

REGION OF PEEL

PUBLIC WORKS DESIGN, SPECIFICATIONS & PROCEDURES MANUAL

LINEAR INFRASTRUCTURE

Regional Roads and Traffic

REVISED February 2010

**PUBLIC WORKS
REGIONAL ROADS AND TRAFFIC DESIGN CRITERIA
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1. INTRODUCTION

The following procedures and guidelines provide a series of steps to ensure that all Regional requirements are met during the conceptual and design periods of a Regional Road Project.

All design works are to be carried out in accordance with the latest revision of the Public Works (PW) Design, Specifications & Procedures Manual, Roadway Design Manuals from the Transportation Association of Canada (TAC), the Ontario Traffic Manual (OTM), and Ministry of Transportation of Ontario (MTO), OPS Standard drawings and specifications, the Occupational Health and Safety Act (OHSA), and the Ontario Electrical Safety Authority (ESA).

Bridge structures shall be designed in accordance with the latest edition of the Canada Highway Bridge Design Code (C.H.B.D.C.). Bridges shall be planned and designed in accordance with M.T.O. Standard Planning Guidelines; Structural Manual; Roadside Safety Manual and Geometric Design Standards.

Railway structures shall be designed to the latest edition of the American Railway Engineering Association (A.R.E.A.) and design guidelines of applicable authorities.

Refer to the Environmental Assessment Process section of this manual to determine steps required to fulfill the Class Environmental Assessment process.

Prior to the commencement of any road project, confirm the availability of funds and the project scope.

In the event watermains and sanitary sewers are to be reconstructed in conjunction with the road work, design watermains and sanitary sewers in accordance with the Region's "Public Works Design, Specification & Procedures Manual".

1.1 Approvals

Approvals will need to be obtained prior to commencing construction. Approvals include but are not limited to Conservation authorities (NEC, TRCA and CVCA) and Provincial authorities (MTO, MOE, MNR) railroads (CN, CP Rail, Railway Development Corp, Orangeville, Go Transit). An Archeological Study may also be required.

Consult with emergency services regarding road closures and detours

1.2 Traffic Analysis

Based on Region of Peel's requirement for minimum 10 year traffic projections, a traffic impact study and any other studies are required prior to the start of functional designs, Environmental Assessments (EA) and detailed design.

1.3 Project Design Review

1.3.1 30% Design Requirements

The following are required for review and comments:

- Design Criteria;
- Topographic Survey;
- Cross Sections;
- Preliminary Design Plan.

Return redlined drawings with resubmission

1.3.2 60% - 90% Design Requirements

Upon completion of road design, provide, at minimum, the following drawings for review and comments, together with an equal number of contract specifications:

- Two (2) complete sets of contract drawings;
- One (1) complete set of contract documents;
- Two (2) sets each of traffic signal, pavement markings, signing and staging/detour plans to the Project Manager;
- One (1) complete set of contract drawings for review by the Roads Operations/Maintenance Division;
- Four (4) complete sets of Contract drawings for review by Traffic Development, Traffic Operations, street lighting (local municipality) and landscaping/streetscape (local municipality).

Return redlined drawings with resubmission

1.3.3 Revisions

Revise contract drawings if necessary and resubmit three (3) sets of complete drawings for final review. **(Return redlined drawings with resubmission).**

1.4 Geotechnical Investigation

- a) Should an RPA (Region Purchase Agreement) not be in place, obtain a minimum of three (3) proposals from geotechnical consultants to investigate the following:
 - i) Assessment of the existing pavement condition;
 - ii) Sub-surface investigation to determine soil composition and type under the existing pavement and the existing pavement composition including a chemical analysis. In the event of sewer and/or watermain installation included as part of roadwork, the investigation should be carried to a minimum of one (1) meter below the deepest proposed pipe line inverts;
 - iii) Falling Weight Deflectometer (FWD) or other method accepted by the Region's Engineer, to determine the existing pavement strength.
- b) The report from the geotechnical consultant shall contain the data collected from the investigation and recommendation with respect to the proposed pavement composition.
- c) The proposals shall contain the following breakdown:
 - i) Estimated costs for items a) (i), (ii) and (iii) each including recommendations;
 - ii) Estimated cost for meeting with Project Manager;
 - iii) Estimated cost for contingency.

Note: The consulting firm must be aware that it will be responsible for obtaining the location of all utilities prior to any subsurface investigations.

1.4.1 Structural Requirements

Soils testing shall be carried out on all reconstruction and widening projects. The reports will reflect the existing soil conditions with recommendations of the suitability of soils for use in backfill and construction of road base and embankments. The engineer will be able to determine the pavement design from information provided in the soils report.

Types and depth of Granular “B” and Granular “A” will be determined by the engineer based on the results of the soils report.

Dynaflex testing shall be carried out on all existing pavements where the road will be widened to provide additional lanes. The results of the testing will provide the Engineer with recommendations for the required methodology to upgrade the structural strength of the road.

2.0 DESIGN

A project design review group shall be established, including representation from the Traffic Engineering Section, Engineering and Technical Services and the Roads Operations/Maintenance Division.

First meeting:

To review and determine the project scope and address design issues and concerns all in accordance with the ESR (Environmental Study Report).

Second meeting:

60% design review. To discuss and review any additional design issues prior to finalizing design.

Third meeting:

90% design review. To finalize design concerns and issues prior to contract document preparation.

100% design review to be for final tender package review.

2.1 Construction Staging/Detour(s)

All detours are to be reviewed and approved by the Region of Peel. This aspect of design needs careful consideration to provide motorists with as smooth as possible passage through the construction zone with no undue delays or surprises (i.e. unexpected design elements). The design must be in accordance with Ontario Traffic Manual Book 7, “Temporary Conditions” and shall take into consideration traffic patterns so that the level of service will not be significantly affected, especially during peak hours.

Temporary pavement marking and road signage are to be designed and applied in accordance with the OTM Book 11, “Pavement, Hazard and Delineation Markings”, OTM Book 7 “Temporary Conditions” and OPS specifications and standard drawings.

In the event traffic flow will be considerably reduced, a detour shall be considered. If no practical detour is available, a temporary paved detour may be required. The detour may require illumination.

In the event local roadways are to be used as a detour, local municipality consent is mandatory. Approval must be obtained from Regional Council for a Regional Road closure. Note that a two month lead time is required to close a Regional Road, refer to Regional Policy W30-12 for additional requirements.

All staging plans to be designed as detailed traffic management plans in accordance with the requirements of the Ministry of Labour's Health and Safety Act and OTM Book 7 in advance of implementation.

Additionally, a pre-construction meeting will be required as well as bi-weekly construction progress meetings.

2.1.1 Temporary Works

Pedestrian access shall be maintained on closures signed and approved by the Region's road operations section.

Through lanes shall maintain a minimum width of 3.5 metres, unless otherwise approved.

Delineation of traffic between motorists traveling in opposite directions shall be undertaken with a yellow centre line as opposed to traffic cones.

New Jersey Barriers (NJB) with crash attenuation devices must be used on long term projects as opposed to barrels.

Traffic signal heads shall be adjusted for visibility.

2.2 Final Road Geometrics

Geometric design standards shall be in accordance with the Transportation Association of Canada Manual (TAC), the Geometric Design Standards for Ontario Highways (MTO), Roadside Safety Manual (MTO) and the Region of Peel's Controlled Access By-Law.

Standard Drawings for road works shall be in accordance with the Ontario Provincial Standards (OPS) for Roads and Municipal Services. General conditions of contracts and specifications for construction shall be in accordance with the Ontario Provincial Standards for Roads and Municipal Services.

Where barriers are required, a minimum 4.25m offset shall be maintained between the centerline of road and the barrier.

Gravel shoulder width shall be no less than 2.75m; paved shoulder shall not be less than 2.5m and partial paved shoulder to be a minimum of 1 m, all with a grade of 4% - 6%.

Curb and gutter sections to include a 1m Splash Pad as per STD. DWG. 5-1-3.

Where shoulder is not existing, a minimum of 1 m lateral support is required, 2 m for disabled vehicles and shall comply with geotechnical report recommendations.

Typical cross sections are to be reviewed and approved by the Region.

2.3 Grading and Drainage

Road grading shall be assessed for efficient drainage of storm water to provide safe passage of vehicles.

A grading & drainage plan is required for review & approval detailing intended treatment of run-off from lands adjacent to the roadway. A Stormwater Management Report, as described in the Functional Servicing and Stormwater Management Report section of this manual may be required.

Post-Development flows must be equal to or less than Pre-Development levels

Storm Sewers

Design storm sewers in accordance with the Region's "Public Works Design, Specification & Procedures Manual"

- (i) Prior to storm sewer design, advise the affected area municipality of the proposed design and obtain confirmation of acceptability of the design criteria. In the event area municipalities design criteria are higher, design storm sewers to meet their requirements.
- (ii) Bridges are to be designed for a regional storm event and a HEC II analysis may be required.

For rural roads, ditch crossings for driveways shall be with corrugated steel pipe (C.S.P), PVC or approved equivalent minimum 375mm inside diameter and roadway crossings of Regional Roads, minimum 600mm diameter C.S.P, PVC or approved equivalent to be used.

Grading

Minimize the use of rip-rap; maintain 2.1m offset from curb, for maintenance purposes, do not use on right angle alignment. Asphalt/concrete spillway is a preferred alternative.

Ditch/Embankment side slopes 3:1 max, 4:1 to 10:1 preferred. Flat bottom ditch is preferred.

Driveway side slopes to be top dressed with minimum 100mm topsoil and sodded/seed & mulch

Controlling or minimizing erosion or siltation on-site or downstream during and after construction will need to be included into the design.

2.3.1 Pavement Elevations

A grading and drainage plan view of the roadway and intersections shall show centreline and pavement edge elevations at 20 meter intervals or less, as may be required. Centreline elevations will be controlling elevations along the road. Special attention is required when establishing grades at intersections to provide a smooth riding surface while providing surface drainage.

2.4 Road Surface

- Generally, cross sections shall be designed at 2 – 3% for traveled lanes, gravel and paved shoulder @ 4%-6%;
- Use asphalt Butt joints;
- Radius curb to be used at intersections, include curb depressions as per the turning template requirement and design.

Compaction to be as per Ontario Provincial Standard Specification (OPSS), Construction Specification for Hot Mix Asphalt specifically table 9 “Pavement Compaction Requirements Based on Maximum Relative Density”.

2.5 Removals and Adjustments

Existing pavement removal and grinding, removal of poles, fences, islands, curb and gutters, signs, etc. shall be reviewed and shown on separate plan view drawings. Further these drawings shall show required adjustment of manholes, catchbasins, hydrants, valve boxes and other appurtenances.

2.6 Access

Access requirements shall comply with Region of Peel Controlled Access By-Law.

- Existing commercial entrances are to be paved up to property line.
- In principle, emergency access points are not preferred since they may be difficult to remove in the future. However, if deemed necessary, they shall be barricaded; with no use by public, construction vehicles or personnel.

2.7 Landscape / Streetscape Plan

Landscaping for Regional roads shall be minimal, project specific and be in accordance with the local municipality's standards and have regard for clear zones, sight lines, utilities, site conditions and cost.

Check species for salt tolerance, maintenance, location at street line, snow drift, sight triangle, coir/dogwood/willow suitable for slope stabilization.

Landscape drawings will be completed by a landscape architect and shall be in accordance with terms and conditions set down by the Region's Engineer and local municipality.

Sidewalks will be constructed by the Region in conjunction with the roadworks as required by the local municipality.

Multi-use recreational trails shall be included in projects where the right-of-way is available as requested by the area municipality and in accordance with Region's policy and local municipality specifications.

Ensure all landscaping is not too close to hydrants. Separation to be as described in the Watermain Design Section of the Public Works Design, Specification and Procedures Manual, generally a minimum 1.2 m separation is required.

2.8 Pavement Marking

All temporary and final roadway and intersection markings shall be shown on a plan view drawing and be in accordance with the OTM manuals. The use of symbols to indicate line markings is not acceptable; rather, the drawings must clearly indicate to scale what is to be applied in the field.

2.9 Traffic Signs

All temporary and final traffic signs shall be shown on a plan view drawing and be in accordance with the OTM manuals. The use of symbols to indicate traffic signs is not acceptable; rather, the drawings must clearly indicate to scale what is to be applied in the field.

All required traffic signs, whether regulatory, warning, temporary or guide/directional in nature shall be installed in accordance with the standards specifications and legislation contained in the OTM manuals, the HTA and Region of Peel Traffic By-Law 57-2005.

All signs to be supplied by the Contractor.

2.10 Traffic Signals and Street Lighting

Electrical works shall conform to the Ontario Provincial Standard drawings and Region of Peel Standard Drawings. General conditions of contracts for construction shall be in accordance with the Ontario Provincial Standards for Roads and Municipal Services. Refer to Volume 2.5 – Standard Specifications for Traffic Signals, Street lighting and Electrical Work for construction specifications and Ontario Regulation 22/04. The location of traffic controllers are to be approved by the Region of Peel and local municipalities Parks and Recreation Department.

Equipment shall not encroach on private property without permission to enter/ easement/permanent or temporary undertakings. Traffic controller equipment shall require adequate dedicated access.

Prior to design, arrange a meeting with the Traffic Signals and Systems to obtain information and instruction regarding the following:

- i) The “Design/Tender Package” for street lighting and signalization
- ii) The drawing contents and preparation
 - ◇ street lighting layout along the road and intersections
 - ◇ street lighting schematic wiring diagrams
 - ◇ temporary traffic signal installations
 - ◇ permanent traffic signal installations and schematic wiring diagram
 - ◇ electrical standards
 - ◇ combine street lighting, pavement markings and signing on one plan, where practical, for any given section of road

iii) Electrical quantity sheet(s) for each of the following may be required:

- ◇ electrical manholes and underground junction boxes
- ◇ ducts and associated wiring
- ◇ pole assemblies and footings
- ◇ removal of electrical equipment
- ◇ traffic signal equipment
- ◇ power supply equipment
- ◇ concrete pads
- ◇ high voltage cable terminators
- ◇ groundings
- ◇ traffic signal controller, controller components and external detection devices
- ◇ fire preemption equipment

2.11 Winter Maintenance

For road projects that will not be completed prior to the end of the construction season, the following will need to be considered in order to winterize the construction project to ensure safe conditions during winter:

- i. Where applicable, curb and gutter sections are to be completed, the base course asphalt shall be in place.
- ii. Catchbasins and maintenance holes set to existing base grade.
- iii. Steel plating not permitted
- iv. Hot mix asphalt (HMA) only.
- v. Lane delineation and pavement marking completed.
- vi. Where New Jersey Barrier used, offset no less than 4.25m from edge of traveled lane.
- vii. The road and boulevard must be free of obstructions to accommodate safe snow plow operation considering that a wing and plow is 6 m wide and 1.52 m snow storage minimum required.
- viii. All catch basin grates shall be side inlet, OPSD 400.081 (latest version) unless otherwise noted.
- ix. Winter shut down meetings with the Region of Peel road maintenance staff are required prior to seasonal shut-down and shall be organized by the Project Manager or designate.

2.12 Noise Attenuation

Noise attenuation walls are to be designed as per the Noise Wall Standards and Specifications section of the Public Works Design, Specifications and Procedures Manual and shall comply with MTO requirements.

An Acoustical Consultant is to complete a noise study recommending noise and control measures.

Noise attenuation walls are to be located within the right-of-way and will be maintained by the Region.

3.0 UTILITIES

Relocation of utilities undertaken at applicant's expense and in such a way to be aesthetically pleasing

Coordination of the required relocations is needed to ensure that conflicts are avoided during the construction period.

All utility relocation must be submitted to the Public Utility Coordinating Committee (PUCC) and approved prior to construction.

3.1 Electric Power Utility Relocation

As soon as is practical, consult with local Hydro commissions (Enersource Hydro, Hydro One Brampton, Hydro One Network, and Hydro One), to assess the necessity and timing for relocation of their overhead and/or underground lines.

Coordination with electric power utilities to commence during the 60% design review stage.

3.2 Other Utility Relocation

Underground and overhead power and communication lines, gas lines, Bell Telephone, TV Cable, Consumers Gas, etc.

- Consult with each utility company and assess the necessity and timing for relocation of their plant
- Provide the utility companies with all the necessary drawings for their design

3.3 Scope and Schedule

Review the intended works and schedule them prior to road construction if at all possible. Otherwise work must complement construction staging to minimize outside contractor interference with road reconstruction.

4.0 DRAWINGS

The following drawings are required for Regional Road projects.

- a) Title sheet
- b) Index
- c) List of quantities
- d) Removals and adjustments
- e) Staging/Detours
- f) Storm sewers, sanitary sewer, storm water management and watermain (if applicable)
- g) Temporary and final traffic signals
- h) Pavement markings and signs
- i) Landscaping
- j) Typical sections
- k) Details
- l) Grading and pavement elevations
- m) Electrical – traffic signals (including wiring diagrams)
- n) Street lighting – illumination
- o) Truck turning
- p) New construction

The following shall be included on the above mentioned drawings where applicable.

All final electrical, pavement marking and signing plans shall be submitted in MicroStation format and be in accordance with the CAD Submission Requirements section of the Public Works Design, Specifications and Procedures Manual. The file is to be submitted to the Project Manager for signature and legal approval **PRIOR TO THE TENDER CALL.**

4.1 Alignment; Horizontal, Vertical and Intersection Layout

The centre line alignment shall be defined on the plan and profile drawing, by a single line, where practical, at 1:500 scale, and shall include:

- ◇ Chainage commencing with 0 + 000 on the extreme left hand and continue to the right. The drawings shall show centre line deflection angles and curves, event stations, vertical alignment and deflection angles, intersecting street centre line angles and stationing, and ties to survey iron bars.
- ◇ All vertical and horizontal event points shall be assigned stations, elevations and geodetic coordinates, for ease of alignment layout

- ◇ Vertical curves are to be shown by their length, “K” value and their respective stopping sight distance.
- ◇ Horizontal curves are to be defined by their radius, as well as beginning and end of curve stations

All pertinent information required to lay out the design shall be shown on the drawings

4.2 Typical Cross Sections

Cross-sections shall include all components of the roadway. This includes: pavement composition, lane widths, median, offsets, curb and gutter, splash pad, sidewalks, grading, etc.

The number of cross-sections required will depend on the nature of the road alignment, i.e. rural or urban, number of intersections and the number of areas with special grading concerns.

4.3 Miscellaneous Details

The designers, where required, will provide detail drawings for works which are not possible to be clearly presented on other drawings, or are not to standards. These may include: special manholes, storm outlets, structures, bridge paths, grading, signal poles, bases, etc.

4.4 As Constructed Drawings

As constructed drawings shall be submitted to the Region within 60 days of “Substantial Completion” of the project in accordance with the criteria outlined in the CAD Submission Requirements section of the Public Works Design, Specification and Procedures Manual.