Engineering Design Criteria Manual

Last Updated: February 2022

Revision Information Sheet

The current and future revisions are numbered consecutively. If you are maintaining a hardcopy version of this electronic document, you are required to remove and replace the applicable pages in your manual to ensure that your manual is up-to-date.

All future updates and revisions to this manual will be posted to this page. It is the user's responsibility to visit this page periodically to check for changes to the manual. Individual notifications will **not** be sent to consultants advising them of new updates or revisions.

Engineering Design Standards & Criteria

February 2022 Update

Section	Comments
2.2.4	Revised number of hard copies required for submissions
2.2.4 and 5.11	Added provision that Landscape drawings must be prepared by an OLA.
2.3.2	Added street furnishing requirements for as-built surveys
2.3.2	Removed requirement for CAD files for subdivisions (kept it for Capital work projects)
3.3	Changed intersection angles for all road types to 80-90 degrees
3.4	Added requirement for GPS coordinates of geotechnical investigation boreholes to be added to drawings.
3.6	Changed sidewalk width requirements to between 1.5 and 1.8m for arterial roads
3.7	Added a new section with MUP design requirements.
3.8	Removed reference to City of Oshawa Zoning By-law 60-94.
3.9	Added requirement that properties must be 16m wide to have a second driveway.
3.10	Added topsoil testing requirements as per 10.6.8
3.15	Referred applicants within the Downtown Growth Centre to the Oshawa Downtown Streetscape Vision which is now posted online
4.3.4	Updated pipe crossing clearance requirements to the match the Region's requirements.
4.9	Added new section for Site Plan storm sewer connection information and drawing requirements to lay out connections.
5.4	Section now references Appendix 23, which includes drawing requirements for all drawings.
5.5.3	Added requirement for clayey cap between buildings that are less than 1.2m apart
5.5.4	Added requirement for 1.0m wide fence platform between lots

Section	Comments
5.10	Added comment k) regarding sub-dividers responsibilities prior to assumption
7.3	Updated wording with regards to pond drawdown and conveyance pipes
7.4	Added new section with requirements for SWM pond Operations and Maintenance manual
10.5.1	Added topsoil testing requirements
10.6.3	Updated asphalt requirements in Table 7
10.6.7	Added section regarding compaction
10.6.8	Added Topsoil Acceptance Criteria

Engineering Standard Drawings

Standard	Comments
OS-220	Added note that flexible sub-drain on curves and tight radii is acceptable at the discretion of the City inspector.
OS-223	Changed title to include multi-use paths. Added notes regarding backslope requirements.
OS-225	Added Note #4 that 4% sidewalk crossfall may be permitted under extenuating circumstances.
OS-301	Added note that 4% sidewalk crossfall may be permitted under extenuating circumstances.
OS-302	Added note that dowels are to be added only if directed by the City.
OS-304	Updated drawing and notes regarding TWSI locations and setbacks.
OS-306	Added lateral clearance notes.
OS-316	Fixed spelling mistakes.
OS-321	Revised title and noted to include multi-unit buildings. Added note regarding curbing for rural entrances.
OS-323	Added note that all materials shall conform to O.P.S.S. specifications.
OS-523	Revised standard to show offset cul-de-sac with minimum 13.0m radius.

Appendices

Appendix	Comments
Appendix 14	Revised to reflect changes to what work OPUC does and what the developer’s requirements are.
Appendix 23	Added new appendix. Drawing requirement items from Section 5.4 were moved here and additional drawing requirements added.

Table of Contents

Page

Revision Information Sheet 1.1

Table of Contents 1.1

1.0 Introduction 1.1

1.1 General 1.1
1.2 Organizational Structure of Development Services Department 1.1
1.3 Development Engineering Section Responsibilities 1.1
1.4 The Regional Municipality of Durham 1.2
1.5 Other Approving Agencies 1.3

2.0 Subdivision Development Process 2.1

2.1 Draft Plan Approval 2.1
2.2 Engineering Approvals & Agreement Process 2.2
2.3 Post Construction Process 2.14
2.4 Miscellaneous - Subdivision Development 2.23

3.0 Roadways 3.1

3.1 General 3.1
3.2 Road Classification 3.1
3.3 Geometric Design 3.2
3.4 Geotechnical Investigation and Road Structure Design 3.4
3.5 Concrete Curb and Gutter 3.11
3.6 Concrete Sidewalk 3.11
3.7 Asphalt Multi-Use Path within Right of Ways 3.12
3.8 Walkways 3.14
3.9 Driveways 3.14
3.10 Boulevards 3.15
3.11 Cul-de-Sacs 3.15
3.12 Temporary Turning Circles 3.15
3.13 Road Sub-Drains 3.16
3.14 Utilities 3.16
3.15 Downtown Streetscape 3.16
3.16 Secondary or Emergency Access 3.16
3.17 Roundabouts 3.17

4.0 Drainage Systems 4.1

4.1 General 4.1
4.2 Storm and Foundation Drain Collector Sewer 4.2
4.3 Storm and Foundation Drain Collector Sewer Requirements 4.4

4.4 Calcium Carbonate Mitigation – Foundation Drain Collector 4.7
4.5 Manhole Requirements 4.7
4.6 Catchbasin and Connection Requirements 4.9
4.7 Foundation Drain Connection 4.10
4.8 Cost Sharing for Oversizing 4.11
4.9 Site Plan Storm Sewer Connections 4.1

5.0 Lot Grading 5.1
5.1 General 5.1
5.2 Definitions 5.1
5.3 City of Oshawa Council Resolutions 5.2
5.4 Engineering Drawing Requirements 5.3
5.5 Lot Grading Design -General 5.3
5.6 Site Grading Plan 5.6
5.7 Roof Water Leaders 5.7
5.8 Retaining Walls 5.7
5.9 Catchbasins 5.8
5.10 Acceptance and Certification 5.9
5.11 Site Plan Development 5.11

6.0 Erosion and Sediment Control Guidelines 6.11
6.1 General 6.11
6.2 Definitions and Interpretations 6.12
6.3 Guidelines 6.12

7.0 Stormwater Management 7.1
7.1 General 7.1
7.2 City of Oshawa Interim Stormwater Management Policy 7.1
7.3 Stormwater Management Facility Design Guidelines 7.4
7.4 Stormwater Management Facility Operations and Maintenance 7.5

8.0 Place Holder 8.5

9.0 Site Alteration 9.1

10.0 Construction 10.1
10.1 General 10.1
10.2 Contract Document Review 10.1
10.3 Pre-construction and Site Meetings 10.1
10.4 City Inspection Responsibilities 10.2
10.5 Material Testing 10.3
10.6 Acceptance Criteria 10.7
10.7 Construction Services Inspection - Acceptance Certificates 10.13
10.8 Mud Control Policy 10.15

11.0 Pavement Markings, Signage, and Streetlighting 11.1

11.1 Pavement Markings 11.1
11.2 Signs 11.2
11.3 Streetlighting 11.4

12.0 Utility Coordination 12.1

12.1 General 12.1
12.2 Plan Submission Requirements 12.1
12.3 Pre-Construction 12.2
12.4 Construction 12.2
12.5 Post-Construction 12.2

Appendices

Appendix 1 Regional Roads within the City of Oshawa
Appendix 2 Servicing Cost Estimate Sample
Appendix 3 City Council Policy Related to “Residential Development”
Appendix 4 City Council Policy Related to “Types of Securities”
Appendix 5 Sample Letter from Contractor Confirming Receipt of Payment
Appendix 6 Sample Letter from Subdivider or Engineer Confirming Payment to Contractor
Appendix 7 Sample of Engineer’s Certificate of Completion of Services
Appendix 8 Storm Sewer Design Sheet
Appendix 9 Storm Design – Intensity – Duration – Frequency Rainfall Curves
Appendix 10 Storm Design – Time of Concentration for Overland Flow – Plate “A”
Appendix 11 Storm Design – Velocity for Gutter Flow Chart – Plate “B”
Appendix 12 Storm Design – Capacity and Velocity – MANNING’S FORMULA
Appendix 13 City Council Policy Related to Mud Control on Streets
Appendix 14 City Council Policy Related to Decorative Street Lighting and Signage
Appendix 15 Sample of Form Letter from Engineer Confirming Actions Related to Subgrade Problems
Appendix 16 Sample Foundation Control Certificate
Appendix 17 Sample Lot Grading Certificate
Appendix 18 Sample of Form Letter from Approved Alternate to Subdivider's Engineer related to Certification of Site Grading Plans
Appendix 19 Sample Retaining Wall Certificate
Appendix 20 Sample as Built Maintenance Hole and Sewer Information Sheet
Appendix 21 Final Measurement Form for Sketches Showing FDC Sewer Service Connections

Appendix 22 Final Measurement Form for Sketches Showing FDC and Storm Sewer Service Connections for Street Townhouses

1.0 Introduction

1.1 General

The following standards, criteria and policies shall be used as a guideline for the preparation and processing of all engineering submissions presented to the City of Oshawa for approval.

The following sections will identify:

- The requirements for subdivision development engineering including design criteria, engineering submissions, subdivision agreements, subdivision construction and inspection, and subdivision provisional and final acceptance
- Various City development policies and procedures
- Information pertaining to the City's Development Charge By-law
- Applicable subdivision standard forms and letters

1.2 Organizational Structure of Development Services Department

Development Services Department is organized into five separate Branches, as follows: Building, Planning, Engineering, Economic Development and Administration & Accessibility Services. .

Although both Building and Planning Services are referenced throughout the development engineering approval and agreement process, the focus of the following sections deals with process and requirements as they relate to Engineering Services.

Engineering Services consists of three Divisions being Development & Technical Services, Infrastructure Services, and Infrastructure Delivery.

Staff from each of these divisions are involved in the development engineering approval, agreement, and construction process, with Development Engineering being the central facilitators and coordinators for development activity within Engineering Services. Development Engineering staff work very closely with Planning Services and Building Services in the development process. Development Engineering should be the prime contact point in all matters related to development engineering.

1.3 Development Engineering Section Responsibilities

The general responsibilities for this Section include the coordination of all engineering issues within Engineering Services related to:

- Pre-consultation services to developers, engineering consultants and outside agencies on matters related to the City’s storm water management, servicing and road requirements.

- Comments and engineering conditions on Zoning and/or Official Plan Amendments relating to Draft Plans of Subdivision and/or Condominium;
- Acceptance of Storm Water Management Reports;
- Acceptance of Subdivision Engineering Drawings (excluding water & sanitary);
- Acceptance of Development Related Studies such as Geotechnical, Storm Water Management;
- Pre servicing approvals;
- Registered Plan review and Subdivision Agreement preparation;
- Pre and Post Construction Liaison with Subdivider's, Consultants, Other Approving Agencies, Other City Departments, Home Purchasers;
- Progress Payment and Letter of Credit Reduction Processing;
- Subdivision Compliance Reports;
- Lot Grading and Drainage Inquiries;
- Provisional and Final Acceptance of Services;
- Comments related to location of top of bank adjacent to watercourses.

In addition to the primarily subdivision orientated responsibilities listed above the Development Section is also responsible for the coordination of all engineering issues and comments related to:

- Zoning and/or Official Plan Amendments not related to Subdivision Development;
- Part II Plans
- Part Lot Control Exemption;
- Land Severance and Committee of Adjustment;
- Site Plan Review and Approval
- Other development related studies

1.4 The Regional Municipality of Durham

The Regional Municipality of Durham is responsible for all sanitary sewers and watermains plus appurtenances that are to be installed on all road allowances and registered easements within the Region of Durham. The Region also manages a number of Regional Roads within the City maps illustrating Regional roads in the City is provided in the Appendices.

Subdivider's and their engineering consultant shall contact the Region of Durham, Works Department to obtain copies of the Region's design criteria and standards for sewers, watermains, and Regional roads or visit www.durham.ca. The City of Oshawa is primarily responsible for storm water drainage and City streets.

While the Region and City both function as separate entities, there are areas within the development process that are jointly managed by both such as the construction process.

1.5 Other Approving Agencies

There are also a number of other agencies, which may require the submission of engineering documents for approvals and permits or for general coordination. The following list is a sample of such agencies, however the responsibility for obtaining **all** appropriate external agency approvals ultimately shall be the developers and their consultants.

- Regional Municipality of Durham – (R.O.D)
- Central Lake Ontario Conservation Authority – (C.L.O.C.A.)
- Ministry of Natural Resources – (M.N.R.)
- Ministry of the Environment, Conservation and Parks – (M.E.C.P.)
- Ministry of Transportation – (M.T.O.)
- Ministry of Municipal Affairs and Housing (M.M.A.H.)
- Department of Fisheries and Oceans – (D.F.O.)
- Canada Post
- Environment Canada
- Oshawa P.U.C. Networks Inc.
- Enbridge Gas Distribution Inc.
- Bell Canada
- Rogers Cable

2.0 Subdivision Development Process

2.1 Draft Plan Approval

The subdivision of land is subject to the Planning Act, R.S.O. 1990, c. P.13, as provided for under Section 50 of the Act. Section 50 deals primarily with the application and approval of a draft plan of subdivision. The draft plan approval process is coordinated through Planning Services.

Pre-consultation with Engineering Services by the developer and their consultants is encouraged as part of the draft plan development to confirm submission requirements and obtain available engineering data. Engineering Services may require a number of studies in order to adequately assess the proposed draft plan. The requirement for and timing of studies will be dependent on the scale of the development and if studies were provided as part of any previous planning process (i.e. Part II Plan). The following may be required:

- Draft plan
- Stormwater management plan/report outlining the following:
    - proposed major and minor storm systems
    - external drainage areas to be accommodated
    - preliminary stormwater management alternatives and design parameters
    - water quantity and quality control measures
    - foundation drain requirements
    - assessment of impact on any receiving waters (bank erosion control, fluvial geomorphology)
    - proposed erosion and sedimentation mitigation controls
- Geotechnical (i.e. ground water analysis, low impact development, seasonal level, chemical calcite content-refer to Section 4)
- Traffic impact or functional alignment study
- Traffic Management general plan as part of any Traffic Study.

NOTE: All documents shall be submitted through Planning Services, including a minimum of **one (1)** copy for Engineering Services. A digital copy in a format acceptable to Infrastructure Services of any final plan, document or report should also be submitted in addition to the noted hard copies.

Upon receipt of the plan and requisite studies, the Development Engineering Section coordinates comments from other City departments.

All comments from Engineering Services are consolidated by Development Engineering into a detailed engineering report to Planning Services. Once the draft plan and supporting documents are acceptable to Engineering Services, recommended conditions of draft plan approval are established in coordination with Planning Services to include in their report to Committee and Council. It shall be the Subdivider's responsibility to clear any approved draft plan conditions.

2.2 Engineering Approvals & Agreement Process

2.2.1 Definition of Terms

"**Stage 1 Services**" means the construction of all underground services, intersection control and street name signs,(temporary street name signs shall be in place until permanent street name signs are installed), temporary pavement markings, streetlighting, stormwater management facilities, storm sewers, foundation drain collectors, sanitary sewers and watermains with connections, storm sewer connections including catch basins, utility duct road crossings, granular base road with a binder course of asphalt, stage 1 curb, graded boulevards, electrical plant and all appurtenances normally associated with the construction of such services and may also include, where good engineering practice dictates, culverts, walkways, fencing, watercourse alterations and curbs and gutters.

"**Stage 2 Services**" means the completion of any service not included in the Stage 1 construction and without limitation includes the construction of the final course of asphalt pavement on roads, traffic management signage, the final pavement markings, the curbs and gutters, sidewalks, the sodding of boulevards, walkways, cul-de-sacs, the adjustment of all Stage 1 services to fit the Stage 2 construction, if necessary, the cleaning of sewers and any other necessary repair work to the Stage 1 services, driveway repair, and without limiting the generality of the foregoing, may also include any other service which may be required by the subdivision agreement.

"**Subdivider**" means the Subdivider named in the subdivision agreement or anyone obtaining title to any land in the Plan from him directly or indirectly and includes a mortgagee in possession of any land or any contractor retained by the Subdivider to build services or any subcontractor employed under such contractor or any other Subdivider or subcontractor or builder who obtains title to any land in the Plan as the context requires, but shall not extend to or include a homeowner or anyone obtaining title through or from a homeowner as defined in the subdivision agreement.

"**Engineer**" means a Professional Engineer who holds a Certificate of Authorization as required by the Professional Engineers Act of the Province of Ontario and who has been engaged by the Subdivider to provide professional engineering services to carry out detailed designs and to undertake contract administration and to act as the Subdivider's representative in all matters pertaining to the development of the plan and the construction of services.

"**Tender**" means the contract tender agreement which includes, but is not limited to, the form of tender, the instructions to contractors, the general conditions of the contract, the special conditions or provisions of the contract, the detailed specifications of the contract, the standard specifications of the contract, and the contract drawings.

2.2.2 Council Policies on Subdivision Development

Council policies referred to in this manual which may also be included as Appendices are transcribed from actual Council minutes. Certain changes in organizational restructuring, minor procedural changes, interpretation and administration of these policies referenced in this manual are sometimes inferred and not actually reflected in the adopted policies.

2.2.3 Professional Engineer (Engineering Consultant)

The Subdivider is responsible for retaining a Professional Engineer to manage all engineering aspects of the subdivision development. The Engineer shall be subject to the approval of the Director of Engineering Services.

The engineer retained by the Subdivider shall be responsible for, but not limited to, carrying out all necessary engineering, including stormwater management reports and design briefs, any specialized reports such as, geotechnical investigations, noise studies, environmental impact, environmental site assessment studies, etc., all design work, contract administration, full time resident supervision of work and engineering certification where required, all in accordance with terms and conditions of the standard Appendix "I" of every subdivision agreement which are representative of the policies, standards and specifications found in this manual.

2.2.4 Engineering Submission Requirements and Drawing Approvals

The Engineer should consult with staff of Development Engineering to determine how many sets of engineering drawings, copies of reports and other documents or plans may be required. However, the general requirements can be summarized as follows.

- As part of every first engineering submission a fixed payment including applicable taxes is required to be provided which reflects the base fee as set out in Schedule “D” of the General Fees and Charges By-law 13-2003 (as amended from time to time) for the processing of the engineering drawings. This payment will offset the final fixed payment requirement for the processing of the engineering drawings with execution of the subdivision agreement.

- One (1) digital and a minimum one (1) hard copy of the Draft Plan Condition response matrix that is completed by the applicant to supply the City with how each of the issued Draft Plan Conditions has been addressed

- One (1) digital and a minimum of one (1) complete set of the engineering design drawings which must include Utility Coordination plans (see Utility Coordination Section) together with Pavement Marking and Signage Plans. These engineering design drawings are to include all details for the construction of the Stage 1 and Stage 2 services, stormwater management and any other such design as may be required which are to be prepared in accordance with current standards and design criteria of Engineering Services and all other applicable agency or authority.

- One (1) digital (in .PDF format) and a minimum of one (1) copy of any geotechnical or soils reports that address topics related to any matter specific to the construction of the Stage 1 and Stage 2 services or the housing construction on the lands in the plan that include but are not limited to soil slope stability, structural integrity and ground water analysis. Copies of these reports must be accompanied by a full set of the engineering construction drawings illustrating the soil profiles of the boreholes test location at the associated chainage, which represent the soil structure in the profile to provide the relationship comparison of the design road grade to the existing ground of the test pit.

- One (1) digital (in .PDF format)and a minimum of one (1) copy of any detailed stormwater management reports together with two complimentary copies of the storm sewer design sheets as required to consider the full extent of the existing and ultimate design drainage area.

- One (1) digital (in .PDF format) and a minimum of one (1) of any detailed groundwater investigation analysis/report that identifies potential of calcium carbonate build-up together with two copies of the Foundation Drain Collection design sheets as required to consider the full extent of the existing and ultimate design drainage area.

The Engineer shall provide digital copies in a format acceptable to Infrastructure Services of all final documents, reports and any plans included with the reports.

Landscape design details for the lands to be conveyed to the City as a condition of draft plan approval need to be submitted directly to Planning Services as soon as possible so that they do not fall behind the review of engineering drawings. All Landscape Plans shall be prepared by an accredited professional Landscape Architect in good standing with the Ontario Association of Landscape Architects (OALA). The Landscape Architect shall coordinate with all other consulting professionals to ensure accurate representation of the site and the proposed development. This extends to include the legal plan submission for the plan (draft 40M-plan). The Engineer should consult with Planning Services for the submission requirements of this item.

Development Engineering will co-ordinate a response to the Engineer based on the internal circulation of the engineering submission to other Divisions and Branches within the Development Services Department, and will provide all marked up engineering drawings or other related documents as necessary to clarify the conclusion of comments received through this process. The Development Engineering Project Coordinator will provide a response that will describe the requirements for the subsequent submission as it relates to the quantity of drawing sets and other engineering document requirements.

Second and subsequent submissions of drawings and documents must be accompanied by a letter from the Engineer which identifies how previously requested changes or issues were addressed, and outline any additional changes that were made that affect the design previously reviewed by City staff. All copies of the marked drawings or other documents from the previous submission must also be returned.

This process will continue as above until the various divisions or branches of the department have indicated their acceptance of the drawings. Development Engineering will also require confirmation from all external agencies related to their acceptance of the municipal servicing of the City Stage 1 and 2 services. The endorsement of the Utility Coordination plans forming part of the engineering drawings will conclude municipal consent for the utility servicing within the plan.

The Engineer should consult with staff of Development Engineering to determine how many sets of engineering drawings, copies of reports and other documents or plans may be required on the conclusion of the engineering. However, the general requirements are summarized as follows:

- Four (4) full scale sets of the final engineering drawings

- Two (2) half scale sets of the final engineering drawings
- Five (5) folded copies (8 ½ x 14) of the general plan(s)
- One (1) set of the final engineering drawings in .PDF format
- One (1) copy of the finalized Servicing Costs Estimate (as defined in section 2.2.6) in .XLS format
- One (1) copy of the SWM Operations Manual (if applicable)

These final engineering drawings will be stamped and endorsed by Engineering Services for identification as the plans to form Appendix "II" of the subdivision agreement.

2.2.5 Registered Plan Review & Approval

Copies of the draft 40M-plan (plan to be registered) are to be submitted to Planning Services for internal City circulation and approval. Development Engineering coordinates the review of the plan in Engineering Services with the engineering plan submission and provides comments to Planning Services.

Items reviewed by Engineering Services include:

- Geometric
    - Review engineering drawings to ensure drawings and plan correspond (road allowance widths, sight triangles, tangent lengths)
    - Ensure road widening required in the draft plan are included
    - Visual inspection of bearings and distances
    - Ensure reserves are broken into proper lengths to facilitate future dedication
    - Review of detailed blow ups to confirm all information shown is correct
- Description of Plan
    - Ensure all parts, blocks, reserves, City or Subdivider owned portions of the plan are properly described. Heavy outline of plan should be reflected in description
- Owner's Certificate (Subdivider)
    - 1st Statement – ensure all lots, blocks, streets (named and spelled correctly), street widenings and reserves are included as being owned by the Subdivider and included as all parts contained in the heavy outline of the plan.
    - 2nd Statement - ensure streets and widenings are dedicated to the City as public highways. (Reserves not to be included here).
    - 3rd Statement (if any) – ensure street widenings are dedicated to the Region as public highways.
    - Ensure Subdivider's legal name is shown.
- Owner's Certificate (City)
    - 1st Statement – ensure all parts, blocks, streets, widenings and reserves owned by the City have been included and properly described for layout.
    - 2nd Statement – ensure all parts, blocks, streets, widenings and reserves that are being dedicated as public highway are properly described.

- Ensure Commissioner of Development Services is shown in signing portion.

- General

  - Check for scale, north arrow, labeling of previous 40M plans, registered plans, etc.
  - Check proper street names and spelling on the plan

The Subdivider or their Engineer should consult with Planning Services for any further information. Once the City has approved the draft 40M-plan in principle, Development Engineering requires the Subdivider to provide **two (2)** copies of a photo-reduced plan on legal size paper for inclusion in the subdivision agreement to form Exhibit "I" of the agreement. The Subdivider must arrange to have Exhibit "I" plan illustrate proposed sidewalks, fencing and Canada Post community mailbox locations and other related features considered appropriate. This plan must also illustrate any existing sidewalks or fencing that is adjacent to or related to the draft plan. This plan must show the lot and block structure of the approved draft 40M-plan with all the related lot and block numbering.

2.2.6 Servicing Cost Estimates

The Engineer will provide Development Engineering with a detailed cost estimate of the servicing for the subdivision for review, approval and calculation of the related fees to be included with the subdivision agreement. This information is required prior to or as part of any request of pre-servicing.

The detailed estimate must be broken down by Stage 1 and Stage 2 services and submitted in the format as provided in the Appendices of this manual. A detailed estimate of any roads the City has financial contribution must be provided as a separate estimate in the same format, together with separate details of estimated servicing of external to the plan.

2.2.7 City's Share of Services

The City will cost share in any "oversizing" of collector and arterial road based on the following:

Collector and Type "C" Arterial Roads:

The City shall pay to the Subdivider the cost of excess capacity for all Collector and Type "C" Arterial roads within and abutting the Plan on the basis of the difference in cost between a residential street 8.5m in width and the width of the prescribed Collector or Type "C" Arterial road. The payment pursuant to the Agreement will be determined by the City in its sole discretion but generally will be based upon the Local Development Industry's average construction cost as established on the September 1st immediately preceding construction of the road. The said Local Development Industry's average construction cost shall be equal to the arithmetic average of the sum of the costs to the Local Development Industry of a cross-section of collector/arterial road construction occurring in the twelve month period immediately preceding the aforementioned September 1st date. In the absence of reasonable amount of actual construction cost data in the twelve month period immediately preceding the aforementioned September 1st date, the construction cost used for the previous year shall be increased by a statistical index to

establish unit cost by the City in its sole discretion. The Subdivider shall be entitled to receive the payment for the excess capacity following issuance of a Provisional Acceptance Certificate for Stage I and Stage II Services, provided the requirements of the Construction Lien Act have been complied with in each instance.

Type "C" Arterial Roads Crossing Creek Valleys or Hydro Corridors:

Notwithstanding, where the Plan provides for a Type "C" Arterial road crossing a creek valley or hydro corridor, the City shall pay to the Subdivider the cost of the full width of the traveled road for the frontage as specified on the Plan, excluding all other components typically required in a subdivision development such as but not limited to street lighting and sidewalks. The payment for the above-mentioned sections shall be determined in a manner identical to the City's share for Collector and Type 'C' Arterial roads as outlined above. The Subdivider shall be entitled to receive the appropriate payment for the roadway sections following issuance of a Provisional Acceptance Certificate for Stage I and Stage II Services provided the requirements of the Construction Lien Act have been complied with.

Where the construction of a Type "C" Arterial road is required to cross a creek valley requiring the installation of a culvert or bridge, the City shall pay the Subdivider for the actual construction cost of the culvert/bridge up to and including wingwalls and fill material required to establish subgrade for the road structure.

For the purpose of determining the City's estimated cost to construct the culvert/bridge, the Subdivider's engineering consultant shall prepare a separate estimate, to be approved by the City, for the culvert / bridge, showing all items and projected quantities of the culvert / bridge crossing and any unique requirements of the specific design. This estimate shall also provide for a maximum of 15% engineering costs.

The payment, pursuant to the Agreement, shall be based upon the actual costs of the eligible items as detailed in the aforementioned estimate, for the culvert/bridge as provided and documented in the progress payment certificates to the Subdivider's contractor. The Subdivider shall be entitled to receive the appropriate payment for the culvert/bridge following City's receipt of a progress payment certificate to the Subdivider's contractor and issuance of a Provisional Acceptance Certificate, provided the requirements of the Construction Lien Act have been complied with in each instance.

2.2.8 Engineering Fees

Engineering fees will be assessed in accordance with By-law 13-2003 (as amended from time to time) to cover all Engineering Services costs associated with processing of the draft plan of subdivision, subdivision agreement, review of engineering drawings, construction inspection and acceptance of municipal services.

2.2.8.1 Processing Fees

The Subdivider shall be assessed a base fee per lot (refer to by-law) which is an interim fee payable at the time of first submission of engineering drawings. This base fee forms part of the payment requirements calculated in accordance with By-law 13-2003. The

Subdivider will need to account for this prepayment when submitting the financial requirements with the return of the executed subdivision agreement to Legal Services.

Multiple Engineering Drawing Submissions

The calculated engineering fee as set out in By-law 13-2003 and as noted allows for three submissions of the engineering drawings and details. Engineering fees for review of any revisions beyond the third submission will be invoiced on an actual cost basis.

In addition to engineering and inspection fees, there are other fixed fees collected with the execution of the subdivision agreement in accordance with the General Fees and Charges By-law:

- Legal costs associated with preparation of the subdivision agreement and documents required under the agreement, and for the registration of the agreement and documents.
- Planning Services fee for preparation of agreement.
- Street tree planting. This fee will represent only the balance of street trees not provided for in the final landscape plans and securities for street tree planting by the Subdivider.
- There is a $500 fee for signs installed by the City for any stormwater management pond. Intersection control and street name signs will be installed by the Subdivider and be included as part of the Stage I services securities. Refer to Section 11 for information.

Additional fixed fees that may be specific to the development such as:

- Long term landscape feature maintenance (Planning)
- Subdivider's share of City constructed capital services
- Subdivider's contribution towards future municipal services required by the development not included as part of the Subdivider's Stage 1 and 2 servicing installation
- Long term maintenance of stormwater management facilities
- Existing road resurfacing as determined necessary due disturbance as a result of subdivision servicing or road rehabilitation works due to increased traffic to rural type roads from new subdivision development.
- Payment in lieu of conveyance of the land for park or other public recreational purposes under the Planning Act
- Taxes applicable to appropriate services

2.2.9 Security for Services

In order to ensure the performance by the Subdivider for the installation, maintenance and repairs of the various public services and other matters performed by the Subdivider, the Subdivider shall deposit with the City, securities in the amount of **100%** of the estimated cost of the installation of the public services and other matters for which they are responsible.

A copy of City Council's policy in this regard is provided in the Appendices of this manual.

2.2.9.1 Types of Securities Acceptable for Subdivision Deposit

A Subdivider may be allowed the choice of any one or a combination of the following types of securities for subdivision deposits:

(a) Cash or Certified Cheque;
(b) Letter of Credit from a Chartered Bank;
(c) Marketable Government Bonds - Municipal, Provincial and/or Federal;
(d) Negotiable Investment Certificates from a Trust Company

A copy of City Council's policy and procedure for Types of Securities is provided in the Appendices of this manual.

2.2.10 Subdivision Pre-Servicing Approval

Authority for subdivision pre-servicing approval, prior to execution of a subdivision or development agreement, is delegated to the Director of Engineering Services. Pre-servicing will only be considered where it is not possible to execute a subdivision agreement in the time frame required to commence servicing for engineered servicing that has otherwise found to be acceptable with conformation from all agencies and authorities involved.

In order for a Subdivider to obtain pre-servicing approval, the following steps shall be taken:

1. The Subdivider, or their Engineer, must provide a formal written request to Engineering Services requesting approval to pre-service.

2. Development Engineering will review the status of engineering approvals and consult with Planning Services and the Region of Durham, Works Department. If satisfactory progress has been made, Engineering Services will provide the Subdivider, or their Engineer with pre-servicing conditions that will address requirements of all other agencies.

3. The Subdivider, or their Engineer, must provide a comprehensive written response to Development Engineering, advising how the conditions have been met.

4. Once all conditions have been satisfied, Engineering Services will issue formal pre-servicing approval and construction can commence.

The following outlines standard conditions that will generally be included as a requirement for pre-servicing. Please note that specific conditions may also be applied to a particular development.

(a) That a fixed payment be provide to the City, representing the remaining payment of engineering review, agreement preparation, and inspection fees;

(b) That a fixed payment be provided to the City, representing the Subdivider's share of servicing, if any, external to the Subdivider's plan. (It should be noted that where an existing City road allowance needs to be disturbed to affect pre-servicing of the plan, the Subdivider will be required to provide security for the full amount of any work being performed by the Subdivider. Typically this would be Stage 1 works. A fixed payment will be required for any restoration work being performed by the City. Typically this would be Stage 2 works).

(c) That the Subdivider obtain a road occupancy permit for works external to the plan and provide the payment of the associated fee. The deposit will represent the securities as part of the permit process administered by Road Operations Branch through Service Oshawa.

(d) That the Subdivider obtain a site alteration permit and provide the payment of the associated fee and deposit the securities as determined appropriate as part of the permit process. The deposit shall be held by the City, until such time, as a subdivision agreement is executed by the Subdivider or the site is fully restored, including vegetation by the Subdivider. In the event that the City is required to enter the lands to complete restoration, the deposit shall become the sole property of the City, free from all claims of the Subdivider, and the Subdivider shall not, under any circumstances, be entitled to any refund of any part of the said money, whether or not the actual cost of providing the services is less than the amount secured by the Subdivider.

(e) That a letter be provided to the city, whereby, the City is held harmless for any failure to execute a subdivision or development agreement. The letter shall further advise that the Subdivider understand that: "In the event that the Subdivider should fail to execute a subdivision or development agreement, any fixed payments required, shall become the sole property of the City, free from all claims of the Subdivider, and the Subdivider shall not, under any circumstances, be entitled to any refund of any part of the said money, whether or not the actual cost of providing the services is less than the amount paid by the Subdivider."

(f) That the engineering drawings including the utility coordination plans and Pavement Marking and Signage Plans shall be completed to the satisfaction of the City. This extends to include a requirement to have an application for municipal consent on file with the City for any proposed utility plant outside of the plan. The approved drawings shall be provided to the City and the developer's contractor.

(g) That, in accordance with the terms set out in the City's Subdivision Agreement, the Subdivider provides the City with verification that it has in place a Commercial General Liability Insurance policy written on an occurrence basis with a liability limit

of not less than five million dollars ($5,000,000) with respect to any one accident or occurrence and the City of Oshawa named on the policy as Additional Insured. The Subdivider must verify that valid insurance is in place by submitting an Insurance Certificate to the City that must be acceptable in all respects to the City.

(h) That the Subdivider, or their Engineer, obtain written confirmation from the following agencies that their requirements have been met and that they have no objections with construction proceeding:

- Oshawa P.U.C Networks Inc. has provided the Subdivider with an offer-to-connect;
- Region of Durham, Works Department;
- Ministry of the Environment, Conservation and Parks in the form of all requisite Environmental Compliance Approval;
- Central Lake Ontario Conservation;
- Any other approval agency as required (Hydro One, Trans Canada Pipeline, etc.)

(i) That the Subdivider, or their Engineer, confirm that Professional Engineering services required by the City, as it relates to contract administration, full time resident supervision, and engineering certification of the work, has been retained and further, advising of the firm that has been retained.

(j) That prior to signing any contract for construction, the Subdivider shall obtain City approval for the contractor. The Subdivider shall, before the signing of any contract for the construction of the services, submit to the City a complete set of the contract documents as tendered by the contractor for the City's review. In the event the contract requires the construction of any service for which the City has a financial contribution, the contract documents will not be executed or work commenced on the plan until the approval of the bid, which the Subdivider proposes to accept has been given by the City. The Subdivider acknowledges that, should it fail to abide by the requirements of this Section, the City, at its sole discretion, may be relieved of its obligation to make any financial contribution. On conclusion, the Subdivider agrees to provide the City with two copies of complete contract tender documents, one set of which will be an original signed set, executed by the contractor and the Subdivider.

(k) That a draft 40M-plan with lot frontage and area calculations be submitted to ensure compliance with Zoning By-law 60-94.

(l) That the Subdivider install all sedimentation and erosion control works for the subdivision to the satisfaction of the City.

(m) That the Subdivider install snow fencing and hoarding around existing trees, if any, to be pre-serviced within or abutting the subdivision to the satisfaction of the City.

(n) That the Subdivider submit an archaeological report and receive approval from the Province.

(o) That a Record of Site Condition acknowledged by the MOE that covers the lands in this phase be provided.

The Subdivider should also be aware that the value of the letter of credit, to be provided for construction of the services with the execution of the subdivision agreement, may be reduced to reflect any construction contract progress payments made prior to execution of the subdivision agreement, subject to the Subdivider's engineer providing the appropriate documentation normally associated with a letter of credit reduction.

2.2.11 Subdivision Agreement & Appendices

Development Engineering will initiate the preparation of the first draft subdivision agreement following acceptance of the engineering drawings in principle, reference plans describing easements, draft 40M plan and servicing cost estimate. Once Development Engineering has completed the first draft, it is forwarded to Planning Services for their input.

A sample of the current subdivision agreement and appendix I can be obtained by contacting Development Engineering.

2.2.12 Insurance

Before commencing the construction of any Services, the Subdivider shall insure against all damages or claims for damage with inclusive limits of not less than $5,000,000.00 issued in the joint names of the Subdivider and the City.

Before commencing any of the Services and Landscaping work, the Subdivider shall have in place a Commercial General Liability (CGL) insurance policy written on an occurrence basis with a liability limit of not less than five million dollars ($5,000,000) per accident or occurrence and the City named on the policy as an Additional Insured without subrogation.

Policy coverage shall include, but will not be limited to, third party bodily injury including death, property damage, products and completed operations, personal injury, contractual liability and non-owned automobile liability.

In addition to CGL insurance coverage, the Subdivider shall have in place, for all vehicles owned, rented or leased by the Subdivider, an Automobile insurance policy with a liability limit of not less than five million dollars ($5,000,000) per accident. The Subdivider must verify that valid insurance coverage is in place by submitting an Insurance Certificate to the City which must be acceptable in all respects to the City.

2.2.13 Tender Documentation

Prior to calling tenders for the construction of Stage 1 or Stage 2 Services, the Subdivider's Engineer must submit the Tender documents together with a covering letter to Development Engineering advising that the Tender as prepared is in compliance with City of Oshawa requirements (Standards and Specifications). Any proposed deviations from the City's requirements contemplated in the Tender must be identified. The Tender and covering letter will be reviewed by Construction Services. Construction Services will

advise Development Engineering if the Tender is acceptable or alternatively if any changes are required. The Engineer will be advised accordingly.

Prior to signing any contract for the construction of either Stage 1 or Stage 2 Services the Subdivider must obtain written approval of the Director of Engineering Services or their designate for any contractor or subcontractor to be employed to construct the Services. The Engineer will be required to provide Development Engineering with the name of the contractor proposed to be employed to construct the Services. Development Engineering will consult with Construction Services on the acceptability of the contractor and will advise the Engineer within ten (10) working days of the acceptance or rejection of the contractor. In those instances where the contractor has not previously been employed within the City for the construction of Services for or on behalf of the City, references with the name of contact persons must be provided.

If the contract includes the construction of any Services for, which the City has a financial contribution, the Engineer must in addition provide the City with a complete set of contract documents as tendered by the contractor for review by the City. The City will within ten (10) working days of receipt of the Tender advise of its acceptance or rejection of the Tender.

2.2.14 Pre-Construction Meeting

Following acceptance of the contractor and, if required the Tender, the Subdivider's Engineer must arrange a pre-construction meeting with Construction Services.

Prior to or at the meeting the Engineer must provide the City with the following:

(a) A contract construction schedule that would include dates of completion for Stage 1 and Stage 2 Services.

(b) Two complete sets of contract documents, including prices, one set of which will be executed by the Subdivider and the Contractor;

(c) Verification that the Subdivider's insurance liability endorsement has been lodged with the City. If the liability insurance endorsement excludes blasting, the Engineer must provide confirmation in writing to Development Services that blasting will not be permitted during the construction of services.

(d) Verification that the Letter of Credit to secure services has been lodged with the City;

(e) If required a resume of the full-time Resident Inspector to be employed by the Engineer to administer the contract;

(f) The name and telephone number of the consultant's contact person in the event of an emergency.

The Subdivider's Engineer must provide Construction Services with 48-hours' notice prior to commencing construction. During the course of construction of the services, the Engineer will liaise with Construction Services on all matters relating to the contract

construction. The contract will be subject to the policies established by Construction Services with respect to quality control and other matters. This extends to include, but not limited to, road base requirements for fall and winter construction that occurs from October 15 to May 1.

2.3 Post Construction Process

2.3.1 Letter of Credit Reductions

The Subdivider's Engineer may apply to Development Engineering for reductions in the letter of credit deposited with the City to secure construction of the Stage 1 or Stage 2 Services as progress payments are made to the Contractor. Requests in this regard must be accompanied by payment in accordance with General Fees and Charges By-law together with the following documents:

(a) A copy of an interim or provisional inspection certificate is provided by the City, Construction Services Division, that the services under consideration for reduction of securities have been completed and verified to be acceptable for the purpose to reduce the securities or to provide for the commencement of the minimum two year warrantee period as defined for provisional acceptance.

(b) A copy of the progress payment certified as correct by the Subdivider's Engineer;

(c) A comparison between the estimates in the subdivision agreement and the progress payment. The comparison must show items, quantities, unit prices and totals for both the estimate and the work completed as per the progress payment certificate;

(d) A letter from the Contractor, on the Contractor's company letterhead, confirming receipt of the payment set out in the payment certificate (a sample of this letter is provided in Appendices of this manual);

(e) A letter from the Subdivider or Engineer, on the Subdivider's or Engineer's company letterhead, confirming that the payment set out under the payment certificate has been made to the Contractor. (A sample of this letter is provided in Appendices of this manual);

(f) A statutory declaration from the Subdivider declaring that the Construction Lien Act R.S.O. 1990, c. C-30, as amended, has been complied with.

Upon receipt of the above noted documentation, Development Engineering will process the letter of credit reduction.

In calculating any reduction to a letter of credit, the City will retain a minimum of 20% of the completed work. At no time prior to the issuance of Certificate of Final Acceptance for Stage 1 services, will the letter of credit be reduced to less than 20% of the costs of services. After Final Acceptance of Stage 1 services, the balance of the letter of credit will not be reduced to less than 20% of the cost of Stage 2 services until a Certificate of Final Acceptance is issued for Stage 2 services.

2.3.2 “As Built” Requirements

Stage 1 Services

The Engineer must submit the following documents and information to Construction Services to allow confirmation of the quality and quantity of the completion of the Stage 1 Services prior to the scheduling of construction of the Stage 2 Services and/or prior to Construction Services issuing their inspection certificate of completion of the Stage 1 Services to the Development Engineering section for consideration of preparation of the Provisional Acceptance Certificate. Please refer to Section 10 Construction for further details.

- Video inspection of all storm sewers, F.D.C. sewers, catchbasin leads, storm sewer connections and under-drains in a format acceptable to Infrastructure Services.
- All soils and material test results as set out in Section 10 (Construction).
- Tabulated list of "As Built" inverts, pipe lengths and pipe grades of all storm sewers, FDC sewers, catchbasin leads and storm sewer connections for review and confirmation (paper copy drawing format also acceptable). Refer to Appendix 20 for format.
- House service connections (laterals) for F.D.C. and storm sewers (where roof drain connections are provided for street town homes) are required to be shown on a location plan; refer to Appendices for format requirements.
- "As Built" information of all control grade elevations (pond invert, berm weirs, orifice plate, riser pipe inlets, etc.) together with piping inverts and grades for any stormwater management facility for review and confirmation. This is to be verified by topographical survey. This information shall also be included in the final submission of the "As Built" Engineering design drawings.
- Any other sketches or survey notes that may be considered necessary for specific circumstances as determined necessary by Construction Services.

Notwithstanding the foregoing, Stage 1 Services shall not be eligible to receive a Certificate of Final Acceptance until a Certificate of Provisional Acceptance of Stage 2 services is granted and the minimum two year guarantee period has expired for the Stage 1 services.

Stage 2 Services

The Engineer must submit all documents and information as previously listed in the requirements for Stage 1 services that would relate to the quality control construction of the Stage 2 services to Construction Services to allow confirmation of the inspection of the "As Built" Stage 2 services. This part of the process requirements must provide Construction Services with the information to their satisfaction to issue an inspection certificate of completion to Development Engineering for consideration of processing a Provisional Acceptance certificate to commence the guarantee period of two years, as set out in the subdivision agreement. Prior to consideration of final acceptance, the Engineer

must also submit one (1) paper copy of the "As-Built" construction Plan and Profile drawings together with the Utility Coordination Plans, streetlight drawings and any other detailed plans of the stormwater management facility (if applicable) to Development Engineering for review. These plans are to be completed as a revision to the original drawings and are to be submitted as part of the requirements for final acceptance and conclusion of the obligations by the Developer prior to consideration of assumption of the services completed in accordance with the requirements of the subdivision agreement. These drawings are to illustrate the "As Built" information on the original drawings in a drafting format that conforms to Technical Services requirements as may be set out in the Appendices or design standards of this manual. The drawings must include, but not limited to, the information as follows:

As-Built Field Survey

- Final location of all above ground utility structures
- Location of duct crossings shown on U.C. plans
- All storm sewer and FDC sewer pipe lengths and grades (including rear yard catchbasin and any block service connections)
- All manhole and catchbasin locations, rim elevations and inverts
- Pipe sizes
- Distance between maintenance holes
- Streetlight locations
- Start and finish locations of any roadside protection elements
- Pavement markings
- Crownline elevations at 20 metre intervals to be shown on lot grading plans or in profile on construction drawings
- Any and all details related to field adjustments to location, grade or elevation of the municipal services that was required or requested during construction. This includes changes to the road design, subgrade depth, granular depth and subdrain depths.
- All control grade elevations shown on stormwater management pond detailed plan (if applicable) which include but are not limited to pond inverts, berm, weirs, orifice plates, riser pipe, inlet and outlet elevations, piping inverts, lengths and grades
- Elevations of any major overland flow routing through walkway blocks or servicing easements, which must be shown on the lot grading plans or construction drawings
- Drawing numbers must also be included on the plans that correspond to the Engineering Services file number for the project

- For City of Oshawa Capital projects this additional As-built information shall also be included:

    - Street tree locations;
    - Back and front edge of sidewalk/MUP grades at 20 metre intervals
    - Culvert inlet and outlet invert elevations

As-Built/Record Drawings

Refer to the Professional Engineers of Ontario document entitled “Use of the Professional Engineers Seal” (latest edition) for the definition of and distinction of As-Built and Record drawings.

Upon completion of the project the required as-built measurement forms for the City of Oshawa services shall be completed and submitted to the City of Oshawa’s Construction Services department.

As-Built drawings shall consist of the original engineering drawings which have been revised to show as-built conditions. As-built drawings shall be provided in hard copy and electronic PDF.

For City of Oshawa Capital Works projects, CAD files shall also be submitted. CAD files shall be in a format compatible with the City of Oshawa’s current version of AutoCAD.

Original design information (inverts, grades, etc.) shall remain on the drawing, with a diagonal line struck through it and as-built information boxed in, adjacent to original information.

eg. E. ~~INV 97.55~~ (Original Design Invert)
$\boxed{\text{INV 97.62}}$ (As-Built Invert)

The as-built drawings for City services shall incorporate all revisions of the following items:

- Percent grade for sewers, roads and Multi-use Paths
- Invert elevations and stations
    - Storms sewers at maintenance holes, plugs and catchbasins
    - FDC sewers at maintenance holes and plugs
- Pipe length, size, material type, class and bedding
- Distance from property line for storm and FDC sewers.
- Storm and FDC house connections locations and elevations
- Any changes to the road design, subgrade depth, granular depth and subdrain depths.

- “As Recorded” shall be shown in the revision column with date. All previous notations shall be left on the drawing to allow the City to confirm the drawing includes all previous revisions.

- Street names shall be in conformity with the registered plan (40M) or as approved by the City.

Submitted AutoCAD files shall be:

- In a format compatible with the City of Oshawa’s current version of AutoCAD
- Delivered with an integrated coordinate system being UTM NAD83, Zone 17
- Purged of all non-essential CAD information

AutoCAD files shall be named by drawing numbers as specified for “Issued for Construction” drawings. Provide a copy of all CAD drawings on a CD or DVD, or USB flash drive labelled with the City’s contract or subdivision number.

Storm and FDC Drainage Plans

Two copies of storm and FDC drainage plans and electronic files shall be submitted to the City of Oshawa’s Construction Management Department for permanent record. The electronic files shall be in GIS format and/or the City’s current version of AutoCAD, utilizing UTM coordinates of NAD83 Zone 17 sub-metre accuracy.

As-Built Design Sheets

Two complete sets and the electronic file of design sheets recalculated to conform to as-built measurements for City of Oshawa services shall be submitted to the City of Oshawa Construction Management Department for permanent record.

Shop Drawings

One complete set of shop drawings with the as-built conditions shall be completed and submitted to the City of Oshawa Construction Management Department for permanent record.

The list of drawings for "As Built" record need only include the plan/profile construction drawings, general lot grading plans, the Utility Coordination Plans and any plans related to the construction of a stormwater management facility.

2.3.3 Payment of City's Share of Services

The Subdivider, following Provisional Acceptance of the services, shall be entitled to payment from the City for their share of Stage 1 or Stage 2 construction of any collector or arterial roads within the plan as set out in the subdivision agreement. To qualify for the collector or arterial road payment the following information must be submitted:

(a) Confirmation that the requirements of the Construction Lien Act have been complied with to the satisfaction of the City.

(b) The appropriate final payment certificates must be submitted to the City in the manner set out in the Subsection on Letter of Credit Reductions.

(c) A declaration from the Subdivider that all accounts relative to the installation of the completed services have been paid.

Development Engineering, following the review and acceptance of the information provided above shall process payment to the Subdivider.

2.3.4 Closed Circuit TV (C.C.T.V.) of Underground Services

The Subdivider shall be responsible for ensuring that all storm sewer services including catchbasin leads and FDC piping including connections are C.C.T.V.'d and inspected prior to the placement of base asphalt. Copies of all C.C.T.V. inspection reports shall be submitted in accordance with the Region of Durham specification 01450 Quality Control Section 1.07 Camera Inspection. Additionally all reports shall be submitted in a digital format complete with U.T.M. coordinates for all maintenance holes to a precision of one decimal place, to the City's inspector for review. All identified repairs shall be rectified to the City's satisfaction prior to placing base asphalt.

It should be noted that the City's inspector will require the services to be C.C.T.V. inspected again prior to Final Acceptance of Stage 1 services.

2.3.5 Calcium Carbonate

Where potential for calcium carbonate has been identified through testing procedure requirements identified in the Draft Plan and Engineering criteria, the developer shall follow procedures as identified in Section 10.

2.3.6 Construction of Stage 2 Services

Construction of Stage 2 services shall not commence until:

(a) the calendar year following the installation of Stage 1 services;

(b) the television inspection of services has been completed and any deficiencies rectified;

(c) at least 80% of the buildings on the street have been completed.

Notwithstanding the above all services shall be completed within 12 months from completion of 80% of the buildings on the street or within 42 months of the commencement of construction of Services on the Plan, whichever occurs first. However, the City's Commissioner retains the right to direct the Subdivider to complete Stage 2 services at any time, at his sole discretion.

2.3.7 Provisional & Final Acceptance of Subdivision Services

2.3.7.1 Provisional Acceptance of Stage 1 & 2 Services

The Subdivider, following completion of construction and rectification of all deficiencies of City services, shall be entitled to a certificate of Provisional Acceptance (completion acceptance) of the services constructed. In order for Development Engineering to process a Provisional Acceptance Certificate, the following documentation must be received:

(a) In the case of Stage 1 Services:

- The Engineer's Certificate of completion of services (Refer to Appendices for sample letter)
- A letter/contract from Oshawa P.U.C. Networks Inc. and/or private utility contractor stating that an agreement and financial arrangements for electrical servicing and street lighting have been made;
- A Completion Acceptance letter from the Region of Durham
- A letter from Construction Services advising that all services have been completed to their satisfaction and that they have received and reviewed all quality control test results as set out in Section 10 titled “Construction”.
- A letter from Works and Transportation Services advising that streetlighting has been completed to their satisfaction
- A statutory declaration to the City from the Subdivider stating that all accounts relating to the construction of the completed services have been paid and that the Construction Lien Act R.S.O. 1990, c.C-30 as amended, has been complied with.
- A fee in the amount as described in Schedule ‘D’ of the General Fees & Charges Bylaw 13-2003 for the reduction of Letter of Credit or Cash Securities for City Services or Landscaping pursuant to Subdivision Agreements

(b) In the case of Stage 2 Services:

- The Engineer’s Certificate of Completion of Services (Refer to Appendices for sample letter)
- A letter from Construction Services advising that all services have been satisfactorily completed and that they have received all test results documents.
- A statutory declaration to the City from the Subdivider stating that all accounts relating to the construction of the completed services have been paid and that the Construction Lien Act R.S.O. 1990, c.C-30 as amended, has been complied with.

- A fee in the amount as described in Schedule ‘D’ of the General Fees & Charges Bylaw 13-2003 for the reduction of Letter of Credit or Cash Securities for City Services or Landscaping pursuant to Subdivision Agreements

The certificate of Provisional Acceptance will provide the date to be taken as the commencement date of the maintenance guarantee period. The Provisional Acceptance and guarantee maintenance period may be coincidental with the completion acceptance and maintenance period dates issued by the Region of Durham. However, in no instance will the Director of Engineering Services issue Provisional Acceptance until the Region has advised the City of its Completion Acceptance of its services.

It shall be the Subdivider’s responsibility to ensure that their Engineer, their Soils Consultants, their electrical servicing contractor, Transportation Services, the Region of Durham, and Oshawa PUC Networks Inc. provide Development Engineering with the above noted documentation.

With each certificate of completion, provisional or final, the Developer is entitled to a reduction of the securities subject to receipt of the documents as set out in Subsection titled "Letter of Credit Reductions".

2.3.7.2 Final Acceptance of Stage 1 & 2 Services (Assumption of Streets & Services)

The Subdivider or their Engineer, not less than sixty (60) days prior to the expiration of the guaranteed maintenance period of Stage 1 or Sta29ge 2 Services, as the case may be, shall contact Construction and Works and Transportation Services to arrange for a joint inspection of the services and streetlighting. The Director, Engineering Services will issue a Certificate of Final Acceptance for Stage 1 or Stage 2 Services as the case may be subject to receipt of the following:

(a) In the case of Stage 1 Services:

- Written confirmation from the Region of their Final Acceptance, advising that all defects to their services have been corrected and the services have been accepted

- A final inspection report from Construction Services advising all defects have been corrected and the services can be accepted;

- A final inspection report from Works and Transportation Services advising that the streetlighting service can be accepted;

- A statutory declaration to the City from the Subdivider stating that all accounts relating to the construction of the completed services have been paid and that the Construction Lien Act R.S.O. 1990, c.C-30 as amended, has been complied with.

- A fee in the amount as described in Schedule ‘D’ of the General Fees & Charges Bylaw 13-2003 for the reduction of Letter of Credit or Cash Securities for City Services or Landscaping pursuant to Subdivision Agreements

(b) In the case of Stage 2 Services;

- The Engineer has provided the original engineering drawings, U.C. plans together with the lot grading drawings, to the City, in both mylar and digital format, showing as constructed information in accordance with the City's standards.

- The Subdivider has provided a statutory declaration to the City stating that all accounts related to the construction of the completed services have been paid and that the Construction Lien Act R.S.O. 1990, c.C-30 as amended, has been complied with;

- A fee in the amount as described in Schedule ‘D’ of the General Fees & Charges Bylaw 13-2003 for the processing of Engineering Final Acceptance of City Services including preparation of an assumption by-law and final reduction of Letter of Credit or cash securities

- The Subdivider, has provided the City with a certificate from an Ontario Land Surveyor certifying that all standard iron bars shown on the registered plan marking the main points of the limit of the highways and any other blocks on the plan which have been dedicated or conveyed to the City or the Region are installed in their correct location;

- The Engineer has provided the City with written verification that all services have been constructed in accordance with the Agreement and that sanitary sewer connections have been tested and none are connected to the storm sewer or foundation drain collector pipe. This verification shall apply to all lots on which buildings have been constructed and connections to the sewer systems completed. The verification shall further note those lots that have not been built upon.

- Confirmation that all Subdivider’s accounts with the City have been paid (Internal Check)

- A final inspection certificate from Construction Services advising all defects have been corrected and the streets and services can be assumed (Internal Check);

- A final inspection certificate/letter from Works and Transportation Services advising all defects have been corrected related to the streetlighting and that all financial accounts are in good standing.

- All lot grading certificates for all buildings constructed in the Plan have been received (effective agreements executed January 1, 2006)

- Driveway clearance engineer's certificate.

- An Assumption By-law has been processed to conclusion with City Clerk’s office.

Following the issuance of a certificate for Final Acceptance for Stage 1 and/or Stage 2 Services, the Subdivider shall be entitled to receive the final 20 percent reduction in their letter of credit together with the securities held as the roadway damage and siltation control deposit.

The issuance of the final acceptance of the Stage 2 Services includes assumption of the streets and the services constructed by the Subdivider on behalf of the City.

2.3.8 Engineering Services Requirements for Building Permit Release

The Subdivider shall not be entitled to building permits until the services on the streets within a plan of subdivision have been constructed and the full depths of Granular "B" gravel and Granular "A" gravel have been placed together with any other item specific to that plan or building lot within the plan. The Subdivider is, however, entitled to permits for model homes as provided for in Appendix I to the subdivision agreement and the current City Zoning By-law. In addition, the Subdivider or his Engineer will be required to provide evidence that an agreement has been executed with the Oshawa PUC Networks Inc. and/or the private utility contractor for installation of street lighting. Upon receipt of the above, Engineering Services will advise both Building and Planning Services that subject to the terms of the subdivision agreement, Engineering Services would have no objection to the issuance of building permits.

The Subdivider shall normally not be entitled to allow occupancy until binder asphalt has been completed within the subdivision. In that regard all subdivision agreements have a condition that will only allow conveyance between June 30th and October 30th if the road construction is completed to binding asphalt. Any conveyance in the absence of the binding asphalt road condition requires the Subdivider to maintain all essential servicing including but not limited to snow plowing and waste collection. An issue that must be given special consideration by the Subdivider in this circumstance is the maintenance of the graded condition of the granular roads to provide emergency vehicle access.

2.3.9 Guarantee & Maintenance Period

In accordance with City Council policy regarding residential development, the Subdivider shall guarantee all of the Services from all defects in workmanship or material for a minimum period of two years. During the maintenance period the Subdivider shall maintain all services in good working order and in a good state of repair.

2.4 Miscellaneous - Subdivision Development

2.4.1 Residential Development Charges

The City of Oshawa Development Charge By-law as amended from time to time provides for charges to be imposed against development of land to pay for increased capital costs required to satisfy the increased needs for services arising from the development of the area to which the by-law applies.

The Subdivider should contact Building Services for a copy of current City development charges. The City’s website will also provide a copy of the current by-law and current charges.

In addition to City Development Charges, the Region of Durham, the Durham Board of Education and the Durham Catholic Board of Education have established Development Charges payable prior to issuance of a building permit. All residential Development Charges are collected by Building Services prior to issuance of a building permit.

2.4.2 Provision of Services by the City of Oshawa

The Subdivider will be responsible for the cost of any signs and install street name and traffic control signs upon completion of Stage I Services. For additional information on the City's standards and policies related to provision of street signs refer to Section 11.0 of this manual.

Winter road maintenance and waste collection will be provided by the City upon completion of Stage I Services and upon occupancy of any dwelling unit. Winter sidewalk maintenance will be provided by the City where the sidewalk is adjacent to City property and where boulevard grading has been completed. Waste collection will only be provided to occupied dwellings. The Subdivider will, at their expense, be responsible for snow plowing and waste collection services if any dwellings are occupied prior to binder asphalt being placed. The Subdivider will also, at their expense, be responsible for snow plowing of all emergency access roads as may be required because of phasing limits to provide secondary access as determined necessary through the engineering review process.

3.0 Roadways

3.1 General

The purpose of this section is to outline the engineering design criteria requirements pertaining to roadways in the City of Oshawa.

These requirements are not all encompassing and do not relieve the Developer of the responsibility of submitting a finished product of competent Engineering design and construction.

Any proposal to deviate from City of Oshawa Standards and requirements shall be discussed with and approved by the City prior to making a formal submission.

This document shall be read in conjunction with the City of Oshawa standard drawings (OS-Series) as well as all applicable O.P.S.S., O.P.S.D. and T.A.C. (Transportation of Canada) specifications, standards and guidelines referenced or recommended by the City of Oshawa.

3.2 Road Classification

All roadways in new developments shall conform to City of Oshawa and Region of Durham Official Plans.

Through both Official Plan documents, the following hierarchy of roads and streets have been established:

Road Type	General Function	Typical Right-of-Way Width	Intersection & Access
Arterial Type A	Large volumes of all types of traffic. May include HOV or bus lanes.	36 m to 50 m	Intersection with freeways and other arterial roads. Direct access generally not permitted.
Arterial Type B	Moderate volumes of all types of traffic. May include H.O.V. or bus lanes.	30 m to 36 m	Intersection with arterial and collector roads. Direct access generally not permitted.
Arterial Type C	Lower volumes of all types of traffic city-wide	26 m to 30 m	Intersection with arterial and collector roads. Direct access may be permitted (minimum 12.0 m single lots).
Collector	Moderate volumes of traffic primarily moving between points of origin and arterial roads.	Urban – 20 m to 26 m Rural – 30 m	Intersection with arterial, collector and local roads. Direct access permitted.

Road Type	General Function	Typical Right-of-Way Width	Intersection & Access
Local	Light volumes of traffic moving between points of origin and collector roads.	Urban –20 m - 18 m (with justification) - 16 m Service Road Rural – 30 m	Intersection with collector and local roads. Direct access permitted. Intersection with arterial roads to be discouraged.

Roadway classification and right-of-way width will be confirmed at the draft plan approval stage.

3.3 Geometric Design

Generally, the latest edition of the Geometric Design Guide for Canadian Roads issued by the Transportation Association of Canada (T.A.C.) shall be used in the geometric design of City roads. Generally, the geometrics in this table are intended for an urban design situation.

Geometric Detail	Arterial	Collector	Local
Right-of-Way Width(1) (metres)	Type B – 30-36 Type C – 26-30	20-26	20 18 (with justification) 16 (service road)
Pavement Width(1) (2)	Type B – 14.5 Type C – 14.5 (11 first stage)	10	8.5 residential 10 industrial/ commercial
Design Speed (km/hr)	Type B – 80 Type C – 70	60	50
Minimum Curve Radius (metres) (Low speed urban design)	Type B – 380 Type C – 260	175	110
Minimum Intersection Spacing (metres)	200	60	3 Way – 40 4 Way – 60
Intersection Angle	80-90º	80-90º	80-90º
Minimum Tangent Length Through Intersection (metres)	120	90 at arterial roads 60 at other roads	60
Minimum Grades (percent)	0.75	0.75	0.75
Maximum Grades (percent)	5	5	5

Geometric Detail	Arterial	Collector	Local
Minimum Safe Stopping Sight Distance (metres)	Type B – 140 Type C – 110	85	65
Minimum Sag Curve K Factor (Urban illuminated)	Type B – 16 Type C – 12*	9*	6* *(4) Intersection under stop control
Minimum Crest Curve K Factor	As per T.A.C Manual	As per T.A.C Manual	As per T.A.C Manual
Superelevation	Site Specific	None	None
Curb Return Radii	Refer to OS-500 Series	Refer to OS-500 Series	Refer to OS-500 Series
Width of Traffic Lane (metres) (Add 0.25 m for curb)	3.5 – 3.75	3.5	2.75 residential 3.5 industrial/ commercial
Width of Parking Lane (metres)	n/a	2.75	2.75
Width of Turning Lane (metres)	3.5	3.5	n/a

Notes:

1. Additional right-of-way and/or pavement width may be required in specific situations to provide for such features as bus bays, turning lanes, upgraded landscape features or medians, bike lanes, additional underground services or utilities.

2. Pavement width is measured from a point 150 mm inside of the back edge of curb.

3. The use of minimum horizontal curvature and minimum vertical curve at the same location will not be permitted.

4. For geometrics and dimensions of turn lanes, storage length, taper length, minimum width and length of raised medians, etc. refer to the appropriate section of the TAC manual. Associated traffic volumes and T.I.S. (Traffic Impact Study) recommendations must also be considered in the design.

5. All profile grade changes >1% shall be designed with vertical "K" curves as outlined above.

6. Minimum horizontal curvature, minimum stopping sight distance and desirable maximum grades are the normal limiting values. They are to be improved where technically required, but may not be lowered without the expressed consent of the City. Use of ‘stacked’ minimum/maximums are not permitted.

7. For standard cross-sections and utility locations on City roads, please refer to the standard drawings, OS-200 series. Engineering Services shall be consulted for

specific right-of-way requirements for roads during draft plan submissions as requirements may differ from the standard drawings in certain situations. Road widths shall be considered minimum and maybe increased in specific situations.

8. Daylight triangles are required at all intersections between two collector roads and where any class of road intersects with an arterial road. Although typically not required at local to local intersections, sight triangles will be required at locations where geometric constraints exist to ensure safety requirements are met for both pedestrian and vehicular traffic.

9. All sight triangles shall be calculated based on Transportation Association of Canada (T.A.C.) requirements and all line paintings shall be based on the Ontario Traffic Manual (O.T.M.).

10. Where not specifically discussed in this manual the T.A.C Geometric Design Guide For Canadian Roads manual shall govern.

11. Where appropriate (i.e. Lower volume/speed intersection), sight distance at T-intersections should be as per T.A.C. manual.

12. The location of stop block setback should be assumed to be 3.0m from road edge (without sidewalk) and 1.5m behind back edge of sidewalk (at intersection with sidewalk).

13. Calculations should be based on design speed and the use of operating speed will only be permitted in restrictive urban areas.

3.4 Geotechnical Investigation and Road Structure Design

Soil Sampling

Test holes shall be taken by the use of a drill rig capable of taking soil samples and determining soil penetration resistance. The drilling should be supervised and recorded by a qualified soils technician.

A certified Soils Laboratory with membership in C.C.I.L. (Canadian Council of Independent Laboratories) must perform a complete soils analysis at minimum 100 m intervals along the centerline of proposed roadways noting soil types, depths, moisture content, consistency and water table in determining soil classification and frost susceptibility.

Boreholes shall extend 0.50 m below the lowest underground services or a minimum of 3.50 m below the proposed finished crown elevation. Should poor or unstable soil conditions be encountered, additional boreholes will be required to determine the limits of such.

Sufficient soil samples shall be taken of each type of soil horizon. A minimum of 2 samples should be analyzed per borehole.

All soils should be retained by the soils consultant until the City determines if more soils analysis will be necessary.

Soils Analysis and Classification

The soils samples shall be analyzed in accordance with A.S.T.M. Specifications.

The results shall be plotted on a grain size distribution curve according to the U.S. Bureau of Soils Classification. The percentages of Clay, Silt, and Very fine sand and silt shall be shown for each sample.

%Clay	0.005mm to 0.0mm
% Silt	0.050mm to 0.005mm
% VF SA & Silt	0.104mm to 0.005mm

The soil classification can be obtained by plotting the % Clay and % Silt on the U.S. Bureau of Soils classification triangular chart.

The soils shall also be categorized according to the City of Oshawa Frost Susceptibility Chart.

A copy of the Borehole logs and the grain size analysis charts should be included in the soils report.

The borehole log, along with the sample analysis, are to be plotted on the road profile drawings (including GPS coordinates) showing the proposed sub-grade depths and submitted as part of the geo-technical report for review by the Director of Engineering Services and/or his designate.

If in the opinion of the City, more tests and/or more information are needed on the soils profile to determine the depth of excavation, the City will notify the consultant to request the information required.

The City will not be responsible for any delays due to insufficient information contained in the soil report.

No rough road grading can proceed in a subdivision until the results of the soil tests have been evaluated by the City and notification has been sent to the Subdivider outlining the requirements for sub grade construction of the roadways.

Design of Road Structure

Road structure designs are to be done in accordance with the City of Oshawa Standards noted on OS-200 series.

Granular materials must conform to O.P.S.S.

Use of Crusher Run Limestone will be considered on its own merit.

Reclaimed materials (R.A.P., R.C.M.), glass, ceramic, air cooled blast furnace, nickel, or steel slag shall not be used in the production of Granular A, Granular B or S.S.M. unless approved by City of Oshawa Inspector.

Since there may be instances where the designer needs to apply broad guidelines to specific problems, consideration will be given to special designs not covered by the City of Oshawa Standards.

Road designs shall be determined using the City of Oshawa Pavement Design Guidelines chart. These guidelines may be adjusted depending upon soil moistures, plasticity, drainage problems, and the amount of underground services being constructed. The time of year that the road will be constructed should also be considered when developing the pavement design.

Unacceptable and high borderline soils will require removal to 1200mm below the finished road grade.

Under drains will be required on all streets and will be placed according to the depth of excavation and the ground water conditions encountered. In areas where ground water could be a potential problem, under drains shall be placed at the sub base elevation. Refer to City of Oshawa Standard OS-200 Series.

Where a change in sub grade depth occurs, a minimum 10.0 m transition must be provided. Care should be taken to ensure positive drainage of the under drains.

Road structure design shall be based on a minimum service life of 25 years for the surface and 50 years for the base.

A note shall be placed on drawings indicating that any road constructed between October 15th and May 1st of the following year shall be constructed to the City of Oshawa Type E road design (1200).

Proof Rolls

A Proof Roll is required on the road sub base prior to placing any granular materials and on the Granular A material prior to placement of base asphalt.

The City of Oshawa's Inspector shall be given 24 hours' notice prior to any proof roll activity.

The City of Oshawa's Inspector shall be given all proof roll reports within 24 hours of performing the proof roll. These reports should include a sketch indicating limits of proof roll and any modifications that are required. These modifications shall also be placed on the as built drawings that are supplied to the City of Oshawa. No asphalt shall be placed until proof roll reports have been received by the City of Oshawa's Inspector.

Any modifications required due to soft sub-base shall be modified a minimum of 300mm across the entire width of the road. Consideration shall be given to address subsurface drainage concerns.

Where the Developer's Engineer is taking a different course of action to the recommendations of the Soils Consultant, a written explanation for the variance shall be provided to the City with the copy of the Soils Consultant's recommendations. The use of a form following the format illustrated in the Appendices is acceptable.

A representative from the consultant/developer, soils consultant, and City Inspector shall be present at all proof rolls.

The equipment used to perform the proof roll shall be a tri-axel dump truck filled with an approximate load of 15 tons. If this equipment is not available the City of Oshawa's Inspector may accept another piece of equipment that he/she feels will provide an acceptable load, approximately 20 tons.

The City of Oshawa's Inspector shall have the final decision on all pavement design modifications required due to unacceptable deflections or field conditions observed during the proof roll.

Frost Susceptibility Chart

Group Classification	% Silt	% VF Sand & Silt
Acceptable	0-39	0-44
Borderline No 1	40-42	45-48
Borderline No 2	43-44	49-51
Borderline No 3	45-46	52-54
Borderline No 4	47-48	55-57
Borderline No 5	49-50	58-60
Unacceptable	51-100	61-100

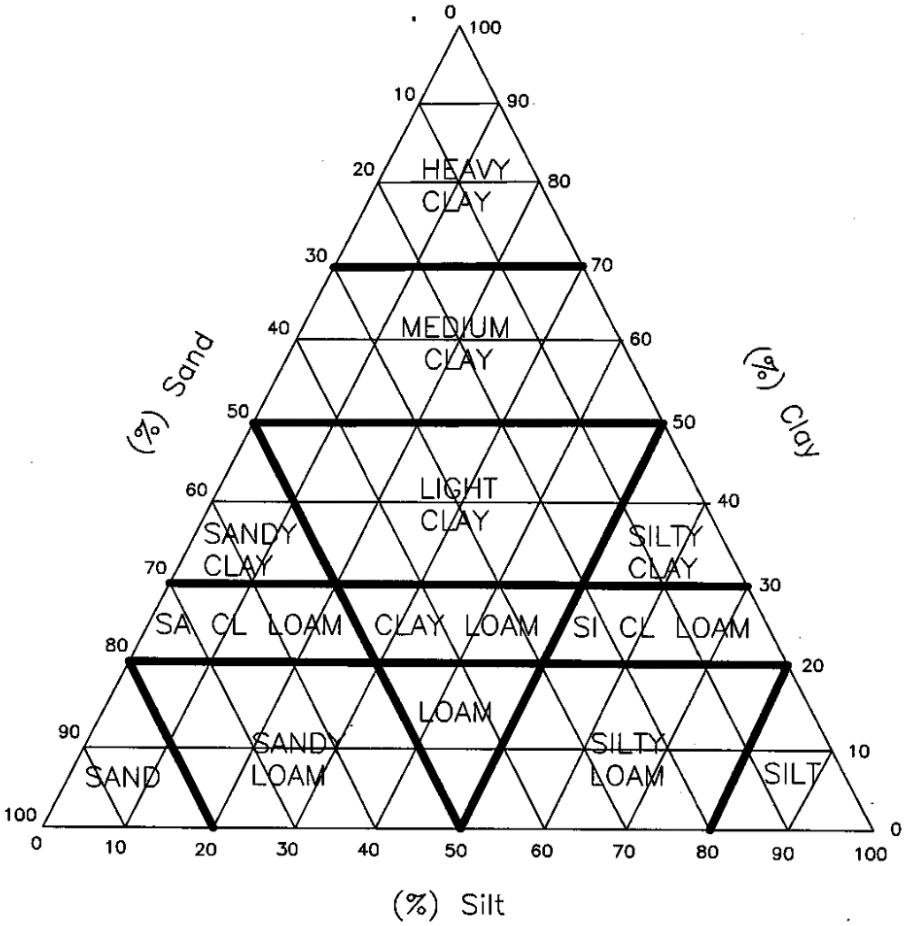
To determine Group Classification use the most severe condition

Granular Base Equivalency Chart

Material	G.B.E. Factor
Asphalt	2
Expanded Asphalt	1.5
Granular A	1
Granular B	0.667
Select Subgrade Material	0.5

U.S. Bureau of Soils Classifications

Classification	Grain Size mm
% Clay	0.005mm to 0.0mm
% Silt	0.050mm to 0.005mm
% VF SA & Silt	0.104mm to 0.005mm



CITY OF OSHAWA		DEVELOPMENT SERVICES DEPARTMENT
CHK'D:	SOILS CLASSIFICATION (U.S. BUREAU OF SOILS)	REVISION No.
APP'D:		DATE: MAR. 5, 2012
DATE: MAR. 5, 2012		

City of Oshawa Pavement Design Guidelines

Residential Streets – P.G. Asphalt Grade – 58-28

Sub-grade Material Classification	Clay	Silt	VF SA & Silt	HL3	HL8	Granular A	Granular B	Total Depth	Total GBE
Type A - Sandy Loams, Clay Loams, Sandy Clays	25-35	10-20	<25%	50	50	150	300	550	GBE548
Type B - Light to Medium Clay	40-55	25-35	25-30	50	50	150	350	600	GBE581
Type C - Medium to Heavy Clay	55+	25-35	25-40	50	50	150	450	700	GBE647
Type C - Acceptable to Light Borderline	N/A	35-45	40-55	50	50	150	450	700	GBE647
Type D - Light to High Borderline	N/A	40-50	45-59	50	50	150	550	800	GBE713
Type E - High Borderline to Unacceptable	N/A	+45	+50	50	50	150	950	1200	GBE977

*Indicates imported Select Sub-grade Material

Collector Streets – P.G. Asphalt Grade – 64-28 (Polymer Modified)

Sub-grade Material Classification	Clay	Silt	VF SA & Silt	HL3HS	HDBC	Granular A	Granular B	Total Depth	Total GBE
Type A - Sandy Loams, Clay Loams, Sandy Clays	25-35	10-20	<25%	50	80	150	320	600	GBE608
Type B - Light to Medium Clay	40-55	25-35	25-30	50	80	150	370	650	GBE654
Type C - Medium to Heavy Clay	55+	25-35	25-40	50	80	150	470	750	GBE720
Type C - Acceptable to Light Borderline	N/A	35-45	40-55	50	80	150	470	750	GBE720
Type D - Light to High Borderline	N/A	40-50	45-59	50	80	150	570	850	GBE786
Type E - High Borderline to Unacceptable	N/A	+45	+50	50	80	150	920	1200	GBE1017

*Indicates imported Select Sub-grade Material

Arterial Streets – P.G. Asphalt Grade – 64-28 (Polymer Modified)

Sub-grade Material Classification	Clay	Silt	VF SA & Silt	HL3HS or HL1	HDBC	Granular A	Granular B	Total Depth	Total GBE
Type A - Sandy Loams, Clay Loams, Sandy Clays	25-35	10-20	<25%	50	80	150	320	600	GBE628
Type B - Light to Medium Clay	40-55	25-35	25-30	50	80	150	420	700	GBE687
Type C - Medium to Heavy Clay	55+	25-35	25-40	50	80	150	520	800	GBE753
Type C - Acceptable to Light Borderline	N/A	35-45	40-55	50	80	150	520	800	GBE753
Type D - Light to High Borderline	N/A	40-50	45-59	50	80	150	620	900	GBE819
Type E - High Borderline to Unacceptable	N/A	+45	+50	50	80	150	920	1200	GBE1017

*Indicates imported Select Sub-grade Material

The above guidelines may be adjusted depending on soil moisture contents, plasticity, drainage problems, amount of underground services to be installed and time of year construction will take place.

3.5 Concrete Curb and Gutter

Concrete curb and gutter shall be constructed as per O.P.S.D.-600.040 where 2-stage curb and gutter is to be utilized the City of Oshawa will require construction as per our standard OS-602. Please note OS-602 is a modified version of O.P.S.D.-600.070 to include City of Oshawa requirements.

Concrete curb and gutter conforming to City of Oshawa standard OS-601 shall remain in effect for infill areas and where repairs are required to roads with that standard unless otherwise advised/approved by the City of Oshawa.

Concrete curb only shall conform to O.P.S.D. 600.110.

Concrete curb section(s) adjacent to concrete sidewalk(s) shall conform to City of Oshawa Standard 303.

Driveway entrances shall conform to City of Oshawa Standards 320, 321, 322 and 323.

Curb depressions are required at roadway intersections as per City of Oshawa Standard 304 to accommodate concrete sidewalk ramps. (Adjust curb width where OS-601 is used.)

Where a weir is required to provide for overland flow, the full curb height may be reduced as per OS-316.

Concrete shall conform to O.P.S.S. 353 having a minimum compressive strength of 32 MPa at 28 days.

Acceptance criteria associated with the construction of two-stage is provided in the construction section of this manual.

3.6 Concrete Sidewalk

Concrete sidewalk(s) shall conform to City of Oshawa Standards OS-301, OS-302 and OS-303.

Concrete sidewalk ramps shall conform to City of Oshawa Standard OS-304.

All concrete ramps to include tactile walking surface indicator as per M.T.O.D. 310.039.

Tactile warning strip to be Neenah Foundry Detectable Warning Plate or approved equivalent.

An accessible pedestrian signal pole as per Region of Durham Standards to be installed at all signalized intersection crossings or as required.

Concrete sidewalk(s) shall have a minimum thickness of 130 mm except through driveways where the minimum thickness shall be 150 mm. Wire mesh is required where sidewalk is placed through high density residential, commercial and industrial driveways.

Concrete sidewalks shall be constructed on both sides of all Arterial and Collector roads.

Concrete sidewalk shall generally be constructed only on one side of all Local roads. Depending on land uses along the road and surrounding active transportation infrastructure the City reserves the right to require that sidewalks be provided on both sides of a local road. The appropriate side is to be determined based on predicted pedestrian movement, generally serving the majority of pedestrians. Where there is no appreciable difference in predicted pedestrian movement on either side, the north and east sides shall be used as defaults to maximize exposure to the sun during winter months.

Concrete sidewalks are not to be constructed on cul-de-sacs. However, where direct access is provided to a park, recreation site, path/walkway or large pedestrian generator via the cul-de-sac, sidewalk shall be provided on one side only.

Standard width of sidewalk shall be:

- 1.50 m for local and collector roads when not adjacent to sidewalk
- 1.80 m for all roads when adjacent to sidewalk (Per OS-303)
- 1.50m to 1.80m for arterial roads depending on land uses along the road and surrounding active transportation infrastructure the City reserves the right to adjust the width of sidewalk.

Refer to City of Oshawa standards OS-200 series for typical location within the right-of-way.

Unique locations may require additional sidewalk width based on urban design, higher volumes of expected pedestrian traffic or combined use with cycling.

The linear design of the sidewalk should avoid the use of low points whenever possible. When low points are unavoidable, they should be located within a driveway or at a ramp location.

Any sidewalks requiring temporary and/or long-term termination shall be terminated in accordance with OS-410.

Concrete sidewalk ramp locations takes precedent over any proposed driveway location.

3.7 Asphalt Multi-Use Path within Right of Ways

3.7.1 General Design considerations

- Asphalt path(s) shall conform to City of Oshawa Standard 306.
- All asphalt shall conform to asphalt acceptance criteria in Section 10 of these design criteria.
- Typical width shall be 3.0 m unless otherwise approved by the City of Oshawa.
- Road crossings and pavement markings shall conform to the Ontario Traffic Manual (O.T.M) Books 15 and 18.
- Yellow centre line is required for all multi-use paths.

3.7.2 Lateral Clearances

Lateral clearances are areas to the side of the trail surface that improve safety conditions for trail users by providing space for avoiding collisions, running off the trail, or falling -- all without risk of colliding with any fixed object.

The preferred lateral clearance for a multi-use trail is 1.0 metre; anything less than this shall be provided with warning signage or other mitigation measures.

The minimum lateral clearance for any class of multi-use trail shall be 0.50 metres unless approved by the City. Lateral clearances of less than 0.5m shall be justified by the presence of some constraint that cannot be reasonably overcome, such as large trees or existing structures.

Where possible, lateral clearance areas are to be designed, constructed and maintained free from any obstruction.

3.7.3 Slopes

Due to accessibility requirements, running slopes on multi-use paths should be limited to 5% (or match existing road grade), and cross-slopes should be limited to between 2% and 4% (including crowned configurations).Where a running slope greater than 5% cannot be avoided, designers should consult with stakeholders and use their best judgement to determine which of the following two options is preferred:

- design the sloped segment to be continuous with adjacent sections of trail or road, adding mitigation measures such as warning signage and rest stops ; or

- design the segment as a grade-separation, in consultation with the City of Oshawa. This would accommodate a wider range of possible strategies, such as ramps and/or switchbacks.

    - Ramps should be designed to meet and exceed the Ontario Building Code and the City of Oshawa's Accessibility Design Standards where possible. These include all of the dimensional requirements for stairs and ramps as well as requirements for surfaces, guards, handrails and most other components.

    - Where a switchback is desired, it should be designed to conform with the requirements for ramps that are noted above. Avoid design features that encourage or facilitate fast cycling (long, straight runs, greater widths) because the turning radii used for switchbacks are not suitable for such a use.

Lateral clearance areas should match the slope of the trail, and should also not exceed 2%. Any area outside of the lateral clearance, but within 2 metres of the shared-use surface should not exceed a downward slope of 16.7% (6:1) without a guardrail, but may include a steeper uphill slope.

3.8 Walkways

Walkways shall conform to City of Oshawa Standards OS-310 and OS-311 (concrete).

Walkways shall be designed to promote proper circulation of pedestrian traffic and, if necessary, provide an overland flow route for storm flows greater than pipe capacity.

Walkways shall be a minimum of 3.00 metres in width with a chain link fence on both sides. Refer to City of Oshawa Standard OS-901 for fencing details.

Adequate lighting shall be provided for all walkways serving access to school properties, public buildings or providing a link from one road to another road.

Chain link fence heights shall be:

- 0.9 m in the "front yard"
- 1.50 m in the "side yard"
- *1.80 m in the "side yard" when connecting to an active park or school

*Ensure that the height of the "side yard" fence for the walkway matches the height of the "rear yard" chain link fence.

Bollards shall be installed as per City of Oshawa Standard 312 when the walkway extends to the road with a curb depression for a ramp or where a curb depression is constructed to provide for an overland flow route.

3.9 Driveways

Driveways shall conform to City of Oshawa Standards OS-320, OS-321, OS-322 and OS-323.

Driveways must be designed to conform to the following minimum requirements:

Driveway grades shall be as per OS-323.

The minimum spacing between driveways and between driveways and sidewalk ramps shall be 1.30 metres.

The minimum clear distance between the edge of driveway and a utility structure, hydrant or tree shall be 1.00 metre.

Driveways shall have a minimum clearance of 11.0m to the face of curb of any intersecting street (i.e. corner lots).

A property shall have a frontage greater than 16m to permit a second driveway access. The minimum spacing between the driveways on the same property shall be 7.5m.

When laying out residential driveways in new subdivisions, generally driveway width should be from edge-to-edge of the garage. The minimum driveway width should be 3.5 metres, save and except for street townhomes and/or semi-detached houses where a 6.0 m lot frontage should have a driveway width of 3.0 m. A 0.5 metre driveway flare shall

be provided on the right side (nearest approaching side from the curb lane) of any residential single car driveway on an arterial road.

Every effort shall be made to ensure catchbasins are not located at the end of driveways.

3.10 Boulevards

Boulevards shall be defined as the land area between the property line and curb and shall be constructed at positive crossfall grades no less than 2% **nor greater than 10%**. Exceptions may be permitted to allow a positive minimum grade of 1% to accommodate an overland flow route through the boulevard. (Refer to section 3.4 for curb height permitted to provide overland flow routes.)

Sod shall be placed on all boulevard areas unless otherwise approved by the City's Director of Engineering Services. Refer to OS-225 for additional details regarding boulevard treatment.

Topsoil and Sod shall be in accordance with O.P.S.S. 802 and 803.

Topsoil shall meet the Topsoil Acceptance Criteria found in section 10.6.8 Testing shall be carried out according to section 10.5.1 minimum testing requirements, topsoil section.

Boulevard shall be constructed to include a minimum uniform depth of 200mm of **screened topsoil compacted to 95% proctor**.

3.11 Cul-de-Sacs

Permanent cul-de-sacs shall conform to City of Oshawa Standards OS-520 (Residential), OS-521 (Commercial/Industrial) and OS-522 (Rural).

A cul-de-sac will be the only acceptable method of terminating a non-continuous roadway. The use of cul-de-sacs should be minimized through road network design.

Minimum gutter grades of 0.5% shall be maintained along the flow line of all gutters around cul-de-sacs.

Maximum length of a cul-de-sac is controlled by emergency access requirements – refer to Secondary or Emergency Access Requirements under Section 3.

3.12 Temporary Turning Circles

Temporary turning areas shall conform to City of Oshawa Standard OS-523. The installation of temporary turning circles will be generally permitted to accommodate short term development phasing but use will be subject to Engineering Services approval. Long term phasing shall require construction of a permanent cul-de-sac as per Oshawa Standards OS-520 or OS-521. Temporary turning area is generally required where the road length from the centerline of the intersecting street is in excess of 40 m.

3.13 Road Sub-Drains

Road sub-drains will be required to run continuous along both sides of all roads with curb and gutter or as specified in unique situations, and shall conform to City of Oshawa Standard OS-220.

Whenever possible subdrains shall tie into catchbasins as illustrated in OS-220. When no catchbasin is available, cleanouts as per Region of Durham Standard S-100.030 shall be provided for maintenance purposes.

3.14 Utilities

Refer to City of Oshawa Standard Drawings OS-201-206 and OS-208-209 for the location of common trench utilities within the public right-of-way. Refer also to City of Oshawa Standard OS-226 for common trench details.

The location of any utility ducts crossing roads will be confirmed with the utility company in conjunction with subdivision design (Utility Co-ordination Plan). All ducts must be placed in conjunction with road base construction and prior to installation of sub-drains, and must conform to City of Oshawa Standard OS-221. Any duct crossings required after base asphalt is placed shall be directional bored.

3.15 Downtown Streetscape

Applicants working within the City's Downtown Oshawa Urban Growth Centre (Per Appendix A of the City of Oshawa Official Plan) should refer to the Oshawa Downtown Streetscape Vision for direction regarding streetscape and boulevard considerations in this area. These documents can be found on the City's webpage.

3.16 Secondary or Emergency Access

The City of Oshawa does not support permanent Emergency Access locations and the need for such should be eliminated through road network design techniques.

Any combination of streets, public or private, exceeding 250m in length from a single access point will require a secondary street access. This distance shall be measured along the centre line of the road.

Temporary emergency access locations are discouraged. However, they will be permitted to accommodate the phasing of Plans of Subdivision when all other alternatives have been exhausted.

The emergency access shall be a minimum of 6.00 metres in width and constructed to a minimum depth of 300mm granular A and 50mm HL 8 asphalt. The access shall be constructed as per City of Oshawa Design Standard OS-315. P-Gates or Swing Gates are required at both limits of any secondary or emergency access constructed.

The Subdivider is responsible for the removal of the emergency access when it is no longer required (i.e. road network complete for subsequent phase) and must ensure that all municipal services (i.e. curb and boulevard) are restored.

The Subdivider shall ensure that the access is clear of material at all times. The City will assume winter control of the access at the same time it assumes snow clearing responsibilities for other streets in the plan.

3.17 Roundabouts

Generally, roundabouts shall be designed and constructed in accordance with the Ontario Traffic Manuals (O.T.M.), the Ontario Provincial Standards (O.P.S.), and the M.T.O. Design Submission Requirements for Roundabouts and are subject to peer review at the City of Oshawa's discretion.

Concrete for truck aprons and splitter islands shall be 32 MPa at 28 days.

Truck Apron shall be constructed using a minimum of 325mm reinforced impressed concrete on a minimum of 400mm Granular 'A'. Mountable curbs shall be as per OS-603.

Splitter Islands shall be constructed using a minimum of 100mm impressed concrete on a minimum of 325mm Granular 'A'.

Materials shall conform to the following:

- Colour hardener shall be A-01 Terra Cotta (C.C.I.-100).
- The impression style shall be 200 mm x 200 mm running bond (Unilock Unigranite A pattern) placed perpendicular the centerline of the road.
- One coat of Cure and Seal as manufactured by Concreation Canada Inc., Toronto, and supplied by the above shall be applied at the time and at a coverage rate as per the manufacturer's recommendations or approved equivalent.

3.17.1 Roundabout Submission Requirements

The following items are to be submitted as part of any design submission that contains a roundabout:

- Intersection Control Study
- Geometric Elements Summary Table
- Speed-Radius Relationship Calculations
- Clear View Area Drawing and Sight Distance Drawing
- Entry Angles Drawing
- Design Vehicle Turning Movements
- Entry Path Radii
- Horizontal/Vertical Geometrics Drawing
- Coordinate/Layout Plan
- Pavement Marking and Signage Drawing
- Landscape Plan

- Illumination Plan
- Overland flow route analysis
- Ultimate Roundabout Design (if applicable)
- Construction Staging Plan (if applicable)

4.0 Drainage Systems

4.1 General

The purpose of this section is to outline the general design requirements for the construction of storm sewer and foundation collector drainage systems in the City of Oshawa.

These requirements are general in nature and do not relieve the Developer of the responsibility for submitting a finished product of competent engineering design and construction.

Any proposal to deviate from the minimum City of Oshawa standards and requirements shall be discussed with, and approved by Engineering Services prior to making a formal submission.

Notwithstanding the following criteria outlined under this section**,** the City of Oshawa By-law 9-90 related to Storm Sewer Connection requirements shall also apply.

4.1.1 Storm Sewer System

Storm sewers designed and constructed in accordance with the most recent requirements and specifications of the City of Oshawa are required on every road within all plans of subdivisions unless otherwise approved by the Director of Engineering Services.

Storm sewers and storm water management facilities shall be designed to accommodate offsite drainage from future development within the upstream watershed and/or for the drainage of any areas designated by the Director of Engineering Services. Should the Subdivider wish to seek cost recovery for any over sizing, the City may consider a front ending agreement in accordance with requirements of the Development Charges Act. Cost sharing shall be calculated as outlined in Section 4.8. Storm drainage shall be directed to a suitable outlet to the satisfaction of Engineering Services.

Channel works, bridges, culverts and all other drainage structures or works shall also be designed and constructed in accordance with the most recent requirements and specifications and are to be approved by the City of Oshawa and all other applicable agencies such as the Ministry of Environment, Conservation and Parks, the Central Lake Ontario Conservation Authority, the Ministry of Natural Resources, etc.

4.1.2 Maintenance

Storm sewers and related appurtenances shall be guaranteed for a minimum period of two (2) years after the City has issued provisional acceptance.

All above ground storm sewer appurtenances shall be maintained at no cost to the City until assumption of the subdivision occurs.

Channel works (including headwall structures) shall be maintained at no cost to the City until assumption of the subdivision occurs.

4.1.3 Erosion and Sediment Control

Erosion and sediment controls shall be designed, constructed and maintained in all developments in accordance with the most recent requirements and specifications of the City of Oshawa. (Refer to Section 6 of this Manual.)

An erosion and sediment control plan shall be submitted to the City for review and approval prior to any works on the site including stripping and/or grading.

The approved erosion and sediment control measures shall be in place and be maintained at all times in good condition prior to the commencement of and during construction.

Development setbacks from watercourses shall be established in conjunction with City of Oshawa, M.E.C.P. /M.N.R. and C.L.O.C.A., and shall take into account the respective guidelines and requirements of such.

4.2 Storm and Foundation Drain Collector Sewer

4.2.1 Storm and Foundation Drain Collector Sewer Design

For the purpose of storm sewer design, foundation drains connected to a Foundation Drain Collector (F.D.C.) pipe shall be designated as Type I System. Foundation drains connected to the storm sewer shall be designated as Type II System. When foundation drains are connected to sanitary sewer pipe they shall be designated as Type III System.

Type I System – Foundation Drains connected to the Foundation Drain Collector

The storm sewer will be shallow (1 metre minimum cover) and will be discontinuous through high points at the top end of the system. Connections to the storm sewer will generally be restricted to catch basins, storm sewer connections as required by the Storm Sewer Connection By-law 9-90 and roof water leader connections as per Section 5.7.

I. The storm sewer shall be designed using the City of Oshawa one-year intensity-duration-frequency curve.

II. The F.D.C. pipe shall be designed sufficient in capacity to convey anticipated flows as determined through a hydrogeological study, but shall not be less than 0.075 litres per second per dwelling unit connected.

III. The F.D.C. pipe shall outfall to a free outfall above the elevation of the 100 year flood line.

Type II System – Foundation Drains connected to the Storm sewer

I. The storm sewer shall be designed assuming free-flow conditions using the Toronto - Bloor Street ten–year intensity–duration–frequency curve. The storm sewer shall be deep (2.75 metre minimum cover) and will be continuous throughout the complete street length with individual foundation drain service connections to each dwelling unit.

II. A 100-year hydraulic gradeline analysis shall be prepared for this system. The resulting hydraulic gradeline shall be plotted on the detailed design drawings.

III. The underside of the footing elevation shall be designed such that it is located at minimum 0.60 metres above the 100-year hydraulic gradeline elevation at the point of the foundation drain connection to the storm sewer.

4.2.2 Run-off Calculations

Storm sewers shall be designed for storm drainage run-off based on the Rational Method. Where the drainage area is larger than 10 hectares, the Rational Method calculations must be checked against computer models. The larger of the flows is to be used in the design of the sewer system.

$Q = A \times I \times R = 27.77\ A \times I \times R/0.036$

Where;

Q = Design flow in litres per second
A = Drainage area in hectares
I = Run-off co-efficient
R = Rainfall intensity in centimeters per hour

All storm sewer design calculations shall be completed on City of Oshawa design sheets. A sample of the design sheet is included in the Appendices. An electronic sample is available on request.

Drainage Area

Drainage area is the gross area in hectares of the watershed, which has been defined and/or approved by the City of Oshawa.

Run-off Co-efficient

The run-off co-efficient is determined either by the type of land use or by the type of surface, whichever is greater.

a)

Type of Land Use	**Run-off Co-eff. (I)**
Residential	0.50 - 0.90
Commercial	0.90
Industrial	0.90
Schools	0.65
Institutional	0.45 – 0.90
Conservation Land	0.20
Open Space & Recreation	0.20

b)

Type of Surface	**Run-off Co-eff. (I)**
Impervious	0.90

Type of Surface	Run-off Co-eff. (I)
Unpaved	0.40 – 0.60
Grass, Woods or Railroad	0.20

Rainfall Intensity Duration Curves

The intensity of rainfall shall be determined using the most recent City of Oshawa standard Intensity – Duration – Frequency Rainfall Curves. See Appendix 9, Sheet 2.

When designing Type I or Type III systems, the one year curve shall be used.

When designing a Type II system, the ten year curve shall be used.

Time of Concentration

T.C. = T.C. (entry) + Tp

Where;

T.C. = total time of concentration in minutes at the point under consideration
T.C (entry) = entry time at the first catch basin

Use;

T.C. (entry) = 5 minutes (Type II System)
T.C. (entry) = 10 minutes (Type I and Type III Systems)

Or;

T.C. (entry = To + Tg (if approved by the City)
To = total time of overland flow determined as per Plate “A” in Appendix 10
Tg = time of gutter flow determined as per Plate “B” in Appendix 11
Tp = time of pipe flow in the sewer

Note: The use of To + Tg to determine T.C (entry) will only be accepted under specific circumstances, and only when prior approval of the City has been given.

4.3 Storm and Foundation Drain Collector Sewer Requirements

4.3.1 Pipe Capacity

The flow capacity of pipe shall be determined by Manning’s Formula (Appendix 12) by using, n=0.013, for all storm sewer pipes (concrete, P.V.C., H.D.P.E.) of all sizes.

The minimum main line storm sewer pipe size shall be 250mm diameter.

The minimum foundation drain collector (F.D.C.) sewer pipe size shall be 250mm diameter.

4.3.2 Velocity Control

The velocity in storm sewers shall be limited to a minimum of 0.75 metres per second, and a maximum of 4.00 metres per second.

The maximum decrease in velocity from one pipe to another through a maintenance hole shall not exceed 0.60 metres per second.

4.3.3 Location

The location within the road allowance of storm sewer systems and/or F.D.C. pipe shall be in accordance with City of Oshawa OS-200 series drawings.

Foundation Drain Collector pipe shall generally be located in a common trench with the sanitary sewer pipe.

4.3.4 Alignment

Storm sewer(s) shall be constructed in a straight line between manholes unless radial pipe has been designed and approved.

Generally, a minimum clearance of 0.25m shall be provided between the outside of the pipe barrels at the point of crossing for storm and sanitary sewers. Watermains shall normally cross above sewers with sufficient vertical separation (minimum 0.25 m) to allow for proper bedding and structural support of the watermain and sewer main. When it is not possible for the watermain to cross above the sewer, the watermain passing under the sewer shall be protected by providing: A vertical separation of at least 0.5 m between the invert of the sewer and the crown of the watermain. Adequate structural support for the sewer to prevent excessive deflection of joints and settling. In the event the minimum clearances cannot be obtained, then the pipes at the crossing shall be concrete encased to ensure that the pipes are properly bedded.

Radius pipe may be allowed for storm sewers provided that a manhole is located at the beginning and at the end of the radial section.

Properly deflected sewer pipes within the manufacturers specifications are allowed upon approval from the Director of Engineering Services.

4.3.5 Pipe Size Changes

No decrease of pipe size from a larger upstream to a smaller size downstream will be allowed unless approved by the Director of Engineering Services.

4.3.6 Pipe Classification and Bedding

The type of bedding and class of pipe shall be designed to accommodate both the ultimate dead load and a live load equivalent to Highway H-20 Loading, regardless of the location of the sewer, except when the sewer crosses a railroad in which case Railway E-80 Loading shall be used instead of Highway Loading.

The type and classification of storm sewer pipe and bedding shall be as follows:

Alternative 1: Concrete Pipe

Specifications: O.P.S.S. 1820

Non-Reinforced Concrete Pipe C.S.A. A257.1 - M1982

Reinforced Concrete Pipe C.S.A. A257.2 - M1982

Non-Reinforced Concrete Pipe may be used for pipe sizes up to and including 375 mm diameter.

Minimum strength of non-reinforced pipe shall be Class 3

Minimum strength of reinforced pipe shall be Class 65-D

Alternative 2: Polyvinyl Chloride Pipe (P.V.C.)

P.V.C. pipe may be used For Pipe Sizes Up To And Including 600 Mm In Diameter.

Specifications: OPSS 1841, C.S.A. B182.2, C.S.A. B182.3

The class of P.V.C. pipe shall not have an S.D.R. (standard dimension ratio) greater than 35.

Bedding for P.V.C. pipes shall be class “P” bedding as per Regional Municipality of Durham Standard S-200.010.

Alternative 3: High Density Polyethylene (HDPE) – Smooth Walled Interior

High Density Polyethylene (H.D.P.E.) smooth walled interior pipe with gasketed bell and spigot joints may be used for pipe sizes up to and including 600 mm in diameter.

Specifications: O.P.S.S. 1840, C.S.A. B182.6

Bedding for H.D.P.E. pipes shall be Class “P” bedding as per Regional Municipality of Durham Standard S-200.010.

Use of corrugated steel pipes (C.S.P) for construction of storm sewers is not permitted unless approved by the Director of Engineering Services.

Manufactured tees must be used for storm sewer connections if the sewer is 450mm diameter or smaller.

Connections to storm sewer 525mm diameter and larger may be made using field installed tees such as mortared-in bells or strap-on saddles.

The maximum allowable deflection of main line sewer when using P.V.C. pipe shall be 5%.

Bedding material(s) for all storm sewer related pipe shall conform to Regional Municipality of Durham S-200.010 and S-100.040 (Common Trench Bedding Detail), O.P.S.D. 802.010 (Flexible Pipe), OPSD 802.030 (Rigid Pipe Bedding – Type 1 or Type 2 Soil), O.P.S.D. 802.031 (Rigid Pipe Bedding – Type 3 Soil), OPSD 802.032 (Rigid Pipe Bedding – Type 4 Soil) and O.P.S.D. 802.034 (Rigid Pipe Bedding and Cover In Embankment).

The width of 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 strength pipe is used.

4.3.7 Headwalls

Headwalls shall be as per O.P.S.D. standards. Fencing, as per O.P.S.D. 972.131, shall be provided where the dimension from top of headwall to the invert of the outlet exceeds 1.0 m.

4.4 Calcium Carbonate Mitigation – Foundation Drain Collector

For a new subdivision development, the Subdivider will be required to undertake a groundwater study to assess the potential for calcium carbonate formation in foundation drains. The study shall include the drilling and placement of sufficient boreholes to identify groundwater elevations in the proposed plan and in particular to highlight areas within the plan where building footings may be located at or below the seasonal groundwater level. Chemical analysis shall be carried out for groundwater within the depth of influence of the foundation drain system. The analysis should include field pH, alkalinity, iron, DOC and major anion/cations to allow assessment of the state of saturation of the natural groundwater with respect to calcium carbonate.

Through the overall design of grades within the plan, the Subdivider shall minimize the number of footings located at or below the seasonal high groundwater level. This is intended to minimize groundwater flow to foundation drains and limit the rate of calcium build-up.

Where a groundwater study has identified that the groundwater is either saturated or near saturation levels with respect to calcium carbonate and the planned footing elevations are at or below the seasonal high groundwater levels, the Subdivider shall ensure that washed 19mm clear stone from pit source is used around footing drains and beneath the floor slab. The affected building lots shall be identified on the engineering drawings for subsequent inclusion as a condition in the Subdivision Agreement.

All foundation drain collector (F.D.C.) lateral connections between the street line and the home footing drain shall be 150 mm in diameter to facilitate cleaning.

The design of the F.D.C. system shall minimize the extent of drop structures to reduce cascading of turbulent flow.

4.5 Manhole Requirements

4.5.1 Manhole Types

Manholes may be either pre-cast or poured in place and shall be designed and constructed in accordance with the most recent O.P.S.D. standards and specifications.

Although the O.P.S.D. standard drawings provide details for manholes up to certain maximum depths and sizes, the Consulting Engineer shall analyze, individually, each

application of the standards related to soil conditions, loading and other pertinent factors to determine structural suitability.

In all cases where the standard drawings are not applicable, the manholes shall be individually designed and detailed.

4.5.2 Location and Spacing

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

Maximum spacing of manholes shall be 110m for sewers 1200mm or less in diameter and 150m for sewers greater than 1200mm in diameter.

Storm sewers shall be installed to the limits of subdivision development, being terminated by installation of a storm manhole or storm sewer stub as approved by the Director of Engineering Services. The design of the terminal manhole must allow for the future extension of the sewer or storm sewer stub.

4.5.3 Manhole Details

Manhole 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 change in direction of flow in any manhole shall not be greater than 90 degrees.

Safety gratings shall be provided in all manholes 5.0 metres in depth or more as per O.P.S.D. standards.

Manhole ladder rung(s) shall be as per O.P.S.D. standards.

Manhole frame and cover(s) shall be as per O.P.S.D. 401.01. Any adjustment and setting of the frame and cover shall be completed in accordance with details as provided in the O.P.S.D. standards.

Watertight manhole cover as per O.P.S.D. 401.030 shall be provided for any F.D.C. manholes located within an overland flow route or stormwater ponding area.

Manholes shall be provided with drops not less than the total amount as determined by the following. However, regardless of the amount of drop required, the obvert on the upstream pipe shall not be lower than the obvert of the downstream pipe.

Drop required for Transition

Where there is a change in the size between the pipes connected to a manhole, the deflection angle of benching wall relative to the centerline of sewer pipe shall be not more than 12.5 degrees, and a drop shall be provided between the invert elevations, of inlet and outlet, as determined by the following:

$Ha = Ka\ (dv)^2 / 2g$

Where;

Ha = required drop in metres
Ka = 0.1 for contraction (reducing size) **or** = 0.2 for expansion (increasing size)
dv = difference in velocity (m/s)
g = 9.8m/s

Drop required for Bend

The centerline radius of a bend, "R", in a manhole shall be not less than the diameter of the inlet pipe, D, and a drop shall be provided as determined by the following:

$Hb = Kb\ V^2\ /\ 2g$

Where;

Hb = required drop in metres
Kb = 0.4 when $D < R \leq 2D$ **or** = 0.2 when $2D < R$
V = velocity of inflow (m/s)
g = 9.8m/s

4.5.4 Benching in Manhole

Depending on the amount of drop provided, the following provisions shall be made:

- 0.25m or less — Provide benching in straight line between the inverts of inlet and outlet pipes.
- over 0.25m up to 1.80m — Provide vertical curve benching to direct the flow tangentially into the outlet pipe. The maximum height of the bottom of the curve benching is to be 0.45m measured from the invert of outlet pipe.
- over 1.80m — Provide a 0.30m deep tumbling basin in the manhole

4.6 Catchbasin and Connection Requirements

4.6.1 Catchbasin Types

Catchbasins may be either pre-cast or poured in place and shall be designed and constructed in accordance with the most recent O.P.S.D. and O.P.S.S. requirements.

Any special catchbasins and inlet structures proposed must be fully designed and detailed by the Consulting Engineer for approval by the Director of Engineering Services.

Frame and grate for catchbasin (s) shall be as detailed in the O.P.S.D. standards. The "bicycle proof" catchbasin grate, as per O.P.S.D. 400.020, shall be required for all catchbasins located in the City of Oshawa. Any adjustment and setting of the frame and cover shall be completed in accordance with details as provided in the O.P.S.D. standards.

4.6.2 Location and Spacing

For design purposes assume that one catch basin will be required for each 0.3 hectare of upstream-undeveloped area.

The maximum spacing for catchbasins shall be 90m on each side of the roadway. (However, with Type II systems, and subject to the approval of the Director of Engineering Services, increased spacing may be permitted.)

Double catchbasins shall be installed at the low point of any road. In locations where there is a small contributing drainage area, a single catchbasin may be considered.

Catchbasins shall generally be located upstream of all pedestrian crossings and at the point of curvature on the upstream side of all curb returns.

Catchbasins shall not be permitted within a sidewalk ramp depression.

Wherever possible, it shall be desirable not to have a catchbasin (s) located in a driveway curb depression.

4.6.3 Connections

All catchbasin laterals, whether concrete, polyvinyl chloride or ribbed polyvinyl chloride pipes, shall conform to the requirements as outlined under Section 4.3.6.

The minimum size and grade of catchbasin connections shall be in accordance with the following:

Diameter	Single Catchbasin	Double Catchbasin	Two Double Catchbasins
*200 mm	1.20%	4.80%	N/A
250 mm	0.35%	1.40%	5.50%
300 mm	0.15%	0.50%	2.00%

* - 200 mm diameter catchbasin connections shall only be permitted where constraints prevent the use of a 250 mm diameter and must be approved by Engineering Services.

No more than two (2) bends are permitted in the catchbasin lateral connection. The first bend shall be placed as close as possible to the catchbasin wall.

4.6.4 Rear Yard Catchbasin Leads

Rear yard catchbasin leads shall be concrete encased from the property line to the basin, as per Region of Durham Standard S-200.010.

4.7 Foundation Drain Connection

All foundation drain connections to new sewers shall be constructed using manufacturer's standard tees and wyes unless otherwise approved by the Director of Engineering Services.

All foundation drain connections shall be 150mm diameter concrete or P.V.C .pipes and shall be installed aligning downstream at a minimum grade of 2%.

For the required strength and bedding of a concrete foundation drain connection, refer to the Concrete Pipe specification as outlined under Section 4.3.6.

The class of P.V.C. foundation drain connection pipe shall not have an S.D.R. (standard dimension ratio) greater than 28.

Bedding of P.V.C. foundation drain connection shall be class “P” as per Region of Durham Standard S-200.010.

4.8 Cost Sharing for Oversizing

In accordance with Council Policy (March 1993), Subdivider’s must initially construct and finance the storm sewer system required to service the upstream drainage area when fully developed. Where the City enters into a front-ending agreement as defined under the Development Charges Act for the oversizing, cost sharing by the upstream benefitting area shall be calculated as described in this section.

The amount expected for reimbursement shall be based on the cost incurred to provide the additional storm sewer capacity. This amount will be calculated by the Subdivider’s engineer, and will be the difference in cost of a complete storm drainage system required to service only the development under consideration and the cost of the system actually required to be constructed to accommodate a fully developed watershed. Costs will be indexed according to the Engineering News Record publication of indices. Once the cost of oversizing is determined, it will proportioned to the upstream benefiting area(s) based on impervious areas. The following example illustrates how the calculation would be made:

Subdivider A is required to construct a storm system to accommodate developments B (30 Ac, Residential R1), C (5 Ac, Commercial), D (2 Ac, Residential R8)

1. Total Cost for Oversizing (Front-end cost) = $100,000
2. Total area subject to Repayment = (B+C+C) = 20.8 AI (see below)

Run Off Calculations for Repayment to Developer A:

Site B = 30 Ac x 0.50	= 15.0 AI	15.0/20.8 x $100,000	= $72,115.38
Site C = 5 Ac x 0.90	= 4.5 AI	4.5/20.8 x $100,000	= $21,634.62
Site D = 2 Ac x 0.65	= 1.3 AI	1.3/20.8 x $100,000	= $ 6,250.00
Totals	**= 20.8 AI**		**$100,000.00**

4.9 Site Plan Storm Sewer Connections

Oshawa By-law 9-90 establishes the basis upon which plans relating to grading and the disposal of storm and surface water shall be approved. Section 5a) states:

"No sewer connection shall be constructed on any City road allowance or other public land except by City forces or under a contract let by the City. Any work done for or by the City shall be under the control of the Commissioner of Works and its scheduling shall be dependent on the workload at the time of application."

In order to properly layout and locate proposed sewer connections the City requires the following information:

1. The developer is required to provide a Northing and Easting of the centerline of all proposed underground structures that require a tie in to any storm line or facility owned by the City of Oshawa. The coordinates must be NAD83-ORIG based
2. The developer is required to provide project control from the original site plan survey. All project control must have a Northing, Easting, Elevation (down to the nearest mm). The coordinates must be NAD83-ORIG based. The developer may also choose to provide the coordinates (Northing, Easting, Elevation) of minimum three existing (3) property bars of the property being serviced in lieu of project control local to the site. The coordinates must be NAD83-ORIG based.

The following information shall be shown on the servicing plans:

1. Connection point along the mainline. A distance from the upstream and downstream centerline of manholes that are on either side of the pipe segment that is being broken into.
2. A dimension from a property corner to the point where the storm connection crosses the property line.
3. Any coordinates of proposed structures that are being tied into
4. City of Oshawa benchmark as published by Cosine.
5. Any site benchmarks are to be shown.
6. Proposed pipe invert at property line.
7. Length of pipe within the road allowance.
8. Identify pipe crossing clearances.

Refer to Storm Connection By-law 9-90 for further information.

5.0 Lot Grading

5.1 General

The purpose of this section is to outline the engineering design criteria requirements pertaining to lot grading in the City Of Oshawa.

The design and construction of grading is of considerable importance to the City of Oshawa. While the attached criteria reflects minimum City requirements with respect to grading, the Developer and their consultants are responsible for designing and constructing a finished product based on the following objectives:

- No adverse impact to adjacent lands.
- Storm drainage self-contained within the developing property.
- The riparian rights of adjacent lands to be respected.
- Positive surface drainage directed away from all buildings.
- All existing perimeter ground elevations of the developing property to be maintained.
- Property owners to be provided with maximum use of their property.
- The use of retaining walls and/or terracing to be minimized.
- Existing trees to be preserved wherever practicable.
- Ponding to be minimized.
- The use of rear lot catchbasins to be minimized.

While innovations by the Developer's engineer at the design stage will be considered by the City, any proposal to deviate from the City standards and requirements shall be discussed with and approved by the City prior to formal submission.

While the criteria presented in this section has been primarily developed to provide guidance to residential subdivision development, the basic principles shall apply to other types of land development as well.

Effective June 12, 2006, the City passed By-law 85-2006 to control the dumping of fill, removal of topsoil, and the alteration of grades within the City. A copy of the By-law is provided in the Appendices of this manual. Fees associated with the By-Law can be found on the City's website under the General Fees and Charges By-law.

5.2 Definitions

Department of Planning and Development – Shall mean Development Services Department.

Department of Public Works – Shall mean Engineering Services.

Master Lot Grading Plan – A plan drawn to a scale not less than 1:500 for single family or semi-detached areas or 1:250 for multi-family areas, showing the overall drainage, grading, house type, etc. in a plan of subdivision. This plan must also show the directions of the minor and major storm flows within the limits of the development.

Site Grading Plan – A plan required as part of a building permit application drawn to a scale not less than 1:250, for a single building lot in a subdivision, showing all proposed grading and drainage details for the site. This plan shall also include the Subdivider's Professional Engineer's Declaration of Compliance with the reviewed Master Lot Grading Plan. Declaration of Compliance by an approved alternate will also be accepted.

Foundation Control Elevation(s) – One or more points of control indicating the relationship between the building and the surrounding lot grading. At a minimum, elevation(s) of basement floor, top of basement wall, top of garage floor, and ground adjacent to the building envelope shall be shown.

5.3 City of Oshawa Council Resolutions

(i) Resolution dated 1983 07 04:

"That effective immediately where a lot grading plan is on file with the City, a site grading plan for each lot shall be submitted with all applications for building permits for residential development. The site grading plan must include a certification by a Professional Engineer or an Ontario Land Surveyor that he has reviewed the plan and that the proposed grading conforms with the intent of the approved lot grading plan on file with the City, and that the proposed dwelling unit is compatible with the grading. The site grading plan with appropriate number of copies will be submitted to the Building Branch of the Department of Planning and Development at the time of the building permit application. One of the copies of the plan will be forwarded to the Department of Public Works by the Building Branch." Note amended as per part 1 of resolution dated 2005.10.03 below as to who can certify plan.

(ii) Resolution dated 1983 11 21:

"That before house construction proceeds beyond the basement level, a Professional Engineer or an Ontario Land Surveyor provide the City with a certificate conforming that the foundation control elevation(s) has been checked and is in accordance with the elevation shown on the site grading plan submitted with building permit application.

(iii) Resolution dated 2005 10 03:

"1. That Council's policy with respect to Site Grading Plans be amended to reflect that certification of compliance of individual Site Grading Plans to the Master Lot Grading Plan be performed by the designer of the Master Lot Grading Plan or a pre-qualified Ontario Land Surveyor. Exceptions to this policy will be considered by the Commissioner or his designate provided the alternate professional has been pre-qualified and has first met with the City to confirm City requirements.

2. That the City play a more active role in the Site Grading Plan submission process through the initiation of a spot check quality assurance review of Site Grading Plans

3. That the City play a more active role in the foundation control process by ensuring all Foundation Control Certificates are received.

4. That the City play a more active role in Lot Grading Certification by ensuring all certificates are received and by performing periodic quality insurance inspections and response to complaints.

5. That Council's policy with respect to Lot Grading Certification be amended to require certification by the designer of the Master Lot Grading Plan with any exceptions to this requirement considered by the Commissioner or his designate on a case by case basis.

6. That the City play a more active role in grading issues on developments under a site plan agreement and require certification of grading by the professional who designed the original Site Grading Plan."

5.4 Engineering Drawing Requirements

All applicable drawing requirements as referenced in Appendix 23, as well as OS-1001 and 1002 shall be adhered to.

5.5 Lot Grading Design -General

The drainage from all lands within the limits of the development must be self-contained. Drainage over abutting lands will only be permitted in situations where such drainage merely continues the existing pattern of natural overland flow and has no adverse impact to lands external to the subject development.

Master Lot Grading Plans shall be submitted for all lots and blocks in new developments. The City of Oshawa shall review all grading plans with the intent of ensuring sites are suitable for the erection of buildings as well as providing satisfactory drainage for all land within the development.

Storm water flows in excess of the design capacity of the piped storm sewer system shall be accommodated as overland flow within the roadway or defined swales and in such a manner as to carry excess flow to an approved point of acceptance. The analysis should be based on a storm event with the one hundred (100) year return period.

Generally major overland routes shall follow the road network. If overland flow must be conveyed between private lots or properties, the City will request a block conveyance as opposed to an easement. The block must be of sufficient width to convey the 100 year flow.

Upon acceptance from the City of Oshawa, Master Lot Grading Plans shall be referenced in all development agreements and remain on file with the City. Certification from the Subdivider's Professional Engineer, or an approved alternate, shall be submitted to the City of Oshawa ensuring that all lot grading has been completed in compliance with the Master Lot Grading Plan, within permissible tolerances.

Lot grading shall in all cases be designed and constructed to conform to the drainage pattern approved for the design and construction of the City's minor and major storm system.

5.5.1 Front Yards

Grades designed for front yards shall be controlled by the elevations at the property (street) line. The front yards of all residential lots shall be graded to drain toward the street.

The minimum slope for front yards shall be 2%.

The maximum slope for front yards shall be 10%.

Any differential between the street line and the front of the house that cannot be accommodated by a uniform slope within the range as specified above shall be designed as follows:

- 3:1 slope of a maximum vertical height of 1.50m for each terrace.
- a retaining wall of a maximum height of 1.50m for each terrace.
- or a combination of the above.

5.5.2 Driveways

Council Resolution of 1971 12 06

"That in the case of attached garages and basement garages for one and two family dwellings, all driveways be required to slope away from the garage with a minimum driveway grade of 2%, from the garage doorsill to the finished grade at the property line, provided, however, that an exception to this policy will be permitted in those areas with low rear yards and which are not affected by storm water ponding at road low points and where a properly designed garage entrance drain with a free outfall into the rear yard can be constructed."

In addition to the above resolution the following conditions shall apply:

- The maximum design grade of driveways shall be 8%. The maximum constructed grade shall be 10%.

- Driveways should not be used as outlets for any swales. Where driveways abut each other at the property line, a shallow swale or depression between the driveways is encouraged to prevent "sheet flow" on the driveways.

- Rainfall leaders shall not discharge directly on a driveway.

5.5.3 Side Yards

The maximum slope in side yards shall be 3:1.

In areas where the above objective cannot be met, steps and/or retaining walls (maximum height of 1.50m for each terrace) shall be required.

A minimum 0.6 metre wide apron sloping 2% away from the foundation wall shall be constructed along one side of the building to allow proper access to the rear yard.

The minimum grade for a side yard swale shall be 2%

The maximum depth for any side yard swale shall be 500mm measured on the low side.

The minimum depth for any side yard swale shall be 150mm measured on the low side.

The maximum slope for a side yard swale shall be 2:1.

The maximum flow allowable to any side yard swale shall be that from 4 rear yards (inclusive of the two lots on which the swale is located) or 0.1 hectares, whichever is less.

Drainage swales shall be located on the common lot line between adjacent lots.

Where the separation between buildings does not facilitate the grading of an acceptable swale, the use of rear to front drainage types shall generally not be permitted.

Where combined side yards between two buildings are 1.2m or less a maintenance free medium, such as clear stone, is required. In this instance, a cap consisting of 0.30m depth of light to medium clay material should be placed between the backfill and the stone.

Where combined side yards between two buildings are greater than 1.2m, topsoil and sod shall be specified.

A typical side yard swale cross-section shall be included on the master lot grading plan.

5.5.4 Rear Yards

The minimum slope for rear yards shall be 2%.

The maximum slope for rear yards shall be 10%.

All rear yards shall be graded to maximize the useable rear yard area with a minimum outdoor living area to be no less than 56 m² for single family homes; 46 m² for each semi-detached unit, and 37 m² per unit for row housing. The useable rear yard area shall be located within 5.0 metres of the rear wall of the housing unit and shall have a minimum slope of 2% and a maximum slope of 5%.

Any proposed terracing to overcome height differentials may be accommodated by a slope which shall not be steeper than 3:1, and shall have a maximum vertical height of 1.50m or a retaining wall of a maximum height of 1.50m. Combination of slope and retaining wall is acceptable providing the combined vertical height does not exceed 1.50m for each terrace. To facilitate fence installation, maintenance and stability. A 1.0m wide fencing platform, with minimum 2% and maximum 10% grades, shall be provided between the top of slope along applicable property lines.

All rear yard drainage shall be directed away from the houses to outlet at the curb, sidewalk or catch basin.

The maximum flow in rear yard swales that may be discharged onto the road allowance at any one location is that from 4 back yards or 0.1 hectares, whichever is less.

The maximum flow in rear yard swales shall be that from 6 semi-detached lots or 10 detached lots, or 16 street townhouse lots or an equivalent combination thereof. However, in no case shall the length of rear yard swale exceed 60 m.

The maximum area contributing to the rear yard swale shall be 0.2 hectares.

The minimum grade for a rear yard swale shall be 2%

The maximum depth for rear yard swales shall be 750 millimeters measured on the low side.

The minimum depth for rear yard swales shall be 230 millimeters measured on the low side.

The maximum side slope for rear yard swales shall be 3:1.

A typical rear yard swale cross-section shall be included on the master lot grading plan.

5.6 Site Grading Plan

A Site Grading Plan for each individual lot shall be submitted to the City of Oshawa as part of the building permit application for each residential lot. This plan must conform to the intent of the Master Lot Grading Plan in every respect. The plan shall generally be prepared at a 1:250 scale unless clarity of presentation dictates otherwise. City Standards are reflected on OS-Series Drawings.

At a minimum, the following information shall be shown on each site grading plan:

- Lot number and street name.
- Proposed building location.
- Proposed elevations for all lot corners, swale inverts and intermediate points of grade change at reasonable intervals along the boundaries of the lot to illustrate drainage of the lot in relation to the surrounding lands and buildings.
- Driveway grades.
- Direction of surface water runoff using arrows to show the drainage pattern for the lot.
- Location of above ground utilities.
- All foundation control elevations.
- Finished first floor elevation
- Locations of rain leader discharge points.
- Location of any stormwater control device.
- Location of any sump pump discharge point.

- Existing trees to be preserved.
- Proposed acoustical fencing and/or berm.
- Grate locations and elevations of all rear yard catch basins.
- Locations of any easements and underground services.
- Slopes/terracing/retaining walls
- Outline of the useable rear yard area

The Subdivider's Professional Engineer, or an approved alternate, must certify that they have reviewed the Site Grading Plan and that the proposed grading conforms to the intent of the reviewed Master Lot Grading Plan and that the proposed dwelling unit is compatible with the grading. In order to certify conformance, all proposed grades must agree with the Master Lot Grading Plan, along with house and grading type. The use of retaining walls within the lot, not reflected on the Master Lot Grading Plan, shall be discussed with and agreed upon by the City prior to certification.

5.7 Roof Water Leaders

Roof water leaders shall be connected directly to the storm sewer system for any residential buildings containing three or more dwelling units and for any development other than residential. For townhouse development, the roof water leader at the front of the housing units shall be connected to the storm sewer.

Roof water leaders discharged to the surface shall be directed to front and rear yard permeable areas only and not to the side yard swale.

The grading certificate shall confirm that roof water leaders have been correctly installed in accordance with Site Grading Plan submitted with the building permit application.

5.8 Retaining Walls

The use of retaining walls shall be minimized in developing the Master Lot Grading Plan and subsequent individual Site Grading Plans.

Where retaining walls are required along development limits or adjacent future public lands within the plan, the Master Lot Grading Plan shall identify the location, length, height, material and type of proposed wall. The design of any such walls shall be carried out by a Professional Engineer in conjunction with the Master Lot Grading Plan.

The Master Lot Grading Plan shall also reflect the proposed location of any other retaining walls of 1 metre height or greater to be constructed on lots or blocks within the plan. Detailed design of these 'internal' walls will not be required at the Master Lot Grading Plan stage.

Where retaining wall(s) over 1 metre high are proposed on a Site Grading Plan and the retaining wall(s) were not previously identified or designed with the Master Lot Grading

Plan,, design of the wall(s) shall be carried out by a Professional Engineer and be designed in accordance with the recommendations contained in the Geotechnical report(s).

The construction of any wall noted above shall be field reviewed and certified by the Professional Engineer upon completion of construction. A sample of the certification required can be found in the Appendices.

Retaining walls shall be designed and constructed entirely on one property so that tie backs or wall footings do not cross boundaries.

A minimum setback of 0.5 metres shall be maintained from the tiebacks to the foundation of any structure.

Fencing and/or a security barrier shall be required at the top of all retaining walls 1 metre high or greater that are located at property limits. They shall be designed in conjunction with retaining wall and appear on the stamped retaining wall drawings.

General notice will be incorporated in the subdivision agreement advising the future property owners of the presence of retaining walls on the affected properties and their responsibilities for maintenance and impact on useable land within their property.

The Developer shall be responsible for obtaining from the Chief Building Official, any building permits required for the construction of retaining walls associated with the development. The certification noted in the Appendices is not required where the retaining wall is deemed to be a designated structure requiring a building permit. Instead, general review by a Professional Engineer will be required in accordance with the Ontario Building Code.

5.9 Catchbasins

If a catch basin is deemed necessary to facilitate drainage, the developer will be required to provide a 3 metre wide easement in favor of the City. The easement shall be centered on the lot line and the storm connection and catch basin shall be offset 0.75 metres from the lot line so that the service is located entirely within one lot. The City does not support storm connections traversing multiple lots.

The use of front yard catchbasins shall be avoided.

The use of rear yard catch basins is permitted as a means of improving surface drainage conditions. Where the topography is steep, consideration shall be given to the need for additional catch basins. The City may request additional catch basins in specific situations to avoid future drainage issues.

The maximum depth of ponding at a blocked catchbasin shall be 0.40 metres and no ponding of water is permitted within 0.30 metres of an opening of a house.

See section 5.5.4 for rear yard CB information.

5.10 Acceptance and Certification

The following criteria applies in relation to Acceptance and Certification:

(a) The Master Lot Grading Plan must be reviewed and accepted by the City prior to the issuance of building permits.

(b) The Subdivider's Professional Engineer, or an approved alternate, as to its compliance with the Master Lot Grading Plan, must certify the Site Grading Plan (see paragraph 3 section 5.5). Certification shall be provided on the Site Grading Plan as follows:

"I hereby certify that the building type, appurtenant grading, drainage and servicing works proposed for Lot_____, Plan 40M _____ complies with sound engineering design and that the proposed grading is in conformity with the Master Lot Grading Plan reviewed as appendices to the subdivision agreement and with adjacent lands for both drainage and relative elevations."

Date:_____ Reviewed by:_____

Company Name and Engineers Stamp (If applicable)

In situations where there is no Master Lot Grading Plan, such as for in-fill lots, the following certification shall be provided:

"I have reviewed the plans for construction of (type of building) located at (municipal address) and have prepared this plan to indicate the compatibility of the proposal with all adjacent properties and existing municipal services. It is my belief that adherence to the proposed elevations and gradients as shown will produce adequate surface drainage and proper facility of municipal services without detrimental effect to the existing drainage patterns or adjacent properties."

Date: _____ Reviewed by: _____

Company Name and Engineers Stamp (if applicable)

(c) The correctness of the Foundation Control Elevation(s) must be certified by a Professional Engineer or an Ontario Land Surveyor. This certificate must be provided to the City before house construction proceeds beyond subfloor level. Appendix 17 includes a sample of the certificate to be provided.

(d) The City will require a certificate in a form satisfactory to the City of Oshawa from the Subdivider's Professional Engineer, or an approved alternate, that the grading and drainage of the lot is in general conformance with the Master Lot Grading Plan and the Site Grading Plan within the guidelines stipulated under section e). The Appendices includes a sample of the certificate to be provided. Grading certification shall be provided within 6 months of completion of sodding on the lot. The subdivision will not be assumed until all grading certificates for the plan are received.

(e) The lot grading of the plan as a whole and of individual lots shall be deemed to comply with the Master Lot Grading Plan if the spot elevations internal to the plan are within

acceptable tolerances of the elevations shown on the approved plan. Deviations or tolerances generally not exceeding 100 mm shall be considered acceptable as long as the intent and integrity of the approved plan with regard to drainage is complied with in every other respect.

(f) Deviation from any of the approved elevations along the periphery of the plan will not be entertained unless written agreement is obtained from the abutting owner(s) and such proposed changes are satisfactory to the Director of Engineering Services.

(g) If the grading on a lot differs from the Master Lot Grading Plan and cannot be certified within the acceptable tolerances indicated under section e), the plan shall be deemed to not be in compliance with the plan. To bring it into compliance with the plan shall either require re-grading of the lands or, if deemed practicable, the City will consider a request for an amendment to the Master Lot Grading Plan.

(h) To evaluate a request for an amendment to the Master Lot Grading Plan, the City shall be provided with details setting out the variances and a proposal as to how the discrepancies are to be overcome.

(i) The Master Lot Grading Plan as amended shall become the accepted plan and all certificates referred to under this section must relate to the accepted plan at the time of providing such certificate.

(j) Retaining wall certification shall be provided as outlined in Section 5.0.

(k) Prior to assumption of the subdivision by the City it shall be the Sub-divider and the Subdivider's Professional Engineer's responsibility to review and approve any proposed changes or deviations from the approved Lot Grading Plan requested by homeowners (for pool installations, etc.). They shall also re-issue a Lot Grading Certificate to reflect these changes.

Under sections b) and d) above it notes that certification is to be performed by the Subdivider's Professional Engineer or an approved alternate. If the Subdivider or Builder wishes to use someone other than the Subdivider's Professional Engineer to perform the certification requirements of b) and d) outlined above, the following is required **prior to application for any building permits** for which the alternate services are proposed:

- The Subdivider or Builder must convey in writing to Engineering Services that they wish to use an alternate for the provision of certification services,

- The alternate must be either a Professional Engineer or an Ontario Land Surveyor,

- The alternate responsible for certification must meet with Engineering Services to confirm that they have a copy of the Master Lot Grading Plan, a copy of the City's current grading criteria, and that they clearly understand their role and responsibility for certification. All individuals proposed for performance of certification on behalf of the alternate must attend the meeting.

- Engineering Services will then confirm the acceptability of the alternate in writing and any conditions associated with approval of the alternate. If approval of the alternate is

granted, it shall include the names of individuals authorized to perform the certification on behalf of the alternate.

The City shall retain a register of approved alternates and individuals. After the alternate has been initially approved by the City and placed on the register, future requests can be reduced to a letter from the alternate advising they have been retained by the Builder to perform certification. The letter should indicate the lots and plan being certified, contain confirmation they have a copy of the Master Lot Grading Plan and the City's current grading criteria, and advise of the individuals that will be performing the certification. A sample letter is provided in the Appendices.

In accordance with changes to Council policies dated 2005 10 03, as detailed in Section 5.0, the City will play a more active role in matters related to lot grading in the City's development processes and will implement a quality assurance program to monitor grading activities. The City's role in providing this service does not relieve the developer and their professionals from overall responsibility for the proper design and certification of grading.

5.11 Site Plan Development

As noted in the general introduction to this section, the lot grading criteria has been primarily developed to provide guidance to residential development in subdivisions. The basic principles do however apply to properties under site plan development.

It should be noted that a professional engineer shall perform the grading design for any residential buildings containing three or more dwelling units and for any development other than residential.

All Landscape Plans shall be prepared by an accredited professional Landscape Architect in good standing with the Ontario Association of Landscape Architects (OALA). The Landscape Architect shall coordinate with all other consulting professionals to ensure accurate representation of the site and the proposed development.

Where there is a landscape plan proposed as part of the site plan application, the professional engineer designing the site grading plan shall review the landscape plan and shall provide the City with a declaration advising that the proposed landscape works are in conformance with the site grading plan.

Once construction is completed, the professional designing the grading plan shall provide the City with a Lot Grading Certificate and any required Retaining Wall Certificates in a form similar to the Appendices of this manual.

6.0 Erosion and Sediment Control Guidelines

6.1 General

The developer is responsible for obtaining any necessary approvals from the Central Lake Ontario Conservation Authority (C.L.O.C.A.), including permits, before commencing any work on site.

An erosion and sedimentation control plan will be required by the City of Oshawa and must be acceptable to Engineering Services prior to commencing any work on the site.

6.2 Definitions and Interpretations

In these Guidelines the following definitions and/or interpretations apply:

- "**Site**" refers to lands from which it is proposed that topsoil will be removed.
- The term "**body of water**" includes any brook, creek, stream, river, lake, pond, waterway, watercourse, canal, wetlands or other flowing or standing water.
- A "**land disturbance**" is any man-made change of the land surface including, but not limited to, the removal of vegetative cover, excavation, filling, grading and construction or building of roads or parking. "**Disturbed land**" shall have a corresponding meaning.

6.3 Guidelines

1. All water pumped from the Site shall be treated by one or a combination of temporary sedimentation basins, grit chambers, sand filters, upflow chambers, swirl concentrators or other appropriate controls. If the water has been trapped for more than 48 hours and reasonably clear visually, then de-watering operations may be conducted provided the water is not permitted to discharge directly into receiving ***bodies of water***.

2. All storm drainage inlets on the site shall be protected with filters, or equivalent barriers meeting accepted design criteria, standards and specifications accepted by the Engineer so as not to admit sediment-laden runoff escaping from the disturbed areas of the ***site***.

3. The following criteria apply to ***land disturbance*** activities that result in runoff leaving the ***site***:

   (a) Concentrated runoff from adjacent areas passing through the *site* shall be diverted around areas of ***land disturbance***, if practical. Otherwise, sediment control fences placed along the edges of the channel containing runoff shall protect the concentrated runoff. This will reduce the amount of sediment contaminating the concentrated runoff.

   (b) All activities on the ***site*** shall be conducted in a logical sequence to minimize the area of bare soil exposed at any one time.

   (c) Any soil or dirt piles must be stockpiled in such a way that it will not erode and find its way to a watercourse or a roadway. Any stockpiled topsoil shall not be uncovered for more than thirty (30) days after which it shall become covered with mulch, vegetation, traps, etc., and shall not be allowed within the vegetated buffer strip required to protect a warm water or cold water fishery. A sediment control fence shall be erected around the storage pile during the entire time when it is left uncovered.

(d) Precautions shall be taken to ensure that mud will not be tracked offsite by any vehicle exiting the site through the installation of mud mats.

(e) A sediment control fence shall be installed as required to protect adjacent areas.

(f) A three (3) metre wide buffer strip of undisturbed land must be provided along the perimeter of the downslope of the ***site***. It must be entirely located upon the ***site***, which is to be developed. The buffer zone shall be increased to fifteen (15) metres and thirty (30) metres respectively when the *site* abuts warmwater or coldwater fisheries.

(g) Erosion and Sediment Control shall follow the latest edition of the Ontario Guidelines on Erosion and Sediment Control for Urban Construction Sites and any other currently prescribed policies or guidelines

(h) For ***sites*** with extensive fill requirements, the Engineer may waive the requirements for stabilization of ***disturbed land*** after thirty (30) days of inactivity provided that the sediment control measures have been implemented to the satisfaction of the Engineer.

(i) Crossing watercourse only at approved locations with rubber tire vehicles preferred.

(j) Streambed shall not be used as a vehicle or equipment route.

4. Runoff from the area of ***land disturbance*** on the ***site*** shall be controlled as follows:

(a) All ***disturbed land*** left inactive shall be stabilized by seeding, sodding, mulching or covering, or other equivalent control measures. The period of time of inactivity shall be at the discretion of the Engineer, but shall not exceed thirty (30) days or such longer period as deemed advisable at the discretion of the Engineer.

(b) For *sites* with less than two (2) hectares of ***disturbed land*** at one time and slopes less than twelve (12%) percent grade, filter fence (the minimum required erosion and sediment control measure) shall be placed along all sideslope and downslope sides of the ***site***.

(c) For ***sites*** with two (2) or more hectares of ***disturbed land*** at one time, or with slopes greater than twelve (12%) percent grade, or where a channel originates in the area of ***land disturbance***, one or more sedimentation basins shall be constructed. The design of the sedimentation basin shall be consistent with the current Provincial standards (see Ministry of Natural Resources, Technical Guidelines, Erosion and Sediment Control, February 1989).

5. Rehabilitation of the ***site*** shall include:

(a) the leveling and re-grading of affected lands

(b) the planting of trees

(c) the replacement of topsoil - minimum one hundred (100) millimeter depth for areas to be further developed, and a minimum one hundred fifty (150) millimeter depth for all other areas

(d) the stabilization of replaced topsoil through sodding, hydro seeding, mulching or such other methods as may be acceptable to the Engineer.

6. The Erosion and Sediment Control plan shall include but not be limited to the following information:

(a) a key map showing the location of the ***site***

(b) the ***site*** boundaries and number of hectares of the ***site***

(c) the use of the land and the location and use of the buildings and other structures adjacent to the ***site***

(d) the location, dimensions and use of the buildings and other structures existing or proposed to be erected on the ***site***

(e) the location of lakes, streams, wetlands, channels, ditches, other water courses and other ***bodies of water*** on and within thirty (30) metres beyond the ***site*** boundary

(f) the Regional Storm Flood Plain and Conservation Authority Fill Regulation lines

(g) the location of the predominant soil types

(h) the location and type of vegetative cover

(i) the location and dimensions of any existing and proposed storm water drainage systems and natural drainage patterns on and within thirty (30) metres beyond the ***site*** boundary

(j) the location and dimension of utilities, structures, roads, highways, and paving

(k) the existing ***site*** topography at a contour interval not to exceed one half of one metre and to extend a minimum of thirty (30) metres beyond the ***site*** boundary

(l) the proposed final elevations of the ***site***

(m) the location and dimensions of all proposed ***land disturbing*** activities

(n) the location and dimensions of all temporary soil or dirt piles

(o) the location, dimensions, design details and design calculations of all construction site control measures

(p) a schedule of the anticipated starting and completion dates of each ***land disturbing*** or ***land developing*** activity including the installation of construction site control measures

(q) provisions for the maintenance of the construction site control measures during construction

(r) the scale of the drawing

(s) any other necessary information with respect to the ***site***

(t) a written summary of the evaluation of ***site*** erosion potential based on basic information, such as slope gradient, slope length, and soil type (see Guidelines on erosion and Sediment Control for Urban Construction Sites)

(u) a written statement regarding the impact of the topsoil removal activities of the ***site*** on the downstream water uses

(v) an indication of the degree of erosion and sediment control measures anticipated, based on the ***site*** erosion potential and downstream impacts

(w) a re-vegetation scheme to be indicated for stripping areas subject to long term exposure

(x) a drainage plan showing the existing and proposed overland flow routes of the ***site***

(y) show location of any manholes which may be ½ or 2/3 bulkhead in order to trap sediment; sewer system to be cleaned periodically and to the City's satisfaction before assumption

(z) details of the basic "good housekeeping" practices to be implemented

(aa) procedures for monitoring and maintaining the erosion and sediment controls, including method of removing and disposing of sediment from any sediment traps

(bb) details of contingency plan for failure of control elements during extreme runoff events, when impacts from water are severe impacts

7.0 Stormwater Management

7.1 General

There are five watersheds within the City of Oshawa as follows:

1. Oshawa Creek
2. Harmony Creek
3. Montgomery Creek
4. Corbett Creek (drains into the Town of Whitby)
5. Farewell Creek (drains from the Municipality of Clarington)

The location of these creeks is illustrated in the Appendices.

Of the four, Oshawa Creek and Harmony Creek are the two primary watersheds. The City has completed and endorsed major studies on both of these primary watersheds. Any development occurring within these watersheds shall respect the recommendations of these studies. Copies of these studies can be obtained from Engineering Services at cost as follows:

1. Oshawa Creek Watershed Study (September 1995) - $50
2. Harmony Creek Subwatershed Plan Study (June 2001) - $55

It should also be noted that the Central Lake Ontario Conservation Authority is currently in the process of updating the Oshawa Creek Watershed Study. Consequently the developer should contact the City or C.L.O.C.A. to confirm the status of this study and any recommendations if development is proposed within this watershed.

7.2 City of Oshawa Interim Stormwater Management Policy

Policy & Procedure 2.3.1-022

Department of Public Works
Division: Engineering Services
Section: Administrative

Established: 1992 06 01
Approved By: D. M. Robertson
Date: 1993 03 26

Title: City of Oshawa Interim Storm Water Management Policy

Purpose

To provide an interim storm water management policy which will allow new development to proceed in an orderly fashion, without unduly affecting the quality of the environment.

Source

City Council Minutes, 1992 06 01.

Policy

“That the policy outlined in the Director of Public Works’ report dated 1992 05 26, Item No. 76-92, be adopted as the City’s interim position on storm water management until such time as the Master Drainage Studies for Oshawa and Harmony Creeks are completed and approved.“

Interim Storm Water Management Policy:

1. The City endorses the M.E.C.P./M.N.R. Interim Storm Water Quality Control Guidelines document, dated May 1991, as being the general basis for storm water management controls.

2. In the absence of the Master Drainage Plans, the extent of water quality controls shall be arrived at based on the Ministry of Natural Resources’ "no net loss of productive capacity of fisheries habitat" and any special requirements by the Central Lake Ontario Conservation Authority, the Ministry of Environment, Conservation and Parks, and the City.

3. The selection of storm water quality controls shall be in accordance with the MOE "Storm Water Quality Best Management Practices" (1991).

4. Storm water management facilities on City rights-of-way, easements, and City owned parkland or open space must be approved by the City, and will be owned and maintained by the City as part of its overall storm water collection system.

5. The Interim Storm Water Quality Control Guidelines (attached) be the basis for the controls.

Procedure

Interim Storm Water Quality Control Guidelines for the City of Oshawa

1. A storm water management plan shall be prepared for each new development. The plan shall address all the interim drainage elements that would permit the development to proceed in an environmentally sensitive manner. A concept plan shall be approved by the City prior to the formulation of draft plan conditions. This plan shall be required to be submitted in conjunction with the development application.

2. A sediment and erosion control plan shall be submitted to the City for review and approval prior to any works on site, or stripping or grading.

3. The approved sediment and erosion control measures shall be in place and be maintained in good condition prior to the commencement of construction.

4. Development setbacks from watercourses shall be established in conjunction with City, M.E.C.P./M.N.R., and C.L.O.C.A., and shall take into account the M.N.R./M.E.C.P. and C.L.O.C.A. guidelines and City requirements.

5. Topsoil stripped from a site must be stockpiled in such a way that it shall not erode and find its way to a watercourse. Any stockpiled topsoil shall be seeded to establish a temporary vegetative cover. Stockpile shall not be allowed within the vegetated buffer strip required to protect a warm water or cold water fishery.

6. In order to prevent disturbance of sensitive areas, snow fencing shall be installed along the limits of all creek banks, ravines, or vegetative buffer strips before any grading or construction commences.

7. The selection and design of the sediment and erosion control measures for a developing site shall be consistent with the current provincial standards (refer to the Guidelines on Erosion and Sediment Control for Urban Construction Sites, Urban Development Institute, May 1987, and "Technical Guidelines - Erosion & Sediment Control", February 1989, published by M.N.R.).

8. In order to maintain their effectiveness, it is the developers' responsibility to ensure that sediment and erosion measures shall be inspected daily and cleaned out and maintained as required. These measures shall also be inspected during the routine inspections carried out by the City's subdivision construction inspectors.

9. The criteria for the design and installations of storm water quality control facilities shall meet the requirements of the M.E.C.P./M.N.R. Interim Stormwater Quality Control Guidelines for new development, May 1991. Stormwater Best Management Practices (B.M.P.) shall be implemented using the B.M.P. selection process outlined in the Stormwater Quality BMPs report, June 1991.

10. In the absence of Master Drainage Plans, the local Best Management Practices plan shall be designed to address the existing watershed concerns on fishery, baseflow preservation and sediment accumulation within the Oshawa Creek and Harmony Creek Watersheds. The proponent shall be responsible for construction of B.M.P. facilities, if required.

11. The design of stormwater management controls shall be investigated at the earliest stage of development, and shall be coordinated with the Ministry of Natural Resources, the Central Lake Ontario Conservation Authority, and the Ministry of the Environment, Conservation and Parks. The use of soft B.M.P. approaches such as additional green spaces in addition to the implementation of buffer strips for the control of water quality concerns is encouraged.

12. Wetlands, recharge areas, environmentally significant areas and areas of natural and scientific interest shall be protected.

13. Techniques which promote infiltration from pervious areas and rooftops are encouraged.

14. In the absence of detailed studies or analyses which define groundwater contamination potential, the application of structural infiltration techniques, which accept runoff from roadways, in the areas located within the highly or moderately high sensitive regions identified in the Environmental Sensitivity Mapping Project Study, June 1978, or other special areas identified by the City is prohibited.

15. Construction of instream ponds which will impede the passage of fish is prohibited.

16. The use of natural channels and "natural channel design" is encouraged. In the event that channelization is deemed necessary, the design of the channel shall also satisfy the habitat protection provisions of the Federal Fisheries Act, and the guiding principle of the "no net loss" as discussed in the Department of Fisheries & Oceans Policy for the Management of the Fish Habitat.

17. An operations, maintenance and monitoring plan for any storm water retention/detention facility shall be provided to the City indicating the extent, type and frequency of maintenance required.

7.3 Stormwater Management Facility Design Guidelines

In general, the design of the facility shall comply with the M.E.C.P. Stormwater Management Practices and Design Manual (June 1994). In addition to the Manual, some of the parameters the City of Oshawa specifically requires are as follows:

- A wet pond design is preferred.
- The pond should be designed to be drawn down and maintained, primarily via gravity flow, to a maximum depth of 0.50m.
- The outlet draw down pipe should be flush with the bottom of the pond invert. A 0.50m deep lined sump with slopes not steeper than 5:1 should be incorporated into the design at this location.
- The permanent pool shall have a minimum depth of 1.5m and a maximum depth of 3.0m.
- The forebay bottom and side slopes should be lined with Terrafix Blocks or equivalent and the side slopes shall not be steeper than 5:1.
- A pipe connecting the main cell and the forebay should be provided in the forebay berm. The conveyance pipe invert should be located sufficiently above the anticipated 10 year accumulated sediment depth, but shall not be less than 0.60 m above the forebay invert.
- The forebay berm shall be lined with Terrafix Blocks or equivalent and the top elevation shall be set at the permanent pool water level.
- The side slopes below the permanent pool shall not be steeper than 5:1.
- The side slopes above the permanent pool shall not be steeper than 4:1.
- A transition Zone (safety ledge) shall have a minimum vertical depth of 1.0m and the slope shall not be steeper than 6:1.
- A minimum 4.0m wide access road shall be provided for maintenance purposes.

- A safety buffer of 5.0m wide with a maximum crossfall grade of 5.0% shall be provided around the perimeter of the pond.
- If there is a trail system linking the pond to the surrounding lands, then a standard 5.0m wide plateau (3.0m wide asphalt trail + 1.0m flat shoulders on both sides) shall be considered.
- The side slopes of the pond should be sodded from 0.6m below the permanent pool up to the top of the extended storage detention.
- A landscaping plan shall be prepared for the pond.
- The outlet structure/chamber (Hickenbottom) shall be contained in a manhole and embedded into the banks of the pond.
- The invert elevation of the inlet pipe shall be at the permanent pool level.
- The reverse sloped pipe invert elevation shall be the permanent pool at 0.6m above the pond bottom.
- In addition to the quality storage volumes, the pond volumes shall take into consideration the erosion storage volume in isolation of the quantity storage volume.

7.4 Stormwater Management Facility Operations and Maintenance

The design engineer shall prepare an operations and maintenance manual for the stormwater management facilities; including, but not limited to, instructions for the seasonal draw down of our stormwater ponds and long term monitoring plan to assess the performance of the facilities.

8.0 Place Holder

9.0 Site Alteration

This Section is under review

10.0 Construction

10.1 General

The purpose of this section is to aid the Subdivider/Engineer/Contractor by outlining the construction responsibilities and approval process pertaining to City of Oshawa Standards and Specifications as related to the construction of roads and services in new subdivision development.

The Subdivider should read this section in conjunction with Section 2.3, Post Construction Process.

Section 10.0 deals with specific construction requirements while Section 2.3 describes the details related to the acceptance process of the services and requirements or obligations of the Subdivider to obtain reductions of the securities for the municipal services covered by the agreement.

10.2 Contract Document Review

Refer to section 2.2.13 for submission and review requirements of the subdivision contract document.

Construction Services will provide a cursory review of the contract document and provide any comments to Development Engineering regarding modifications to the contract document to provide compliance with Oshawa criterion. At all times the Developer's Engineer shall be responsible to ensure all City of Oshawa standards, criteria and specifications are adhered to.

Where any error or omission is later discovered within the contract document, the Developer/Engineer acknowledges that the City of Oshawa's criterion shall take precedence.

10.3 Pre-construction and Site Meetings

Prior to the start of construction the Developer/Engineer shall arrange a pre-construction meeting to include representation from the following; Developer, Engineer, Contractor, Region of Durham, City of Oshawa and any other agencies involved with the development. Refer to section 2.2.14 for a list of information to be provided to the City of Oshawa at, or prior to the pre-construction meeting. This meeting shall not take place until 72 hours after the City has received the complete signed package including the drawings.

The Developer/Engineer, for the purpose of monitoring the progress of work and/or to resolve any issues that may arise, shall schedule regular site meetings (biweekly) during the construction process of the development.

A pre-paving site meeting shall be scheduled no later than 48 hours prior to any paving operation taking place. The meeting shall include representation from the Developer, Engineer, Contractor, Paving Contractor and the City of Oshawa.

10.4 City Inspection Responsibilities

The Developer/Engineer shall be responsible to administer the contract including the provision of ***full time onsite*** inspection services.

The City of Oshawa will perform periodic inspections to assure that the City's requirements are being adhered to.

10.4.1 On Site Inspections

The City's inspection shall include, but not limited to the following:

- Liaise with the Developer/Engineer on matters pertaining to the construction process.
- Provide regular site inspections during the construction process to ensure that City Standards and Specifications are being adhered to and that the work being performed is in accordance with the Subdivision Agreement.
- All proof rolls shall be done according to City of Oshawa proof roll criteria as defined in "Section 3 Roadways".
- The Consulting Engineer shall provide a C.C.T.V. Inspection Report including a complete list of deficiencies for sanitary sewer mainline, storm sewer pipe, foundation drain collector pipe and catch basin leads. All C.C.T.V. inspection reports must be submitted 5 business days prior to the placement of surface course asphalt. C.C.T.V. Inspection Reports for subdrains and FDC/storm house connections may be requested by the City Inspector on an as needed basis.
- C.C.T.V. Inspection Reports shall generally conform to the Region of Durham CCTV inspection requirements.
- Participate in joint inspections of Stage 1 and Stage 2 services to identify deficient work, confirm completion of such and to issue inspection acceptance certificates for Provisional and/or Final Acceptance of services culminating with the eventual assumption of the subdivision development by the City. The consultants written inspection reports are to be provided to the City of Oshawa inspector 72 hours after inspection has been completed.

Copies of all inspection reports are to be submitted to the City in a hardcopy and/or digital format acceptable to Infrastructure Services. Co-ordination of joint inspections shall be arranged through the City of Oshawa Supervisor, Construction Services, or his designate.

Joint follow-up inspections to assess, confirm deficiencies are not to be arranged unless and until the Engineer has inspected the contractor's work and is satisfied that it meets the City Standards and Specifications.

10.4.2 Related Inspections

The City's related inspection shall include, but not limited to the following:

- Investigate any complaints pursuant to the construction process received by the City and forward the information to the Developer/Engineer for corrective action.
- Inspect constructed roadways within the subdivision phases as well as adjacent City roads to ensure maintenance of a clean, mud-free condition.
- Inspect sedimentation control devices such as, but not limited to; catchbasins, siltation fences, rock check dams and temporary siltation ponds, to ensure proper maintenance and good working condition.

The City Inspector shall report any infractions related to the above items to the Developer/Engineer for the necessary corrective action(s). Should the Developer/Engineer fail to initiate the required corrective action(s) in a reasonable time, the City Inspector shall make arrangement to have the corrective action(s) undertaken by City forces and/or contract services. Should this action be taken, all related costs will be charged back to the Developer through the roadway damage and siltation control deposit on file with the City as part of the performance security provided by the Developer with the Subdivider agreement or through the draw down of the Letters of Credit on file as deemed appropriate.

10.4.3 Referee Testing

The Developer shall reimburse The City of Oshawa for all costs incurred while attending referee testing. This shall include staff time, mileage and meals. The cost per day shall be as per Schedule D in the subdivision approvals agreement.

10.5 Material Testing

The Developer/Engineer shall engage the services of a certified Laboratory (membership in C.C.I.L.) to provide quality control testing during all phases of the construction process.

The Laboratory shall be responsible for conducting tests on compaction, granular material, concrete and asphalt. Tests are to be conducted in accordance with current O.P.S.S. and C.S.A. standards and procedures.

The Laboratory shall assess any problems related to materials/quality control, which may arise during the construction process and recommend corrective measures as required.

Copies of all laboratory and/or field tests conducted shall be forwarded to the City Inspector on a daily basis.

City of Oshawa Laboratory personnel may conduct periodic quality control testing for comparison purposes and is not intended to replace the testing responsibilities of the Developer/Engineer.

Grain size analysis shall be performed on subgrade materials to confirm that the proposed subgrade material classification is still being met. The City shall receive a map showing test locations and results prior to placing any granular materials in the road base.

10.5.1 Minimum Testing Requirements

Compaction

Area	% Compaction	Frequency	Test Location Identification
Mainline sewer trench	95% (514.17.08)	15m, 0.6m maximum lift	Street Distance from downstream manhole, i.e. MH 23 + 30m
Mainline Watermain Trench	95% (514.17.08)	15m, 0.6m maximum lift	Street, Station and Offset
Road Sub-base	95% top 1.2m (501.08.02)	15m "Z" Pattern	Street, Station and Offset
Service Trenches	Same as Road Sub-grade	Random Selection	Lot Number
Watermain Crossings	Same as Road Sub-grade	Each crossing	Street, Station
Utility Trenches*	95% (sub-grade) (501.08.02)	Each crossing	Street, Station or Adjacent Lot Number

***Note:** Utility crossings are to be placed prior to placement of granulars.

Compaction

Area	% Compaction	Frequency	Test Location Identification
Curb Line Bedding	100% (501.08.02)	15m	Street, Station and Left or Right i.e. 0+030 R
Granular 'B'	100% (501.08.02)	15m "Z" Pattern	Street, Station and Offset i.e. 0+120, 3.5m R
Granular 'A'	100% (501.08.02)	Same as Granular 'B'	Same as Granular 'B'
Asphalt**	Table 9 (OPSS 310)	15m each lane	Street, Station and Left or Right, i.e. 0+120 south

****Note:** Recycled asphalt (R.A.P.) is accepted by the City of Oshawa, up to 30% RAP is permitted in base asphalt and up to 15% RAP is permitted in surface asphalt. Any RAP placed at over 20% requires a PG AC Bump down of 1 grade.

Ex 58-28 52-34 over 20% RAP
20% RAP or less over 20% RAP

Concrete

Item	Test Location Frequency	Identification
Curb and Gutter	▪ 1 Test per 50 m^3 of concrete ▪ Minimum 3 cylinders per location to break at 7 and 28 days ▪ Minimum of 1 test per day that concrete is poured ▪ Slump and air tests at each sampling location ▪ Conformity with O.P.S.S. 1350	Station, left or Right or Station, North, South, etc.
Sidewalk	▪ 1 Test per 50 m^3 of concrete ▪ Minimum of 3 samples per location to break at 7 and 28 days ▪ Minimum of 1 test per day that concrete is poured ▪ Slump and air tests at each sampling location ▪ Conformity with OPSS 1350	Station, left or Right or Station, North, South, etc.

Asphalt

Item	Test Location Frequency	Identification
All Hotmix	▪ Samples to be taken every 500t or per day of paving for each type of Hotmix. ▪ Samples to be taken on every street paved. ▪ Temperature shall be recorded for each sample taken (ambient air and hotmix temp.). ▪ Minimum 1 Marshal Test and 1 extraction test per day of paving ▪ Conformity to O.P.S.S. 1003, 1101, 1150 (AADT>5000) required ▪ One additional sample to be taken and saved for further testing in the event of required referee testing. ▪ Weather conditions shall be recorded with corresponding H.M.A. sample. ▪ Mix design is to be approved by City of Oshawa.	Station, left or Right or Station, North, South, etc.

Granular

Item	Test Location Frequency	Identification
Gran A, B and Select Subgrade Material	▪ All gravel shall meet OPS muni 1010 ▪ OPS 1010-B shall be invoked ▪ Samples shall be taken as per table B-2 in OPS 1010-B ▪ Minimum of 1 gradation test shall be analyzed per street	Station, left or right or Station, North Lane, South Lane, etc.

Item	Test Location Frequency	Identification
	▪ Minimum of 1 sample of granular shall be analyzed per day if Granular material is being imported to site ▪ There is no borderline result for a Granular Material. The sample either passes or fails. ▪ If a sample fails the gradation, testing frequency should be increased until the City is satisfied that material consistently meeting the specifications is being delivered. ▪ No Rap or Crushed Concrete material is permitted in Granular Materials unless approved by City Inspector. ▪ Crusher Run Limestone is not permitted to be used as a Granular A material unless approved by City Inspector. ▪ Granular tests shall be submitted to the City no more than 48 hours after Granular material is sampled. ▪ A map showing each test location and its result (pass or fail) shall be produced and submitted to the City prior to placing base asphalt.	
	▪	

Topsoil

Item	Test Location Frequency	Identification
Topsoil	▪ Topsoil sample shall be collected from suppliers stockpile prior to being imported to site. The sample shall be tested and meet the requirements found in section 10.6.8, Topsoil acceptance requirements section. ▪ 1 sample of Topsoil shall be tested for every 250 linear meters of area that topsoil will be applied. ▪ Samples shall adhere to the requirements found in section 10.6.8 Topsoil acceptance requirements section.	Station, left or right or Station, North Lane, South Lane, etc.

10.6 Acceptance Criteria

General

- Guidelines should be established by the Developer/Engineer for the protection of Municipal Infrastructure during house construction.
- Procedures for concrete placement (hot and cold weather), cutting of control joints and curing of concrete should be strictly adhered to.
- Completion of driveway and boulevard areas by the homeowners/builders will not be a determining factor for the replacement of deficient curb and gutter or sidewalk.
- All concrete shall adhere to O.P.S.S. MUNI 1350. The concrete temperature at the time of discharge from the truck shall be between 10 and 28 °C as per O.P.S.S. MUNI 1350.07.02.

10.6.1 Two Stage Curb and Gutter Acceptance Criteria

Reinforced base curb

- As per OS 602 ; O.P.S.S. 353
- All curb with structural damage is to be removed and replaced
- Minimum length of curb replacement to be 1.5 m. No remaining section to be less than 1.5 m
- Hairline and/or shrinkage cracks may be left in place provided the crack width is not greater than 0.5 mm
- Based on test results any sections that do not meet the specified concrete design criteria are to be removed and replace
- No sawcuts to be made in the base curb

Top curb and gutter

- As per OS 602 ; O.P.S.S. 353
- All curb and gutter with structural damage is to be removed and replaced
- Curb and gutter with cracks greater than 0.5 mm in width is to be removed and replaced
- Diagonal and/or longitudinal cracks are to be removed and replaced
- Curb and gutter sections with over 25% spalling or scaling are to be removed and replaced

- Misaligned, settled or sections causing excessive ponding are to be removed and replaced
- Based on test results any sections that do not meet the specified concrete design criteria are to be removed and replaced
- Minimum length of replacement to be 1.5 m. No remaining section to be less than 1.5 m in length
- 1.5 m sections are not to be considered the standard. Only two (2) consecutive 1.5 m sections are allowed
- Reflective cracks should not be saw-cut
- Deficient top curb and gutter to be removed and replaced prior to the placement of surface asphalt

10.6.2 Sidewalk Acceptance Criteria

- As per OS 300 series standard drawings; O.P.S.S. 206, 310, 314, 351, 501, 510

Sidewalk shall be removed and replaced under the following circumstances:

- Sidewalk or ramps constructed in excess of maximum or below minimum grade or crossfall
- Structural damage
- Misaligned, heaved or settled by generally causing a discontinuity of 10mm or greater
- Spalling or scaling over 25%
- Tooled perpendicular edges
- Improper curb taper lengths as per OS-304 (this shall also include removal and replacement of the curb & gutter)
- Graffiti or imprints and/or depressions causing ponding
- Where expansion joint material has not been installed to full depth of the concrete sidewalk.

Corrections to any deficiency must be a minimum 1.5m length or between either existing control joints. Corrections at sidewalk ramps may also necessitate corrections to adjacent curb and gutter sections.

10.6.3 Asphalt Acceptance Criteria

- All asphalt shall conform to O.P.S.S. 310
- All P.G.A.C. shall conform to O.P.S.S. 11-01.

- OPS 310 Table 7 and Table 9 shall be deleted and replaced with amended Table 7 and Table 9 presented below.

TABLE 7

Tolerances for the Job-Mix Formula Aggregate Gradation and Asphalt Cement Content

Mix	Attribute	Tolerances on the Job-Mix Formula (Note 1) %	
		Acceptable	Rejectable
Surface Course	DLS, 4.75 mm Sieve size	< 7.0	> 7.0
	600 µm sieve size	< 4.5	> 4.5
	75 µm sieve size	< 2.5	> 2.5
Binder and Levelling Courses	DLS, 4.75 mm sieve size	< 8.5	> 8.5
	600 µm sieve size	< 5.0	> 5.0
	75 µm sieve size	< 2.5	> 2.5
All Mixes	Asphalt Cement	4.7%-5.4%	Less than 4.7% Greater than 5.4%

Note:

1. Tolerances on the job-mix formula apply as both plus and minus from the job-mix formula percent.

TABLE 9

Air Void Criteria for Hot Mix Asphalt Types (LS-265)

Mix	**Acceptable %**	**Rejectable %**
DFC	2.5 to 4.5	< 2.5 and > 4.5
All Other Mixes	2.5 to 5.5	< 2.5 and > 5.5

- The contractor shall be solely responsible to ensure that the quality control tests, specifically for aggregate gradation, asphalt cement content and/or air void content fall within the acceptable limits category of OPS 310 Table 8 and amended Table 7 & 9. Results are either Acceptable or Rejectable.

- Asphalt cores are not an acceptable substitute for referee samples and will only be undertaken at the discretion of the City. Failure to produce a proper referee sample as per the City's design criteria may result in the City denying a referee test request, and as such, the asphalt results represented by the proposed referee test will be deemed rejectable.

- Surface course asphalt shall not be placed after November 15 without written consent from the Director of Engineering, or designate. When consent is granted the execution of the work must still conform to the requirements of O.P.S.S.

- Base asphalt shall not be placed after December 1 without written consent from the Director of Engineering, or designate. When consent is granted the execution of the work must still conform to the requirements of O.P.S.S.

- All paving requires use of an approved MTV (material transfer Vehicle) / Shuttle buggy for transfer of hotmix to the spreader.

- Any hot mix being placed after Nov 1st shall require the addition of a warm mix additive. The type of warm mix additive being used shall be approved by The City of Oshawa. A new mix design shall be submitted to the City of Oshawa.

- All hot mix asphalt mix designs shall have minimum of 5% asphalt cement content.

- Maximum temperature for hot mix asphalt shall be 165°C; any asphalt heated above this maximum shall be considered rejectable.

- No paving shall take place in the rain unless authorized by City of Oshawa.

- Any Job Mix Formula adjustments must be approved by the City of Oshawa. The request shall consist of a properly filled out JMF adjustment form signed and stamped by a member of PEO and should include a reason for the request.

- Any JMF adjustment submitted after paving and QA results have been completed will not be accepted unless the City of Oshawa deems the change is required.

- The Contractor shall use an approved method of re-heating, re-working and compacting all centerline longitudinal cold joints. Contractor shall use an infra-red heating system, capable of maintaining a minimum temperature of 93°C to produce a welded joint, without scorching or burning the mix. The density of the asphalt at any longitudinal joint measured within 0.3m of the joint, shall be within 1.5% of the mainline mat density.

- All paving shall be in echelon or the use of a joint heater could be considered as an alternate.

- The City of Oshawa shall receive 2, 1 litre asphalt cement samples within 24 hours of paving. The sample shall be obtained as per OPS11-01.08.03.

- Any hot mix placed not conforming to the Operational constraints described in O.P.S.S. 310.07.06.02 will be considered rejectable.

- Any corrective action proposals submitted by the consultant will be reviewed by The City of Oshawa. The final decision on the corrective action will be solely at the discretion of The City of Oshawa.

- Tack coat shall be applied as per O.P.S.S. 310.

- Minimum size of any asphalt patch is dependent upon available compaction equipment and the ability to properly compact the granular base and H.M.A.
- Minimum dimension of an asphalt patch shall be determined by City of Oshawa inspector.
- The City of Oshawa shall not accept more than a 30mm thickness of H.M.A. padding unless otherwise approved by City of Oshawa inspector.
- Based on the supporting information made available, the City of Oshawa shall identify the limits of all deficient H.M.A. that has been placed. All costs associated with addressing the deficient H.M.A. shall be borne by the Developer. Base asphalt inspections shall have representation from City Construction staff, the subdivision consultant, and the consultant's geotechnical engineer.

10.6.4 Material Specification for Performance Graded Asphalt Cement (OPSS. MUNI 1101)

All asphalt cement shall conform to OPSS. MUNI 1101.

10.6.5 Calcium Carbonate Acceptance Criteria

The Subdivider's Engineer shall undertake visual inspection of the foundation drain collector (F.D.C.) main for calcium carbonate build-up once per year after homes have been connected to the system. The initial inspection shall be carried out within one year after the first home is connected to the system and every year thereafter until assumption. If calcium carbonate build-up is identified through any inspection, the City shall be notified and the Subdivider shall take necessary investigations to identify the lots contributing to the calcium build-up and their laterals shall be cleaned. The Subdivider's Engineer shall initiate a higher frequency of inspection in such areas to determine the rate of build-up and frequency of cleaning required. Prior to final assumption, the Subdivider shall complete a .C.C.T.V. inspection of all F.D.C. mains to ensure that the system is clean. The video shall be submitted to the City with a report from the Subdivider's Engineer, summarizing the dates and findings of all inspections performed since connection of the first home, any issues encountered with respect to calcium carbonate, their location, and actions taken. The report shall be submitted in a format acceptable to Infrastructure Services.

10.6.6 Bridge Acceptance Criteria

Ontario Regulation 160/02 – Standards for Bridges, dictates that the structural integrity, safety and condition of every bridge shall be determined through the performance of at least one inspection every 2 years under the direction of a professional engineer and in accordance with the Ontario Structure Inspection Manual; as published and amended by the Ministry of Transportation.

The following will be required;

- An OSIM Inspection report signed and sealed by a professional engineer licensed to practice in the Province of Ontario certifying substantial completion of the structure and structural integrity of the structure prior to opening to traffic.

- Complete OSIM Inspection every 2nd year from the date of substantial completion to Stage 1 Final Acceptance. A current OSIM Inspection report (within 60 days) must be submitted to the City prior to Stage 1 Final Acceptance certificate being issued by Construction Services.
- Developer shall be responsible to satisfactorily address/repair all deficiencies noted in the inspection reports and maintain the structure prior to any acceptance procedures by the City and as necessary during interim inspections to address safety concerns and standard maintenance requirements.
- In addition to the OSIM Report the following, but not limited to, will be required for Stage 1 Provisional Acceptance;
    - All shop drawings, indicating "as constructed", mix designs, manufacturer specifications and construction photos.
    - All testing results (bearing capacity, compaction, granular gradation, etc.) reinforcing steel inspections, girders (including mill certificates), concrete piles, pre-cast concrete inspection records, asphalt, waterproofing membranes and waterstops inspection records, etc. as appropriate.
    - All extra work orders, written field instructions/notes and construction photos

10.6.7 Compaction of Granular Materials

- Granular Material must have a moisture content not less than 2% or more than 1% higher than the optimum moisture content.
- Compaction testing of Granular A material must take place within 72 hours of paving operation.
- Compaction testing of Granular B material must take place within 72 hours prior to placing concrete or Granular A material on the compacted Granular B material.

10.6.8 Topsoil Acceptance Criteria

Topsoil shall be tested for the following parameters and meet the specifications provided:

- pH 5.5 – 7.5
- Organic Matter (%) 4-15
- Total Salts (mmhos/cm) <1.5
- Phosphorus (ppm) 10-60
- Potassium (ppm) 80-250
- Calcium (ppm) 1000-4000
- Magnesium (ppm) 100-300
- Sodium (ppm) <200
- Sodium Adsorption Ratio <15
- Chloride (ppm) <100
- Sand % 20-75
- Silt % 5-50
- Clay % 5-30

A general fertility guideline for turf grass shall also be submitted. This guideline shall include recommendations for type of fertilizer and/or other soil enhancement chemicals to

be added as well as providing an application rate. The recommended enhancements shall be applied as per the recommendation.

If any of the above guideline's are not met, the City will require a signed recommendation from an Agronomist indicating recommendations and materials to be added to the topsoil to make it suitable for use.

Topsoil shall be screened and free of stones, roots, subsoil, clay lumps, litter and/or other deleterious materials.

Topsoil shall not contain any sod clumps, crab grass, or noxious weeds.

Topsoil shall not be delivered or placed in a frozen or excessively wet state.

10.7 Construction Services Inspection - Acceptance Certificates

10.7.1 Acceptance Certificate re: Provisional Acceptance of Stage 1 Services

Authorization certificate of inspection recommending commencement of the maintenance period for City services, shall be issued by Construction Services to Development Engineering upon completion, submission, review and satisfactory approval of the following:

- C.C.T.V. inspection report of all storm sewers, F.D.C. sewers and catch basin leads (subdrains and FDC. storm house connections as requested) shall be submitted in accordance with the Region of Durham specification 01450 Quality Control Section 1.07 Camera Inspection. Additionally, all reports shall be submitted in a digital format complete with U.T.M. coordinates for all maintenance holes to a precision of one decimal place. Correction of all noted deficiencies to the satisfaction of the City of Oshawa (including Region of Durham Services) is required prior to paving base asphalt.

- Submit all soils and material test results for Stage 1 Services – Geotechnical Report

- Provide tabulated list of as-built inverts, pipe lengths and pipe grades of all storm sewers, F.D.C. sewers, catch basin leads and storm sewer connections (refer to Appendix 20 for acceptable format – electronic version is available upon request). In addition, as-built design sheets for storm sewers and F.D.C. sewers shall be provided. The consultant shall update the original design sheets, highlighting deficient runs and options for correction for review and confirmation by Water Resources section of Engineering Services.

- House service connections (laterals) for F.D.C. and Storm sewers (where roof drain connections are provided for street town homes) are required to be shown on a location plan; refer to Appendix 21 and 22 for format requirements.

- As-built information of all control grade elevations (pond invert, berm weirs, orifice plate, riser pipe inlets, etc.) together with piping inverts and grades for any stormwater management facility for review and confirmation by Water Resources section of Engineering Services. This is to be verified by topographical survey. This information shall also be included in the final submission of the as-built Engineering design drawings.

- Any other sketches or survey that may be considered necessary for specific circumstances as determined by Construction Services.

- Joint inspection of all Stage 1 works as outlined in the Subdivision Agreement, a copy of the deficiency list to be supplied to the City within 72 hours of the inspection. All deficiencies to be addressed prior to issuing acceptance letter.

- Satisfactory repairs to all deficiencies as identified through the joint inspection, C.C.T.V., testing results, reports, surveys, etc.

- A map showing all asphalt, granular and concrete test locations shall be supplied to the City prior to receiving provisional acceptance. The map should indicate all test results as a pass or fail.

Acceptance inspection and approval of sanitary and water services shall be conducted by Region of Durham personnel and a certificate of acceptance letter submitted to Development Engineering.

All requirements and documents for Provisional Acceptance as noted in Section 2.0 must be submitted to Development Engineering to attain Provisional Acceptance of Stage 1 Services and formalize the date of the maintenance period commencement.

10.7.2 Acceptance Certificate re: Provisional Acceptance of Stage 2 Services

Authorization certificate of inspection recommending commencement of the maintenance period for City services, shall be issued by Construction Services to Development Engineering upon completion, submission, review and satisfactory approval of the following:

- Submit all soils and material test results for Stage 2 Services – Geotechnical Report

- Joint inspection of all services for Stage 2 works as outlined in the Subdivision Agreement

- Satisfactory repairs to all deficiencies as identified through the joint inspection, testing results, reports, surveys, etc.

- Any other sketches or survey that may be considered necessary for specific circumstances as determined by Construction Services

All requirements and documents for Provisional Acceptance as noted in Section 2.0 must be submitted to Development Engineering to attain Provisional Acceptance of Stage 2 Services and formalize the date of the maintenance period commencement.

10.7.3 Acceptance Certificate re: Final Acceptance of Stage 1 and Stage 2 Services

Final inspections by City and Regional personnel will be conducted at a time prior to the termination dates of the maintenance periods. The Engineer, shall contact the City inspector not less than 60 days prior to the expiration of the maintenance period to arrange a joint inspection.

In the case of Stage 1 Services, the following must be completed prior to Construction Services issuing an Acceptance Certificate:

- The Subdivider shall be responsible for ensuring that a SECOND C.C.T.V. INSPECTION REPORT complete with sanitary mainline sewer. Any identified repairs or issues shall be rectified to the City's satisfaction (including Region of Durham services) prior to paving surface asphalt.
- The second submission of C.C.T.V. shall be inclusive of all original second submission video and all post repair video as identified in the original second submission of C.C.T.V. All post repair video shall be complete from manhole to manhole.
- Manhole and line numbers will be provided by the City and must be reflected in all videos and reports.
- The final report shall be arranged to follow sewers in a street by street manor, i.e. all videoed lines from Street "A" shall be reported and arranged in order before videoed lines from Street "B" are presented.
- Receipt of the Region of Durham's Final Acceptance Certificate
- Provisional acceptance of Stage 2 Services

In the case of Stage 1 and 2 Services, the following must be completed prior to Construction Services issuing an Acceptance Certificate:

- Joint inspection of all services as outlined in the Subdivision Agreement
- Satisfactory repairs to all deficiencies as identified through the joint inspection, C.C.T.V., testing results, reports, surveys, etc.
- Any other sketches or survey that may be considered necessary for specific circumstances as determined by Construction Services

All requirements and documents for Final Acceptance as noted in Section 2.0 must be submitted to Development Engineering to attain Final Acceptance of Stage 1 and 2 Services.

10.8 Mud Control Policy

The City has established a policy relating to standards and procedures to be followed for the cleaning of streets required as a result of deposition of mud and dust from development/building activity. A copy of this policy is provided in the Appendices. The

developers and their respective builders are required to establish a regular cleaning program to mitigate the mud and dust issues on their site. Should the enforcement of the policy by the City become necessary, the developer's deposits/Letters of Credit will be drawn down to cover the associated cost.

11.0 Pavement Markings, Signage, and Streetlighting

11.1 Pavement Markings

11.1.1 General

Generally, all pavement, hazard and delineation marking designs shall conform to the Ontario Traffic Manuals (O.T.M.) and the Ontario Provincial Standards (O.P.S.), and shall be approved by the City of Oshawa Works and Transportation Division.

A solid yellow centerline is required on all arterial and collector roadways and shall conform to the OTM requirements.

All proposed pavement markings must be installed prior to opening any roadway to traffic.

11.1.2 Stop Bar

Stop bars are required at all intersections with an arterial road and at a collector/collector intersection and shall be located as per the O.T.M. and/or OS-401. Installation of 25m on Arterial Roads, 15m on Collector Roads, 10m on Local Roads centre line paint tails are also required at the above noted intersections. Applicable vehicle turning templates shall determine the appropriate location of any left turn lane stop bar. Stop bars shall be 60 cm in width.

Stop bars and tails are required on all approaches at any signalized intersection or all way stop intersection regardless of road designation.

Main street stop bar(s) shall be perpendicular to main street roadway. Minor street stop bar(s) shall be parallel to main street roadway.

11.1.3 Pedestrian Crosswalk

Crosswalk lines are required at all intersections with an arterial road and at all SIGNALIZED intersections, all ALL-WAY STOP intersections, all Collector/Collector intersections (only where sidewalks exist) and shall be located as per OS-401 and the O.T.M. Crosswalk lines shall be 10 cm in width. The location of the pedestrian crossings shall determine the location of pedestrian crossing ramps.

11.1.4 Pavement Markings-Type

Permanent pavement markings shall be as per O.P.S.S. 710 and O.P.S.S, 1716 and are to be installed upon completion of Stage 1 and 2 paving and prior to opening the roadway to traffic.

Acceptable products are Lafrenz System 400, or products on M.T.O.'s D.S.M. listing (see D.S.M. #5.85.43). 2-part Field Reacted Polymeric Line markings spray method commonly known as 2-part spray M.M.A. (Methyl Methacrylate) is acceptable.

Glass beads shall meet the requirements of O.P.S.S. 1750. Acceptable manufacturers are those listed on M.T.O.'s D.S.M. listing (see D.S.M. #5.85.38). Note that subsection

1714.05.04 of O.P.S.S. 1714 requires both premixed and surface applied glass beads for the screed application method.

Pavement markings and symbols shall be placed by the extrusion (screed) method. Appropriate straightedges shall be used for all line work and templates are to be used for symbols.

Temporary pavement markings shall be as per O.P.S.S. 710 and O.P.S.S. 1716 and are to be installed upon completion of Stage 1 paving and prior to opening the roadway to traffic.

11.1.5 Obliteration- Existing Pavement Markings

Prior to placement of new and/or replacement pavement markings, obliteration of existing pavement markings shall be completed by abrasive blasting as per O.P.S.S. 710 Special Provision No. 710S03. The lines shall be completely removed with no residual paint.

11.2 Signs

11.2.1 General

All proposed signage should generally conform to the O.T.M., unless otherwise specified, and shall be approved by the City of Oshawa Works and Transportation Division.

Existing utility poles are acceptable for mounting, if feasible (as per OS-406).

All proposed signage must be installed prior to opening any roadway to traffic.

11.2.2 Street Name Signs – Location

Street name signs shall be placed at each intersection and shall identify each street at the intersection. The location of the street name signs shall be as per OS-407.

Street name signs may be installed on light or hydro poles if positioned in an appropriate location (as per OS-406).

Where the above poles are not available, signs are to be installed on the following.

(a) **Decorative Street Name Signs:** 75mm O.D. posts powder coated black.

(b) **Standard Street Name and Veteran Street Name Signs:** square wooden posts.

(c) **Mast Arm Signs:** traffic signals (as per Region of Durham standards).

All poles must meet all applicable O.P.S. requirements for materials; such as the wood posts (OPSS 1601), etc.

11.2.3 Street Name Sign – Type

Unless otherwise approved intersection street name signs shall be double sided and be as per OS-411, OS-412, and/or OS-413.

The City has two standards for street signs. The basic standard street name sign is a 150mm or 200mm extruded aluminum blade sign with white lettering on a blue background in reflective material. These signs are generally installed either on a 100mm x 100mm wooden post or on a light standard if suitably located. Where approved, the Subdivider may choose a decorative sign (ROSCO style) with reflective sheeting in a choice of available colours including a community name and graphic, if applicable. The decorative post shall be black, powder-coated steel with a decorative bell at ground level.

11.2.4 Traffic Control/Regulatory Signs

All Regulatory and Warning signs shall conform to the O.T.M. and/or any other legislative requirements for location, type, size, sign materials, reflectivity, and installation.

11.2.5 Fasteners and Mounting Brackets

All fasteners and mounting brackets are to be stainless steel or hot dipped galvanized according to CAN/CSA G164

11.2.6 Pavement Marking and Signage- Roundabouts

All signage and pavement markings shall conform to O.T.M., and/or any other legislative requirements.

11.2.7 Pavement Marking and Signage - Bicycle Lanes/Routes

All signage and pavement markings shall conform to O.T.M., and/or any other legislative requirements.

11.2.8 School Zone

Where the subdivision incorporates a school area, all related signage shall utilize the fluorescent yellow/green (F.Y.G.) sheeting (i.e. school zone, school crossing ahead, and school crossing).

11.2.9 Park Area

Where the subdivision incorporates a park area, 40 km/h speed limit and WC-3 (play area) signs are to be installed on all streets surrounding the park area.

11.2.10 Signage on Regional Roads

For signage on regional roads, refer to the Region of Durham's standards and specifications.

11.2.11 Policy and Procedure Regarding Decorative Lighting and Signage

Use of decorative street lighting and street signage must meet the City's criteria as set out in this manual. A copy of the policy and procedure is provided in the Appendices. **Prior to the first submission of engineering drawings, the Subdivider must indicate, in writing, their intent to use decorative lighting and signs.**

11.3 Streetlighting

11.3.1 General

The Subdivider is required to retain the services of a qualified utility design consultant to complete a design of the electrical distribution system to service the development, including a streetlighting design to the satisfaction of Works & Transportation Services. The electrical distribution design is to be confirmed by Oshawa Public Utility Commission Networks Inc. (O.P.U.C.N.). Alternatively, the Subdivider can contract O.P.U.C.N. to complete the design and installation of the electrical distribution system and streetlighting as part of their offer to connect. Regardless of which alternative the Subdivider chooses, O.P.U.C.N. and the Subdivider will need to finalize an offer to connect to provide for the review of the design and the inspection of the electrical distribution by O.P.U.C.N. as the licensed authorized agent, and to allow the installation of the system to be energized.

Prior to issuance of any building permits for property within the plan, the Subdivider is required to provide satisfactory evidence or a copy of the contracts with O.P.U.C.N. and the private contractor to confirm the installation of the essential electrical service and streetlighting has been addressed.

11.3.2 Standards

The City of Oshawa currently has three street light standards that are acceptable in new residential development. The basic standard includes a cobra head street light mounted on a grey concrete pole. The Subdivider may also choose a decorative standard that uses a Victorian style coach lamp and polished black octagonal concrete pole. The City has also approved the Trafalgar Telecommunications pole as an alternative decorative lighting standard. All luminaires are to be L.E.D. technology as approved by the City's Works and Transportation Services Division.

It should be noted that the use of the Trafalgar Pole will require the execution of a separate agreement with the Subdivider, the City Works and Transportation Branch, and the respective telecommunication companies.

11.3.3 Pre-Construction

Prior to start of construction the developer/engineer is required to finalize the Utility Coordination Plan (U.C.P.) as part of any pre-servicing approval or conclusion of the Subdivision Agreement. The U.C.P. will be part of the engineering drawings as set out in Section 2.0 and Section 12.0. The developer/engineer is also required to have an application for municipal consent on file with the City's Design Services Division for any utility plant required to be installed to service the subdivision that is outside the limits of the development and/or phase.

11.3.4 Post-Construction

Following installation of the electrical distribution network and the approval from O.P.U.C.N., the Subdivider/Engineer must contact Works & Transportation Services to arrange for an inspection of the streetlighting. The Subdivider/Engineer will provide all necessary ESA documentation to the City's Works and Transportation Services prior to the

inspection. The Subdivider will be responsible to correct any deficiencies noted during the inspection.

Following any corrective requirements completed by the Subdivider, the City's Works & Transportation Services will provide a certificate of inspection to Development Engineering noting that they are satisfied with the installation. The warranty period will then commence as a Stage 1 Service in accordance with the terms and conditions of the subdivision agreement.

Development Engineering will process the appropriate reduction of securities and issue provisional acceptance of the Stage 1 Services subject to receipt of all other documents as set out in Section 2.0. During the warranty period, the Developer and their contractor are responsible to maintain the streetlighting. If in default, Works & Transportation Services will have the deficiency repaired or replaced as necessary at the sole cost of the Developer. In default of payment, the City has the right to draw the necessary funds from the securities provided to the City with the subdivision agreement.

11.3.5 Inspections and Assumption – Streetlighting

The Subdivider/Engineer is responsible to arrange a joint inspection with the City's Works & Transportation Services prior to conclusion of the warranty period for the Stage 2 Service to ensure all deficiencies have been addressed.

Works & Transportation Services will forward a final certificate of inspection to the Development Engineering Division for consideration and to allow for process of a final acceptance certificate of the Stage 2 Services.

Upon acceptance, Works & Transportation Services will assume responsibility for the repair and maintenance of the streetlighting. However, under the roadway deposit of damages the Subdivider shall remain financially responsible as outlined in the permit.

In the event that there is any dispute as to how the damage occurred, the Subdivider acknowledges as part of the terms and conditions set out in the subdivision agreement that the decision of the City shall be final.

12.0 Utility Coordination

12.1 General

The mandate of this process is to establish a final design location for all above ground and below ground utility plant and structures having respect to limit and co-ordinate structure locations, so as to provide reasonable accommodations in accordance with City Council Street Tree Planting Policies.

To identify all utility servicing work and to provide for municipal consent within new subdivisions, the Engineer must submit Utility Coordination Plans (U.C.P.) as part of the engineering submission for review and approval. The purpose of which is to establish the location of streetlighting and non-municipal utility services in a coordinated manner. This will formally recognize and provide for the requirements of the above ground hardware and utility plant needed for the delivery of various utility services that acknowledges and illustrates their relationship in the municipal road allowance with all other municipal services and the private driveway locations. The conclusion of this plan forms the basis to determine street tree planting in accordance with City Council Street Tree Planting Policies.

The acceptance of UCP as part of the engineering that form Appendix "II" of the subdivision agreement forms the municipal consent by the City for the installation of the utilities.

Any external utility servicing plant required as part of servicing for the subdivision which needs to be extended on existing municipal road allowances is subject to a municipal consent application process through the Design Services Division of Engineering Services.

12.2 Plan Submission Requirements

The U.C.P. forms an integral part of the engineering submission requirements as set out Subdivision Development Process, Section 2.0. The Subdivider/Engineer must solicit the utility designs early in the process of the pre-engineering exercise to establish all of the servicing requirements of the subdivision. The U.C.P. must be included as part of the first engineering design. Acceptance of the U.P.C.'s are required, prior to consideration of pre-servicing approval and/or final engineering submission for preparation of the subdivision agreement.

The plans are to be at a scale of not less than 1:500 and must illustrate the following:

- Road allowance property lines with all lot and block property line fabric of the subdivision with their corresponding street names, lot and block identification numbering.
- Street curb lines and sidewalks.
- Proposed driveway location illustrating actual width to match the housing form.
- Streetlighting and wiring schematics, connection to transformer with locations of disconnect switches.

- Manholes, catchbasins, hydrants shown with all main line piping together with corresponding service connections, and any specific traffic controls.

- Community mailbox locations. Locations for mailboxes should always provide consideration for accessibility with a priority to locate them adjacent to the municipal sidewalk. Additional location criteria is as follows.

    - Along the flankage (sideyard) of corner lots.
    - Next to an open space or park lands.
    - Not closer than 10m from a fire hydrant or bus stop.
    - Location shall not impede vehicular and/or pedestrian sight lines.
    - Locations not adjacent to sidewalks shall not be constructed except at the sole discretion of the Engineering Department.

- Underground plant location of all utilities together with any associated above ground hardware, all which are to include dimensioning from lot line and street lines as appropriate to accurately assess the proposed locations in accordance with the appropriate City Design Standards. Care should be taken to ensure that all utility designs are extended to accommodate any future phasing and to eliminate any future Municipal Consents.

- Underground conduit crossing locations, depth, quantity and dimensional location.

12.3 Pre-Construction

Prior to the installation of any utilities, the U.C.P. must be endorsed by the respective utility authority and accepted by Development Engineering.

Municipal consent must also be granted by the City Design Services Division for any utility installation required beyond the limits of the subdivision plan prior to construction of the proposed services.

12.4 Construction

All utility duct road crossings must be placed in conjunction with road base construction and prior to installation of sub-drains.

12.5 Post-Construction

The installation of all utilities are completed as private contracts by the Subdivider. Following installation of utilities as per the U.C.P., the Subdivider/Engineering is required to provide "As Built" drawings as part of the final acceptance process as set out in Section 2.0.

Any additional utility plants required post-construction that are not included on the U.C.P. must be approved through the Municipal Consent process. Where municipal consent is taking place on an unassumed road, the utility company must circulate the developers engineer who shall acknowledge receipt by stamping the drawings.

Any temporary poles required during the building process will not be permitted within the right of way. Power supply within the right-of-way for the temporary system must be approved through the Municipal Consent process.