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CHAPTER 100 HIGHWAY DESIGN PROCESS

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TYPICAL PROJECT DEVELOPMENT LIFE CYCLE

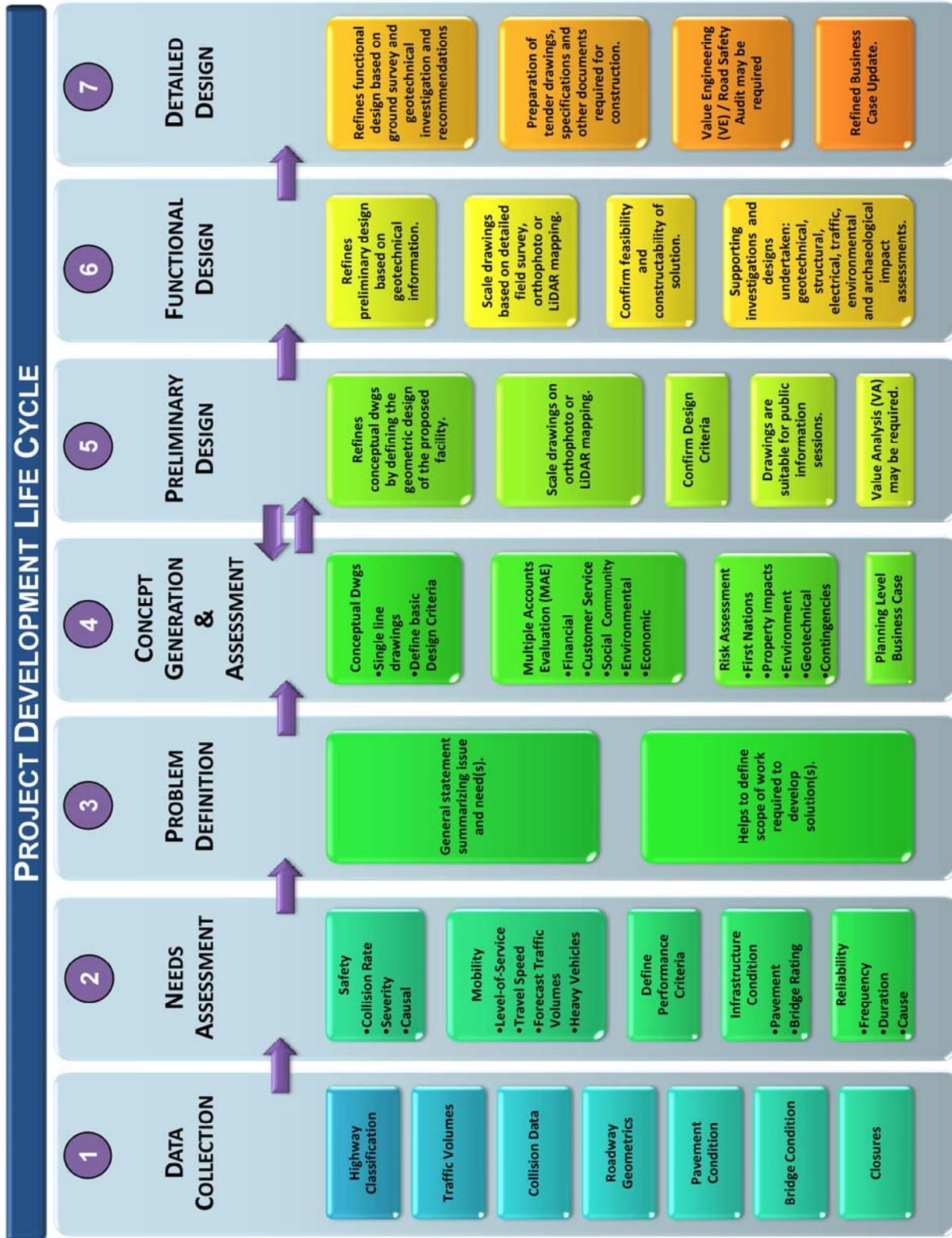


Chart by the Planning Group, SIR; July 2013

Note: This chart is to be used as a general guide and the sequence of tasks may vary by project.

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HIGHWAY DESIGN PROCESS

100.1 INTRODUCTION

The purpose of this chapter is to provide guidance to designers in carrying out design assignments. This chapter is not intended to be prescriptive, but to list typical tasks that a designer may be required to complete depending on the scope and stage of the assignment. The information provided herein may be used for all types of project delivery.

100.2 COMMUNICATION

100.2.1 Project Management

The designer will confirm the scope, schedule and budget with the Ministry's Project Manager. Project deliverables checklists (see Section 100.11.4) should be prepared to identify the submittal requirements at the various submission stages.

100.2.2 Stakeholder Consultations

Unless otherwise directed, the project typically may include:

- Taking the lead role in advising and consulting with all parties or agencies directly affected by the design with respect to the effect and involvement of the proposed design on drainage, rights-of-way, accesses, and traffic.
- Contacting parties and agencies such as, but not limited to, local municipal, regional district, provincial and federal government officials, the local Transportation Authority, utility owners, railway authorities (through the Ministry's Rail/Navigable Waters Coordinator), Commercial Vehicle and Safety Enforcement, trucking associations, environmental agencies and other stakeholders.

- Ensuring all permits, approvals and other regulatory requirements are satisfied and obtained as necessary.
- Preparing materials to assist in advising and consulting with the media, elected officials, community groups, First Nations Bands, the Agricultural Land Commission and private property owners.

Consultants shall submit a copy of all relevant Project correspondence, including letters, memos, facsimiles, emails, conversation records, meeting minutes, decision papers, reports, etc., to the Ministry Contact Person as the design progresses.

100.2.3 Ministry Contact Person

In a Consulting Services Contract, the Ministry will name a Ministry Contact Person who may:

- Prepare and administer the contract.
- Monitor the contract to ensure that works are completed within the assignment schedules and budgets.

100.2.4 Consultant Contact Person

The Consultant shall:

- Identify a project manager who shall be the Ministry's point of contact on all aspects of their Consulting Services Contract.

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100.3 PLANNING AND DESIGN STAGES

100.3.1 Planning Stages

There are several levels of study related to the planning stage that precede the design stages. A brief description of these studies is as follows:

- ❖ Needs Study
 - Definition: Identification of requirements for new or improved highways within the provincial highway network and/or municipal street networks. Needs Studies are usually carried out "in-house" by Ministry staff.
- ❖ Reconnaissance Study
 - Definition: A qualitative, high-level approach to identify all possible corridors and to review the feasibility of each corridor. A single valley would be considered to be a corridor between two specified nodes.
- ❖ Corridor Study
 - Definition: a quantitative and qualitative evaluation to select a preferred corridor from a number of possible alternatives, or to identify the requirements for further study of selected corridors.
- ❖ Route Study
 - Definition: The graphical development of accurate plans for all feasible locations of roads and/or configurations of interchanges/intersections, and their technical review.

The project may be subject to a Value Analysis review during the planning stage.

100.3.2 Preliminary Design

Definition: To determine the ability of selected locations and configurations to meet the needs and requirements established in the planning stages, and recommend one for successive design stages.

Preliminary drawings are developed using accurate base mapping with appropriate contour intervals.

The drawings are suitable for communicating the project intent at public information sessions. These drawings will include the following information:

1. Design parameters.
2. Curb lines, edge of pavement, medians, nose and gore points.
3. Radii, spiral information, critical dimensions.
4. Intersection movements, intersection operation.
5. Proposed centreline and original ground profiles.
6. Developmental phasing options (based on need and fiscal funding).
7. Construction staging if critical to project.
8. Major drainage components.
9. Retaining walls and bridges.
10. Approximate limits of cuts and fills.
11. Utility and rail conflicts.
12. Access provisions.
13. Property acquisition concept and preliminary right-of-way requirements.

The Preliminary Design may consist of several submissions such as the 50%, 90%, and 100% design stages. The preliminary design phase will usually include the following levels of detail:

1. Construction staging is considered for feasibility, but not detailed at this time.
2. Geotechnical field data is considered for natural hazards and foundation

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material competency. This may require drilling, sampling, and testing.

3. Vertical clearances are analyzed for verifying functionality.
4. Original terrain data may be taken from topographic mapping, as detailed field surveys are not usually carried out for preliminary design.
5. Initiation of the Canadian Environmental Assessment Act/BC Environmental Act (CEAA/BCEA) screening process if applicable.
6. Preliminary level cost estimates (refer to Section 100.6 Cost Estimating for intended precision).

If more than one alignment or configuration option is being considered, one will be selected as "preferred" through the preliminary design process, based on its operational efficiency, construction feasibility, social, economic and environmental impacts, cost estimates, public input, and other parameters appropriate for the project.

The lower rated options may be reconsidered in later design stages if problems arise with the selected option.

100.3.3 Functional Design

Definition: The horizontal and vertical geometric design for the phase preceding the development of the final detailed, design drawing.

Functional design drawings are developed at the appropriate scale, using detailed field survey information, or accurate and field verified orthophoto mapping with appropriate contour intervals. These drawings include the following information:

1. All items listed under the Preliminary Design section and recommendations.
2. All horizontal geometric design details.
3. Profiles, with vertical geometric design details.

4. Control lines with stationing including sideroads.
5. Design vehicle turning templates superimposed at critical locations. Consideration may also be required for oversize permitted vehicles.
6. Survey Control information.
7. Final right-of-way requirements.
8. Drainage details.
9. Guide signing information and locations.
10. Environmental drawings with sensitive zones, limits and setbacks from environmental features.

The Functional Design may consist of several submissions such as the 50%, 90%, and 100% design stages. Submissions will be similar to those outlined in Section 100.3.5, although not all of the same items will be required.

The following parameters are considered in Functional Design:

1. Geotechnical design information with respect to pavement structure, stability of rock cuts and earth slopes, overburden removal limits, potential preloading/surcharging, and necessary mitigative measures required for foundation and embankment stability, erosion control, and other special concerns.
2. Profiles are set using earth balance techniques.
3. Consideration of warning, regulatory, guide and informational signs.
4. Biologist field work and reports will be developed to define the environmentally sensitive features, restrictions and suggested mitigation measures.
5. Archaeological study and report.
6. Initial noise study if applicable.
7. Continuation of environmental screening process if applicable.

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8. Cross sections for review purposes.
9. A finished grade Digital Terrain Model to check pavement drainage.
10. Functional level cost estimates for use in construction budgets (refer to Section 100.6 Cost Estimating for intended precision).

100.3.4 Detailed Design

Definition: The development of final construction (tender) drawings and technical specifications for construction, including the completed geometric and geotechnical design, special site considerations and construction details.

Finalize all parameters from the Functional Design stage.

Detailed design drawings including Front Page, Key Plan, Legend, Plans, Profiles, Typical Sections, Geometrics and Laning, Spot Elevations, Signing and Pavement Markings, Drainage and Utilities, Volume Overhaul Diagram, and Gravel Quantity and Haul Charts are prepared as needed. These drawings should include details in accordance with Chapter 1200. Cross sections are finalized in accordance with Chapter 400.

Final quantity estimates and Detailed Design level cost estimates (refer to Section 100.6 Cost Estimating for intended precision) are produced at this time along with Special Provisions. Projects to be tendered require all appropriate tender documents and schedules (refer to Section 100.5.5.12 Deliverables).

100.3.5 Detailed Design Submissions

The Detailed Design may consist of several submissions, including but not limited to:

- 50% Detailed Design.
- 90% Detailed Design.
- 100% Detailed Design.

50% Submission:

The 50% Detailed Design submission consists of, but is not limited to:

- Survey complete and base plans produced.
- Plans showing alignments, access treatments, drainage structures, edges of pavement, roadside barriers and flares, clearing and grubbing limits, critical dimensions, cut / fill toes, utility conflicts, objects/items that are to be relocated or removed, fencing, limits of construction, survey control monuments with their coordinates.
- Profiles showing proposed grades, vertical curve data, K values, horizontal alignment schematic, superelevation, existing and proposed culvert locations, surcharge and preload areas and original ground profile.
- Typical sections showing lane and shoulder widths, clear zone requirements, roadway structure, excavation and embankment slopes, ditch details, stripping, and special treatments.
- Laning and geometrics showing access movements, design vehicles, design speed, and critical laning dimensions.
- Signing and pavement markings showing new sign locations, schedule of signs required, sign removals and relocations.
- Cross sections.
- Suggested staging drawings showing detours if required, typical sections, and cross sections as required.
- Utility relocation drawings.
- Other miscellaneous drawings as required.
- Updated design criteria document.
- Updated cost estimate.
- Draft special provisions.

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90% Submission:

The 90% Detailed Design submission consists of, but is not limited to:

- All revisions and outstanding issues identified in previous submissions complete.
- All agreements in place (e.g. ALR, Environment, Utilities, Municipal, etc.).
- Updated drawings.
- Updated Right-of-Way acquisition drawings complete.
- Updated suggested staging drawings.
- Updated utility relocation drawings, and submitted to the utilities.
- Updated cross sections.
- Updated quantities and estimates, including quantity estimate with neat-line, best case and worst case quantities.
- Updated special provisions.
- Other miscellaneous drawings and associated special provisions (e.g. structural).
- Final signed and sealed design criteria document.
- All reports in draft final format.

100% Submission:

- All revisions and outstanding issues identified in previous submissions complete.
- Final submission of the complete design and tender package including viewing documents (refer to Section 100.5.5.12 Deliverables).
- Relevant rollup documents from project file (such as: planning report, preliminary design report, geotechnical report, etc.).

100.4 REFERENCE MATERIAL**100.4.1 Design Guides**

The designer shall use the current edition of both the *Geometric Design Guide for Canadian Roads*, Transportation Association of Canada (TAC) and the *BC Supplement to TAC Geometric Design Guide* to produce designs for BC MoTI projects in the following manner:

1. The *Geometric Design Guide for Canadian Roads* is the principal reference for:
 - the fundamental principles of highway design that form the basis of the Ministry's approved design practice; and
 - the justification of design exceptions from the Ministry's preferred practice.
2. The *BC Supplement to TAC Geometric Design Guide* is the reference for:
 - the Ministry's recommended preferred design practice in specific situations mostly to ensure better design consistency and lower life cycle costs for the overall Provincial Highway system;
 - the Ministry's complement to and interpretation of the TAC Guide; and
 - specific instructions for preparing design documentation for Ministry projects.

See the Preface of the *BC Supplement to TAC* for more information.
3. *A Policy on Geometric Design of Highways and Streets* (AASHTO) is recommended as a secondary reference.

In addition to the above, the current editions of the following Ministry reference manuals are to be used, but not limited to:

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4. Electrical and Traffic Engineering Manual; Guidelines for the Design of Lighting, Signal and Sign Installation
http://www.th.gov.bc.ca/publications/eng_publications/electrical/electrical_and_traffic_eng/2004-Electrical_Signing_Design_Manual/tableofcontents.htm
5. Manual of Standard Traffic Signs and Pavement Markings
http://www.th.gov.bc.ca/publications/eng_publications/electrical/MoST_PM.pdf
6. Catalogue of Standard Traffic Signs; and Supplemental Traffic Signs
http://www.th.gov.bc.ca/publications/eng_publications/geometsigns.htm
7. Policy Manual for Supplemental Signs
http://www.th.gov.bc.ca/publications/eng_publications/pmss.pdf
8. Manual of Bridge Standards and Procedures
http://www.th.gov.bc.ca/publications/eng_publications/bridge/bridge_standards.htm#manual
9. Manual of Aesthetic Design Practice
http://www.th.gov.bc.ca/publications/eng_publications/environment/design_practice.htm
10. Utility Policy Manual
<http://www.th.gov.bc.ca/permits/Utility%20Permit%20Manual.pdf>

100.4.2 Technical Circulars

Technical Circulars are used to provide general information on changes in operational policy and programs.

Technical Circulars typically introduce approved policy and program changes which may have application, or is required information, for a wider Ministry audience. Technical and/or administrative details may be cited but alternative distribution such as Technical Bulletins are encouraged where the information applies to a more specific audience.

Current Technical Circulars are posted on the following website:

http://www.th.gov.bc.ca/publications/circulars/current_technical.asp

Designers should check this website when starting a design assignment to determine if any Technical Circulars are relevant to their project.

100.4.3 Technical Bulletins

Technical Bulletins are used to provide interim updates to technical and administrative manuals that have been adopted and supported by the Ministry.

Supported manuals are updated on a regular basis to include information contained in the Bulletins.

Technical Bulletins generally cover changes in procedures, standards, guidelines, etc. within the subject matter covered in the related manual.

Technical Bulletins are posted on the following website:

http://www.th.gov.bc.ca/publications/eng_publications/geometsigns/TAC/TAC.htm#Technical%20Bulletins

100.4.4 Other Reference Manuals

1. Standard Specifications for Highway Construction
2. Traffic Control Manual for Work on Roadways
3. Revised Policy for Mitigating the Effects of Traffic Noise
4. Manual of Control of Erosion and Shallow Slope Movement
5. Policy for the Management of Fish Habitat, DFO <http://www.dfo-mpo.gc.ca/Library/23654.pdf>
6. Land Development Guidelines for the Protection of Aquatic Habitat (1992), available from the Department of Fisheries and Oceans Canada, Habitat Management Division, or the Ministry of Environment, Lands and Parks, Integrated Management Branch
www.dfo-mpo.gc.ca/Library/165353.pdf

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7. Equipment Rental Guide (available for ordering at <http://www.roadbuilders.bc.ca/bluebook.php>)
8. Master Municipal Construction Documents (available for ordering at http://www.mmcd.net/order_documents.html)
9. AASHTO Roadside Design Guide (available for ordering at https://bookstore.transportation.org/collection_detail.aspx?ID=105)
10. TAC Bikeway Traffic Control Guidelines for Canada (available for ordering at <http://tac-atc.ca/en/bookstore-and-resources/bookstore>)
11. NCHRP Report 672; Roundabouts: An Informational Guide, Second Edition http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_672.pdf

Many British Columbia Ministry of Transportation and Infrastructure (BC MoTI) engineering branch publications are available at:

http://www.th.gov.bc.ca/publications/eng_publications/eng_pubs.htm

Another useful link to Ministry publications is the Site Index at:

<http://www.th.gov.bc.ca/siteindex.htm>

Some publications are available through Queen's Printer at:

<http://www.publications.gov.bc.ca/>

100.4.5 Proprietary Products

The Ministry's Recognized Products List is posted on the following website:

http://www.th.gov.bc.ca/publications/eng_publications/geotech/rpl.htm

Proprietary products must not be named in the Special Provisions but referenced using generic terminology and described using product specifications.

100.5 ENGINEERING DISCIPLINES

Most projects involve multiple engineering disciplines. The Ministry requires a single-point engineer (Coordinating Professional Engineer) to coordinate the engineering aspects of the work, and ensure that the work has been performed by or under the direction of appropriate registered professionals and that the interrelationships between the involved engineering disciplines have been assessed and issues have been addressed or brought to the attention of the Ministry. A Coordinating Professional Engineer is required when there is more than one Engineer of Record. Refer to Technical Circular T-06/09 for complete information on roles and responsibilities. http://www.th.gov.bc.ca/publications/Circulars/Current/T_Circ/2009/t06-09.pdf

100.5.1 Geomatics (Survey & Mapping)

The General Survey Guide describes standardized procedures and deliverables for survey services for the BC MoTI. The survey guide covers a variety of topics and is designed to be used as both a contract terms of reference and reference guide.

The General Survey Guide is posted on the following website:

http://www.th.gov.bc.ca/publications/eng_publications/survey/General_Survey_Guide.pdf

This guide shall be considered as a minimum requirement of all surveys by or for the Ministry.

If needed, identify and request additional survey work which would be required to complete the assignment.

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100.5.2 Traffic Engineering

Liaise with the traffic engineer with respect to traffic design requirements such as, but not limited to:

- auxiliary lane requirements
- traffic volumes
- laning configuration
- signing
- pavement markings
- traffic safety
- vulnerable road users

100.5.3 Geotechnical Engineering

100.5.3.1 Geotechnical Investigation

Examine and assess all geotechnical information, designs and reports provided to establish their completeness with respect to the earthwork design requirements.

If needed, identify and request additional geotechnical information required to complete the design (e.g. drill logs, soil tests, pavement evaluation data, geo-environmental site assessments of contaminated materials, foundation reports for structures, etc.).

100.5.3.2 Pavement Structure Design

As the design progresses, reappraise the proposed pavement structure design to achieve the most economical solution compatible with the proposed profile and geometric design. The recommended pavement structure design must be approved by the Ministry's Geotechnical Engineer.

100.5.3.3 Geotechnical Design

The designer should liaise with the geotechnical engineer for the geotechnical design requirements.

Incorporate into the roadway design geotechnical recommendations such as, but not limited to:

- cut and fill slopes
- stripping depths
- shrink/swell factors
- pavement structure
- retaining walls
- berms
- geotextile requirements
- erosion control
- surcharging
- Special Provisions language

100.5.3.4 Aggregate Sources

Liaise with the Ministry's Regional Gravel Manager with respect to the supply and costs of aggregate.

100.5.4 Environmental Management

100.5.4.1 Environmental Design

A current list of environmental agency contacts is available from:

Highway Engineering
 Environmental Management Section
 Ministry of Transportation and
 Infrastructure
 4B - 940 Blanshard Street
 PO Box 9850 Stn Prov Govt
 Victoria BC V8W 9T5
 Telephone: (250) 387-7557

Review existing environmental assessment reports for the Project area.

Incorporate environmental mitigation and/or compensation recommendations, and drawings as appropriate.

Prepare environmental Special Provisions for the tender documents.

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100.5.4.2 Landscaping

Identify landscaping requirements. Liaise with the Ministry's Environmental Roadside Manager with respect to the final landscaping design criteria and levels of landscape treatment required.

100.5.4.3 Archaeological Assessment & Approvals

This is part of the CEAA/BCEA screening process. If needed, modify the design to avoid any archaeological impacts.

100.5.4.4 Socio-community Issues

If needed, incorporate noise assessment and mitigation into the design in accordance with the Revised Policy for Mitigating the Effects of Traffic Noise.

100.5.5 Highway Engineering

100.5.5.1 Design Criteria

Prepare and recommend Design Criteria for approval by the authorized Ministry engineering management (see Section 100.11.1 for example Design Criteria form).

100.5.5.2 Geometrics

Prepare a detailed roadway and drainage design in accordance with the recommended Design Criteria in conjunction with the Ministry's B.C. Supplement to TAC Geometric Design Guide, the TAC Geometric Design Guide for Canadian Roads, and the Ministry's Technical Bulletins, Technical Circulars and project specific design documentation.

The design shall accommodate cyclists (where allowed) in accordance with the Ministry's cycling policy which is available at: <http://www.th.gov.bc.ca/BikeBC/policy.html>.

The design drawings shall illustrate complete detail and geometry required to lay out and construct the roadway and drainage facilities. Drawings may include, but are not limited to, details of clearing and grubbing, organic stripping, contaminated soil areas, surcharge, granular base and sub-base, subgrade, open or

enclosed drainage courses and structures, asphalt pavement, bikeways, bus bays, accesses, enforcement bays, pullouts and footpaths for maintenance access to high mast light poles and power distribution kiosks, traffic barriers, impact attenuators, retaining walls, fencing, sound barriers, pavement markings, signage, seeding, landscaping and other right-of-way treatment. Refer to http://www.th.gov.bc.ca/publications/eng_publications/geom/drafting/geomdraft.htm for Ministry AutoCAD standards and the *BC Supplement to TAC Geometric Design Guide*, Section 1200, for contract drawing requirements, drafting standards and drafting samples. Also satisfy municipal requirements for drawings illustrating their utility services.

The designer should summarize existing accesses and their treatments (i.e. retained, relocated, or closed) as well as proposed accesses. The summary should be submitted for review and approval by the appropriate Ministry District Manager, Transportation.

100.5.5.3 Right-of-Way Requirements

Identify proposed right-of-way acquisition boundaries and required easements on the Property Acquisition Plans. Give consideration to right-of-way costs when determining the most cost-effective solution.

Everything that is required for the road and its supporting structures should be encompassed within the right-of-way. In flat terrain, right-of-way should generally be 3 to 5 m from the toes. Where terrain is sloping, use the cross sections to determine the severity of the slope and select a pessimistic offset from the toes (e.g. fill slopes may extend farther due to deeper than anticipated stripping depths or back slopes may extend farther than the cross sections indicate). Other considerations for selecting the offset from the toes are: utility requirements, future maintenance requirements, access, storage of stripping, and foundation excavation for retaining walls.

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The final right-of-way line should generally, wherever possible, form a uniform, constant line without frequent jogs or kinks.

Calculate and record the required areas on the plans and on the Ministry's Clearing, Grubbing and Right-of-Way Areas (H749) form, or equivalent, showing the breakdown of right-of-way areas by parcel. Forward the completed forms and plans to the Ministry's Property Services Branch in order that the purchase of required right-of-way and easements may commence prior to the completion of the detailed design. Investigate the feasibility of design revisions to address concerns identified during the property acquisition process and incorporate these changes where feasible.

Due to the complexity of property negotiations, good liaison with the Property Services Branch is required throughout the design process. Refer to Section 1220.11 for further information.

The Property Acquisition Coordinator will review zoning plans and advise the Designer of impacts to Agricultural Land Reserve lands.

100.5.5.4 Signing & Pavement Markings

Locate all regulatory, warning and guide signs in accordance with the Ministry's Manual of Standard Traffic Signs and Pavement Markings. Ensure that all signs are located to allow for appropriate decision sight distance. Design all permanent pavement markings and delineators in accordance with the aforementioned manual.

The Ministry's Catalogue of Standard Traffic Signs is to be used for reference to provincial standard traffic signs utilized along the provincial highway system.

Prepare signing and pavement marking drawings showing the proposed highway layout and all regulatory, warning and customized guide sign placements, proposed messaging, sizes and shapes required by and affected by the Project. Prepare designs and determine locations for sign structures and foundations. (Note that the guide sign layout may extend beyond the actual limits of construction and

may include interim signing.) Liaise with the Ministry's Regional Traffic Engineer with respect to guide sign design policy and practice, and assistance with messaging.

Prepare a separate, complete and continuous set of signing and pavement marking contract drawings detailing all signing and pavement marking requirements for the Project.

Prepare Ministry approved customized guide sign and messaging designs for final signing and pavement marking drawings. Include the location of all route marker and street name guide signs and information signs. Complete individual Ministry Sign Record (H0172) sheets.

Liaise with the Ministry Sign Shop.

Consult with the Ministry's Area Manager for current Service and Attraction Sign requirements.

100.5.5.5 Drainage

Refer to Chapter 1000 Hydraulics for drainage design.

Produce a drainage report which details stormwater requirements and hydraulic analysis, if required.

Include a copy of all drainage design calculations (hydrology and hydraulics) in the Design Folder.

Culverts ≥ 3 m in span are structures and fall under the Bridge Engineering discipline.

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100.5.5.6 Utilities

Review and update existing underground utility information necessary to complete the Design. Arrange for locating and uncovering critical utilities if warranted. BC One Call (www.bconeccall.ca, Ph. 1-800-474-6886) is a valuable resource for assistance with locating underground utilities.

Identify all public or private utilities or other installations on or close to the present and proposed rights-of-way to be removed, relocated, adjusted or protected as a result of the improvements. Contact and meet with utility owners to establish their constraints and review their requirements with respect to the Project.

Include and incorporate utility relocation design drawings and Special Provisions prepared by others in the tender documents.

Provide technical assistance to help with negotiating relocation arrangements with the utility owners.

Review utility pole relocation designs supplied by utility owners to establish conformance with Ministry clear zone guidelines and to determine possible conflicts with other aspects of the Project.

100.5.5.7 Railway Crossings and Navigable Waters

Liaise with the Ministry's Rail/Navigable Waters Coordinator.

A special purpose drawing may be required for new at-grade railway crossings, as well as reconstruction, relocation, or revision of an existing crossing. Significant lead time may be required for the approvals process. Refer to Section 1100.1 for more information.

Transport Canada has authority of works over or in Navigable Waters. This can typically affect the highway profile alignment due to the vertical clearance requirement under bridges. This will require liaising with the Bridge Engineering department (also see 100.5.7.1).

100.5.5.8 Value Engineering Review

The project may be subject to a Value Engineering review. The Designer shall cooperate and participate in the review process which will be conducted by others.

100.5.5.9 Road Safety Audits

Projects may be subject to a Road Safety Audit at the preliminary, functional, or detailed design stage. The Designer shall cooperate and participate in the Road Safety Audit process which will be conducted by others in accordance with the Transport Association of Canada's Road Safety Audit Guide (ref. Technical Circular T-02/04, Road Safety Audit Guidelines).

100.5.5.10 Constructability

Conduct a constructability review of design alternatives evaluating them with respect to their constraints. Recommend provisional construction scheduling, including the scheduling of future utility installations and relocations of existing services, and critical path networks for the recommended alternative. Prepare drawings illustrating practical staging of construction, general detour routings and special traffic handling provisions.

100.5.5.11 Maintenance & Operations

Meet with the Ministry's Area Manager with respect to maintenance procedures and operational requirements or problems with existing facilities. Include necessary maintenance, emergency, and traffic operation features as may be necessary both during construction and after the Project is completed.

Obtain approval from the District Manager, Transportation for the Traffic Management Special Provisions clause.

100.5.5.12 Deliverables

A Project Deliverables Checklist should be completed (see Section 100.11.4).

Professional Engineers are required to sign and stamp all drawings, specifications, design criteria documents and reports as per the

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Engineer's Act. The Ministry's policy on the Engineer of Record and Field Review Guidelines is provided in Technical Circular T-06/09 which can be found at: http://www.th.gov.bc.ca/publications/Circulars/Current/T_Circ/2009/t06-09%20.pdf.

Prepare a final set of documentation for tender and construction purposes.

The following documentation is typically required:

- Drawings
 - Submit original full size signed and stamped contract drawings.
 - Submit all drawings in current Ministry AutoCAD DWG format.
 - Include and incorporate drawings prepared by others (e.g. bridge design / electrical design / landscaping design / utility relocation design) in the tender documents.
- Cross Sections
 - Prepare working cross sections as reference information for the contract. Refer to the *BC Supplement to TAC*, Section 410, for cross section format and content requirements.
- Schedule 7, Approximate Quantities & Unit Prices
 - The current version of the Excel spreadsheet form H0088 (available at <http://www.th.gov.bc.ca/forms/getForm.aspx?formId=768%20>) must be used. Always use the drop down boxes to select units. Ensure section headings correspond to those in the Special Provisions.
- Any additional explanatory material and bills of material as required
- Design Folder
 - The design folder is an essential source of information that is used by the Project Supervisor. The design folder should be provided in a ringed binder and should contain the following:

- Table of Contents
- Design Criteria (see Section 100.11.1)
- CAiCE Design Project Electronic Deliverables Quality Checklist (see Section 1270.13)
- CD containing the appropriate CAiCE files
- Quantity calculation sheets for all items (i.e. each item in Schedule 7 must have a corresponding section in the design folder that shows how its estimated quantity was determined)
- Drainage calculations to support culvert and ditch sizing
- Quality management (QC & QA) checklist (example shown in 100.11.3)
- Project correspondence, including minutes of meetings
- Project photos
- Final Design Report / Letter
 - When required, prepare a Final Design Report / Letter including, but not limited to, summaries of the following:
 - existing conditions
 - the initial Project scope
 - design activities that have resulted in revisiting previous designs, and their outcomes
 - subsequent major revisions and/or scope changes and the reasons for them
 - significant features of the design that could require special attention from the field inspection staff or the Design Engineer during construction
 - grading distribution report
 - drainage report

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- all utility contacts, potential conflicts and required relocations and their status
- all environmental agency contacts and concerns
- critical construction staging and traffic control considerations
- all provisional sums shown on Schedule 7, including a brief explanation for each. Include details of any factors considered to be beyond the Designer's control which qualify or are likely to qualify the accuracy of the cost estimate.
- all unresolved design issues, all agreements, and any other special conditions and considerations that may impact on the construction of the Project
- variances in design criteria, including a signed copy of the Achieved Design Criteria with supporting documentation for not meeting or exceeding values specified in the Recommended Design Criteria.

For projects to be tendered, the following guidance is provided. Always refer to the table on the Construction Maintenance Branch website

http://www.th.gov.bc.ca/publications/const_maint/contract_serv/contract_services.htm to ensure that the latest forms are being used to prepare tender documentation. The table contains links to the current version of all schedules. Ensure that the title of the project is consistent throughout all schedules in the Tender Document Package.

Designers typically submit the following Tender Documents:

- Schedule T3, Contract Specific Reference Documents

Provide project specific reference material, e.g. cross sections, geotechnical reports, environmental reports, contaminated site assessments, as-built drawings, etc.

- Schedule 1, Supplemental General Conditions

Use the appropriate link in the table and use as directed (see "Hidden Text" within the Supplemental General Conditions document).

- Schedule 3, Special Provisions & Appendices

Use the appropriate link in the table and use as directed (see "Hidden Text" within the Sample Special Provisions document). Include and incorporate special provisions prepared by others (e.g. bridge design / electrical design / landscaping design / utility relocation design).

- Schedule 4, Drawings

List all drawing numbers complete with the latest revision letter. Do not list Contract Specific Reference drawings here, e.g. cross sections.

- Schedule 5, Time Schedule

- Schedule 6, Insurance Specifications

Include a completed INS-152 form. Include Part 2 if applicable.

- Schedule 7, Approximate Quantities and Unit Prices

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100.5.6 Electrical Engineering Integration

Overlay the electrical design onto the roadway design to confirm the constructability of pole bases, checking for conflicts with existing or proposed underground utilities and drainage. Also check to ensure that signing is not obscured. Design accesses to high mast light poles where required.

100.5.7 Bridge & Structural Engineering Integration

Liaise with the Bridge Engineering department to ensure bridges, retaining walls, culverts with spans ≥ 3 m, etc. work with the highway design.

100.5.7.1 Hydraulic Engineering

Liaise with the Hydraulics Engineer concerning issues pertaining to structure clearances and profile elevations.

100.5.7.2 Proprietary Structure Design

Liaise with the Structural and Geotechnical Engineers concerning issues pertaining to the requirements for proprietary structure design.

100.6 COST ESTIMATING

Information on how to access Construction Cost Data can be found at: <http://gww.th.gov.bc.ca/gwwpmss/Content/costestimating.asp>

This is a restricted Government Wide Web site; therefore, consultants must submit a written request for access to the site. Consultants should contact the Ministry's Project Manager to get a copy of the appropriate application form.

A link to a list of the Activity Codes can be found under the Definitions section on the Construction Cost Data web page at the following location:

http://hce.th.gov.bc.ca/cost_est/index.htm

Describe and list contract items in accordance with the terminology and in the order of the Ministry's Cost Estimating Framework. Number contract items using a numeric decimal system, e.g. #.###.##.

Prepare a construction cost estimate (Ministry Estimate) with most probable quantities falling between the best case and worst case, or with neat-line quantities for contract items which include materials to be supplied by the Contractor, e.g. catch basins, manholes, culverts, concrete roadside barrier, etc.

The intended accuracy of cost estimates under normal circumstances is as follows:

<u>Estimate Level</u>	<u>Range of Precision</u>
Preliminary Design	-15% to +50%
Functional Design	-10% to +25%
Detailed Design	-5% to +10%

Each successive "Estimate Level" should indicate a greater level of confidence than the preceding estimate. Each subsequent estimate should be more accurate (closer to the final anticipated cost of the project) and more precise (the range around the anticipated cost should decrease).

Maintain an updated estimate of costs on the Schedule 7 as the design progresses. Provide an overall cost summary including estimated costs of utility relocations, engineering supervision during construction, property acquisition, contingency amounts, and costs of materials and services to be provided by the Ministry and others.

The current version of the Excel spreadsheet form H0088 (available at <http://www.th.gov.bc.ca/forms/getForm.aspx?formId=768%20>) must be used for the final Schedule 7 submission.

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100.7 SPECIAL PROVISIONS

If required, write special provisions supplementary to the Ministry's current issue of Standard Specifications for Highway Construction. Use the Sample Special Provisions format and wording found in the table (on the Construction Contract Services Tender and Contract Information website) at http://www.th.gov.bc.ca/publications/const_maint/contract_serv/contract_services.htm for the appropriate type of construction contract. Submit in an MSWord DOC file including Table of Contents. In the table under the heading Additional Related Documents, you will find a link to "SpecProvAmendmentTable" which lists all changes to the sample Special Provisions between the current version and earlier versions.

Include and incorporate special provisions prepared by others (e.g. bridge design, electrical design, landscaping design, utility relocation designs). If applicable, appendices should include copies of approved Sign Records.

100.8 GENERAL ENGINEERING

100.8.1 During Tender

Prepare language, sketches or drawings for inclusion in addenda to the Tender Documents.

100.8.2 During Construction

Attend the preconstruction meeting and subsequent meetings related to questions on the Detailed Design to provide technical advice or clarifications as required.

Respond to requests from the Ministry's Project Manager, Construction Services Manager, or delegate (Project Supervisor or Resident Engineer) to provide Engineering Services, if required, during the construction phase (i.e. after award of tender for the construction of the Project).

Provide the following Engineering Services as requested:

- Carry out periodic field reviews as necessary to satisfy APEGBC bylaw requirements and attend meetings on site.
- Respond to specific queries.
- Make design revisions.
- Prepare revised signed and stamped Construction drawings.
- Respond to Road Safety Audit recommendations.
- Review and evaluate contractor initiated alternative designs and value engineering proposals.

Refer to Technical Circular T-06/09 "Engineer of Record and Field Review Guidelines" for additional roles and responsibilities. http://www.th.gov.bc.ca/publications/Circulars/Current/T_Circ/2009/t06-09.pdf

100.8.3 Post-Construction

Attend Project debriefing/close-out meeting to discuss lessons learned.

Prepare and submit "Record" drawings in accordance with the guidelines in Technical Circulars T-06/09 and T-07/09 which can be found at:

http://www.th.gov.bc.ca/publications/Circulars/Current/T_Circ/2009/t06-09.pdf

http://www.th.gov.bc.ca/publications/Circulars/Current/T_Circ/2009/t07-09.pdf

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100.9 QUALITY MANAGEMENT FOR CONSULTANT ASSIGNMENTS

The Quality Management Accord can be found at:

http://www.th.gov.bc.ca/eRISP/documents/Quality_Management_Accord.pdf

The following sections discuss Quality Management requirements that a Consultant must meet; however, all in-house Ministry design assignments should also follow a Quality Management process that meets the spirit of the Quality Control and Quality Assurance outlined below.

100.9.1 General

Design agencies shall have their own in-house Quality Management program in place prior to preparing any designs or data. Failure to maintain an effective in-house Quality Management Plan shall result in poor performance ratings in the Consultant Performance Evaluation process and will affect future project work for the design agency.

The Ministry's Engineering Representative is responsible for assuring that the quality of work submitted by a design consultant meets the standards and guidelines expected by the Ministry.

The Quality Management activity is composed of three parts: Quality Control and Quality Assurance, which rests with those responsible for carrying out the work (Design Consultant), and Quality Audit, which is the task of those overseeing or monitoring the work (Ministry). The various components of Quality Management are collected here for reference. It is intended to be integral to the various design processes required to meet the assignment's deliverables.

Generally speaking, Quality Control and Quality Assurance are in the hands of the Consultant, and Quality Audit is the responsibility of the Ministry's Engineering Representative.

100.9.2 The Consultant's Quality Control and Quality Assurance Role

The Consultant is responsible for controlling the quality of the work done by its staff in accordance with APEGBC Bylaw 14(b).

Quality Assurance activities will involve reviewing periodic Quality Control Reports/Design Checklists (a requirement of technical review submission), and confirming the Consultant's Quality Management Plan for the design assignment has been followed.

The Consultant's Project Manager or designate is responsible for spot checking the components of the Consultant's work for general compliance of standards, for accuracy of drawings and reports, appropriateness, good form and engineering common sense as work is submitted for the specified deliverable submissions.

100.9.3 The Ministry's Quality Audit Role

Informal Quality Audit is an ongoing activity on the part of the Ministry Engineering Representative. This involves experience and judgment in the assessment of the acceptability of the concepts or documents submitted by the Consultant to the Ministry as required to meet the Ministry's guidelines and design assignment requirements.

100.9.4 Objectives of the Consultant's Quality Management Plan

The Consultant's Quality Management Plan shall govern the Consultant's internal review and checking process throughout the entire course of the work. The Plan is intended to demonstrate how the Consultant shall achieve the following results:

1. All design is carried out in accordance with good engineering practice and all work meets the requirements of the Ministry as set out in the Terms of Reference, the *TAC Geometric Design Guide for Canadian Roads*, the *BC*

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Supplement to TAC Geometric Design Guide, the Electrical and Traffic Engineering Manual and other applicable guidelines, procedures and standards.

2. All drawings, calculations and other items submitted to the Ministry are free of errors, conflicts and misalignments, having been independently checked and re-checked by experienced engineers or technicians who have been assigned that responsibility.
3. Effective internal communication with the total Consultant (its own staff and that of sub and associated consultants where applicable) is ensured by means of an appropriate system for disseminating and storing information on standards, policies, guidelines and engineering correspondence.

100.9.5 Requirements for a Consultant's Quality Management Plan

The Plan shall set out a general review and checking program to be carried out by identified members of the Consultant's staff. Using the checklist, however, does not relieve the Consultant of basic professional responsibility for sound, effective, accurate engineering, analysis and design in all aspects of the assignment.

The designer, checker, draftsperson and quality control reviewer shall be clearly identified by name (initials not acceptable) on the contract drawings. Where required, all reports, construction control documents and any other relevant documented work shall be initialed by the persons designated in the Quality Management Plan.

All original drawings and calculations shall be retained on file by the Consultant for the duration of the contract, or until required to be submitted as specified by the Ministry.

The Consultant's Project Manager shall convene periodic quality control meetings with the members of the project team responsible for

the various components of the work underway. The Plan shall also identify the nature of the internal communication system relating to dissemination of information on standards, policies, guidelines and engineering information.

The Plan shall include the following:

1. Checking protocol; the nature, scope, and persons responsible for checking shall be identified and related to both time and process Milestones and Deliverables.
2. The specific nature of the various checks shall be identified, such as:
 - conformity to project requirements, preliminary information,
 - appropriateness of design procedures used,
 - consistency with views / recommendations / findings of other disciplines,
 - consistency with adjacent sections of the Project,
 - conformity to presentation standards (drafting, terminology),
 - conformity to Design Criteria (where applicable), and
 - accuracy of calculations.
3. Specific procedures shall be identified in the following three areas:

Design methods - the senior designer in each discipline shall establish a written design process for his/her component of the Project. This process shall typically identify the standards, guidelines, formulas, procedures, etc., to be used for design. The senior designer, as part of his/her quality control responsibilities, shall monitor and document

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reviews of work at defined intervals to ensure that the above process had been appropriately used.

Calculations - the recording format for all calculations shall be specified, in order to ensure that a neat, logical record of all calculations is maintained. The checkers shall be required to complete their work as soon as the design is complete. Errors noted shall be recalculated by the designer and rechecked by the checker. Computer generated calculation shall be spot-checked and reviewed for logic.

Drawings - shall be checked by the designated checker and the senior designer. Checking shall be for conformity with design standards or guidelines, drafting protocol, clarity and good professional practice. Also, conformity with adjacent plans shall be checked.

4. **Quality** Management responsibilities shall be specifically identified by naming the Consultant's Quality Control staff and the nature and timing of their responsibilities. A chart format is useful in this regard and shall show the originator/designer, checker and the senior technical person responsible for quality in that area of work.
5. Documentation related to the Project shall be kept in files separate from files for other work the Consultant may have. The Consultant's Project Manager shall be responsible for designing and managing the filing system. All design notes, calculations and other pertinent written information related to the various components of the Project shall be prepared in

neat, legible fashion in the Ministry's "H" form format (where applicable) or equivalent and maintained in binders or folders as appropriate. Each design engineer/technician shall be responsible for maintaining his/her own notes. All computer files shall be backed-up in accordance with a specified schedule.

6. Resolution of differing technical points of view within the Consultant shall be the responsibility of the Consultant's Project Manager. The process for resolving such differences shall be specified as part of the Plan.
7. Design change control procedures shall be developed as part of the Plan. The focus and responsibility and the process shall be described.
8. Internal approval procedures shall be established and documented. These shall involve those at the various responsibility levels. The Consultant's Project Manager shall conduct a final review of all items prior to their submission.

100.9.6 Evidence of Implementation of the Quality Management Plan

Evidence that the Consultant's Quality Management Plan is functioning effectively shall be provided by the submission, with key deliverables, of "Quality Control Reports", as specified in the various design processes. Failure to submit an acceptable Quality Control Report at the agreed point in the process may result in subsequent submissions of work being returned to the Consultant without review and the action noted in the final performance evaluation.

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100.9.7 Typical Design Checklists Provided

The Ministry has developed typical checklists (see Section 100.11.3) in Word format for the Consultant to modify and use as appropriate for the design deliverables. The design checklists need to be adapted by the Consultant for its required use in order to meet their Quality Management Plan.

100.10 MINISTRY ROLES AND RESPONSIBILITIES FOR CONSULTANT ASSIGNMENTS

While the Ministry will strive to provide adequate and timely information, the Consultant shall review in detail all information to ensure it provides all the details necessary for a comprehensive, thorough and accurate detailed design.

Depending on the scope of the consultant's assignment, the Ministry will provide some or all of the following information or services with respect to the Project as required. A more comprehensive list of Ministry responsibilities may be outlined in the Request For Proposals.

100.10.1 General

Provide access to all available pertinent reports, drawings, inventories and correspondence that will assist in the design process.

Prepare and undertake a communications strategy to communicate and receive input from residents and stakeholders on the design and engineering scope of the Project. Take the lead role in advising and consulting with the media, elected officials, community groups, First Nations Bands, the Agricultural Land Commission, private property owners and environmental agencies.

Review the work as it proceeds and advise on matters regarding standards, guidelines and policy when possible. This review does not constitute an acceptance of liability by the Ministry or its employees for the design, but is

solely conducted as a check to ensure the Ministry's interests are being considered and assured. Scope changes are the Ministry's responsibility after considering the consultant's advice and recommendation. Changes to the design shall remain the Consultant's responsibility for completeness and accuracy.

100.10.2 Property Acquisition

Provide cost estimates for proposed property acquisitions as available.

Negotiate and acquire highway right-of-way.

100.10.3 Electrical

All electrical drawings shall be issued a drawing series number provided by the Ministry's Traffic Systems and Electrical Engineering Section, South Coast Region.

100.10.4 Signing

Discuss directional guide sign messaging with municipalities. Review preliminary / approve final message text designs, layouts and locations for all directional guide signs, and service and attraction signs.

100.10.5 Railway Regulatory Liaison

Make formal application and Notices to the regulatory agencies and stakeholders as required by the Canadian Transportation Act and the Railway Safety Act and applicable regulations for crossings of Federally or Provincially Chartered railways. Make financial arrangements and outline facility provision after consultation with the railway and stakeholders. Give direction and provide overview of the design of roads crossing the railway. Prepare Agreements and sign on behalf of the Ministry for railway crossings.

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100.10.6 Navigable Waters Liaison

Review site information for determination if a Navigable Waters Protection Act approval is required. Determine navigational clearance requirements, signs, lights and protection works in consultation with Transport Canada and stakeholders. Give direction and provide overview of the design of culverts, bridges and in water works associated with highways including rip rap, rock spurs, diversions, etc. Make formal application to the regulatory agencies and stakeholders as required by the Navigable Waters Protection Act.

100.11 DESIGN CRITERIA AND SAMPLE CHECKLISTS

100.11.1 Project Design Criteria Approval and Exceptions to Design Criteria

100.11.1.1 Design Criteria Approval

All projects involving construction or rehabilitation of provincial highway infrastructure require Project Design Criteria approval by authorized Ministry engineering management.

Terms of Reference (TOR) for engineering consultant design assignments must clearly set out the Province's design criteria requirements.

For projects to be designed and/or delivered by other agencies, but involving provincial highway infrastructure, design criteria and performance specification requirements will be set out by the BC MoTI regional office. This includes Design/Build projects and Partnership projects with other agencies or as part of a Public Private Partnership process.

For projects to be designed and/or delivered by developers, but involving provincial highway infrastructure, design criteria and performance specification requirements will be set out by the BC MoTI district office with advice from the Manager of Highway Design at the regional office. This includes projects driven by Development Approval processes that involve provincial highway infrastructure.

The design criteria approval process is as follows:

- i) A Project Design Criteria Document will be produced for all highway design projects. This document will identify and define the problem(s) being addressed, the options considered, the scope of the project, and the development of the design criteria. Note that the Project Design Criteria Document is a required part of the project design file and subject to audit.
- ii) Complete the Project Design Criteria sheet. A typical Project Design Criteria sheet, including a cover sign-off page, for highway geometric design is provided at the end of this section. Similar processes for documentation of approval of design criteria and exceptions to engineering guidelines or accepted practice should be followed for other engineering disciplines.
- iii) Ministry approval/acceptance of the design criteria is required before the design starts and upon completion of the design. The project design criteria sheet is included in the Project Design Criteria Document, which is in turn an essential part of the Project design folder.

100.11.1.2 Exceptions to Design Criteria

For all projects involving provincial highway infrastructure, any variance from engineering guidelines or accepted practice requires the approval of authorized Ministry engineering management, starting with the Regional Manager of Engineering for the Region. The Regional Manager of Engineering will determine if the exception to guidelines or accepted practice requires the further approval of the Chief Engineer for the Ministry.

The approval process for exceptions to guidelines or accepted current engineering practice is as follows:

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- i) Carry out an economic or other appropriate analysis as required justifying any variation in the project design criteria from the *TAC Geometric Design Guide*, the *BC Supplement to TAC* or of accepted current engineering practice.
- ii) Where Ambient Condition consideration is recommended for a project within a highway corridor, approval of the Project Design Criteria sheet will follow the procedure set out in the “Guidelines for the Development and Preparation of the Project Design Criteria for Construction and Rehabilitation Projects” (March 3/99). This document is located behind Tab 13.
- iii) Where Context Sensitive Design consideration is recommended for a project within a highway corridor, approval of the Project Design Criteria sheet will follow a similar procedure to that which is set out in the “Guidelines for the Development and Preparation of the Project Design Criteria for Construction and Rehabilitation Projects” (March 3/99). This document is located behind Tab 13.
- iv) For any other recommended variance from the *TAC Geometric Design Guide*, the *BC Supplement to TAC* or of accepted current engineering practice, the Project Design Criteria sheet must clearly highlight the variance in forwarding the document for approval. Full discussion justifying the variation in the project design criteria must be contained in the document.

100.11.1.3 Project Design Criteria

The first two items listed on the Project Design Criteria sheet specify road classifications. The possible options are as follows:

Functional Classification: Primary, Secondary, Major, Minor, or Local

Design Classification: LVR, RLU, RCU, RCD, RAU, RAD, RED, RFD, ULU, UCU, UCD, UAU, UAD, UED, or UFD

To determine the Functional Classification, refer to the list titled “British Columbia Numbered Highways - Functional Classification”. This list includes a section entitled “Overview of B.C. Highway Functional Classification” which provides a description of each classification. This list can be found at:

http://www.th.gov.bc.ca/publications/planning/Provincial%20Highways/BC_Numbered_Hwy_Functional_Classes.pdf

100.11.2 Roundabout Geometric Design Information Sheet

Refer to Section 740 Roundabouts for design guidelines.

A typical Roundabout Geometric Design Information Sheet is provided at the end of this section. Due to the wide variety of roundabout configurations, there are no specific minimum criteria for all of the listed geometric parameters.

There are only five items under the BC MoTI Guidelines Criteria column that have values listed on the Information Sheet. Four items are standardized criteria for all roundabouts and the fifth item, the inscribed circle diameter, is to be filled in with a range based on the number of lanes and whether it is urban or rural. For each leg of the roundabout, the proposed criteria for all Geometric Design Elements are to be listed.

It is possible that some of the guidelines criteria may not be achievable. In this case, justification for deviation from guidelines must be documented and signed off following procedures similar to 100.11.1.2 Exceptions to Design Criteria.

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Project Design Criteria

Highway Design & Traffic Engineering Ministry of Transportation and Infrastructure

Project:	<i>(i.e. Project Name and Number)</i>
Type of work:	<i>(i.e. Capital/Rehab/Reconstruction, Interchange/Intersection/Access Improvement, Corridor Improvement, Re-alignment of Horizontal/Vertical, Shoulder Widening, etc.)</i>
Location:	<i>(i.e. LKI Segment and km reference, Road Names (Major/Minor), Cardinal Directions, Municipality, Electoral District, etc.)</i>
Length:	<i>(i.e. Length of each L-Line identified on Project Limits)</i>

- all Projects involving highway geometrics

<u>APPROVED/ACCEPTED BY:</u>	
_____	_____
Manager, Highway Design	Date

- Major Projects;
- Partnership Projects;
- all exceptions to standards; and
- highway corridor standards

<u>APPROVED/ACCEPTED BY:</u>	
_____	_____
Regional Manager, Engineering	Date

- Major Projects; and
- Partnership Projects

<u>APPROVED BY:</u>	
_____	_____
Regional Director, Transportation	Date

- major exceptions to standards;

<u>APPROVED BY:</u>	
_____	_____
Chief Engineer	Date

- Notes:**
- All projects require approval at the Manager, Highway Design level. Where exceptions to standards are proposed for a project, for corridor-wide standards, or where Ambient Standards or Context Sensitive Guidelines are proposed, the Regional Manager must approve. Where there are major exceptions to prevailing standards, the Chief Engineer's approval will be required. For Major Projects or Partnership Projects, the Regional Director must also approve.
 - The following page(s) set out more detailed design criteria for this project.
 - The list of items will not necessarily be the same for all projects; therefore, items may be deleted or added as appropriate.

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**Project Design Criteria
Highway Design & Traffic Engineering
Ministry of Transportation and Infrastructure**

Project:	<i>(i.e. Project Name and Number)</i>
Type of work:	<i>(i.e. Capital/Rehab/Reconstruction, Interchange/Intersection/Access Improvement, Corridor Improvement, Re-alignment of Horizontal/Vertical, Shoulder Widening, etc.)</i>
Location:	<i>(i.e. LKI Segment and km reference, Road Names (Major/Minor), Cardinal Directions, Municipality, Electoral District, etc.)</i>
Length:	<i>(i.e. Length of each L-Line identified on Project Limits)</i>

Design Element	Present Conditions	Adjacent Project Conditions	MoTI/TAC Guidelines Criteria	Proposed Project Criteria	Achieved Project Criteria	Comments / Notes
Functional Classification						
Design Classification						
Posted Speed	km/h	km/h	-	km/h	km/h	
Design Speed	km/h	km/h	km/h	km/h	km/h	
Basic # of Lanes						
Minimum Horizontal Radius	m	m	m	m	m	
Min. "K" factor..... Sag V.C.						
Min. "K" factor..... Crest V.C.						
Max. Grade	%	%	%	%	%	
Max. Superelevation	%	%	%	%	%	
Minimum S.S.D.	m	m	m	m	m	
Lane Width	m	m	m	m	m	
Shoulder Width Outside	m	m	m	m	m	
Shoulder Width Inside	m	m	m	m	m	
Clear Zone - Offset Width	m	m	m	m	m	
Recovery Slope (X:1)	:1	:1	:1	:1	:1	
Median Width	m	m	m	m	m	
Catchment Width in Rock Cuts	m	m	m	m	m	
Current Traffic Volume: SADT						
Design SADT / Design Hourly Vol.						
Level of Service (to year 20xx)						
Design Vehicle						

Explanatory Notes / Discussion:

(Provide brief scope statement, purpose of project and what is being achieved. Enter comments for clarification where appropriate and provide justification and evidence of engineering judgment used for items where deviations are noted in the design parameters listed above or any other deviations from TAC and BC Supplement to TAC which are not noted in the table above.)

RECOMMENDED BY: Engineer of Record: _____ Date: _____
(Print Name / Provide Seal & Signature)

Engineering Firm: _____
(Print Name)

MoTI Section	100	TAC Section	Not Applicable
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ROUNABOUT GEOMETRIC DESIGN INFORMATION SHEET

Project: <i>(i.e. Project Name and Number)</i>
Type of work: <i>(i.e. Capital/Rehab/Reconstruction, Interchange/Intersection/Access Improvement, etc.)</i>
Location: <i>(i.e. LKI Segment and km reference, Road Names (Major/Minor), Cardinal Directions, Municipality, Electoral District, etc.)</i>
Length: <i>(i.e. Length of each L-Line identified on Project Limits)</i>

GEOMETRIC DESIGN ELEMENTS <small>(See last page for a diagram of Key Dimensions)</small>	BC MoTI GUIDELINES CRITERIA	Xxxx St. N/B Appr. South Leg	Xxxx St. S/B Appr. North Leg	Yyyy Ave. W/B Appr. East Leg	Yyyy Ave. E/B Appr. West Leg
		Proposed Criteria	Proposed Criteria	Proposed Criteria	Proposed Criteria
Functional Classification of Approach Road:	----				
Design Classification of Approach Road:	----				
Posted Speed of Approach Road:	----				
Angle of Intersecting Roads ¹ :	desirable 75° to 105°				
Approach Grade:	desirable max. 4%				
Inscribed Circle Diameter (ICD):					
Circulatory Roadway Width (C _w) ² :	e to 1.2e				
Apron Width:	2.0 m min.				
No. of lanes (by leg: entry/exit) ³ :	----				
Approach Lane Width (v):	----				
Entry Width (e) ⁴ :	----				
Entry Radius (R _e):	----				
Exit Width (s):	----				
Exit Radius (R _s):	----				
Bypass Lane (Yes or No)	----				
Current Traffic Volume: SADT ⁵ :	----				
Design Hour Approach Volumes ⁵ <i>(enter design year) (AM/PM):</i>	----				
Truck Volume %:	----				
Level of Service:	----				
Design Vehicle:	----				

- 1 This is the interior angle measured between the approach leg tangent and the adjacent right side exit leg tangent.
- 2 C_w should be equal to or up to 20% larger than the widest Entry Width (e). C_w to be measured in front of entry leg splitter island.
- 3 Example: "2/1" means there are 2 entry lanes and 1 exit lane for this leg.
- 4 e = perpendicular distance from left lane edge/yield line point to edge of pavement (excluding gutter pan).
- 5 Use winter volumes if appropriate (ex. ski resort area).

NOTE:

Justification for deviation from guidelines and proposed mitigation must be documented and referenced by footnote number on subsequent pages attached to this sheet.

MoTI Section	100		TAC Section	Not Applicable
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**ROUNABOUT
GEOMETRIC DESIGN INFORMATION SHEET (cont'd)**

RECOMMENDED BY: _____
 Engineer of Record (Print Name / Provide Seal & Signature) DATE

 Engineering Firm (Print Name)

A. FOR PROJECTS WITHIN BC MoT GUIDELINES:

APPROVED BY: _____
 Manager, Highway Design DATE

B. FOR PROJECTS NOT WITHIN BC MoT GUIDELINES:

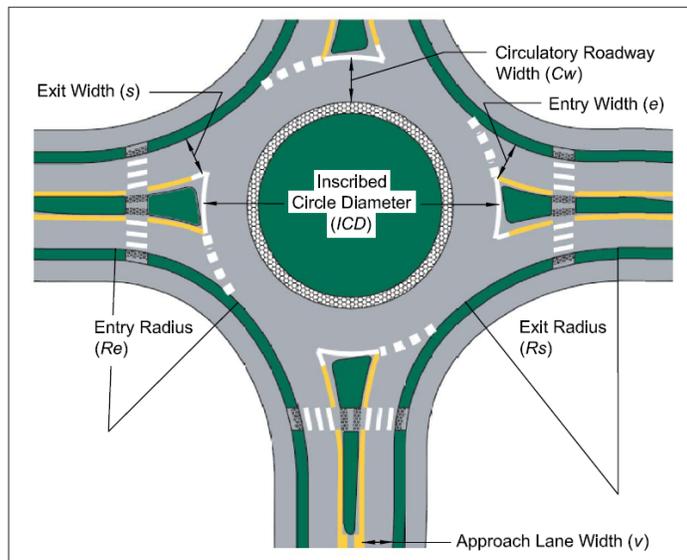
RECOMMENDED BY: _____
 Manager, Highway Design DATE

RECOMMENDED/APPROVED BY: _____
 Regional Manager, Engineering DATE

APPROVED BY: _____
 Chief Engineer DATE

The Design Criteria sheet is to be signed off by the indicated level of authority using either A or B as shown above.

KEY DIMENSIONS



MoTI Section	100	TAC Section	Not Applicable
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100.11.3 Typical Design Checklists

Quality Management Plan Design Checklists					
Project Description					
Project Number					
Engineer of Record	Name	Date	Reviewed by	Name	Date
Consulting Company Name and Address					
Design Criteria [MoTI Accepted?] (✓)	<input type="checkbox"/> Yes	<input type="checkbox"/> No			
Quality Control Stage (✓)	<input type="checkbox"/> 30% - 50% complete	<input type="checkbox"/> 90% complete	<input type="checkbox"/> 100% complete		

GENERAL

CALCULATIONS - SEE SEPARATE SHEETS.

Verify that all mathematical calculations have been checked and transferred correctly to the drawings.

DRAWINGS	Yes or No or n/a	Original Work by:	Checked By:	Date:
KEY PLAN				
Location Map: Shows site, nearest town names, land marks, etc. and North arrow				
Key Map: Alignments, Station ticks (500 m), Limits of Construction with stations, gravel sources, disposal sites, relevant names, roads, rivers, lakes, etc., scale, legal boundaries where feasible, sheet layout with plan numbers				
Standard title layout from BC Supplement to TAC				
Appropriate Signing Authority block				
Complete Symbol Legend (may be on separate sheet if too large)				
Plan Index				
Issue Record and date (when designed by a Consultant and only for submissions prior to final tender drawings)				
Consultant's name (if Applicable)				
COMMENTS:				

MoTI Section	100	TAC Section	Not Applicable
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DRAWINGS	Yes or No or n/a	Original Work by:	Checked By:	Date:
PLANS				
Base Mapping up to date or has been updated by recent survey				
Base Mapping to be screened (no screening on Utility Drawing set)				
Standard drawing format as per BC Supplement to TAC				
Sheets laid out in orderly sequence (intersections not broken up between sheets where possible, interchanges easily defined, etc.)				
Chainage runs left to right				
North arrows				
Toes shown and labeled C or F				
Limits of Construction shown for all alignments				
Cross-referencing where required				
Right-of-way layout in respect to toes				
Right-of-way matches at join lines				
Legal Descriptions shown				
Required Easements (construction, slope, etc.) shown				
Clearing and Grubbing limits correctly defined with areas boxed and sheet summaries				
Removals and adjustments shown (culverts, manholes, valves, houses, pavement, etc.)				
Urban Projects: Curb & Gutters, Sidewalks, Stairs, Storm Sewers, etc., if applicable				
Fencing requirements shown				
Structures identified				
All required chainages, curve data, co-ordinates and azimuths shown				
L-Line referenced to monuments/iron pins, co-ordinates shown				
Detours shown if applicable (may be separate drawings)				
Mini Key plan showing plan location on the contract				
All work items identified and boxed with leader lines to item where required.				
Coherent drafting (no overlapping lines, text, etc.)				
Text sizes readable when drawings half-sized				
Contours (5's, 10's 15's, etc.), elevations labeled and easy to find				
Waste areas identified				
Is sound attenuation required?				
Any need for crash attenuators?				
Scale Bar				
COMMENTS				

MoTI Section	100	TAC Section	Not Applicable
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DRAWINGS	Yes or No or n/a	Original Work by:	Checked By:	Date:
PROFILES				
Standard drawing format				
Existing ground line shown				
Design Speed shown				
Stationing of alignments (T.S., S.C., etc.) coincides with plans				
Note about finished grade elevations, excavation and embankment quantities, etc.				
Quantities match unadjusted figures in design folders				
Correctly-placed bench marks (outside limits of work) at 400 m intervals				
K-values for stopping sight distance shown				
Vertical curve lengths (standards)				
Vertical & Horizontal alignments integrated (aesthetics)				
Correct spiral lengths and superelevations				
Method of superelevation transition shown when there is insufficient tangent length between two curves for runoff. (stations/S.E. rates)				
Limits of construction shown				
All proposed and important existing culverts shown				
Existing affected utilities (storm, sanitary, gas, etc.) shown				
Rivers, creeks, bridge sites and structures identified, abutment stationing and bridge end fills shown				
Crossing roads, intersections, etc., identified by station, elevation and name				
Unnecessary irregularities or roller coaster effect in the grades (aesthetics)				
Impact on drainage (level grades, T.S./S.T. at low point on V.C., etc.)				
Construction Notes, surcharges, anticipated settlements, etc.				
Have separate Storm Sewer profiles been produced				
Surcharge shown on finished grade line (if applicable)				
COMMENTS:				

MoTI Section	100	TAC Section	Not Applicable
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DRAWINGS	Yes or No or n/a	Original Work by:	Checked By:	Date:
TYPICAL SECTIONS				
For completeness, covering all variations required for the project (e.g. minimum median, wide median, wall one side, etc.)				
Correct pavement structure				
Constructability				
Gravel depths measured at the correct hinge points?				
Subgrade crossfall correct (from geotechnical recommendations)				
Any obvious errors in the dimensions?				
Has stationing been shown covering the location of design requirements?				
Has subgrade crossfall transition treatment for curves been shown?				
Surcharge details and projected settlement?				
Appropriate ground lines used.				
Has clear zone been met as per BC Supplement to TAC?				
COMMENTS:				

MoTI Section	100	TAC Section	Not Applicable
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DRAWINGS	Yes or No or n/a	Original Work by:	Checked By:	Date:
GEOMETRICS AND LANING				
Design Speed(s), Design Vehicle(s) and referencing notes				
Compliance with BC Supplement to TAC specifications and guidelines?				
Intersection/interchange/access spacing, where applicable				
Configuration improvement possibilities				
Meets minimum traffic island dimensions				
Wheel chair ramps employed				
Island surfacing treatment (usually decorative finish in urban areas)				
Maximum radii (11 m) criteria for stop sign installations without islands				
Correct access types and locations (no accesses on Accel/Decel lanes, etc.)				
Lane balance achieved				
Weave lengths check, confirmed by Traffic Section				
North arrow and mini key plan				
Lateral sight distance (stopping/avoidance) checked				
Curb and Gutter, Asphalt and Concrete drainage curb limits				
Roadside and Median Barrier, Sta. to Sta. limits and summary of materials, Flares				
Various alignments numbered (L100, L200, etc.)				
Pedestrian Refuge details				
Attenuator requirements detail				
Proposed 4 lane design tapers to existing 2 lane highway (or should it be built full width with temporary tie-in using barriers?)				
Have lane drops and Intersection/Interchanges been checked for Directional Signability by Traffic Section				
Tapers shown (stations, start/stop)				
Checked by Traffic Section for Electrical				
COMMENTS				

MoTI Section	100	TAC Section	Not Applicable
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DRAWINGS	Yes or No or n/a	Original Work by:	Checked By:	Date:
SPOT ELEVATIONS				
Note that elevations shown are finished grade				
Elevations shown where required for construction purposes				
Spot check for obvious errors				
Shoulder or hinge point elevations shown if possible				
Cross check to see how spot elevations have drainage provisions.				
Have curb return profiles been done and spot elevations adjusted?				
COMMENTS				

DRAWINGS	Yes or No or n/a	Original Work by:	Checked By:	Date:
DRAINAGE				
Work items boxed				
Enclosed Drainage Systems: poor layout, obvious errors, C.B. spacings, pipe and M.H. sizes, A.S.T.M. No. and class, wall thickness, material selection (P.V.C. vs. C.S.P. vs. Concrete), drainage profiles produced?, etc				
Correct rain fall intensity for calculations				
What return period was the facility designed for?				
River Diversions shown				
Elevations shown for proposed extra ditching				
Ditch block details (vertical sandbags pose a hazard in clear zone - must have 10:1 slope facing oncoming traffic)				
Perforated pipe layout, details & location of cleanouts				
Invert elevations for all pipes shown				
All affected existing items addressed (removals, adjustments, abandon, extensions, relocations, etc.)?				
Reference notes to other drawings				
Culverts, Inlet Structures, C.B.'s, M.H.'s, etc., adequately described as to location, elevation, diameter, materials, wall thickness, etc.				
Calculations done for enclosed system				
Check for conflicts with other utilities, e.g. electrical, etc.				
Rip Rap details shown				
COMMENTS:				

MoTI Section	100	TAC Section	Not Applicable
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DRAWINGS	Yes or No or n/a	Original Work by:	Checked By:	Date:
UTILITIES (may be combined with Drainage drawings if clarity permits)				
Layout and location (avoidance of the travelled roadway prism where possible)				
All affected utilities contacted and dealt with?				
All agreements in place				
All work items boxed?				
Clear descriptions noted where required?				
References to other drawings and specifications				
Detail not screened				
Any special crossing drawings required				
Special drawings approved by appropriate agencies				
COMMENTS:				

DRAWINGS	Yes or No or n/a	Original Work by:	Checked By:	Date:
SOIL-STEEL AND CONCRETE STRUCTURES (over/underpasses, rivers, etc.)				
Site plans				
Typical sections				
Profiles				
Detail Drawings				
Coherent design plans				
Foundation excavation, structure backfill & height of cover (min.) to specs?				
Subdrainage addressed?				
Alternate bids addressed?				
COMMENTS:				

MoTI Section	100	TAC Section	Not Applicable
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DRAWINGS	Yes or No or n/a	Original Work by:	Checked By:	Date:
RETAINING WALLS				
Layout offsets shown				
Sufficient dimension and elevations for construction				
Type of wall selected suits installation location regarding aesthetics, soil conditions, cost-effectiveness and constructability?				
Subdrains where required				
Foundation excavation and structure backfill limits				
Typical Section(s)				
Plans				
Profiles				
Shown on working cross-sections?				
Railing or Barrier required?				
Wall finish				
COMMENTS:				

DRAWINGS	Yes or No or n/a	Original Work by:	Checked By:	Date:
CONSTRUCTION DETAILS				
Coherent and workable?				
Errors or omissions?				
Typical Sections reflect the work?				
Geotechnical and Environmental issues addressed?				
Staging and implementation				
COMMENTS:				

DRAWINGS	Yes or No or n/a	Original Work by:	Checked By:	Date:
GRAVEL HAUL CHART (if applicable)				
When bid prices include haul, this drawing is not required				
Overhaul chart shows project km as well as haul km				
Pit(s) name/location/distance from project shown with vertical line where gravels would enter the project				
Types of granular material and totals				
COMMENTS:				

MoTI Section	100	TAC Section	Not Applicable
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DRAWINGS	Yes or No or n/a	Original Work by:	Checked By:	Date:
VOLUME OVERHAUL DIAGRAM (if applicable)				
Complies with BC Supplement to TAC guidelines				
Check for obvious errors				
Marked "For Information Purposes Only" if haul is included in excavation bid prices				
COMMENTS:				

DRAWINGS	Yes or No or n/a	Original Work by:	Checked By:	Date:
SIGNING AND PAVEMENT MARKINGS, ELECTRICAL, GEOTECHNICAL, BRIDGES, LANDSCAPING, ENVIRONMENTAL MITIGATION, MUNICIPALITIES AND OTHER AGENCIES				
To be reviewed by their respective Branches/Sections				
Signing and Pavement markings				
Geotechnical				
Bridges				
Landscaping				
Environmental				
Municipalities				
Other Agencies				
COMMENTS:				

MoTI Section	100	TAC Section	Not Applicable
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DRAWINGS	Yes or No or n/a	Original Work by:	Checked By:	Date:
ELECTRICAL and SIGNING (Usually completed by electrical designer)				
Hydro service locations confirmed with utility company (provide confirmation from utility company)				
Telephone service locations confirmed with utility company (provide confirmation from utility company)				
Overhead utility lines checked for conflicts with poles				
Electrical design drawing checked for conflicts with underground utilities				
Signal and Sign pole capacities checked using the Pole Capacity Program				
Verify illumination levels				
Final civil design drawings cross checked with the Electrical Design drawings				
Materials List checked and finalized				
Directional Sign Records finalized				
Ministry Regional comments addressed				
Ministry Electrical Section comments addressed				
Ministry Sign Section comments addressed				
Ministry Regional Electrical Manager comments addressed				
Construction cost finalized at 'Detailed Design' estimate level (refer to Section 100.6)				
All Drawings checked to identify conflicts (underground and overhead)				
COMMENTS:				

DRAWINGS	Yes or No or n/a	Original Work by:	Checked By:	Date:
GEOTECHNICAL				
Has draft geotechnical report been produced?				
Have all material horizons been identified?				
Has pavement structure been confirmed?				
Has depth of stripping been determined?				
Have all cut and fill slope rates been set?				
Has all information required for existing pavements been obtained?				
Have all soil issues been addressed?				
Has final report been produced?				
COMMENTS:				

MoTI Section	100	TAC Section	Not Applicable
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DRAWINGS	Yes or No or n/a	Original Work by:	Checked By:	Date:
ENVIRONMENTAL				
Have environmental agencies been contacted? (List in comments)				
Have environmental issues been identified and included in design work?				
Have approvals been obtained from environmental agencies?				
COMMENTS:				

DRAWINGS	Yes or No or n/a	Original Work by:	Checked By:	Date:
SUGGESTED CONSTRUCTION STAGING				
Marked "For Information Purposes Only"				
Is the staging workable with minimum traffic interruption?				
COMMENTS:				

DRAWINGS	Yes or No or n/a	Original Work by:	Checked By:	Date:
DETOURS				
Should show all of the information required for construction at the proposed design speed: Typical sections, surface treatment, drainage, profiles, etc				
Is the detour design functional, constructible and to Ministry guidelines?				
Have quantities been included in project calculations?				
COMMENTS:				

MoTI Section	100	TAC Section	Not Applicable
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DRAWINGS	Yes or No or n/a	Original Work by:	Checked By:	Date:
SIGNING & PAVEMENT MARKINGS PLAN (USING LANING BASE)				
Are all warning, regulatory and guide signs shown?				
Is all sign information illustrated correctly?				
Are sign bridges or cantilever signs required and bases shown?				
Has roadside barrier protection been reviewed for sign bridges, etc.?				
COMMENTS:				

DRAWINGS	Yes or No or n/a	Original Work by:	Checked By:	Date:
BRIDGES				
R/W, Horizontal and Vertical alignments to be compatible with grade design				
Clear distinct separation of quantity take off (from road construction)				
Separate Q.C./Q.A. done by Bridge Section				
Barrier connected to roadside barrier (also shown on Laning and Geometrics)				
COMMENTS:				

MoTI Section	100	TAC Section	Not Applicable
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DRAWINGS	Yes or No or n/a	Original Work by:	Checked By:	Date:
RIGHT-OF-WAY DRAWINGS				
Is cover sheet the same as detailed design, complete with "Property Acquisition Plan"?				
Has a legend sheet been included?				
Is plan scale the same as design drawings?				
Have Agricultural Land Commission concerns been addressed?				
Are all limits of construction shown?				
Is cadastral shown with plan numbers?				
Is right-of-way clear of toes 5 m min. on highway and 3 m min. on local roads?				
Is right-of-way dimensioned and do dimensions agree with design plans?				
New Right-of-way required is to be referenced from existing R/W wherever possible, rather than offsets from "L" or control lines				
Do match lines meet and is correct number for adjacent sheet shown?				
Are drawing numbers correct with 'RW' added?				
Does right-of-way line encompass entire project?				
Is correct linetype utilized?				
Are working easements "license to construct" areas shown?				
Are areas shown to correct decimal place and shown boxed?				
Are summary sheet areas listed by legal description?				
Are all lots, parcels, easements, utility corridors, etc. included?				
Have total areas been checked?				
Have all the following been eliminated from plans: contours, clearing and grubbing lines and areas, proposed edge of pavement, drainage structures, pipes, catch basins, retaining walls and rip-rap?				
Have any alignment changes occurred during the 30% - 50% review?				
Has right-of-way been altered to reflect changes?				
Is right-of-way as submitted in Final Draft?				
COMMENTS:				

MoTI Section	100	TAC Section	Not Applicable
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DRAWINGS	Yes or No or n/a	Original Work by:	Checked By:	Date:
CROSS-SECTIONS				
Do section widths match what is shown on plans?				
Are underground utilities shown?				
Is right-of-way shown on cross-sections?				
Are cross-section sets updated to final contract stage?				
Are the cross-culverts shown?				
Required number of sets of cross-sections been forwarded?				
Are the walls/surcharges/construction details shown?				
COMMENTS:				

SPECIAL PROVISIONS AND ESTIMATE:	Yes or No or n/a	Original Work by:	Checked By:	Date:
Concise, accurate, cross-referenced, addressing only those items not properly covered in the Standard Specifications or the Construction Agreement.				
SECTION 1 - GENERAL				
SECTION 2 - GRADING				
SECTION 3 - ELECTRICAL				
SECTION 4 - LANDSCAPE				
SECTION 5 - PAVING				
SECTION 6 - SIGNING				
SECTION 7 - BRIDGE				
SCHEDULE OF APPROXIMATE QUANTITIES AND UNIT PRICES				
MISCELLANEOUS BY OTHERS				
COMMENTS:				

DESIGN FOLDERS	Yes or No or n/a	Original Work by:	Checked By:	Date:
Complete, covering all items in the Schedule of Approximate Quantities				
Quantities can be traced as to how they were compiled/arrived at, and agree with the associated contract documents				
Project history, design decisions with background and approvals, utilities and agency contacts and approvals, etc.				

MoTI Section	100	TAC Section	Not Applicable
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100.11.4 Project Deliverables Checklist

Project: _____

Designer: _____ Date: _____

Req'd	Rec'd	SURVEY DELIVERABLES (reference the latest version of MoTI General Survey Guide)
<input type="checkbox"/>	<input type="checkbox"/>	All survey data in CAiCE Survey Project Data format (General Survey Guide, Section 800). Include control points defined by point identifier, northing, easting, elevation & feature. Define elevation datum. The legacy Survey Results File (SRF) format may be acceptable under some circumstances.
<input type="checkbox"/>	<input type="checkbox"/>	Survey data reduced electronically in ASCII file format
<input type="checkbox"/>	<input type="checkbox"/>	All legal plans used to define rights-of-way and property lines (in TIFF format if available)
<input type="checkbox"/>	<input type="checkbox"/>	All underground utility plans and other drawings used
<input type="checkbox"/>	<input type="checkbox"/>	All drawings meeting standards and contents specified in the General Survey Guide (Section 1100)
<input type="checkbox"/>	<input type="checkbox"/>	Quality management documentation

Req'd	Rec'd	DESIGN DELIVERABLES _____ % Submission
<input type="checkbox"/>	<input type="checkbox"/>	Right-of-Way Acquisition Plans
<input type="checkbox"/>	<input type="checkbox"/>	Geotechnical Summary Report detailing additional geotechnical investigations recommended
<input type="checkbox"/>	<input type="checkbox"/>	Drainage and Grading Distribution Report
<input type="checkbox"/>	<input type="checkbox"/>	Electrical Design Folder (ref. MoT Electrical & Traffic Engineering Manual, Sec. 202.7) <i>Check with Sr. Electrical & Video Systems Engineer for requirements.</i>
<input type="checkbox"/>	<input type="checkbox"/>	Traffic Design Folder (ref. MoT Electrical & Traffic Engineering Manual, Sec. 202.8) <i>Check with Sr. Traffic Engineer/Regional Traffic Engineer for requirements.</i>
<input type="checkbox"/>	<input type="checkbox"/>	Environmental Reports
<input type="checkbox"/>	<input type="checkbox"/>	Half size (11" x 17") and full size hardcopies, DWF files and DWG files of design drawings
<input type="checkbox"/>	<input type="checkbox"/>	Half size hardcopies and DWF files of cross sections and other reference drawings
<input type="checkbox"/>	<input type="checkbox"/>	DOC file of Special Provisions and Appendices
<input type="checkbox"/>	<input type="checkbox"/>	Engineer's Estimate on H0088 form (Approximate Quantities and Unit Prices)
<input type="checkbox"/>	<input type="checkbox"/>	Highway Design Folder containing the following:
<input type="checkbox"/>	<input type="checkbox"/>	<ul style="list-style-type: none"> signed and sealed Project Design Criteria document

MoTI Section	100	TAC Section	Not Applicable
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<input type="checkbox"/>	<input type="checkbox"/>	<ul style="list-style-type: none"> CAiCE design files in accordance with Section 1270, BC Supplement to TAC Geometric Design Guide
<input type="checkbox"/>	<input type="checkbox"/>	<ul style="list-style-type: none"> a completed and signed CAiCE Design Project Electronic Deliverables Quality Checklist
<input type="checkbox"/>	<input type="checkbox"/>	<ul style="list-style-type: none"> quantity calculation sheets showing how the "most probable" approximate quantities were derived and cross referenced to the Engineer's Estimate
<input type="checkbox"/>	<input type="checkbox"/>	<ul style="list-style-type: none"> evidence of a QC & QA plan
<input type="checkbox"/>	<input type="checkbox"/>	<ul style="list-style-type: none"> pertinent project correspondence including minutes of meetings in chronological order
<input type="checkbox"/>	<input type="checkbox"/>	<ul style="list-style-type: none"> project photos, preferably in colour
<input type="checkbox"/>	<input type="checkbox"/>	<ul style="list-style-type: none"> a brief Final Design Report/Letter itemizing outstanding issues and highlighting items of particular importance for Field Services, e.g. utility issues, environmental concerns, construction staging considerations, etc.

Req'd	Rec'd	TENDER PACKAGE DELIVERABLES (use formats referenced in http://www.th.gov.bc.ca/Publications/const_maint/contract_serv/contract_services.htm)
<input type="checkbox"/>	<input type="checkbox"/>	Schedule T3 – Contract Specific Reference Documents: List all reference documents.
<input type="checkbox"/>	<input type="checkbox"/>	Schedule 1 - Supplemental General Conditions
<input type="checkbox"/>	<input type="checkbox"/>	Schedule 3 – Special Provisions and Appendices: Submit in an MSWord DOC file including Table of Contents and Sign Records (if applicable).
<input type="checkbox"/>	<input type="checkbox"/>	Schedule 4 – Drawings: List all contract drawings including revision letter. Do not list Contract Specific Reference Documents here, e.g. cross sections.
<input type="checkbox"/>	<input type="checkbox"/>	Schedule 5 – Time Schedule
<input type="checkbox"/>	<input type="checkbox"/>	Schedule 6 – Insurance Specifications
<input type="checkbox"/>	<input type="checkbox"/>	Schedule 7 - H0088 – Total Tender and Associated Ministry Cost Estimate
<input type="checkbox"/>	<input type="checkbox"/>	Contract Specific Reference Documents, e.g. Cross Sections, Geotechnical Reports, etc.
<input type="checkbox"/>	<input type="checkbox"/>	Full size, signed and sealed contract drawings