prior to the issuance of drawings for tendering and signing by the Town Engineer.

SECTION A - GENERAL INFORMATION

A4.00 GENERAL PLAN OF SERVICES

A4.01 A "General Plan of Services" drawing shall be prepared for all developments at a maximum scale of 1:1250.

A4.02 When more than one "General Plan of Services" drawing is required for any development then the division of drawings shall reflect the limits of the Registered Plans as closely as possible. Where more than one plan is prepared, a supplementary "General Plan of Services" at a smaller scale shall be prepared to show the entire plan of subdivision on one drawing.

A4.03 The reference Geodetic Benchmark and the Site Benchmarks to be used for construction shall be identified on the General Plan of Services.

A4.04 A drawing index shall be shown on all "General Plans of Services" to identify the Plan and Profile Drawing number for each street or easement shown.

A4.05 All road allowances, lots, blocks, easements and reserves are to be shown and are to be identified in the same manner as shown on the Registered Plan.

A4.06 All existing services, utilities and abutting properties are to be shown in dotted lines.

A4.07 All services to be constructed are to be shown on the "General Plan of Services" in solid lines.

A4.08 All storm and sanitary sewer sizing, direction of flow and type of the sewer.

A4.09 All manholes will be shown and are to be numbered in accordance with the design drawings.

A4.10 All catchbasins are to be shown.

A4.11 All watermains, valves and hydrants are to be shown. Watermains to be identified only by sizing.

A4.12 All curbs and sidewalks are to be shown.

A4.13 All fencing is to be indicated by height and type.

A4.14 All street lighting location and hydro transformers are to be shown.

A4.15 All sites for parks, schools, churches, commercial and industrial development must be shown.

SECTION A - GENERAL INFORMATION

A4.00 GENERAL PLAN OF SERVICES (cont'd)

A4.16 If a subdivision encroaches on an existing floodplain, the approved fill and flood line restrictions must be shown, as specified by the local Conservation Authority.

A4.17 Proposed locations of Community Mail Boxes and the associated number of units shall be shown on the "General Plan of Services".

A4.18 The location of all traffic control and information signs is to be clearly shown.

SECTION A - GENERAL INFORMATION

A5.00 PLAN AND PROFILE DRAWINGS

A5.01 All plan and profile drawings shall be prepared at a scale of 1:500 horizontally and 1:50 vertically. A complete legend shall be provided on each drawing.

A5.02 Plan and profile drawings are required for all roads, blocks and easements where services are proposed, for all outfalls and for all boundary roadways abutting the development.

A5.03 All existing or future services, utilities and abutting properties shall be shown in dotted or dashed lines.

A5.04 All services to be constructed to be shown in solid lines.

A5.05 All road allowances, lots, blocks, easements and reserves are to be identified. Lot and block frontages are to be shown.

A5.06 All curb and gutter and sidewalks are to be shown and dimensioned on the plan portion of the drawings.

A5.07 All storm sewers shall be shown and dimensioned on the plan and shall also be plotted on the profile of the drawings to true scale size. Sewers shall be described only be size, type and direction of flow on the plan portion. The length, grade, material, class of pipe, usage and type of bedding shall be described in detail on the profile portion.

A5.08 All manholes shall be shown on the plan portion and the profile portion of the drawings. The manholes shall be identified by number and chainage on the plan portion and by number, chainage, offset, size, invert elevations and applicable Town of Shelburne Standard Drawing or Ontario Provincial Standard Drawing on the profile portion of the drawing. Manholes that have safety platforms or drop connections shall be noted and referred to an O.P.S.D.

A5.09 All catchbasins and catchbasin connections shall be shown.

A5.10 All rim and invert elevations for rear lot catchbasins are to be shown.

A5.11 Left and right ditch profiles and grades shall also be shown.

A5.12 All watermains, hydrants, valves, etc., shall be described and dimensioned on the plan portion of the drawings. The watermain is to be plotted to true scale size on the profile portion of the drawing and shall be described.

SECTION A - GENERAL INFORMATION

A5.00 PLAN AND PROFILE DRAWINGS (cont'd)

A5.13 The location of all storm, water and sanitary service connections shall be shown on the plan portion of the drawing.

A5.14 The centreline of construction with 20 metre stations shall be noted with a small cross on the plan portion of the drawings.

A5.15 The original ground at centreline and the proposed centreline road grade shall be plotted on the profile. The proposed profile shall be fully described (length, grade, P.1. elevations, vertical curve data, etc.).

A5.16 Details of the gutter grades for cul-de-sacs and crescents shall be provided on the plan portion as a separate detail at a scale of 1:100.

A5.17 Chainage for the centreline of construction as well as the chainages for P.1., B.V.C., E.V.C. shall be noted on the profile portion of the drawing.

A5.18 The proposed pavement structure design shall be noted on the plan portion.

A5.19 All existing utilities and services shall be shown on the plan portion. It may be necessary to dig test holes to determine the actual elevations of these services to avoid conflicts with new construction. These elevations shall be shown on the profile portion.

A5.20 Profiles of roadways shall be produced sufficiently beyond the limits of the proposed roads to confirm the feasibility of future extensions.

A5.21 In addition to the above, the following detail shall be shown on the plan portion of the drawings:

- the curb radii at all intersections;
- the location of all luminaire poles and transformers;
- the location and type of all street name and traffic control signs; and
- any special notes necessary to construction procedures or requirements.

SECTION A - GENERAL INFORMATION

A6.00 OTHER DRAWINGS

A6.01 LOT GRADING PLANS

All lot grading plans shall be prepared in accordance with the criteria in Section G of this document.

A6.02 STORM DRAINAGE PLANS

All drainage plans for the storm sewer design shall be prepared in accordance with the criteria in Section C of this document.

A6.03 DETAIL DRAWINGS

The Town of Shelburne Standard Drawings shall be used whenever applicable. In the absence of a Shelburne Standard Detail the latest revision of the Ontario Provincial Standard Drawings shall be used. Individual details shall be provided by the Consulting Engineer for all special features not covered by any of the above. All details shall be reproduced or drawn on standard size sheets and shall be included as part of the Engineering Drawings.

SECTION A - GENERAL INFORMATION

A7.00 CERTIFICATE OF COMPLETION AND FINAL ACCEPTANCE

The term "Certificate of Completion" shall be used to describe the date when the services are complete and acceptable to the Town of Shelburne subject to the maintenance requirements pursuant to the terms and conditions of the Subdivision Agreement. "Final Acceptance" shall be the terminology used to describe the date when the Developer's maintenance requirements have been fulfilled and the services are acceptable to the Town of Shelburne. "Formal Acceptance" of the subdivision shall be the date on which the Town of Shelburne agrees by By-law that all conditions of the Subdivision Agreement have been fulfilled and all maintenance requirements have been completed.

The Certificate of Completion and Final Acceptance must be requested by the Developer in writing. The dates for all certificates shall be established by the Town of Shelburne.

When the services are completed and cleaned to the satisfaction of the Consulting Engineer, he/she shall advise the Town and the Town Engineer, in writing, that the work is completed and shall request an inspection by the Town of Shelburne. The Town of Shelburne shall carry out their inspections and shall advise the Consulting Engineer of any items that require further rectifications. When all deficiencies have been corrected to the satisfaction of the Town Engineer, a report shall be forwarded to Council ("Certificate of Completion") recommending a date for the commencement of the maintenance period.

Near the end of the maintenance period the services shall be reinspected by the Consulting Engineer and all deficiencies found shall be corrected. When the Consulting Engineer is satisfied that the work is complete and acceptable, he/she shall advise the Town, in writing, and request a final inspection by the Town Engineer. When all work is completed to the satisfaction of the Town Engineer, a report shall be forwarded to the Council recommending "Final Acceptance" of the works.

SECTION A - GENERAL INFORMATION

A8.00 "AS-CONSTRUCTED" DRAWINGS

A8.01 GENERAL

The "as-constructed" drawings constitute the original engineering drawings which have been amended to incorporate the construction changes and variances in order to provide accurate information on the works as installed in the development.

A8.02 "AS-CONSTRUCTED" FIELD SURVEY

The "as-constructed" revisions shall be based on a final survey of all the subdivision services and the Consulting Engineer's construction records. The final survey shall include a final check of the following items:

- location and invert elevations of all sewer manholes
- distances between all sewer manholes and sewer sizes
- location of all roadway catchbasins
- location, rim and invert elevations for all rear yard and lot catchbasins
- location and ties to all valve boxes, chambers, hydrants, curb stops and other watermain appurtenance
- road centreline elevations
- site benchmarks
- location of all service connections to all lots and blocks and location of connection from the nearest downstream manhole, (i.e. 0+023).
- Separate easement map
- Digital copy of auto cad and DPF drawings of project
- Registered plan
- Completed Total station survey of all above ground features

A8.03 DRAWING REVISIONS

The original tracings shall be revised to incorporate all changes and variances found during the field survey and to provide ties and additional information to readily locate all underground services.

All sewer and road grades are to be recalculated to two decimal places.

All street names, lot numbering and block identification shall be checked against the Registered Plan and corrected if necessary.

The "as-constructed" revision note shall be placed on all drawings in the revision block.

The information on the "as-constructed" drawings may be checked by the Town of Shelburne at any time up to two years after final acceptance of the subdivision. If any discrepancies are found, then the drawings shall be returned to the Consultant for

rechecking and further revision.

SECTION A - GENERAL INFORMATION

A8.03 DRAWING REVISIONS (cont'd)

The Consultant shall be required to explain in writing any major difference between the design and the "as-constructed" data and to provide verification that the alteration does not adversely affect the function of the subdivision services.

A8.04 SUBMISSIONS

Upon completion of all construction work and the "as-constructed" revisions, the original tracings shall be submitted to the Town of Shelburne for their permanent records.

The submission of the "as-constructed" drawings in paper and electronic format to the Town must be completed before "Final Acceptance" of the subdivision will be given.

SECTION B - ROADWAYS

B1.00 CLASSIFICATIONS

All roadways in new developments shall be classified according to the traffic volume expected and to the intended use of the roadway. For predominantly residential areas, three classifications shall be noted as follows:

- Local - Estate Residential (lot widths over 60.0 m)
- Local - Urban and Hamlets
- Collector
- Arterial

For industrial and commercial areas, the roads shall be classified Local or Collector dependent upon the length of street, traffic volume expected, and amount of truck traffic.

The proposed classification of all streets shall be confirmed with the Town of Shelburne prior to the commencement of the design.

SECTION B - ROADWAYS

B2.00 GEOMETRIC DESIGN ELEMENTS

	Local		Collector		Arterial	
Geometric Detail	**Estate**	**Urban**	**Minor**	**Major**	**Undivided**	**Divided**
Min. R.O.W. (Metres)	20	20	20	26.0	29.5	37
Design Speed (km/hr)	50	50	50	60	60	80
Mm. Safe Stopping Distance (metres)	65	65	65	85	85	135
Min. Visibility Curves in Sag (K Values)	12	12	12	18	18	30
Min. Visibility Curves on Crests (K Values)	8	8	8	15	15	35
Mm. Horizontal Radius (metres)	80	80	110	160	300	350
Pavement Width (face to face of curbs in metres)	8.5	8.5	10	15	14	2@8
Pavement Crossfall (%)	2	2	2	2	2	2
Minimum Grade (%)	0.5	0.5	0.5	0.5	0.5	0.5
Maximum Grade (%)	6	5	5	5	5	5
Maximum Grade for Through Roads at Intersections (%)	3.5	3.5	3.0	3.0	2.0	2.0
Maximum Grades at Stop Roads at Intersections	2.0	2.0	1.5	1.5	1.0	1.0

SECTION B - ROADWAYS

B2.00 GEOMETRIC DESIGN ELEMENTS (cont'd)

Intersection Angle (degrees)	70-90	70-90	80-90	85-90	85-90	85-90
Minimum Tangent Length Between Reserve Curves (metres)	30	30	50	60	130	130

SECTION B - ROADWAYS

B3.00 DESIGN ELEMENTS

B3.01 HORIZONTAL CURVES

Horizontal alignment is to conform to the requirements as outlined in Section B2.01. In general, "right angle bends" will not be permitted on local streets except in the case of "Courts" or "Crescents" servicing no more than 50 residential lots. Where permitted, these bends must not have a deflection angle greater than 110 degrees.

B3.02 VERTICAL CURVES

All points of grade change in excess of one percent shall be designed with vertical curves as outlined in the current Ministry of Transportation of Ontario publications. The minimum visibility curves to be used are outlined in the geometric details for each roadway classification. The minimum tangent length of any road grade shall be 9 metres.

B3.03 BACKFALL AT INTERSECTING STREETS

At all street intersections the normal crossfall of the major street shall not be interrupted by the crown line of the minor street. A one or two percent backfall shall be provided on the minor street at all street intersections. This backfall shall continue to the end of the curb return radii to facilitate proper drainage of the intersection. Overland flow routing of storm drainage through the intersection must be maintained.

B3.04 CURB RETURN RADII AT INTERSECTIONS

The curb return radii at street intersections shall conform to the following dimensions:

Pavement Width Street A	Pavement Width Street B	Curb Return Radii
8.5 m	8.5 m	10.0 m
8.5 m	10.0 m	10.0 m
8.5 m	12.8 m	10.0 m
8.5 m	14.0 m	10.0 m
10.0 m	10.0 m	12.0 m
10.0 m	12.8 m	12.0 m
10.0 m	14.0 m	15.0 m
12.8 m	12.8 m	12.0 m

SECTION B - ROADWAYS

B3.05 DAYLIGHTING REQUIREMENTS AT INTERSECTIONS

Daylighting at all intersection quadrants shall be included in the road allowances to provide for uniform boulevard widths. Such daylighting shall be included on the proposed plan for Registration (M Plan) and on all engineering drawings.

B3.06 CUL-DE-SAC AND BULBS

Permanent cul-de-sac shall be constructed in accordance with the details provided in the Ontario Provincial Standard Drawings. Minimum gutter grades of 0.5% be maintained along the flow line of the gutters around the cul-de-sac. The design of the road grade shall be such that the drainage is directed away from the end of the cul-de-sac and towards the beginning of the bulb area where catchbasins are to be located.

B3.07 TEMPORARY TURNING CIRCLES

Temporary turning circles will be considered whenever a road is to be continued in the future in a phased Plan of Subdivision. The minimum radius for temporary turning circles shall be 27 m.

B3.08 LOCATION OF UTILITIES

The location of utilities within the road allowance shall be as detailed on the Town of Shelburne Standard Drawings. Utility drawings shall be submitted to the Town Engineer for approval of the proposed utility locations.

All utility wiring is to be housed underground or direct buried. Hydro transformers are to be housed in suitable enclosures and mounted on transformer pads installed at the final elevation of the adjacent ground. The location of transformer pads shall be as detailed on the Town of Shelburne Standard Drawings. Bell Telephone and Cable T.V. junction boxes may be mounted at the surface in approved standard enclosures.

SECTION B - ROADWAYS

B3.09 COMMUNITY MAIL BOX REQUIREMENTS

In general, community mail centres and/or site individual super mail boxes shall be placed in locations approved by the Town of Shelburne. Community mail centres shall be constructed in mini-parks, centrally and suitably located in consultation with Canada Post Corporation. The design of the community mail centre must incorporate such criteria as pedestrian safety, traffic flow and aesthetics. The Town of Shelburne may require the developer to furnish the following amenities within the community mail centre:

- park benches
- fencing
- litter containers
- landscaping
- pedestrian lighting
- concrete pad or interlocking stone surface
- architectural controlled kiosks
- adjacent car bays parallel to the travelled portion of the roadway.

All details associated with the community mail centres or super mail boxes shall be identified on the Engineering Drawings and will be subject to the approval of the Town Engineer. The Developer shall be responsible for constructing community mail centres within residential subdivisions, prior to the issuance of the first building permit.

The approval of Canada Post Corporation with respect to location of community mail centres and/or site individual super mail boxes will be required prior to the approval of the Engineering Drawings by the Town Engineer.

SECTION B - ROADWAYS

B4.00 PAVEMENT DESIGN

The minimum pavement design for all streets in new subdivisions shall be as follows:

40 mm HL3
50 mm HL8
150 mm Granular “A”
450 mm Granular “B”

To confirm the minimum pavement design, a qualified soils consultant shall be engaged by the Consultant to sample, test and design a suitable pavement section. Soil sampling shall be carried out in the presence of the Town Engineer at intervals not exceeding 60 metres along the centerline of the subdivision road.

Copies of all test results and proposed road designs shall be submitted with the Engineering Drawings. In no case will a pavement design less than the minimum Town of Shelburne Standard as shown on the standard drawing for the particular road classification be considered acceptable.

Testing and approval of all granular materials at the designated pits prior to placement and subsequent in-situ verification tests shall also be performed by the Developer’s Geotechnical Consultants

Prior to the placement of asphalt pavement, the Consulting Engineer must submit to the Town Engineer for approval, the asphalt pavement mix designs.

SECTION B - ROADWAYS

B5.00 CONSTRUCTION REQUIREMENTS

B5.01 CLEARING AND GRUBBING AND AREA ROUGH GRADING

The road allowance shall be cleared of all trees and shrubs which are not included in final landscaping, and of all other obstructions for such widths as are required for the proper installation of roads, services and other works. Rough grading shall be done to bring the travelled portion of the road to the necessary grade and in conformity with the cross-section shown on the drawings. Rough grading of all lots and easements must be properly shaped and compacted to 95 percent Standard Proctor Density, prior to any application of granular base course materials. In all cases, topsoil shall be stripped for the complete width of the road allowance and stockpiled at locations approved by the Town Engineer.

B5.02 COMPACTION

All native materials and subgrade shall be compacted to a minimum of 98% Standard Proctor Density.

Prior to placing road granulars, the consultant shall arrange for a proof-roll to be attended by the consultant, the owner's soils engineer and the Town Engineer. No granulars shall be placed until written consent is received from the Town Engineer.

Road granulars shall be compacted to 100% Standard Proctor Density.

Compacting testing shall be carried out no less than every 30 metres of curbs, Granular 'B' and Granular 'A'.

Copies of all compaction testing shall be forwarded to the Town Engineer.

B5.03 ROAD SUB-DRAINS

150 mm diameter perforated, filter cloth wrapped plastic corrugated subdrains will be required to run continuous along both sides of all roads with curb and gutter. It will be the responsibility of the Developer to justify deviation from this standard by submitting a "Soil Drainage Report" from a recognized independent Soils Consultant. Sub-drains may be omitted if it can be shown that the subgrade is sufficiently permeable to ensure adequate drainage of the road base. The Town reserves the right to require video inspection of subdrains.

SECTION B - ROADWAYS

B5.04 SNOW CLEARING

Snow clearing operations prior to "Final Acceptance" may be carried out by the Town if so requested in writing by the Developer and the associated costs may be charged back to the Developer.

B5.05 PLACING OF FINAL SURFACE COURSE ASPHALT

The placement of surface course asphalt shall not commence in any area until all of the following conditions are met:

(a) a minimum period of one year has expired from the completion date for the placement of the base course asphalt;

(b) 85 percent of the dwellings have received Final Occupancy Permits;

(c) all undeveloped lots are rough graded in accordance with the approved lot grading plans;

(d) all service connections for multiple family commercial, institutional or other blocks are installed;

(e) the approval of the Town Engineer is obtained in writing;

(f) all deficiencies and settlements have been repaired; and

(g) favourable weather conditions are present.

B5.06 OTHER REQUIREMENTS

Whenever it is necessary to cut through an existing Town road, the Developer's Contractor will be responsible to obtain a permit from the Town Superintendent. The placement and compaction of the backfill material and the restoration of the surface pavement shall be done in accordance with the standard and specifications in effect at that time.

Before making detours, permission is required from the Town Public Works Department. Where the road is not part of the Town road system, approval from the appropriate road authority will also be necessary. In all cases, the Fire, Police Departments, School Bus Companies and Ambulance Service must be notified by the Developer or his Contractor.

All work will be done in accordance with ordinances and By-laws of the Town of Shelburne.

SECTION B - ROADWAYS

B6.00 CONCRETE CURB AND GUTTER

Concrete curb and gutter conforming to OPSD-600.04 Type C shall be used on all new subdivision roads.

Driveway depressions shall be formed in the curb according to the detail and location as per OPSD-303.02. If driveway locations cannot be determined at the time of pouring, a full section of curb and gutter shall be poured continuously. When the driveway location is determined, a driveway depression can be formed by cutting the back of the curb with a curb cutting machine providing the section to be cut is free from cracks and other defects.

All curb and gutter is to be protected from damage from heavy equipment and vehicles.

Two stage curb is not permitted.

SECTION B - ROADWAYS

B7.00 SIDEWALKS

The location requirements or sidewalks in new subdivisions shall be confirmed with the Town Engineer prior to commencing the detailed design. In general, sidewalks are required on both sides of all arterial and collector roadway and at least one side of all local streets.

The sidewalk shall conform in details and dimensions to the current Town of Shelburne Standard Detail Drawings and shall be installed at locations as shown on the typical road cross sections. The width of sidewalks for streets is 1.2 metres on 20 m R.O.W.'s and 1.5 m on 26 m R.O.W.'s. Concrete shall be 30 MPa.

The sidewalks shall be increased in thickness from 125 mm to 150 mm at all driveway locations as shown on the standard drawings.

At street intersections the curb and the sidewalk shall be depressed to meet the roadway elevations as shown on the standard drawings.

The Town of Shelburne requires that all concrete sidewalks be constructed as indicated on the approved Engineering Drawings, prior to preliminary acceptance.

SECTION B - ROADWAYS

B8.00 DRIVEWAY APPROACHES

The developer is responsible for the grading, graveling and the paving of all driveways from the curb to the property line.

B8.01 MINIMUM DRIVEWAY DESIGN

The minimum consolidated depth requirements for the granular base and asphalt in driveway shall be as follows:

(a) Single Family Residential

- Asphalt	50 mm of HL3A asphalt
- Granular	200 mm Granular A

(b) Commercial, Light Industrial and Apartments

- Asphalt	50 mm HL8 base course plus 40 mm HL3 surface course 225 mm Granular “B” plus 150 mm Granular “A”

(c) Heavy Industrial Driveways

- Asphalt	75 mm HL8 base course plus 40 mm HL3 surface course
- Granular Base	300 mm Granular “B” plus 150 mm Granular “A”

B8.02 DRIVEWAY GRADES

The maximum permissible design grade for any driveway on private lands shall be 8.0 percent. The minimum grade for driveways shall be 1.0 percent.

B8.03 DRIVEWAY DEPRESSIONS

The width and location of driveway depressions in the curb for single family dwellings shall be detailed in OPS drawing 303.02.

The width and location of driveway depressions for commercial industrial and apartment driveways shall be detailed on the engineering drawings, however, the maximum width shall be 12 metres. The maximum width of residential driveway depressions shall be 7 metres.

SECTION B - ROADWAYS

B9.00 BOULEVARDS

All boulevard areas are to be graded according to the details shown on the Town of Shelburne Standard Drawing and to the satisfaction of the Town Engineer. The grade of the boulevard is to be constant from the back of the curb to the property line and in no case will terracing be permitted. The final grade of the sod shall match and not exceed the finished grade of the top of the concrete curb and sidewalk.

All debris and construction materials shall be removed from the boulevard area upon completion of the base course asphalt and shall be maintained in a clean state until the roadway section is completed.

Clean weed free topsoil shall be placed on all boulevard areas that are to be sodded. The minimum depth of topsoil shall be 100 mm.

No. 1 Nursery Sod shall be used for all areas that are to be sodded.

B9.01 OPEN DITCHES

Where permitted, open ditches shall be graded to the lines and grades as shown on the plan and profile drawings.

Ditch slopes shall not exceed 3:1 (4:1 preferred) with a maximum depth of 1.2 metres unless otherwise approved by the Town Engineer. The minimum depth of ditches shall be 150 mm below the subgrade of the road.

Ditches are to be topsoiled with clean weed free topsoil to a minimum depth of 100 mm. The ditch invert is to be sodded to a minimum of 2.0 metres wide and the balance to be seeded and mulched. When the ditch grade exceeds 6.0 percent, rip rap gabion mats shall be used. The minimum ditch grade shall be 1.0 percent.

Driveway culverts shall be a minimum size of 450 mm in diameter and shall be a minimum of 9.0 metres in length. The minimum cover over driveway culverts shall be 450 mm and 600 mm for road crossing culverts. Culvert and driveways are to be installed prior to excavation for houses.

SECTION B - ROADWAYS

B10.00 EASEMENT REQUIREMENTS

B10.01 GENERAL

Where underground services are placed outside road allowances and blocks of land under the ownership of the Town, permanent easements are required as well as an encroachment permit.

Utility easements shall be located on one side of the common lot line between adjacent lots. Pipes shall be centred on the easement. Where two pipes are located in one easement, the minimum width of the easement shall be the width required for the larger pipe plus ½ the width required for the small pipe.

B10.02 STORM AND SANITARY SEWER EASEMENTS

The minimum width of easements for storm and sanitary sewers shall be in accordance with the following:

Size of Pipe	Depth of Invert	Minimum Width of Easement
Up to 675 mm	3.5 m maximum	5.0 m
750 to 1500 mm	3.5 m maximum	8.0 m
1650 mm and up	4.0 m maximum	4.0 m plus 3 times 0 D. of pipe

B.10.03 STORM CONNECTIONS FOR REAR YARD CATCHBASINS

The minimum width of permanent easements for leads to rear yard catchbasins shall be 5.0 metres for pipe sizes ranging from 250 mm to 450 mm in diameter. For pipe sizes greater than 450 mm, criteria under Section 10.02 shall apply. The lead shall be centred on the easement.

B10.04 OVERLAND FLOW ROUTES

Overland flow routes for major storm events shall be contained on dedicated blocks.

SECTION B - ROADWAYS

B10.05 WATERMAINS

The minimum width of easements for watermains shall be in accordance with the following:

Size of Pipe	Depth of Invert	Minimum Width of Easement
Up to 600 mm	3.7 m maximum	6.0 m

B10.06 OPEN CHANNELS

The minimum width of blocks of land for open channels shall be the width of the top of the channel plus 7.5 metres for maintenance requirements.

B10.07 OVERLAND SURFACE FLOWS

SECTION C - STORM DRAINAGE AND STORMWATER MANAGEMENT

C1.00 DRAINAGE POLICIES

C1.01 DRAINAGE OBJECTIVES

The Town of Shelburne has set the following objectives for drainage management within its boundaries.

- Reduce to acceptable levels, the potential risk of health hazards, loss of life and property damage from flooding.

- Reduce to acceptable levels, the incidence of inconvenience caused by surface ponding and flooding.

- Ensure that any development or redevelopment minimizes the impact of change to the groundwater regime, increased pollution, increased erosion or increased transport, especially during construction.

- Maintain the natural stream channel geometry, insofar as it is feasible with achieving the above objectives.

- Encourage groundwater replenishment by infiltration where possible and practical.

POLICY - That post-development runoff not exceed the pre-development runoff.

SECTION C - STORM DRAINAGE AND STORMWATER MANAGEMENT

C2.00 ATTAINMENT OF DRAINAGE OBJECTIVES

C2.01 GENERAL

The Town of Shelburne standards are to be part of an overall storm water plan involving MOEE requirements - Appendix 'A' and the M.V.C.A. Storm Water Management Guidelines - Appendix 'B'.

C2.02 MAJOR AND MINOR SYSTEMS

In general, the Town of Shelburne supports the concept of drainage having two separate and distinct components - the minor drainage system and the major drainage system. The minor system comprises swales, street gutters, ditches, catchbasins and storm sewers. The major system comprises the natural streams and valleys and the manmade channels and ponds.

C2.03 RUN-OFF QUALITY CONTROL

The Town requires developers, contractors and builders to plan and execute their operations so as to minimize sediment and debris pickup and transport to water bodies. The degree of control and methods used must meet the regulations and guidelines of the MOE, MNR, MTO and local Conservation Authorities. The Town will provide on-site inspection of the facilities and will expect all erosion control works to be properly maintained throughout the duration of the project.

C2.04 MASTER DRAINAGE PLANS

The Town requires a Master Drainage Plan for all proposed urban developments. The primary purpose of the Master Drainage Plan is to define the effects of urban development and to determine the solution that is compatible with the objectives for the watershed.

SECTION C - STORM DRAINAGE AND STORMWATER MANAGEMENT

C3.00 MAJOR SYSTEM

C3.01 HAZARD LANDS AND FLOODLINES

The Town of Shelburne requires that Hazard Lands be clearly defined on all watersheds and that no development other than necessary access or services be located therein. The Town also requires that the floodplains that would result from the 1:100 and Regional storms be defined for predevelopment and post development conditions.

C3.02 DETENTION PONDS

Detention Ponds shall be designed so as to minimize any adverse effects to the environment as well as ensuring the safety of local residents. Ponds that exceed 6.0 metres in depth shall have terraced slopes to facilitate maintenance of the facility. The minimum slope of the bottom of the pond shall not be less than 1.0 percent.

Under no circumstances should the contours of the land in such detention ponds be altered after construction without notifying the Town of Shelburne and the appropriate conservation authority it must be agreed by all concerned that such modification will have no detrimental effect on the stormwater management.

C3.03 OUTLET STRUCTURES FROM PONDS

Where a detention or retention pond is proposed for quality control on a major system watercourse, the outlet structures must be designed as much for ease of operation as for hydraulic efficiency. The designer should always consider the possibility of a plugged outlet and should design a maintenance feature for drainage. The inlets and outlets must be protected to prevent child and major debris access. The area at the downstream end must be protected against erosion by channel lining and/or energy dissipater.

The Town of Shelburne requires that the Consulting Engineer submit an outlet of his proposed erosion sediment control plan with the first submission of Engineering Drawings. This may contain any or all of the following measures:

- sediment traps or temporary detention ponds
- seeding of topsoil stockpiles
- isolated stripping of development lands
- vegetation screens.

SECTION C - STORM DRAINAGE AND STORMWATER MANAGEMENT

C4.00 MINOR SYSTEM

C4.01 WATERSHED AREA

The watershed area shall be determined from the contour plans and shall include all areas that naturally drain into the system and any fringe areas not accommodated in adjacent drainage systems, as well as other areas which may become tributary by reason of regrading.

C4.02 STORM DRAINAGE PLANS

EXTERNAL AREAS

A plan shall be prepared to a scale dependent on the size of the watershed area, to show the nature of the drainage of the lands surrounding the development site. The area to be developed and all existing contours used to justify the design shall be clearly shown. This plan shall be prepared and submitted to the Town Engineer at the functional report stage.

INTERNAL DRAINAGE PLAN

All internal storm drainage plans shall be prepared to a scale of 1:1250 and shall include all streets, blocks, lots and easements. The proposed storm sewer system shall be shown on this plan with all manholes numbered consecutively from the outlet. The manholes shall be the tributary points in the design and the area contributing to each manhole shall be clearly outlined on the plan. The area in hectares and the runoff coefficient shall be shown in a circle within the contributing area.

In determining the contributing area to each manhole, the proposed lot grading must be considered to maintain consistency in the design.

The length, size and grade of each section shall also be shown on the storm drainage plan. Large arrows should depict the overland flow route.

C4.03 RAINWATER LEADERS

Rainwater leaders on all single family and semi-detached residential units shall be discharged onto splash pads and shall be constructed in a manner so as to not interfere with adjacent properties and where possible, be directed towards the street.

SECTION C - STORM DRAINAGE AND STORMWATER MANAGEMENT

C5.00 HYDRAULIC DESIGN

C5.01 DESIGN LEVELS

The system of street gutters, catchbasins, storm sewers or open ditches, where permitted, shall be designed for the 1:5 year storm. Culverts or sewers crossing major County roads or highways shall be designed for the 1:25 year storm.

C5.02 RATIONAL METHOD

In general, the Rational Method shall be used for the sizing of the minor sewer system in the final design stage. For areas larger than 130 hectares it may be necessary to make adjustments for any discrepancies in peak flows that the Rational Method fails to take into account. Calculations based on a hydrologic simulation model are required for systems serving large areas or involving treatment and/or storage systems.

C5.03 STORMWATER MANAGEMENT REPORT

Hydrologic studies should describe the model parameters and criteria for their selection as well as input and output data. The Consulting Engineer has the responsibility for the computations, and the Town Engineer shall check the main assumptions and the input data. All information required for this verification shall be submitted with the hydrologic computations.

Stormwater management ponds shall be designed such that the outlet not be in excess of the pre-development runoff for a minimum design storm with a 25-year return period.

SECTION C - STORM DRAINAGE AND STORMWATER MANAGEMENT

C6.00 STORM SEWER DESIGN

C6.01 RAINFALL INTENSITY DATA

Rainfall intensity data to be used in storm sewer design with the Rational Method shall be the most current data provided by Environment Canada for the Toronto-Malton area.

C6.02 RUN-OFF OR IMPERVIOUSNESS COEFFICIENTS

Run-off coefficients to be used in storm sewer design with the Rational Method shall be based upon soil types, slope, and initial moisture conditions within the following ranges:

Parks	0.10-0.25
Single Family Residential (Urban)	0.30-0.50
(Estate Residential)	0.25-0.40
Semi-detached Residential	0.40-0.60
Townhouses, Maisonettes, Row Houses	0.60-0.75
Apartments	0.50-0.70
Schools and Churches	0.50-0.75
Industrial	0.50-0.90
Commercial	0.50-0.90
Paved Areas	0.70-0.95

A ten-minute entry time at the head of the system must be utilized unless large external drainage areas exist.

C6.03 PIPE CAPACITIES

Manning's Formula shall be used in determining the capacity of all storm sewers. The capacity of the sewer shall be determined on the basis of the pipe flowing full.

The value of the roughness coefficient 'n' used in the Manning's Formula shall be as follows:

- Concrete pipe all sizes 0.013
- Concrete Box Culverts 0.013
- Corrugated Steel (culverts only) 0.024
- High Density Polyethylene 0.012

(smooth inside wall)

SECTION C - STORM DRAINAGE AND STORMWATER MANAGEMENT

C6.04 FLOW VELOCITIES

Minimum flow velocity = 0.75 in/sec
Maximum flow velocity = 4.5 in/sec

C6.05 MINIMUM SIZES

The minimum size for a storm sewer main shall be 300 mm in diameter for concrete pipe. The minimum size for entrance culverts shall be 450 mm and the minimum size for road crossing culverts shall be 450 mm.

C6.06 MINIMUM GRADES

Regardless of flow velocities obtained, the minimum design grades for pipe storm sewer shall be as follows:

Sewer Size	Concrete Pipe
up to 375 mm	0.40%
450 mm to 525 mm	0.30%
600 mm to 1200 mm	0.20%
1200 mm and over	0.15%

C6.07 MINIMUM COVER

The minimum cover to the top outside pipe barrel of a shallow storm sewer system shall in no case be less than 1.3 metres from the centreline of the roadway.

C6.08 LOCATION

The storm sewers shall be located as shown on the standard Town of Shelburne road cross section drawings. This standard location shall be generally 1.5 metres south or west of the centreline of the road allowance.

C6.09 LIMITS

All sewers shall be terminated at the subdivision limits when external drainage areas are considered in the design with suitable provision in the design of the terminal manholes to allow for the future extension of the sewer.

SECTION C - STORM DRAINAGE AND STORMWATER MANAGEMENT

C6.10 SEWER ALIGNMENT

All storm sewers shall be laid in a straight line between manholes unless radial pipe has been designed.

C6.11 PIPE CROSSINGS

A minimum clearance of 0.20 metres shall be provided between the outside of all pipes barrels at all points of crossing.

In cases where the storm sewer crosses a recent utility trench at an elevation higher than the elevation of the utility, a support system shall be designed to prevent settlements of the storm sewer, or alternatively the utility trench is to be excavated and backfilled with compacted crushed stone or concrete to adequately support the storm sewer. When the storm sewer passes under an existing utility, adequate support shall be constructed to prevent damage to that utility.

C6.12 CHANGES IN PIPE SIZE

No decrease of pipe size from a larger upstream pipe to a smaller downstream size will be allowed regardless of the increase in grade.

C6.13 SEWER PIPE MATERIALS

Concrete pipe shall conform to the requirements of C.S.A. Specification A257-M 1982 for the classes shown below:

(a) Non-reinforced Concrete Pipe, GSA Standard A257.1 Class 1, 2, 3.

(b) Reinforced Concrete Pipe, GSA Standard A257.2 Strength Class 50-D, 65-D, 100-D and 140-D.

Plastic pipe shall conform to the requirements of C.S.A. Specification 182.6 for high density polyethylene pipe (smooth inside wall and corrugated outside wall) (HDPE). Accepted pipe suppliers are as follows:

(a) BOSS 2000 Poly-Tite with minimum stiffness 320 kPa.
(b) KOR-Flow with minimum stiffness of 320 kPa.

All storm sewer mains over 450 mm diameter shall be constructed with reinforced concrete pipe. Catchbasin leads shall be constructed with non-reinforced concrete pipe, Polyvinyl Chloride SDR 35, or BOSS 2000 HDPE.

SECTION C - STORM DRAINAGE AND STORMWATER MANAGEMENT

C6.14 PIPE BEDDING

The class of pipe and the type of bedding shall be selected to suit loading and proposed construction conditions. Details and types of bedding are illustrated in OPS Drawing 802.03.

C6.15 BACKFILL FOR SEWERS

Backfill for sewers shall be in accordance with OPSD 803.04.

C6.16 SERVICE CONNECTIONS

All storm services shall be double services where possible with a 150 x 125 x 125 “Y” connection near the property line.

Single services shall be 150 mm.

Pipe material shall be P.V.C. SDR28.

SECTION C - STORM DRAINAGE AND STORMWATER MANAGEMENT

C7.00 MANHOLES

C.701 LOCATION

Manholes shall be located at each change in alignment, grade or pipe material, at all pipe junctions and at intervals along the pipe to permit entry for maintenance of the sewer.

C7.02 MAXIMUM SPACING OF MANHOLES

Pipe Size	Maximum M.H. Spacing
300 mm	95 metres
375 mm to 750 mm	100 metres
825 mm to 1200 mm	125 metres
1200 mm and over	150 metres

C7.03 MANHOLE TYPES

Manholes may be constructed of precast or poured-in-place concrete. The standard manhole details as shown on the OPS Drawings shall be used for manholes. In cases where the standard drawings are not applicable, the manholes shall be individually designed and detailed.

Precast manholes shall conform to ASTM Specifications 0-478 M latest revision.

A reference shall be made on all profile drawings to the type and size of all storm manholes.

C7.04 MANHOLE DESIGN

(a) Safety gratings shall be provided in all manholes when the depth of the manhole exceeds 5.0 m.

(b) When the difference in elevation between the obvert of the inlet and outlet pipes exceeds 0.9 m, a drop structure shall be placed on the inlet pipe.

(c) All storm sewer manholes shall be benched in accordance with the **OPS** Drawings.

SECTION C - STORM DRAINAGE AND STORMWATER MANAGEMENT

C7.05 GRADES FOR MANHOLE FRAMES AND COVERS

All manholes located within the travelled potion of a roadway shall have the rim elevation set flush to the base course of asphalt. Prior to the placement of the surface course asphalt the manhole frame shall be adjusted to the finished grade of asphalt. Steel adjusting rings will not be permitted. The concreting and setting of the frame and cover shall be in accordance with the details on the OPS Drawings. A maximum of 300 mm of modular rings shall be permitted on manhole in new subdivisions.

C7.06 HEAD LOSSES THROUGH MANHOLES

Suitable drops shall be provided across all manholes to compensate for the loss of energy due to the change in flow velocity and for the difference in the depth of flow in the sewers.

The minimum drops across manholes shall be as follows:

Change of Direction	**Minimum Drop (mm)**
0	30
1 to 45 degrees	50
46 to 90 degrees	80

SECTION C - STORM DRAINAGE AND STORMWATER MANAGEMENT

C8.00 CATCHBASINS

C8.01 LOCATION AND SPACING

Catchbasins shall be generally located upstream of sidewalk crossings at intersections.

Double catchbasins shall normally be required when the catchbasin intercepts flow from more than one direction. Single catchbasins may be used in the case where the total length of drainage to the catchbasin does not exceed 95 metres, subject to the analysis of the major minor system.

Rear lot catchbasins and connections shall be located as outlined in the lot grading criteria.

C8.02 CATCHBASIN TYPES

Catchbasins must be of the precast type as shown on the OPS Drawing 700.01 or 700.01.

Special catchbasins and inlet structures shall be fully designed and detailed by the Consulting Engineer.

C8.03 CATCHBASIN CONNECTIONS

Type	Minimum Size Of Connection	Minimum Grade Of Connection
Single Catchbasin	250 mm	1.0%
Double Catchbasin	300 mm	1.0%
Rear Lot Catchbasin	250 mm	1.0%

C8.04 CATCHBASIN FRAME AND COVERS

The frame and cover for catchbasins shall be as detailed in the OPS Drawings. In general, the "bike-proof" catchbasin grate shall be used in the roadway or walkway areas and the pyramidal type shall be used for rear lot and ditch located catchbasins. Frames shall be set at finished grade and ramped with asphalt until the top course of asphalt is placed.

SECTION C - STORM DRAINAGE AND STORMWATER MANAGEMENT

C9.00 INLETS, OUTFALLS AND SPECIAL STRUCTURES

C9.01 INLETS

Inlet structures must be fully designed and detailed on the Engineering Drawings. Inlet grates shall generally consist of inclined parallel bars or rods set in a plane at approximately 18 degrees with the top away from the flow.

Gabions, rip rap or concrete shall be provided at all inlets to protect against erosion and to channel flow to the inlet structure.

Precaution must be taken in the design of grating for structures to minimize the risk of entanglement or entrapment of a person.

C9.02 OUTLETS

The OPSD 804.03 standard headwall shall be used for all storm sewers up to 2400 mm in diameter. For sewers over 2400 mm in diameter, the headwall shall be individually designed. All headwalls shall be equipped with a grating over the outlet as per OPSO 804.05.

Gabions, rip rap, concrete or other erosion protection shall be provided at all outlets to prevent erosion of the watercourse and the area adjacent to the headwall.

C9.03 OPEN CHANNELS

The proposed criteria for an open channel shall be submitted to the Town Engineer for his approval. The Consulting Engineer shall be responsible for obtaining the approval from the MNR, MOE and the local Conservation Authority, if the open channel concept is favourably considered.

SECTION C - STORM DRAINAGE AND STORMWATER MANAGEMENT

C10.00 MATERIALS

C10.01 GABION BASKETS

Gabions shall be made of zinc coated steel wire conforming to OPSS 1430 and tied into a uniform mesh pattern. The wires are to be triple twisted to prevent unravelling when cut. Mesh openings shall be approximately 77 mm by 100 mm in size throughout.

Gabions shall be filled so that deformation of the basket is avoided. That is, at no time shall any gabion be filled to a depth exceeding 300 mm more than the adjoining basket. The material used to fill gabion baskets shall be clean, hard stone ranging in size from 100 mm to 200 mm.

C10.02 FILTER FABRIC

Where specified, “Terrafix-Type 270R” or “Textual 7612" or approved equal filter material shall be placed on the back side of the gabion baskets in accordance with the lines and dimensions shown on the engineering drawings.

The fabric shall be laid against the gabion baskets, fully extended out without tension and shall be held in place so that no displacement will occur during backfilling. Care must be taken to prevent puncture or tearing of the fabric during installation. The successive filter fabric mats shall have an overlap of 200 mm minimum.

The filter fabric must meet the requirements of Class II, OPSS 1860.07.02.

C10.03 CABLE CONCRETE

To be specified immediately downstream of outlet headwalls and an emergency or overflow spillways. International Erosion Control System, Terrafix T-55 Block or approved equal shall be used.

SECTION C - STORM DRAINAGE AND STORMWATER MANAGEMENT

C11.00 TESTING

C11.01 DEFLECTION TEST

A deflection test shall be performed on all sewers constructed using PVC material.

A suitably designed device described below shall be pulled manually through the pipe not sooner than 24 hours after completion and backfilling. The device shall be cylindrical in shape and constructed to the following dimensions:

Diameter = Pipe O.D. x (100-0.15 DR) % - 1 mm

Nominal Pipe Size (mm)	Length (mm)
150	100
200	150
250	200
300	250
350	300
400	300

C11.02 VIDEO RECORD

All newly constructed storm sewers shall be TV inspected upon satisfactory completion of all other testing, prior to the municipality's issuance of "Certificate of Completion".

A permanent record in videotaped form shall be supplied, illustrating a continuous record of the sewer installations, service connections, manholes, etc. A report identifying any unusual or substandard conditions shall also be submitted.

The video tape record and the inspection report shall be prepared by a competent firm experienced in this field. All video cassettes, reports and data provided from these inspections shall become the property of the municipality.

At the discretion of the Town/Town Engineer, additional inspections and records may be required prior to "Final Acceptance".

C11.03 MANDREL TEST

All plastic piping shall undergo a mandrel test immediately prior to Final Acceptance.

C11.04 CLEANING

All sewers and catchbasins must be cleaned annually and immediately prior to Final Acceptance.

SECTION D - RESERVED

SECTION E - WATERMAIN AND APPURTENANCES

E1.00 HYDRAULIC DESIGN

E1.01 GENERAL

All watermain shall be sized to meet the greater of the maximum day plus fire flow or the maximum hour demand. For subdivisions greater than 40 ha, the Town may require a computer analysis of the proposed watermain systems.

E1.02 FIRE FLOW

The requirement for fire flow shall be discussed and agreed upon with the Town Engineer prior to proceeding with the detailed design.

In general, the maximum fire flow requirement for a particular structure or area of the municipality shall be as outlined in "Water Supply for Fire Protection, A Guide to Recommended Practice", prepared by the Fire Underwriters Survey of the Insurance Bureau of Canada.

E1.03 SYSTEM PRESSURES

The maximum sustained operating pressure shall not exceed 700 kPa. If pressure in a localized area is above this level, a pressure reducing valve shall be installed on each service within that area.

Under normal conditions of maximum day demand, the pressure shall not drop below 275 kPa at any point in the water system.

Under conditions of simultaneous maximum day and fire flow demands, the pressure shall not drop below 140 kPa at any point in the water system.

E1.04 FLOW DESIGN

The Hazen-Williams formula in accordance with the current Ministry of the Environment design criteria shall be used for the design of water distribution systems.

The Hazen- Williams equation is as follows:

$$Q = 0.84918\ (C)\ (A)\ (R)^{0.63}\ (S)^{.054}$$

Where C = Coefficient of Roughness

A = Cross-Section Flow Area
R = Hydraulic Radius (m)
S = Slope of Energy Grade Line (mm)

E1.05 DOMESTIC DEMAND

Domestic water demand shall be calculated on the basis of an average day consumption rate of 450 L per capita per day.

Maximum day and peak hour factors shall be as recommended by the Ministry of the Environment.

E1.06 COMMERCIAL AND INSTITUTIONAL WATER DEMANDS

A population equivalent of 86 persons per hectare shall be used to estimate the water consumption for large commercial areas unless more specific data is available. Water consumption for other commercial and institutional uses shall be calculated from the following table:

Use	Water Usage
Shopping Centres	2500-500 L/0100 m^2/day
Hospitals	900-1800 L/bed/day
Schools	70-140 L/student/day
Campgrounds	225-570 L/campsite/day

E1.07 INDUSTRIAL WATER DEMANDS

An average day value of 45 cu.in/ha/day shall be used with a maximum day figure of 90 cu.m/ha/day in the absence of more specific information on water consumption for industrial lands.

SECTION E - WATERMAINS AND APPURTENANCES

E2.00 WATERMAIN DESIGN

E2.01 LOCATIONS

Watermains shall be located as shown on the standard Town of Shelburne roadway cross-section. This location shall normally be on the north and east side of the street.

E2.02 DEPTH OF COVER

Curb and Gutter Roads	1.80 m minimum cover
Open Ditch Roads	1.80 m minimum cover
Unimproved Roads	1.80 m minimum cover measured from future design grade
Watercourse, Creeks	1.5 m minimum cover

E2.03 HORIZONTAL SEPARATION BETWEEN SEWERS AND WATERMAINS

Watermains shall be designed to have a minimum clear distance of 2.50 metres from any sewer or manhole.

E2.04 WATERMAIN CROSSING SEWERS AND OTHER UTILITIES

Watermains shall normally cross above sewers with sufficient vertical separation to allow for proper bedding of the watermain.

When it is not possible for a watermain to pass over a sewer, the watermain passing under the sewer shall have a vertical separation of 0.50 metres below the sewer and the top of the watermain. The sewer must be adequately supported to prevent settling and displacement of the joints.

Watermains crossing over or under other utilities must be designed with a vertical separation of 150 mm between the outside edges of the watermain and the utility.

E2.05 DEAD-ENDS

Wherever possible, the watermain distribution system shall be designed in grid patterns and looped to avoid dead-end sections.

SECTION E - WATERMAINS AND APPURTENANCES

E2.05 DEAD-ENDS (cont'd)

Where dead-ends cannot be avoided, a fire hydrant for flushing purposes shall be installed at the end of the watermain.

Temporary dead-ends on watermains that are to be extended in the future shall be equipped with a 50 mm blow-off at the end of the watermain.

E2.06 MINIMUM SIZES

For all watermains designed to carry fire flows, the minimum sizing of watermains shall be as follows:

Residential	150 mm diameter
Commercial	250 mm diameter
Industrial	250 mm diameter

For watermains that are not designed to carry fire flows (i.e. at the end of cul-de-sacs) a minimum size of 50 mm diameter will be permitted.

E2.07 TRACER WIRES

A tracer wire shall be provided along the top of all watermains to permit field tracing of the watermain. The wire is to be secured to the top of the watermain at every fitting and valve and at intervals not to exceed 3 metres.

Tracing wire shall be brought up and looped inside each valve box so that continuity of the wire shall be maintained.

All tracing wires shall be 12 gauge; stranded copper wire complete with outer plastic coating.

E2.08 THRUST RESTRAINT

Concrete thrust blocks are to be installed at all tees, horizontal bends, hydrants, end of mains and connections 100 mm to 300 mm in diameter in accordance with OPSD 1103.01.

Alternatively, approved grip rings may be used.

SECTION E - WATERMAINS AND APPURTENANCES

E3.00 VALVING REQUIREMENTS

E3.01 TYPE

Unless specified or approved by the Town Engineer, all valves shall be Mueller A-2360 resilient wedge gate valves. Valves shall have a non-rising stem and a 50 mm square operating nut opening counter-clockwise.

All valves 400 mm in diameter and larger shall be installed inside valve chambers. These valves shall have flanged ends. A flanged to plain end spacer and a Victaulic coupler shall be installed inside the chamber to permit removal of the valve if necessary.

E3.02 SIZE

The size of the line valves shall be the same size as the watermain up to and including 400 mm in diameter.

Line valves on watermains 450 mm in diameter and larger may be one size smaller than the watermain size.

E3.03 NUMBER, LOCATION AND SPACING

Generally, three valves are required on a tee intersection and four valves are required on a cross intersection with the valves being placed at a point where the street line projected, intersects the watermain. Valve boxes and chambers are to be located in the boulevards and out at the pavement areas as much as possible.

Valve spacing along a watermain shall not exceed 300 metres or 200 metres in residential areas.

E3.04 VALVE BOXES AND CHAMBERS

All valves on watermains 300 mm in diameter and smaller shall have three piece, sliding type, Type ‘D’ valve boxes, 5¼ or 4¼.

All valves 400 mm in diameter and larger shall be installed within concrete chambers and set flush with the finished grade.

SECTION E - WATERMAINS AND APPURTENANCES

E4.00 FIRE HYDRANT REQUIREMENTS

E4.01 TYPE

Hydrants shall be Canada Valve 'Century' compression type complete with Storz nozzle facing the street. All hydrants shall be non-draining.

E4.02 SPACING

Hydrants shall be installed on all watermains 150 mm in diameter and larger with a maximum allowable spacing of 100 metres in all areas.

E4.03 BRANCH VALVES AND BOXES

All hydrants installed on watermains up to and including 300 mm in diameter shall be controlled by a 150 mm diameter branch valve attached to the supply main with an anchor tee.

All hydrants installed on watermains 300 mm in diameter shall be controlled by a 150 mm diameter branch valve directly secured to the supply main with flanged fittings or restraining rods.

E4.04 LOCATION OF HYDRANTS

Hydrants shall be located on the projection of a lot line and offset from the street line in accordance with the standard cross-section.

Hydrants shall be 1.20 m minimum distance from the edge of any driveway or house service location. Other above ground utilities such as light standards, transformers or street signs shall not be located any closer than 3.0 metres to a hydrant.

SECTION E - WATERMAINS AND APPURTENANCES

E5.00 SERVICE CONNECTIONS

E5.01 GENERAL

A single water line 19 mm diameter shall be installed to service each property.

E5.02 MATERIAL

All water service connections shall be constructed of Type K soft copper.

E5.03 MINIMUM SIZING

Single water lines serving only one residence shall be a minimum of 19 mm in diameter. When service lines exceed 30 metres in length, the size of the line shall be upsized to 25 mm in diameter.

E5.04 LOCATION

Single services for one residence shall be located a maximum of 1.2 m from the property line, however, this should not be in conflict with driveways or front yard tile beds.

E5.05 CONNECTIONS TO SUPPLY MAIN

The maximum size of connection that can be tapped into a 150 mm diameter watermain is 50 mm in diameter. A stainless steel double bolt saddle shall be used in all cases. The main stop shall be a Mueller B-25008.

Water service connections 75mm in diameter and larger shall be made by installing a tee on the supply main.

E5.06 LOCATION OF CURB STOPS AND CONTROL VALVES

The curb stops on all water service connections 50 mm in diameter and less shall be located at the street limit. Curb stops shall be Mueller Oriseal H15209 #8 service boxes with stainless steel rods shall be used.

The control valve on water services 100 mm in diameter or larger shall be located at the supply main with the valve being secured by means of anchor tees, flanged fittings or tie rods.

SECTION E - WATERMAINS AND APPURTENANCES

E6.00 TESTING REQUIREMENTS

E6.01 LEAKAGE AND PRESSURE TESTING

Upon completion of the watermain installation, or any part thereof, a leakage and pressure test will be carried out in accordance with the procedures as outlined by the Ministry of the Environment and in the presence of the Town Engineer or his/her representative.

The allowable leakage will be calculated using 2.22 L per mm of pipe diameter per km of pipe per day (24 hr.)

The minimum length of time for any hydrostatic pressure or leakage test shall be 2 hours.

In general, the test pressure shall be one and one half times the normal operating pressure of the water system at the specific location. The Contractor shall ensure that the class number of PVC pipe is not exceeded in any hydrostatic pressure test.

E6.02 FOAM SWABBING

All watermain 300 mm in diameter and smaller shall be foam swabbed to remove all debris and contaminants.

Foam swabs shall be at least 50 mm greater in size than the inside diameter of the watermain and shall have a minimum density of 7.32 kg per square metre. Foam swabbing shall be completed immediately after satisfactory pressure testing and prior to chlorination.

E6.03 DISINFECTING WATERMAINS

Chlorine shall be added in sufficient quantity so that the concentration throughout the section being tested is 50 ppm with a minimum residual after a 24-hour period of 25 ppm.

Chlorination shall not take place until the new main installation has passed the pressure and leakage test and has been foam swabbed.

After a 24-hour minimum period, the watermain shall be thoroughly flushed and a sample of water from the new watermain shall be taken for testing.

SECTION E - WATERMAINS AND APPURTENANCES

E6.03 DISINFECTING WATERMAINS (cont'd)

Connections to the new watermain shall not be made until all testing, chlorination, swabbing and flushing have been completed to the satisfaction of the Town Engineer.

E6.04 BACTERIAL TESTING

No new watermains shall be put into service until Town staff has completed bacterial testing, received satisfactory results, and given authorization in writing.

SECTION E - WATERMAINS AND APPURTENANCES

E7.00 PIPE MATERIALS

E7.01 WATERMAIN MATERIAL

Acceptable material for watermain pipe up to and including 300 mm in diameter are as follows:

Polyvinyl Chloride Pipe PVC manufactured in accordance with the latest edition of AWWA C900, minimum class 150 shall be used.

Fittings shall be cast iron or ductile iron, cement lined and manufactured to AWWA CI 10. All fittings shall be supplied with mechanical joint ends.

E7.02 WATER SERVICE CONNECTIONS

Shall be Type "K" soft copper tubing 19 mm diameter.

All services shall have saddles.

All services shall be single.

SECTION E - WATERMAINS AND APPURTENANCES

E8.00 CORROSION PROTECTION

The minimum corrosion protection requirements are as follows:

	Weight of Zinc Anode Required
1 50 mm dia. And 200 mm dia B Bends or Tees	6 lbs.
1 50 mm dia. And 200 mm dia. Valves	12 lbs
Hydrants	24 lbs
19 mm dia. Copper services (5 m in length)	6 lbs.
19 mm dia. Copper services (15 m in length)	12 lbs.

SECTION F - SANITARY SEWERS AND APPURTENANCES

F1.00 HYDRAULIC DESIGN

F1.01 CONFIRMATION OF CAPACITY

Prior to commencement of any design for sanitary sewage works within the municipality, the applicant shall confirm with the municipality that adequate treatment plant capacity is available for the proposed development.

F1.02 SANITARY DRAINAGE PLAN

The sanitary drainage plan shall be drawn to a scale suitable to show all the tributary areas that are being used to determine the design flows.

The design flow in each manhole and length of sewer shall be computed on standard sanitary design sheets. For each area entered on the design sheet, the manhole numbers, the size and grade of the sewers and the number of the detailed plan ad profile for each section of the sanitary sewer shall be shown.

F1.03 RESIDENTIAL SEWAGE FLOWS

Peak domestic sewage flows are to be calculated using the following formula:

$$Q(d) = \frac{P1M}{86.4} + 1A$$

where

Q(d) = Peak domestic sewage flows (including extraneous flows in L/s)

P = Design population, in thousands.

q = Average daily per capita domestic flow in L/cap/day (exclusive of extraneous flows).

M = Peaking factor

I = Unit of peak extraneous flows in L/ha/s

A = Gross tributary area in hectares

An average daily per capita flow of 450 L/cap/day shall be used.

SECTION F - SANITARY SEWERS AND APPURTENANCES

F1.03 RESIDENTIAL SEWAGE FLOWS (cont'd)

The unit of peak extraneous flow shall be 0.2 L/ha-sec.

The peaking factor shall be calculated based on the Harmon formula:

$$M = 1 + \frac{14}{P^{05} + 4}$$

where

P = Population, in thousands

Maximum	M = 3.8
Minimum	M = 1.5

The design population shall be derived from the drainage area and expected population over a design period of 20 years.

For more detailed information regarding the projected residential growth and densities, the designer is advised to review the municipality's Official Plan.

F1.04 COMMERCIAL SEWAGE FLOWS

A design flow of 65 cu.m/ha-d including allowances for infiltration and peaking effect shall be used for the design of all local sewers. The area shall be based on the gross lot area.

F1.05 INDUSTRIAL SEWAGE FLOWS

A design of 35 cu.m/ha/d for light industry and 55 cu.m/ha/d for heavy industry shall be used. Peak factors shall also be incorporated into the design.

The area shall be calculated using the gross area of the industrial lot or block.

F1.06 INSTITUTIONAL AND SCHOOL SWAGE FLOWS

A design of 65 cu.m/ha/d including allowances for infiltration and peaking effect shall be used for the design of all local sewers.

The area shall be based on the gross area of the school or institutional site.

SECTION F - SANITARY SEWERS AND APPURTENANCES

F2.00 SANITARY SEWER DESIGN

F2.01 LOCATION

All sanitary sewers shall be located as shown on the standard road cross-section.

F2.02 PIPE CAPACITIES

Manning's formula shall be used in determining the capacity of all sanitary sewers. The capacity shall be determined on the basis of the pipe flowing full.

F2.03 FLOW VELOCITIES

Minimum acceptable velocity = 0.6 in/s.

Maximum acceptable velocity = 3.0 in/s.

F2.04 MINIMUM SIZE

The minimum allowable size for a sanitary sewer shall be 200 mm in diameter.

F2.05 MINIMUM GRADE

The minimum desirable grade for sanitary sewers is 0.5%. The minimum grade for the first upstream leg shall not be less than 1.0%.

F2.06 MINIMUM DEPTHS

For residential, commercial and institutional areas, the minimum depth of a sewer shall be 2.75 m. For industrial areas, the minimum depth shall be 2.15 m.

The depth of the sewer shall be measured from the final centreline finished road elevation to the top of the sanitary sewer.

F2.07 CURVED SEWERS

The use of radius pipe or deflected pipe will not be permitted.

SECTION F - SANITARY SEWERS AND APPURTENANCES

F2.08 LIMITS

All sewers shall be terminated at the subdivision limits when external drainage areas are being considered in the design with suitable provision in the design of the terminal manholes to allow for future extension of the sewer.

F2.09 STORM SEWER AND WATERMAIN CROSSINGS

Generally, a minimum clearance of 0.25 m shall be provided between the outside of the pipe barrel at the point of crossing for storm and sanitary sewers. A minimum clearance of 0.5 m shall be provided for sanitary sewer and watermain crossings.

In the event the minimum clearances cannot be obtained, then the pipes shall be concrete encased to ensure that the pipes are properly bedded.

F2.10 SERVICE CONNECTIONS TO DEEP SEWERS

No service connections will be permitted to sanitary sewers exceeding 7.60 m in depth, measured form the finished centreline road elevation.

F2.11 CHANGES IN PIPE SIZE

No decrease of pipe size from a larger upstream to a smaller downstream will be allowed regardless of the increase in grade.

F2.12 HEAD LOSSES

The following minimum allowances shall be made for hydraulic losses incurred at sewer manholes:

(a) straight run grade of sewer;
(b) 45 degree turn 0.03 m; and
(c) 90 degree turn 0.06 m.

In order to reduce the amount of drop required, the designer shall, wherever possible, restrict the change in velocity between the inlet and outlet to 0.6 metres/sec.

SECTION F - SANITARY SEWERS AND APPURTENANCES

F2.12 HEAD LOSSES (cont'd)

Hydraulic calculations shall be submitted for all junction and transition manholes on sewers where the outlet is 1075 mm in diameter or greater. In addition, hydraulic calculations may be required for manholes where the outlet pipe is less than 1075 mm in diameter if, in the opinion of the Town Engineer, there is insufficient invert drop provided across any manhole.

Regardless of the invert drop across a manhole, as required by calculations, the obvert of the outlet pipe shall not be higher than the obvert of the inlet pipes at any manhole location.

F2.13 PIPE BEDDING

The class of pipe and the type of bedding shall be selected to suit loading and proposed construction conditions. Details of the types of bedding are illustrated in the Ontario Provincial Standard Drawings. The width of the trench at the top of the pipe must be carefully controlled to ensure that the maximum trench width is not exceeded unless additional bedding or higher pipe strength pipe is used.

SECTION F - SANITARY SEWERS AND APPURTENANCES

F3.00 MANHOLES

F3.01 LOCATION

Manholes shall be located at each change in alignment, grade or pipe material, at all pipe junctions and at intervals along the pipe to permit entry for maintenance to the sewer.

F3.02 MAXIMUM SPACING

The maximum spacing between manholes shall be as follows:

Pipe Size	Maximum Spacing
200 mm 6 750 mm	110 metres
825 mm to 1200 mm	125 metres
1200 mm and over	155 metres

F3.03 MANHOLE TYPES

Manholes may be constructed of precast or poured concrete. The Ontario Provincial Standard manhole details shall be used for manhole design where applicable. In all cases where the standard drawings are not applicable, the manholes shall be individually designed and detailed.

A reference shall be made on all profile drawings to indicate the type and size of all sanitary manholes. In the case of the standard 1200 mm precast manhole, the size may be omitted reference need only be made to the standard drawing number.

Precast manholes shall conform to ASTM Specification 0.478 latest revision.

F3.04 MANHOLE DESIGN

- All manhole chamber openings shall be located on the side of the manhole parallel to the flow for straight run manholes, or on the upstream side of the manhole at all junctions.

- The manhole shall be centred on the sanitary sewer main.

- The maximum change in the direction of flow in any sanitary sewer manhole shall be 90 degrees. A change of flow direction at acute interior angles will not be permitted.

SECTION F - SANITARY SEWERS AND APPURTENANCES

F3.04 MANHOLE DESIGN (cont'd)

- Drop structures shall be used when invert levels of inlet and outlet sewers differ by 0.9 metres or more. Wherever feasible, sewer systems should be designed to avoid the use of drop structures.

- All manholes shall be benched as detailed in the Ontario Provincial Standard Drawings.

- Safety gratings shall be required in all manholes greater than 5.0 m in depth. Safety gratings shall not be more than 5.0 m apart ad shall be constructed in accordance with the OPSD details.

- Where practical, a safety grating shall be located 0.5 m below the drop structure inlet pipe.

F3.05 GRADES FOR MANHOLE FRAME AND COVERS

Al manholes located within the travelled portion of the roadway shall have the rim elevation initially set flush with the base course asphalt. A maximum of 300 mm height of modular rings shall be permitted on all manholes in new subdivisions.

Prior to the placement of the final course asphalt, the manhole frame shall be adjusted to suit the final surface asphalt elevation. Turner adjustment rings are permitted.

SECTION F - SANITARY SEWERS AND APPURTENANCES

F4.00 SANITARY SERVICE CONNECTION

F4.01 GENERAL

All sanitary sewer service connections for single and semi-detached dwellings shall be double services where possible, with a 125 x 100 x 100 "y" connection near the property line.

F4.02 LOCATION

The proposed location of the sanitary sewer service shall be shown on the plan and profile drawings and generally be located with 1.2 m of the lot line. In no case shall the sewer be located under a driveway.

F4.03 CONNECTION TO MAIN

The connection to the main sewer shall be made with an approved manufactured tee. Approved saddles shall be used for connecting to existing sewer mains.

No service connection of a size greater than half the diameter of the main shall be cut into the main sewer. A manhole shall be installed on the main sewer at the intersection of a service connection which has a size greater than half the diameter of the main sewer except as provided below.

A 150 mm service connection will be permitted to connect to a 200 mm and 250 mm main sewer providing an approved manufactured tee is installed and providing the invert of the service connection is above the springline of the main sewer.

F4.04 SIZE

Single or double service connections for single family and semi-detached units shall be 125 mm in diameter.

Service connections for multiple family and other blocks, Commercial, Institutional and Industrial areas shall be sized according to the intended use.

SECTION F - SANITARY SEWERS AND APPURTENANCES

F4.05 DEPTH

The depth of the service connections for single family units and semi-detached units at the property line measured from the finished centreline road elevation shall be:

Minimum	2.50m
Maximum	3.00 m

Risers shall be used when the obvert depth of the sewer main exceeds 4.50 m. The riser section shall not exceed 3.0 m in depth.

F4.06 GRADE

Size of Connection (mm)	Minimum Grade	Maximum Grade
125	2%	8%
150	1%	6%

F4.07 CONNECTION TO MULTIPLE FAMILY AND OTHER BLOCKS

An inspection manhole shall be required on the private property (1.5 m from P/L to centre of the rim) on all connections to multiple family and other blocks.

F4.08 CONNECTION TO COMMERCIAL/INDUSTRIAL/INSTITUTIONAL BLOCKS

An inspection manhole shall be required on private property located 1.50 m from the property line to the centre of the rim.

F4.09 MATERIALS

All sanitary service connection pipe shall be polyvinyl chloride SDR 28.

All bends on sanitary service connection shall be long radius, sweep bends.

SECTION F - SANITARY SEWERS AND APPURTENANCES

F5.00 PIPE MATERIALS

F5.01 SANITARY SEWERS

Sanitary sewer shall be constructed of reinforced concrete pipe or polyvinyl chloride (PVC) pipe.

The type and classification shall be clearly indicted on all profile drawings or each sewer length.

PVC pipe may only be used or sanitary sewers up to and including 375 mm in diameter. Reinforced concrete shall be used for sewers 450 mm diameter and larger.

Reinforced Concrete shall be steel reinforced and conform to C.S.A. Specification A275.2 M1982 or latest revision thereof, Class 50-D, 65-D, 100-D, or 140-D as required.

Polyvinyl Chloride Pipe (PVC) shall conform to C.S.A. Specification B137.0 and 8137.3, or latest revisions thereof.

Dimension ratio (DR) of PVC sewer pipe shall not exceed 35.

The maximum deflection measured not earlier than 24 hours after backfilling shall not exceed 5.5% of I.D.

F5.02 SANITARY SERVICE CONNECTIONS

All sanitary service connections for residential uses shall be constructed of the following pipe materials ad specifications:

Polyvinyl Chloride (PVC) CSA 8182.1

DR 28 minimum

Material: PV compound 12454-B, 12454-C or 12364-C,
All confirming to ASTM DI 784

Joints: Bell ad spigot with rubber gaskets

MOE approved supplier.

SECTION F - SANITARY SEWERS AND APPURTENANCES

F6.00 TESTING

F6.01 GENERAL

All testing shall be carried out on each section of sewer including house service connection as work progresses.

An infiltration or exfiltration test shall be completed on all sewers. The Town Engineer shall be the sole judge of which test is to be undertaken. All testing shall be done in the presence of the Town Engineer.

F6.02 INFILTRATION TEST

An infiltration test shall be carried out where the groundwater at the time of testing is 600 mm or more above the crown of the pipe throughout the section of sewer being tested.

The allowable infiltration shall not exceed an amount based on the following calculation:

0.075 L/mm of pipe diameter/100 metres of sewer/hour.

F6.03 EXFILTRATION TEST

A exfiltration test shall be carried out where the groundwater table is lower than 600 mm or more above the crown of the pipe of the highest point of the highest service connection included in the test section.

The allowable leakage for the test section shall not exceed the following:

- 0.075 L/mm of pipe diameter/100 metres of sewer/hour.

F6.04 DEFLECTION TEST

A deflection test shall be performed on all sewers constructed using PVC material.

SECTION F - SANITARY SEWERS AND APPURTENANCES

F6.04 DEFLECTION TEST (cont'd)

A suitably designed device described below shall be pulled manually through the pipe not sooner than 24 hours after completion and backfilling. The device shall be cylindrical in shape and constructed to the following dimensions:

Diameter = Pipe O.D. x (100 -0.15 DR) % 1 mm

Nominal Pipe Size (mm)	Length (mm)
150	100
200	150
250	200
300	250
350	300
375	300

F6.05 MANDREL TEST

All plastic pipe shall undergo a mandrel test immediately prior to Final Acceptance.

F6.06 VIDEO RECORD

All newly constructed sanitary sewers shall be T.V inspected upon satisfactory completion of all other testing, prior to the municipality's issuance of "Certificate of Completion".

A permanent record in videotaped form shall be supplied, illustrating a continuous record of the sewer installations, service connection, manholes, etc. A report identifying any unusual or substandard conditions shall also be submitted.

The video tape record and the inspection report shall be prepared by a competent firm experienced in this field.

All video cassettes, reports and data provided from these inspections shall become the property of the municipality.

At the discretion of the Town/Town Engineer, additional inspections and records may be required prior to "Final Acceptance".

F6.07 CLEANING

All sanitary sewers shall be cleaned immediately prior to Final Acceptance.

SECTION G - LOT GRADING

G1.00 GENERAL

The lot grading of all lots and blocks in new subdivisions must be carefully monitored by the Consulting Engineer in order to provide sites that are suitable for the erection of buildings and to provide satisfactory drainage from all lands within the development.

G1.01 LOT GRADING PLANS

All lot grading plans for new development in the Town of Shelburne shall be prepared in accordance with the criteria contained in this section and shall contain the following information and detail:

- scale 1:500
- all existing and proposed lot numbers and blocks
- all proposed rear lot catchbasins, leads, top elevations and inverts
- location of service connections
- existing contours at maximum 0.5 m intervals
- existing and proposed elevations at lot corners
- specified house grades
- proposed road grades, lengths and elevations on all streets with symbols at grade changes indicating direction of slope
- proposed elevations along the boundary of all blocks abutting single family and semi-detached lots in the subdivision
- direction of the surface run-off by means of arrows
- all proposed easements required for registration.

SECTION G - LOT GRADING

G2.00 LOT GRADING DESIGN

G2.01 Generally, the front yards of all lots shall be graded to drain towards the street.

G2.02 All boulevards are to be graded with a constant slope from the curb to the street limit. (Minimum slope to be 2.0 percent and the maximum slope to be 6.0 percent.)

G2.03 All rear yard drainage is to be directed away from the houses in defined swales which outlet at the curb or a catchbasin.

G2.04 Drainage over abutting lands will only be allowed in exceptional cases and only at the discretion of the Town Engineer.

G2.05 The lot grading design shall provide for drainage problems on adjacent property that can be best resolved by permitting drainage through the subdivision.

G2.06 All lot surfaces shall be constructed to a minimum grade of 2.0 percent and a maximum grade of 12.0 percent. Paved surfaces shall have a minimum grade of 1%. No "walk-ups" are allowed.

G2.07 The maximum slope on all embankments and terraces shall be 3:1 (4:1 preferred).

G2.08 The maximum flow allowable to any side yard swale shall be that from two lots plus that from two adjacent lots.

G2.09 The maximum number of rear lots contributing to a rear yard swale shall be that of four rear yards.

G2.10 The maximum length of a rear yard swale between outlets shall be 90 metres. Where rear yard swales provide drainage for more than two lots, the swale must be located within a 4.0 metre drainage easement over the total length. Rear yard swales shall have a minimum slope of 2 percent.

G2.11 Swales providing internal drainage from each lot shall have a minimum slope of 2.0 percent.

G.212 Minimum depth of any swale to be 150 mm.

G2.13 Maximum depth of rear yard swales to be 750 mm.

SECTION G - LOT GRADING

G2.00 LOT GRADING DESIGN (cont'd)

G2.14 Maximum depth of side yard swales to be 450 mm.

G2.15 Maximum side slope on any swale to be 3:1.

G2.16 All drainage swales shall be located on the common lot line between adjacent lots.

G2.17 Rear yard catchbasins and outlet pipes are to be located entirely on the same lot and shall be located 1.0 metres from the lot line.

G2.18 The minimum driveway grade shall be 1.0 percent and the maximum grade permissible shall be 7.0 percent.

G2.19 The grade immediately adjacent to houses shall be a minimum of 150 mm above the invert of adjacent swales.

SECTION G - LOT GRADING

G3.00 CERTIFICATION

G3.01 Prior to application for a building permit, individual lot grading plans for each lot shall be prepared and shall be submitted to the Developer's Consulting Engineer for approval. These lot grading plans shall include the following:

- lot description including Registered Plan Number
- dimensioned property limits and house location
- house type; normal, side split, back split, etc.
- finished floor elevation
- finished garage floor elevation
- finished and original grades over septic tile beds
- finished basement floor elevation
- top of foundation wall elevations (all locations)
- existing and proposed lot elevations
- existing trees to be maintained
- driveway location, width and proposed grades
- arrows indicating the direction of all surface drainage and swales
- location and elevation of swales
- location of decks, porches and patios
- location of terraces and retaining walls
- location and type of any private sewage disposal system, reserve areas and private wells
- lot grading certificate by Developer's Engineer in accordance with the subdivision agreement requirements.

SECTION G - LOT GRADING

G3.00 CERTIFICATION (cont'd)

G3.02 Prior to the release of any lot from the subdivision agreement, the Developer's Consulting Engineer shall provide certification to the Town of Shelburne that the grading and drainage of the lot is in accordance with the approved lot grading and drainage plans.

If the grading differs from the approved plan, the Consultant shall describe the variance and provide a recommendation to rectify the problem.

SECTION G - LOT GRADING

G4.00 AREA ROUGH GRADING

G4.01 GENERAL

Where earth cuts and fills in excess of 400 mm is required within the lots and blocks of the new development, area rough grading must be performed prior to road construction.

G4.02 CONSTRUCTION REQUIREMENTS

As rough grading proceeds, the Developer must immediately enforce an erosion control program that has been previously reviewed and approved by the Town Engineer.

The Developer and his/her Engineer shall control the placement of imported fill material on registered lots where private sewage disposal systems are required. Imported fill must meet or exceed the original ground's capability to support a private sewage disposal system as required by the appropriate Health Unit.

SECTION H - SIGNS

H1.00 PLAN

The proposed location and type of all street name and traffic control signs shall be shown on the Plan and Profile drawings.

H2.00 STREET NAME SIGNS

H2.01 LOCATION

Street name signs shall be placed at each intersection and shall identify each street the intersection. The location of the street name signs are shown on the Town of Shelburne Standard Drawing.

H2.02 TYPE

The street name sign blades shall be extruded aluminum having a minimum thickness of 2.3 mm, a height of 150 mm and a length of 610 to 915 mm.

Lettering for the street name shall be uppercase 100 mm in height. The lettering for street, avenue, crescent, etc., shall be uppercase 50 mm in height.

H.300 TRAFFIC CONTROL AND ADVISORY SIGNS

H3.01 LOCATION

Traffic control and advisory signs shall be located in accordance with the Manual of Uniform Traffic Control devices for Ontario as published by the Ministry of Transportation Ontario.

H3.02 TYPE

Traffic control and advisory signs shall conform to the current revised standards of the Manual of Uniform Traffic Control Devices for Ontario.

Dead-end barricades shall be constructed in accordance with OPSD 906.01.

All signs shall be mounted on 60 mm round galvanized posts 3.65 metres in length. Signs must be erected at the completion of the base course asphalt and maintained by the Developer until “Final Acceptance” by the Town.

SECTION I - STREET TREE PLANTING

I1.00 RESPONSIBILITY

The Developer will be required to plant trees on all lots in accordance with the specifications established in the Subdivision Agreement.

I1.01 LOCATIONS

At least one tree shall be planted in front of each semi-detached and single family lot and at 15 metres intervals adjacent to blocks and parklands. On corner lots, a second tree will be required on the flankage.

Trees are to be planted so as not to interfere with other street functions or services when the tree matures. Trees shall be planted as shown on the typical urban road cross-section.

I1.02 TYPES

The species of tree to be planted shall be selected from trees hardy to the Town of Shelburne area and commonly used in municipal tree planting programs. The species and percentage of types to be used are to be approved by the Town Engineer prior to commencement of the planting program.

The following list of trees include, but does not limit those that are acceptable for this purpose:

Red Oak	Norway Maple	Mountain Ash
Crimson King Maple	Sugar Maple	Burr Oak
Royal Red Maple	English Oak	Downy Serviceberry
Hedge Maple	Turkish Hazelnut	Harlequin Maple
Village Green Zelkova	Shademaster Honey	Bradford Flowering Pear
Fastigate English Oak	Schwedler Maple	

Trees are to be planted in tree pits, large enough to accommodate the root system. Trees shall be planted in a mixture of 1/3 peat moss and 2/3 genuine topsoil, properly filled to eliminate air pockets. All trees are to be placed during the Spring or Fall dormant season in unfrozen soil.

Trees shall be protected by steel ‘T’ posts placed on both sides of the tree, parallel to the street line. A No. 9-gauge wire protected by a vinyl tubing shall be used to support the tree to the posts.

All trees that die or fail to grow prior to “Final Acceptance” shall be replaced by the Developer and be warranted for one year.

SECTION I - STREET TREE PLANTING

I1.03 QUALITY AND SOURCE

All trees shall be No. 1Nursery Stock, 2.25 m to 4.0 m in height with a minimum caliper of 75 mm measured 300 mm above ground level.

SECTION J - PARKLANDS

J1.00 PLAN

The Developer is responsible to prepare a detailed grading plan for all lands to be dedicated for Park purposes. This plan is to be reviewed and approved by the Town. The plan shall show all existing trees and features that conform to the end use of the park and are to remain. All dead trees and other features that do not conform to the end use of the park are to be removed by the Developer.

J1.01 GRADING

The park shall be fine graded in accordance with the approved grading plan with particular care being taken to avoid damage to those trees that are to remain. All graded areas shall be covered with a minimum of 100 mm of approved topsoil and shall be seeded and fertilized in accordance with the specifications of the Town Engineer.

The Town may require the Developer to provide fencing along park boundaries or walkways.

J1.02 TIMING OF CONSTRUCTION

All park blocks are to be graded and seeded within one year of the completion of the base course asphalt road construction in the area adjacent to the park. Seeding must be carried out during the desirable months for seeding, being May, August or September.

J1.03 MAINTENANCE

The Developer shall be responsible for the maintenance, fertilizing and mowing of the parkland until “Final Acceptance”.

J1.04 SERVICES

The Developer is required to provide a water service connection to the street line for the park.

SECTION K - STREET LIGHTING AND UTILITIES

K1.00 GENERAL

All primary hydro, Bell Canada cable, gas lines and cable T.V. shall be placed underground in locations as shown on the road section listed in the Standard Drawings. Design of these utilities shall conform to the regulations of the respective authority.

K1.01 STREET LIGHTING

Street lighting systems for roadways in the Town of Shelburne shall meet the requirements of Ontario Hydro or the Supply Authority.

The Developer shall arrange with Ontario Hydro or the Supply Authority for the connection of the lighting system. The entire system must be energized prior to the release of building permits. The Developer shall supply the local electrical supply authority with easements wherever they are required.

K1.02 STREET LIGHTING DESIGN

The street lighting system shall be designed by a qualified Consulting Engineer and approved by the Town Engineer.

Where possible, poles re to be placed opposite side lot lines in the location shown on the Standard Drawing. Where Super Mail Boxes are being proposed, a street light must be located immediately adjacent to the Super Mail Box.

Street lights shall be a minimum of 1.5 m from driveways and transformers.

The maximum spacing for street lights shall be 45 metres. Staggered arrangements of luminaire poles is acceptable. On curving roadways, lights are to be placed on the outside radii where possible. The minimum average illumination for local roadways shall be 6.0 lux.

K1.03 STREET LIGHT POLES

Poles are to be 9.1 m, Class A, Spun reinforced concrete (round) direct bury, complete with cast zinc hand hole and cover. Poles are to be supplied with 2.4 m polished aluminum elliptical arm bracket (per Stress/Crete TEC 30 ASA-CSA S/F 120 or equivalent.

The mounting height of the fixtures is to be 7.6 metres.

K.104 STREET LIGHTING LUMINARIES

Street lighting luminaires are to be 100 watt, high pressure sodium type luminaire unit.

SECTION L - TOWN OF SHELBURNE STANDARD DRAWINGS

L1.00 LIST OF DRAWINGS

SHE 101 - 8.5 M WIDE SUBDIVISION ROAD CROSS SECTION

SHE 102 - 9.5 M WIDE SUBDIVISION ROAD CROSS SECTION

SHE 103 - SANITARY & STORM SEWER SERVICE DETAIL

SHE 104 - SERVICE LOCATION DETAIL

OPSD - 303.03 - CONCRETE SIDEWALK

OPSD - 600.04 - CONCRETE BARRIER CURB

RAINFALL INTENSITY CURVE - PEARSON INTERNATIONAL