



THE REGIONAL MUNICIPALITY OF DURHAM

DESIGN SPECIFICATIONS FOR ENGINEERING SUBMISSIONS

WORKS DEPARTMENT

1. TABLE OF CONTENTS

1.	TABLE OF CONTENTS	1
2.	General	3
3.	Engineering Submissions - Subdivision Development.....	4
3.1	Functional Servicing Report	4
3.2	Engineering Drawings Review	5
3.3	Information Required for Approval of Engineering Drawings	6
4.	Engineering Submissions – Site Plan Development.....	10
4.1	Basic Requirements for Site Servicing Plans	10
4.2	Drawing Requirements	11
5.	Requirements for Regional Contracts	13
5.1	Personnel Qualifications	13
5.2	Project Standards	13
6.	Engineering Submissions – Regional Contracts.....	14
6.1	Engineering Drawings.....	14
6.2	Format and Content Requirements.....	15
6.3	Reproduction and Distribution.....	17
6.4	Design Documentation and Interim Drawings.....	17
6.5	Final Tender Package.....	17
6.6	Tender Documents	18
6.7	Contract Drawings	19
6.8	Drawing and File Naming Convention.....	22
7.	Easement Requirements.....	24
8.	Separation / Location for Watermains, Sanitary and Storm Sewers and Utilities	25

8.1	Road Allowance	25
8.2	Parallel Installations	25
8.3	Watermain, Sanitary and Storm Sewer Crossings	25
8.4	Utility Crossings	26
8.5	Bridge and Culvert Crossings	26
8.6	Other	26
9.	Preparation of Subdivision & Servicing Agreement.....	27
10.	Ministry of Environment, Conservation and Parks (MECP) Approval	28
10.1	Transfer of Review Approval Program	28
10.2	Requirements for MECP Submissions	29
11.	As Built/ Record Drawings and Standard Forms for Region of Durham Services Submissions	31
11.1	Final Measurement Sketches.....	31
11.2	Lateral Location Sheets	33
11.3	As-Built Field Survey.....	33
11.4	As Built/Record Drawings	34
11.5	Sanitary Drainage Plans	36
11.6	As-Built Design Sheets	36
11.7	Shop Drawings.....	36
11.8	Camera Inspection	37

2. General

The following requirements shall be used as guidelines for the preparation of all engineering submissions presented to the Region of Durham for approval.

The Region of Durham's Water Supply System By-Law 89-2003 and Sewer System By-Law 90-2003 are to be used in-conjunction with the Region of Durham's Design Standards or most recent amendment(s).

There are two distinct types of engineering submissions: development-related submissions, and the submissions for regional contracts. Each submission type has its own requirements, and it is the responsibility of the consultant/developer to ensure that these requirements are met to avoid delays in reviewing and processing the necessary approvals.

Prior to beginning the design for any Region of Durham services, the developer / consultant shall meet with Region of Durham staff to obtain or clarify Region of Durham requirements for presentation of engineering submissions.

The following sections outline the requirements of the Region of Durham with respect to the review and processing of engineering drawings for the construction of regional services and infrastructure.

3. Engineering Submissions - Subdivision Development

Draft plan approval must be granted, and conditions of draft approval must be issued before subdivision engineering submissions will be reviewed by the Region of Durham.

3.1 Functional Servicing Report

The need for a Functional Servicing Report will be established at the initial meeting between Region of Durham staff and the developer or his consultant. The Functional Servicing Report, if required, must include a professional engineer's signed and dated seal, PDF files of the report shall be provided by the applicant and shall include, but not necessarily be limited to, the following information:

1. Storm Sewers Contributing to a Region of Durham Storm Sewer:
 - Drainage areas, existing flows to the Region Storm Sewer with supporting records and proposed control flows.
 - Impact of development to downstream Regional Storm sewers, ditches, and overland flow routes.
 - Main sizing, location, and outfalls; include mapping showing Regional and local storm sewer networks adjacent to proposed site.
 - Stormwater Management Report (if applicable).
2. Sanitary Sewer System:
 - Drainage areas and proposed flows.
 - Main sizing, location, and outfalls.
 - Treatment facilities and pumping stations.
3. Water System:
 - Main sizing, location, and looping.
 - Pressure boundaries, booster stations.
4. Region of Durham Road System:
 - Impact of development on any Region of Durham road or structure within or abutting the development.
 - Traffic impact study (if applicable) Refer to Regional Traffic Impact Study Guidelines.

5. Well Interference:

- Show all existing homes (with municipal address) abutting and/or close to the development that have a private well which could be impacted by the construction of underground services.

3.2 Engineering Drawings Review

Drawing size shall be A1 (594 millimetres X 841 millimetres).

Plan and profile horizontal metric bar scale shall be 1:500 (for rural areas) or 1:250 (for urban areas) unless otherwise approved by Regional Project Manager and the vertical metric bar scale shall be 1:50.

Cross section scales shall be 1:200 horizontal and 1:40 vertical, or 1:250 horizontal and 1:50 vertical if approved by Region Project Manager.

Metric scale for general plans shall be a minimum of 1:1000.

Vertical Control Datum shown on plans shall be based on the 1978 Southern Ontario Adjustment of the Canadian Vertical Geodetic datum.

Horizontal Control Datum shown on plans shall be based on the Universal Transverse Mercator (UTM) geographic coordinate system using NAD83 datum for UTM Zone 17.

All Drawings shall reference an adequate number of site benchmarks which shall be described and detailed on relevant plans.

All drawings shall be neat, legible and shall conform to Region of Durham drawing standards.

All sewers, watermains, maintenance holes, hydrants, water valves, pipe diameter, direction of flow, material type, pipe class, pipe bedding and service connections shall be shown on all drawings. All engineering drawings must clearly identify services being removed, services being abandoned but not removed, existing services that will remain, proposed services and future services.

All sanitary sewer maintenance holes, storm sewer maintenance holes and catch basins on Region of Durham roads shall be numbered with Regional/surveyor-assigned and approved numbers. All numbers shall be shown on the engineering drawings

(plan/profile, general plans, and drainage plans) and the sewer design sheets as part of the second submission.

The rim elevation, maintenance hole size and Ontario Provincial Standard Drawings (OPSD) standard type shall be shown on the profile portion of the drawing.

Drawings of plan, profile and cross-sections are required if the proposed development impacts a regional road or structure. The design shall follow the Region of Durham design specifications (roads and entranceways, storm, sanitary sewers and watermain, traffic, etc.), any applicable Ontario Ministry of Transportation (MTO) Roadside Design Manual requirements, the Canadian Highway Bridge Design Code (CHBDC) (latest edition), the MTO Structural Manual (latest edition) and any other relevant design documents and/or manuals.

Plan, elevations, and sections on structural drawings should be prepared with the same scale in both horizontal and vertical directions, unless otherwise approved by the Region's Project Manager.

All bridge, culvert, retaining walls and cross culverts on Region of Durham roads shall be identified using the Region's assigned Structure ID's.

For structural drawings, all stations and elevations are to be dimensioned in metres and all other dimensions are to be dimensioned in millimetres, unless approved by Region's Project Manager.

3.3 Information Required for Approval of Engineering Drawings

1. One PDF set of engineering drawings. PDF documents must be separated by drawing type. For example, one PDF document for General Plans, one PDF document for Plan and Profile drawings, etc. incorporating the following:
 - General plan of services showing all services to be constructed.
 - General plan showing drawing number and area covered by each plan and profile sheet.
 - General plan showing sanitary sewer drainage areas.
 - General plan showing storm sewer drainage areas (pre and post development) with minor and major flow routes.
 - Lot grading plans.

- Plan and profile of all streets, easements, and watercourses - shop drawings if applicable (i.e., for Concrete Pressure Pipe watermains and/ or feeder mains).
 - When streets require more than one plan, match lines shall be provided with no overlapping of information.
 - The lot and block numbering on all engineering drawings shall be the same as that on the proposed final registered plan (40M-plan).
 - Adobe Acrobat PDF files must include Consultant logo and a Professional Engineer's signed and dated seal. In the case of structural and foundation work, two stamps are required. The drawings shall bear the signature and stamp of the independent checker of the work.
 - Hard copy drawings must be made available upon request.
2. One PDF set of the general plan of services for the purpose of obtaining Region of Durham maintenance hole and catch basin numbers.
 3. A complete set of CAD files for all the contract drawings provided on the Development Approvals Sharepoint site.
 4. One PDF set of the proposed final plan for registration (40M-plan).
 5. Sanitary Sewer Design Sheets utilizing standard Region of Durham form (see Appendix).
 6. Storm Sewer Design Sheets for Region of Durham storm sewers utilizing standard Region of Durham form, if applicable (see Appendix).
 7. A geotechnical report for the subdivision is required at the first submission. This report shall include an investigation for any regional roads and municipal services that are to be constructed. The investigation shall include boreholes with blow counts. Borehole log shall include reading/info to a minimum of one metre below the proposed elevation of regional water, storm and sanitary sewer elevation. For Regional Road design, additional geotechnical information is required (refer to Design Specifications for Roads and Entranceways). The geotechnical report is to be a final report (not preliminary) and signed by a geotechnical engineer. A PDF copy of the geotechnical report is required.
 8. A traffic consultant report if deemed necessary by the Region of Durham. Refer to Regional Traffic Impact Study Guidelines. This document is available on the

Region's website at www.durham.ca. A PDF copy of the Traffic Impact Study is required along with the submission.

9. Calculations for pipe strength and bedding requirements. The suitability of PVC sanitary sewer and storm sewer pipe shall be addressed to satisfy the allowable deflection criteria as stated in Item 3 of the Sanitary Sewer Section of the Region of Durham Design Specifications. Calculations must be stamped and signed by a Professional Engineer.
10. Landscaping plans are to be provided if development abuts a regional road or if landscaping is proposed within the regional road Right of Way. Landscaping and the choice of trees are to account for sightlines, underground utilities, clearance to sidewalks, multi-use paths, street light luminaires, overhead hydro wires, and other utilities. Landscape drawings are to show the existing and proposed underground utilities, sidewalks, multi-use paths, street light illumination, and overhead hydro wires. The design should also address the requirement for sufficient growing medium (topsoil).
11. For residential site plans refer to Waste By-Law 46-2011 Schedule P for Guidelines for Waste Collection Services on Private Property.

When the engineering drawings contain all information necessary for Ministry of the Environment, Conservation and Parks (MECP) approval, the developer or his consultant shall complete and submit MECP application forms (using latest template versions from the MECP website, <https://www.ontario.ca/page/ministry-environment-conservation-parks>) for sanitary sewers and storm sewers (including the Letter's of Incorporation Certificate) to the Region of Durham for the region's approval.

Upon receipt of all required data, the Region of Durham will make the necessary policy check and then return the aforementioned data to the developer or his consultant who will forward it to the Ministry of the Environment, Conservation and Parks (Head Office & District Office) recommending issuance of the Certificate of Approval. A Form 1 – Record of Watermains Authorized as a Future Alteration shall be completed by the developer or his consultant and submitted to the Region for verification.

Upon receipt of approval from all applicable agencies and upon approval of the drawings by the Lower Tier Municipalities the originals shall be submitted to the Region of Durham for approval, which shall mean to be accepted in accordance with the specifications and standards of the Region of Durham. This acceptance is not to be

construed as verification of engineering content nor in any way as relieving the stamping professional engineer from responsibility for engineering content.

Prior to execution of a subdivision agreement the owner or his consultant shall forward, to the Region of Durham:

1. Two hardcopy sets.
2. One PDF set.
3. One electronic (AutoCAD) copy (in a format compatible with the Region of Durham's current version of AutoCAD) of the approved "Issue for Construction" drawings.
4. One complete set of approved shop drawings (if applicable).
5. One hardcopy of the approved general plan of services.
6. One electronic copy of the sanitary sewer design sheet (in Region of Durham's current version of Microsoft Excel format).

The electronic (AutoCAD) copy must be geo-referenced in UTM17NAD83 with the correct rotation and coordinate location.

4. Engineering Submissions – Site Plan Development

4.1 Basic Requirements for Site Servicing Plans

The following outline is intended to assist the applicant in preparing site servicing plans for service connection and entrance design for all developments other than single family or semi-detached dwellings. If further information is required, please contact the Region of Durham Works Department by telephone at 905-668-7711.

If the proposed development is contributing to the Region storm sewer, a stormwater management report is required as detailed under Engineering Submissions for Subdivision Development.

General PDF files (Development Approvals Sharepoint site) of the detailed site servicing plan to the Region of Durham Works Department for approval prior to the issuance of service connection and entrance permits.

The applicant must submit a detailed cost estimate covering all regional services (including road works if the site fronts a Regional Road) within the right-of-way and/or easement, based on the approved site servicing plan.

For estimated cost of works less than \$125,000, the developer has the option of having the Region of Durham construct the works through the quotation contract process or entering into a Servicing Agreement. If the developer chooses to proceed through the quotation process the developer must provide a cheque covering the estimated cost of works including administration and contingencies to the Region of Durham Works Department prior to the project being tendered. If the deposit is less than the accepted bid (including Region of Durham administration and engineering fees) after tendering, the Region of Durham reserves the right to request the additional funds from the applicant prior to awarding the contract. Once the final accounting has been completed for the project and if the actual cost of the work differs from the estimate the applicant will be either invoiced or reimbursed in accordance with Region of Durham policy.

If the estimated cost of Regional Services is greater than \$125,000 the applicant must enter into a servicing agreement with the Region of Durham to construct the works.

The applicant must complete the applicable Development Charge Form for the site and must pay all applicable development charges prior to the issuance of a building permit (development charge forms are available and applicable development charges must be paid at the local authority office).

4.2 Drawing Requirements

The detailed site servicing plan and engineering drawings shall contain following information:

1. See Appendices for sample Site Servicing Plan.
2. Geodetic datum (benchmarks), north arrow and key plan.
3. Drawing size shall be A1 (594 millimetres x 841 millimetres).
4. Property lines, lot and plan numbers, street lines, names, and municipal address.
5. All sanitary sewer maintenance holes, storm sewer maintenance holes and catch basins on Region of Durham roads shall be numbered with Regional/surveyor-assigned and approved numbers. All numbers shall be shown on the engineering drawings (plan/profile, general plans, and drainage plans) and the sewer design sheets as part of the second submission.
6. Title block including drawing scale, date, drawing number and the applicant's name, address, and phone number.
7. On site and surrounding land uses (water course, culverts, railways, pipelines, easements, other).
8. Location of all existing utilities such as hydro, gas, bell, other, including abandoned plant remaining in the ground.
9. Location, type, and size of all existing municipal services.
10. Location, size, length, grade, material, and bedding of all proposed services (service connection profile must be provided).
11. Invert elevations, rim elevations and lowest floor elevation.
12. Meter room location.
13. Flange elevations shall be specified on the contract drawings.
14. Location of existing and proposed entrances. Location, length, and size of culverts.

- 15. Entranceway geometrics.
- 16. Backflow preventers size, type, and location.
- 17. All drawings must include Consultant logo and must be stamped and signed by a Professional Engineer.

5. Requirements for Regional Contracts

5.1 Personnel Qualifications

A Professional Engineer licensed to practice in the province of Ontario and registered in the relevant design specialties must seal and sign all engineering products, including contract drawings, engineering reports and specifications. In the case of structural and foundation work, two stamps are required. The drawings and reports shall also bear the signature or stamp of the independent checker of the work.

The Consultant shall furnish individuals qualified in specialty fields such as geotechnical, electrical, environmental, stormwater management, structural, specification / special provision writing, transportation, and landscape design to lead those activities.

5.2 Project Standards

The Consultant shall prepare the design in accordance with accepted technical standards, specifications, guidelines, and state-of-the-art practices. Where appropriate, the Consultant will be responsible for ensuring compliance with the most recent technical references. The Region's Project Manager will resolve any conflicts in design criteria.

6. Engineering Submissions – Regional Contracts

6.1 Engineering Drawings

Full size drawings shall be A1 (594 millimetres x 841 millimetres). Half size drawings shall be plotted at 50% scale and fit onto 11' x 17' paper.

Plan and profile horizontal metric bar scale shall be 1:250 unless otherwise approved by Regional Project Manager and the vertical metric bar scale shall be 1:50.

Cross section scales shall be 1:200 horizontal and 1:40 vertical, or 1:250 horizontal and 1:50 vertical if approved by Region Project Manager.

Metric scale for general plans shall be a minimum of 1:1000.

Vertical Control Datum shown on plans shall be based on the 1978 Southern Ontario Adjustment of the Canadian Vertical Geodetic datum.

Horizontal Control Datum shown on plans shall be based on the Universal Transverse Mercator (UTM) geographic coordinate system using NAD83 datum for UTM Zone 17.

All drawings shall reference an adequate number of site benchmarks which shall be described and detailed on relevant plans.

All drawings shall be neat, legible and shall conform to Region of Durham drawing standards.

All sewers, watermains, maintenance holes, hydrants, water valves, pipe diameter, direction of flow, material type, pipe class, pipe bedding and service connections shall be shown on all drawings. Storm sewers may exclude material type, class and pipe bedding on Region contracts. All engineering drawings must clearly identify services being removed, services being abandoned but not removed, existing services that will remain, proposed services and future services.

All sanitary sewer maintenance holes, storm sewer maintenance holes and catch basins on Region of Durham roads shall be numbered with Regional/surveyor-assigned and approved numbers. All numbers shall be shown on the engineering drawings (plan/profile, general plans and drainage plans) and the sewer design sheets.

The rim elevation, maintenance hole size and OPSD standard type shall be shown on the profile portion of the drawing.

Sample drawings for roadway and bridge/ structural projects can be found in the CAD Drawing Standards section or can be requested through the Region's Project Manager.

Plan, elevations, and sections on structural drawings should be prepared with the same scale in both horizontal and vertical directions, unless otherwise approved by Region's Project Manager.

All bridge, culvert, retaining walls and cross culverts on Region of Durham roads shall be identified using the Region's assigned Structure ID's.

For structural drawings, all stations and elevations are to be dimensioned in metres and all other dimensions are to be dimensioned in millimetres, unless approved by Region's Project Manager. The General Arrangement drawing (for each structure in a drawing set) shall include a list of structural drawings for that structure.

6.2 Format and Content Requirements

The Region will provide typical format and content guidelines to the Consultant prior to the preparation of any documents. Samples of recent contract drawings are available upon request. The Region's master Special Provision and MasterFormat Specifications documents are available on the Region's website at www.durham.ca.

When preparing deliverables, the Consultant shall:

1. Provide all drawings in AutoCAD / Civil 3D & PDF formats, adhering to the Region's drawing standards. To ensure that PDF files can be viewed or printed as intended, all fonts are to be embedded and AutoCAD SHX information is to be excluded from PDF deliverables. The Region's preferred software for road design is Civil 3D. The Project Manager may accept the use of Bentley InRoads by the consultant, provided they are able to convert and submit their drawings in the standard Region's drawing layers and line types and include all necessary information on the cross-sections. Permission should be obtained from the Region's Project Manager prior to the use of InRoads.
2. The Consultant's name shall be shown on all drawings. The Consultant shall submit sample digital drawings (2D) to the Region's Project Manager before commencing drafting to ensure formatting is acceptable.
3. All AutoCAD files shall be in a format compatible with the Region of Durham's current version of AutoCAD.

4. All sanitary sewer maintenance holes, storm sewer maintenance holes and catch basins on Region of Durham roads shall be numbered with Regional/surveyor-assigned and approved numbers. All numbers shall be shown on the engineering drawings (plan/profile, general plans, and drainage plans) and the sewer design sheets.
5. For all “horizontal construction” (i.e., roads, sewers, watermains, bridges), prepare the schedule of tender items, quantities and estimated unit prices using Builterra online software (for detailed design assignments only). Access to the Builterra online software will require a subscription. Contact the Region for Builterra contact information. The Consultant shall be responsible for all costs related to training their staff in the use of Builterra software, if required. Prepare specifications that meet current Accessibility for Ontarians with Disabilities Act (AODA) standards for accessible documents.
6. For all “vertical construction” contracts, prepare specifications based on the latest MasterFormat specification numbering (six digits). Where the Consultant wishes to combine specification sections, obtain consent from the Region’s Project Manager before combining sections. Prepare specifications that meet current Accessibility for Ontarians with Disabilities Act (AODA) standards for accessible documents.
7. Provide all reports and tender documents, including special provisions (unit price contracts) and specifications (vertical construction contracts), in Region of Durham’s current version of Microsoft Word format using the Region’s layout and formatting conventions. Prepare specifications that meet current AODA standards for accessible documents.
8. Provide all calculation spreadsheets in Region of Durham’s current version of Microsoft Excel format.
9. Provide all schedules in Region of Durham’s current version Microsoft Project format.
10. Provide all presentations in Adobe Acrobat (*.pdf) and/or Region of Durham’s current version of Microsoft PowerPoint format, as appropriate.

The Region is actively working towards achieving a fully accessible website that conforms to the World Wide Web Consortium (W3C) Web Content Accessibility

Guidelines (WCAG) 2.0. The website conforms to the Web Accessibility Initiative's Priority Level AA. The Consultant is expected to provide clear and complete documentation of the design process that meets the W3C WCAG 2.0 Guidelines and Priority Level AA. All project materials that may be issued to the public and/or other stakeholders are to be developed in an accessible format. Key materials will be posted to the regional website by Region staff.

All submittals must be acceptable to the Region's Project Manager. Digital deliverables shall be furnished to the Region via a SharePoint site or other file sharing site approved by the Region's Project Manager. At the end of a project, the Consultant shall provide all reports, drawings, survey data, etc. and all documents must be provided in original form (AutoCAD, Word, etc.) and in Adobe Acrobat (*.pdf) in the Region of Durham's current version.

6.3 Reproduction and Distribution

The Consultant is to provide all drawings and reports digitally in draft for review before finalizing. Hard copies should be made available to regional staff upon request.

6.4 Design Documentation and Interim Drawings

As the Region is making efforts to minimize the amount of paper prints, interim deliverables will be digital only. In addition to the reports, documents, and drawings to be submitted as outlined in this section, the Consultant shall provide copies of the following documents, in digital format:

1. All approvals permits and Board orders, and the application packages.
2. Existing utility location plans and utility relocation plans.
3. Digital design files.
4. Complementary summary sheets for tender estimates.
5. Quantity calculations (see appendices for standard format).

6.5 Final Tender Package

The Consultant shall prepare the final tender package consisting of tender documents and contract drawings as described below and submit the package to the Region's Project Manager for review, comment, and approval.

6.6 Tender Documents

The final tender documents shall generally include:

1. For “horizontal construction” contracts, the schedule of unit price tender items, using Bulterra.
2. For “vertical construction” contracts, the schedule of MasterFormat Divisions and Sections.
3. Construction cost estimate. For “horizontal construction” contracts the estimate shall be based on the sum of all unit price tender items from Bulterra. For “vertical construction” contracts, the estimate shall be based on the sum of all estimated MasterFormat section lump sum prices).
4. For “horizontal construction” contracts, tender item Special Provisions (hardcopy and digital in MS Word).
5. For “vertical construction” contracts, MasterFormat Section Specifications (hardcopy and digital in MS Word).
6. List of applicable standard specifications and details (digital).
7. List of applicable standard drawings (digital).
8. Layout sheets for construction, formatted to Region’s Standards (see samples in appendices), in Excel with detailed construction information for:
 - Pavement elevation sheets
 - Shoulder, stripping, slope, ditch, sidewalk, boulevard, and grading limit sheets
 - Bottom of granular base sheets
 - Bottom of granular subbase sheets
9. Special attachments as required (i.e., project specific non-OPSD Drawings, etc.).
10. Foundation/ Geotechnical Report (Hydrogeological Report, if applicable).
11. Two binders containing copies of the final quantity breakdown sheets (along with digital copy) for all project items for ‘horizontal construction’ contracts (Detailed Design only). The sheets must include the project name, item, section, and date, and must be signed by the persons who calculated and checked the quantities.

The level of accuracy and the methodology of the quantity take-off shall follow Ontario's Contract Design, Estimating and Documentation (CDED) Manual, Chapter B, specifically the Computation and Documentation sections (i.e., breakdown by station-station). In cases where the Region's Contract Documents differ from the CDED specifications for materials, construction methods or measurement of payment, the Contract Documents shall govern. Refer to the appendices section for sample quantity breakdown sheets. Alternate documentation methods may be used if a written approval from the Region's Project Manager is obtained in advance.

12. Contract Drawings (see below for details).

6.7 Contract Drawings

Unless indicated otherwise by the Region's Project Manager, all "Issued for Tender" contract drawings, except "standard sheets" listed below, shall be sealed and signed by a Professional Engineer licensed in the Province of Ontario. In the case of structural and foundation drawings, two stamps are required. The drawings shall bear the signature and stamp of the independent checker of the work. All "Issued for Tender" contract drawings shall be submitted in Adobe Acrobat PDF format only. The "Issued for Tender" contract drawings shall be submitted electronically on a USB flash drive or via OneDrive or similar shareable file software in Adobe Acrobat (*.pdf) format, for both full and half size drawings, and be fully scalable. The Adobe Acrobat (*.pdf) files shall be submitted as one PDF of all drawings combined at scale.

The revision block on all "Issued for Tender" contract drawings shall be cleared of all previous notations. The first row of the revision block shall identify the drawing as Revision 0 with the date, the initials of the issuer and "Issued for Tender" placed in the revision box.

Subsequent revisions to each drawing during the tendering period shall follow numerical order starting with Revision 1 and including the reason for revision and the date placed in the revision block.

At the "Issued for Construction" stage, unless otherwise directed by the Region's Project Manager, the Consultant shall submit a complete new set of PDF files (full size and 50 per cent scale) for all contract drawings complete with all revisions issued during the tender period. The next available row of the revision block shall identify the drawing using the next revision number (following numerical order continued from the tendering

stage), with the date, the initials of the issuer and **“Issued for Construction”** placed in the revision box.

Contract drawings shall be submitted in AutoCAD format for all milestone submissions. AutoCAD files shall be in a format compatible with the Region of Durham’s current version of AutoCAD.

Adobe Acrobat PDF files must include the Professional Engineer’s signed and dated seal. AutoCAD files are not to include the Engineer’s seal.

The contract drawings shall generally include:

1. Standard sheets:
 - Title sheet
 - Index
 - Legend and abbreviations
2. Roadway drawings, including storm sewer works:
 - Tie Sheet – horizontal and vertical control
 - Construction staging and detours (including traffic control measures) with temporary pavement markings
 - Removals
 - Plan and profile showing existing conditions and new construction
 - Pavement elevation layout
 - Pavement markings and signage
 - Typical sections
 - Details
 - Design cross-sections at 10 m intervals for urban projects (20 m for rural projects with Region of Durham approval)
 - Stormwater management facilities
3. Structural (bridge, culvert and retaining wall) drawings, as applicable:
 - General Arrangement
 - Borehole Locations and Soil Strata
 - Staging
 - Removals

- Foundations, Pile Layout
 - Abutments, Wingwalls and Piers
 - Retaining Walls
 - Girders and Bearings
 - Deck Details and Reinforcements
 - Barrier/Parapet Wall Details
 - Barrier/Parapet Railing Details
 - Approach Slabs
 - Expansion Joints
 - Sequence of Expansion Joint Installation
 - Concrete Slope Paving
 - Pile Driving Control
 - Standard Drawings
 - Electrical Embedded Work in Structure
 - Landscaping, Stormwater Management and/or Environmental
 - Any other related structural drawings
4. Landscaping, storm water management and/or environmental drawings including the erosion and siltation control drawings.
 5. Traffic control signal drawings.
 6. Electrical (illumination) drawings.
 7. Sanitary sewer and/or watermain drawings.
 8. Any other drawings.

6.8 Drawing and File Naming Convention

Contract drawings for “horizontal construction” contracts shall be numbered according to the following table:

Title Block & Index Sheet Drawing Number Naming Convention

Drawing Number	Description
TITLE-	Title Sheet
IND-	Drawing Index
LEG-	Legend and Abbreviations
TIE-	Ties To C/L of Construction & Control Points
STG-	Construction Staging
RM-	Removals
R-	Plan / Profile (Road & Storm)
STR-	Structural (Bridges, Culverts, Retaining Walls, etc.)
W-	Watermain
S-	Sanitary Sewer
RSW-, RS-, RW-	Road, Sanitary & Watermain (as applicable)
TYP-	Typical Sections and Details
ENV-	Environmental, Erosion and Siltation Control
PE-	Pavement Elevation Layout
PM-	Pavement Markings and Signage
T-	Traffic (All Drawings)
E-	Lighting (All Drawings)
LAN-	Landscaping
CX-	Cross Sections

Each drawing sheet shall be numbered “Sheet x of y.”

AutoCAD files shall be named similar to the following example:

AutoCAD File Naming Convention (Sample)
001 OF 110 Thickson-TITLE.dwg
002-004 OF 110 Thickson-IND.dwg
005 OF 110 Thickson-LEG.dwg
006-007 OF 110 Thickson-TIE.dwg
008-010 OF 110 Thickson-STG.dwg
011-016 OF 110 Thickson-RM.dwg
017-032 OF 110 Thickson-R.dwg
033-038 OF 110 Thickson-RSW.dwg
039-040 OF 110 Thickson-TYP.dwg
041-042 OF 110 Thickson-ENV.dwg
043-0457 OF 110 Thickson-PE.dwg
058-061 OF 110 Thickson-STG3-4.dwg
084-110 OF 110 Thickson-CX.dwg

AutoCAD drawing files may contain multiple drawing sheets with a separate tab for each sheet.

7. Easement Requirements

The following are the minimum permanent easement widths required for Region of Durham municipal services:

Type of Service, Size & Depth	Minimum Width of Easement
Single sewer or watermain less than 600 millimetres diameter and less than 3.7 metres deep, centred on easement.	Six metres
Single sewer more than 3.7 metre depth or single watermain larger than 600 millimetres dia., centred on easement.	Nine metres
A combination of two mains, either sewer or water, less than 3.7 metres deep centred on easement**	Nine metres
A combination of two mains, either sewer or water, over 3.7 metres deep, no closer than three metres to easement limits**	12 metres
Major trunk sewer** (Possible future twinning)	20 metres
Three or more mains, no closer than three metres to easement limits.	Add three metres to items with ** for each additional main

Easements are for the intended use (sanitary sewer, watermain, etc.). No other utility is permitted within the easements.

Easements are to remain free and clear of all obstructions both above ground and below ground.

8. Separation / Location for Watermains, Sanitary and Storm Sewers and Utilities

8.1 Road Allowance

Watermain location shall be in accordance with municipal road cross sections as approved by the Region of Durham.

The standard road allowance shall be in keeping with the Lower Tier Municipality's cross-section, including the installation of underground services.

Watermains may be located in the road or boulevard a minimum of one metre from a storm sewer catch basin. The distance shall be measured from the nearest edge.

Where possible, watermains shall typically be located on the north or east side of the road or in keeping with the approved Lower Tier standard cross section. Where a significantly larger number of service connections or vacant lots with development potential on the opposite side of the road are proposed, contact Region of Durham Development Approvals.

Hydrants shall be located a minimum of one metre from the centerline of the hydrant secondary valve and 1.5 metres from the centerline of the watermain. Hydrants shall be located in the boulevard one metre minimum from all utilities. No other utilities shall be located between the watermain and hydrant.

Sanitary sewers shall be located 1.5 metres from the centerline of the road and a minimum of three metres from centerline of the storm sewer and a minimum of 1.5 metres from the foundation drain. For common trench installation details, refer to the Region of Durham standard drawings.

8.2 Parallel Installations

Under normal conditions, watermains shall be laid with a least 2.5 metres horizontal separation from any sewer or sewer maintenance hole. The distance shall be measured from the nearest edge.

8.3 Watermain, Sanitary and Storm Sewer Crossings

Watermains shall normally cross above sewers with sufficient vertical separation (minimum 0.25 metres) 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:

1. A vertical separation of at least 0.5 metres between the invert of the sewer and the crown of the watermain.
2. Adequate structural support for the sewer to prevent excessive deflection of joints and settling.
3. The length of water pipe shall be centred at the point of crossing so that the joints will be equidistant and as far as possible from the sewer.
4. A minimum clearance of 0.25 metres shall be maintained between the outside wall of the pipe barrels at the point of crossing for sanitary and storm sewers.

8.4 Utility Crossings

Where watermains cross over or under utilities other than sewers, the clearance and type of crossing provided shall conform to the requirements of the particular utility involved and provide the proper bedding and structural support of the watermain and utility.

8.5 Bridge and Culvert Crossings

Where watermains cross under bridge or culvert foundations, the clearance and type of crossing provided shall provide the proper bedding and structural support of the watermain and bridge/culvert, and shall be discussed with the Region's Structural staff.

8.6 Other

For all other conditions, refer to the MECP "Procedures to Govern the Separation of Sewers and Watermains" and the MECP document "Watermain Design Criteria for Future Alterations Authorized Under a Drinking Water Works Permit."

9. Preparation of Subdivision & Servicing Agreement

Subdivision Agreements are required whenever there is a draft plan approval with conditions which need to be cleared. All other regional works constructed by developers will be facilitated with servicing agreements. The same process is followed for both types of agreements.

The draft agreement will be prepared by the Region of Durham Works Department and forwarded to the Region of Durham Legal Department. The Legal Department will prepare the final agreement and arrange for execution of the agreement by the Region of Durham.

Prior to the preparation of the draft agreement, the Region of Durham must be in receipt of the following information:

1. Ministry of Environment, Conservation and Parks Certificates of Approval for Region of Durham services to be constructed for the proposed subdivision (if applicable).
2. A completed Subdivision or Servicing Agreement Information Checklist form (see Appendices).
3. A detailed cost estimate (based on tender prices) prepared by an engineer for Region of Durham services to be constructed for the subdivision and/or within the municipal right-of-way.
4. A PDF copy of the signed general plan.
5. A PDF copy of the proposed final plan (40M) or (40R) of subdivision.
6. A PDF copy of the reference plan (40R) for any easement to be granted to the Region of Durham.
7. A PDF of the sanitary drainage plans including electronic AutoCAD file.

10. Ministry of Environment, Conservation and Parks (MECP) Approval

10.1 Transfer of Review Approval Program

Under the current MECP Transfer of Review Approvals Program, certain responsibilities for processing and approval of applications for installation of municipal services is vested with the Region of Durham. However, all Final Environmental Compliance Approvals are presently issued by the MECP.

Under the MECP's Drinking Water Licensing Program certain alterations to the water distribution system do not require approval from the MECP as pre-approval has been granted through the systems Drinking Water Works Permit as long as the future alteration meets the requirements of the MECP 's Watermain Design Criteria for Future Alterations Authorized Under a Drinking Water Works Permit. In these situations, a Form 1 – Record of Watermains Authorized as a Future Alteration must be completed, verified by a professional Engineer and by a representative of the Region of Durham prior to the work.

The type of sewer system works covered under the current Transfer of Review program are as follows:

1. Sanitary and storm sewers (excluding new outfalls & headwalls).
2. Sanitary sewage pumping stations except those discharging directly to a sewage treatment plant.
3. Oil/grit separators that are municipally owned and operated.
4. Forcemains and inverted siphons.
5. Rehabilitation of existing (rehabilitation of same size and location does not require approval).
6. Storm management facilities (quantity control only).

The Transfer of Review Approvals program does not currently include the following sewer system works:

1. Sewage treatment works and storm outfalls/headwalls.

2. Storm water management (quality control) including low impact development treatment facilities.
3. Oil/grit separators that are privately owned and operated.
4. Sanitary sewage pumping stations discharging directly to sewage treatment works.
5. Sewers with overflows.
6. Combined sewage storage facilities.
7. Sanitary sewer connections from landfill sites for leachate transport.

Although the above items are not included in the current Transfer of Review Approval Program, for MECP applications, the Region of Durham would be involved in the initial engineering design and approval process for those sanitary sewer, storm sewer and water supply systems, which fall under the jurisdiction of the Region of Durham.

10.2 Requirements for MECP Submissions

Region of Durham Sanitary Sewer and Storm Sewer:

1. The Consulting Engineer shall submit, directly to the Region of Durham Works Department, of the required application forms for each of the services for which approval is being requested.
2. The Consulting Engineer shall submit directly to the Lower Tier Municipalities, three copies of the required application forms for local storm sewers.
3. Upon approval and signature by the Local Municipalities, a PDF copy of the application forms are to be forwarded to the Region of Durham Works Department for processing and submission to the MECP.

Documentation Required with Applications:

1. This information is generally laid out in the MECP publication entitled “Guide to Applying for Environmental Compliance Approval”.

When completing application forms, particular attention should be given to the following:

1. Use the latest ECA and Pipe Data form versions from the MECP website (<https://www.ontario.ca/page/ministry-environment-conservation-parks>).
2. That the application is signed by the applicant, i.e., the individual or corporation requesting the approval.
3. In the case of individuals, i.e., "warm bodies", the applicant(s) will be required to provide appropriate copies of birth certificates with each application form.
4. In the case of "corporations" the applicant(s) will be required to provide copies of Form 1, 2 or 3 (of O.Reg. 189 Corporations Information Act), with each application form.
5. For local municipal storm sewers, confirmation that the review engineer did not design the works that they reviewed as well as confirmation that the review engineer is an employee of the municipality.

Each MECP application form and all engineering drawings must be stamped by the engineer responsible for the preparation of the application and design of the municipal services for which approval is sought. The engineer's stamp must be signed and dated on all engineering drawings and design sheets.

11. As Built/ Record Drawings and Standard Forms for Region of Durham Services Submissions

As of January 1, 2020, mapping of underground regional infrastructure (watermains, sanitary sewers and storm sewers) will be required to 30cm accuracy in accordance with CSA S250 for all new Regional, Area Municipal and Developer contracts. GPS or survey data will be required to be submitted for all fittings/appurtenances as part of the “As Built” data submission process.

Upon completion of the project the required as-built measurement forms for Region of Durham services shall be completed and submitted to the Region of Durham's Construction Management Services Division.

All appurtenances shall be located using the Global Positioning System for GIS applications and provided in electronic format. All UTM Coordinates shall be NAD83 Zone 17 sub-metre accuracy, in a format compatible with the Region of Durham's current version of AutoCAD.

Completion Acceptance shall be issued when all of the following as-built information has been submitted and approved by the Region of Durham.

11.1 Final Measurement Sketches

Final measurement sketches (see Appendix) are required for sanitary connections, watermain, water connections, and Region of Durham storm connections. This includes new servicing with no known civic address.

Final measurement sketches are not required for mainline sanitary, excluding force-mains, and mainline storm (non-servicing).

Provide separate Final Measurement Sketches for each street.

The following information is required on Final Measurement Sketches:

1. Common Information:

- Reference Regional Contract number, Municipal Contract number or Regional Subdivision number.
- North arrow.
- Pipe diameter, material, and class.

- House and lot numbers.
- Label all streets, including intersecting streets.
- When there is more than one final measurement sketch per street include match lines and stations.
- Use the same drawing limits when more than one final sketch per street is required (re: consistent limits and match lines).
- Reference regional numbering system for hydrants and maintenance holes.

2. Watermains

- The distance between and stations of all hydrants, valves, chambers, tees, horizontal bends, plugs etc.
- Distance from property line.
- Flange elevations shall be specified on the contract drawings.
- For Concrete Pressure Pipe (CPP), all distances shall be based on field measurements not the Shop Drawings.

3. Water Service Connections

- Elevation and depth at property line.
- Length of lateral.
- The distance from a hydrant, valve, or chamber to main stop at watermain and tie in curb stop at property line.

4. Sanitary Sewer Service Connections

- Elevation and depth at property line.
- Length of lateral.
- The distance from maintenance holes to tees at mainline sewer and plug at property line.

5. Storm Sewer Service Connections on Regional Roads

- Elevation and depth at property line.
- Length of lateral.
- The distance from maintenance holes to tees at mainline sewer and plug at property line.

If AutoCAD drawings are used for preparing Final Measurement Sketches, remove all irrelevant layers and information which may clutter the sketch.

11.2 Lateral Location Sheets

Lateral location sheets (see Appendix) are required for Region of Durham sanitary, water, and storm service connections. This includes new and replacement connections to existing dwellings or buildings and vacant lots with known civic addresses.

The following information is required on Lateral Location Sheets:

1. Reference Regional Contract number, Municipal Contract number or Regional Subdivision number.
2. North arrow.
3. Lateral pipe diameter, material, and class.
4. Mainline pipe diameter, material, and class.
5. Length of lateral.
6. Elevation and depth at property line.
7. Elevation at Main Line (for Sanitary and Storm connections).
8. House and lot number, if available, or house number of adjacent property.
9. A distance to the closest maintenance hole, hydrant, or valve.
10. A sketch of house/building with offset and distance to property line and mainline sewer or watermain (Measurements must be taken at a 90-degree angle from the corner of the building and then parallel to the mainline, where possible).
11. Reference regional system numbering for all maintenance holes and hydrants.
12. One connection per lateral location sheet (unless the same lot/address).

11.3 As-Built Field Survey

The as-built data shall be based upon an as-built survey of all the services and shall include a field check of the following items:

1. Location of maintenance holes for all sewers (storm and sanitary)
2. Location of catch basins
3. Location and ties, where possible, to valve chambers
4. Maintenance hole inverts
5. Light Poles
6. Pipe sizes
7. Rim elevations
8. Distance between maintenance holes
9. Special maintenance hole details
10. Benchmark to be checked

11.4 As Built/Record Drawings

The as-built drawings consist of the most up to date Issued for Construction (IFC) engineering drawings which have been revised to show as-built conditions. As-built drawings shall be provided in PDF format and AutoCAD file in a format compatible with the Region of Durham's current version of AutoCAD. This will include the AutoCAD files for the Final Measurement Sketches and Lateral Location sheets, if they were done in AutoCAD.

For all Region of Durham contracts, Lower Tier municipality contracts, which include Region of Durham services and subdivisions, submit electronic copies of all as-built AutoCAD drawings, in a format compatible with the Region of Durham's current version of AutoCAD (include all drawings that were included in the IFC drawings).

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.

i.e., - E. INV. ~~97.5~~ (Original Design Invert)

97.62 (As-Built Invert)

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

1. Percent grade for sewers, roads, water feeder mains.
2. Invert elevations and stations:
 - sanitary sewers at maintenance holes and at plugs for future extensions.
 - storm sewers at maintenance holes, plugs, and catch basins.
3. All watermain data, such as top of pipe and/or invert elevations, stationing etc. See As-Built Drawing Sample in Appendix.
4. Pipe length, size, material type, class, and bedding.
5. Box the pipe diameters, material type and class. If these change from the IFC drawings, then strike out the original value and add/box the 'As Built' condition..
6. Distance from property line for sanitary sewer, storm sewer and water mains
7. Sanitary, storm and water house connection's location and elevation.
8. For sanitary and storm (on regional roads) service riser elevations, add the field measured values on the obvert of the pipe at the Main Line connection and on the obvert of the pipe at riser location.
9. For items that were removed or not installed, use at least one set of two diagonal lines over the item and note if not installed.
10. Clearly note items that were abandoned.
11. The Regional Municipality of Durham has the right to request additional "As Recorded" information that is deemed necessary for the maintenance and operation of the Region's infrastructure.

"As Recorded" shall be shown in revision column with date. All previous revision notations shall be left on the drawing to allow the Region to confirm the drawing includes all such previous revisions.

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

See attached sample drawing for a “horizontal construction” contract.

Submitted AutoCAD files shall be:

1. In a format compatible with the Region of Durham’s current version of AutoCAD.
2. Delivered with an integrated coordinate system being UTM NAD83, Zone 17.
3. Purged of all non-essential CAD information.

AutoCAD files shall be named by drawing numbers as specified for “Issued for Construction” drawing. Provide a copy of all CAD drawings on a USB flash drive or via OneDrive or similar shareable file software labelled with the Works Department contract or subdivision number. For plotting purposes, provide a list of the pen colours with coordinating pen sizes or Colour Table File (ctb/stb) and External References (xref) files.

For “vertical construction” contracts, it is the Consultant's responsibility to obtain and verify all measurements and to ensure that the arrangement of the equipment as depicted on the Record drawings is accurate.

11.5 Sanitary Drainage Plans

Two copies of sanitary drainage plan and the electronic file shall be submitted to the Region of Durham’s Construction Management Services Division for permanent record. The electronic files are to be in GIS format and/or Region of Durham’s current version of AutoCAD, utilizing UTM Coordinates of NAD83 Zone 17 sub-metre accuracy.

11.6 As-Built Design Sheets

Two complete sets and the electronic file of design sheets recalculated to conform to as-built measurements for Region of Durham services shall be submitted to the Region of Durham Construction Management Services Division for permanent record.

11.7 Shop Drawings

One complete set of shop drawings with the as-built conditions shall be completed and submitted to the Region of Durham Construction Management Services Division for permanent record.

11.8 Camera Inspection

Refer to the Region of Durham's Construction Specifications for Regional Services, Section 01450, Clause 1.07 - Camera Inspection for the correct format.