

SECTION 10 - BRIDGE PLANNING, DESIGN AND INSPECTION

10.1 DESIGN STANDARDS

All design work shall be done in accordance with relevant codes, current Department standards, specifications, and recognized engineering practices.

10.2 ENGINEERING DRAWINGS

The current version of the Department’s standard title block shall be used for all drawings. The Department will assign drawing numbers (DD, P, N, S, etc.) for all engineering drawings required to complete projects. These numbers and the standard title block template are issued by the Bridge Standards Technologist, Bridge Engineering Section, Technical Standards Branch, (Tel. No. 415-1042).

Whenever possible the Department’s standard drawings shall be used for the construction of bridges and culverts. The drawings are now available at the Department’s website (see Section 10.9) under ‘Bridge Design Guides’.

Refer to Appendix “J1” for schedule of milestone dates of submission of drawings and reports.

10.3 INDEPENDENT DESIGN CHECK

A complete check of the bridge planning, structural design and drawings shall be carried out by a Professional Engineer other than the Professional Engineer responsible for the design. The Professional Engineer who has undertaken this check shall provide design check notes and shall also stamp, sign and seal the drawings. This independent design check shall be carried out by another Consultant when the design Consultant does not have adequate in-house capabilities to provide this check or if so directed by the Department.

Typically, an “Independent Design Check” involves the following activities:

- Complete review of bridge planning and assessments. Re-analysis using other methodologies is warranted for critical design components.
- Complete re-analysis of all aspects of the original structural design, preferably (but not essentially) by a methodology other than that used in the original design.

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- Ensuring that the engineering drawings accurately convey the design philosophies of the original design and the checkers design.
- Ensuring the completeness, integrity, and accuracy of all aspects of the Engineering Drawings.

To resolve issues of concern, an independent check of a specific component of the structure may be requested by the Department at any time throughout the design process.

10.4 BRIDGE SURVEYS

Refer to Section 6.1.4.5.

10.4.1 BENCH MARKS

The Department will assign reference numbers for the Bench Mark tablets when applicable (major bridge only). These numbers are issued by the Survey/Imagery Coordinator, Highway Geomatics Section, Program Management Branch. When available, the final geodetic elevation for the Bench Marks shall be incorporated into the As-Constructed drawings and reported back to the Coordinator.

10.5 RIGHT-OF-WAY REQUESTS FOR STAND ALONE BRIDGE PROJECTS

Refer to Chapter 3.

10.6 STAKEHOLDER INPUT

The Consultant shall discuss the proposed alternatives with municipalities and regulatory agencies as required to facilitate stakeholder input and feedback. The Consultant shall formulate a public participation strategy where required. Any strategy not detailed in the project Terms of Reference requires prior approval of the Department.

10.7 APPROVALS, LICENSES AND PERMITS

The Consultant shall ensure all Provincial and Federal permits and licenses are obtained including any required investigations.

10.8 SUBMISSIONS OF DRAWINGS AND REPORTS

Stages of the project that have been identified (in Appendix J1 or the Terms of Reference) as requiring a review by the Department shall be submitted in a timely manner. The submission shall take into account the ‘milestone dates’ that have been specified in the Agreement (or Appendix “J1” in the absence of detailed dates in the Agreement), and allow sufficient time to enable a level of review appropriate to the work involved to be undertaken.

All bridge drawings and reports submitted to the Department must contain a reference to the unique bridge file number (BF#) that has been assigned to the project.

10.9 BRIDGE ENGINEERING WEBSITE

Additional Information on bridge planning, design, construction and standard engineering drawings etc. can be found at <http://www.trans.gov.ab.ca> (as of April 2002).

10.10 BRIDGE PLANNING AND ASSESSMENTS

Unless otherwise noted the provisions of CAN/CSA-S6-00 with reference to Section 1.2.3 Hydraulic Definitions and 1.10 Hydraulic Design shall NOT apply to this work. All bridge planning and assessments shall otherwise be done in accordance with relevant codes, current Department standards and best practices, specifications, and recognized engineering practices. The Consultant shall complete the assessment and bridge planning including summary reports, sketches and/or drawings for the existing and/or proposed bridge structures and/or associated river training protection works, as applicable. Assessments should be used to determine the best course of action for an existing bridge structure such as: should the bridge be maintained, rehabilitated, replaced, widened or eliminated.

All major bridge or culvert structures and/or associated river engineering works shall require preparation of Design Data Drawings in accordance with Appendix “J1”.

10.10.1 ASSESSMENTS

The bridge assessment should include when applicable, but not be limited to, the following considerations:

- site history
- traffic flows, patterns, projections, accident records
- future developments

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- land use
- train traffic (number, length, speed, number of lines, hazardous materials, etc.)
- hydrology
- hydraulics
- geotechnical factors
- environmental factors
- corrosion survey
- structural conditions and options
- road geometrics
- clearances
- high load corridor (current and future)
- log haul routes (log haul truck dimensions)
- any other factors potentially impacting the recommendation

The Consultant shall undertake an economic evaluation and life cycle costing of alternatives including maintenance, rehabilitation and replacement costs. Existing files and drawings shall be reviewed and the site should be inspected.

10.10.2 BRIDGE PLANNING

The Consultant shall:

- Identify appropriate alignment, location and structure type alternatives (consideration shall be given to right-of-way requirements, utilities, geotechnical and hydrotechnical information, traffic accommodation detour and staging requirements).
- Identify right-of-way requirements.
- Prepare conceptual alternatives for advancement to Design Data drawing (DD drawing) stage including preliminary cost estimates, preliminary hydrotechnical design, site survey, and appropriate conceptual sketches as well as a draft bridge summary report.
- Complete hydrotechnical, river engineering and geometric design.
- Complete preliminary geotechnical investigation.
- Complete corrosion survey (culverts only).
- Prepare DD drawings and bridge planning summary report as detailed in Appendix “J1”.

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10.10.3 SUMMARY OF REPORTING AND SUBMISSION REQUIREMENTS

As applicable, at the conclusion of the Bridge Planning phase, the Consultant shall submit to the Project Sponsor (or already have submitted) the following documentation:

- Bridge assessment report
- Geotechnical Report
- Cost estimates for alternatives considered
- Bridge Concept Approval documentation including supporting technical information and draft Bridge Planning Summary report.
- All applicable environmental impacts, investigations, approval applications and submissions including supporting documentation.
- Navigable Water Protection Act (NWPA) drawings, permit applications, approvals, proof of advertising, etc.
- Railway grade separation drawings, submissions to the Railways (under the “Canada Transportation Act” CTA), and approvals (including the CTA order)
- Fisheries Act submissions and approvals
- Stamped, signed and sealed original Design Data (DD) drawings and Bridge Planning Summary report. The Department may, at its discretion, request that the Consultant retain the DD drawings until the construction contract has been awarded
- Draft of Bridge Planning (DD Drawing) Completion form
- Electronic data files in an accepted format
- Design notes and all other data identified in the Agreement (for record purposes only)
- Geotechnical Report

Final Design Data (DD) drawings and the Bridge Planning Summary report (stamped and signed) are to be received by the Department prior to the “Preliminary Engineering (DD Drawing) Completion date identified in the Agreement”. (“Completion” may also occur at this time).

For further details of “Reporting and Submission Requirements” refer to Appendix “J1”.

10.11 BRIDGE STRUCTURAL ENGINEERING

The Consultant shall complete the bridge designs for the project as detailed in the following sections:

10.11.1 PRELIMINARY STRUCTURAL DESIGN

The Consultant shall prepare a structure alternatives report for structure options considered suitable for the site (including rehabilitation when appropriate), illustrative drawings, and “B” cost estimates and life cycle cost, etc., for each alternative.

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10.11.2 DETAILED STRUCTURAL DESIGN

The Consultant shall prepare a “Project Design Brief” (See Appendix “J1”) for the chosen structure (major bridges and overhead sign structures only) prior to commencement of detailed design. The Consultant shall complete the detailed design and construction drawings for the selected structure, including special provisions, “C” cost estimate, bid items, contract quantities, reinforcing steel bar lists, material lists, etc.

10.11.3 SUMMARY OF REPORTING AND SUBMISSION REQUIREMENTS

At the conclusion of the project, the Consultant shall submit (or already have submitted) the following documentation:

- Preliminary Structures alternative report
- Any outstanding applications, approvals for licenses or permits, etc., required to carry out the work which were not obtained during the bridge planning phase
- Corrosion survey report (culverts only), and life expectancy calculations
- Cost estimates (“B” & “C”) for alternatives considered
- After the contract is awarded, a “D” cost estimate will be prepared and submitted to the Project Sponsor with copies to Bridge Construction Specialist, Bridge Engineering Section, Technical Standards Branch, Edmonton
- ‘Choose Design’ record
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- Project Design Brief (major bridges and overhead sign structures only)
- Draft of “Design Completion” form
- 3 sets of the approved shop or fabrication drawings, erection drawings, stressing, calculations, etc. (2 sets to Fabrication Standards Specialist, Bridge Engineering Section, 1 set to Project Sponsor)
- 5 sets of reduced drawings to Bridge Standards Technologist, Bridge Engineering Section. (These drawings are required in addition to the requirements for plans and drawings prior to tendering as specified in Section 11.1.2.4)
- 9 sets of full size drawings within two weeks after the Contract is awarded (4 sets for Contractor, 3 sets to Bridge Standards Technologist, Bridge Engineering Section, 2 sets to Project Sponsor). The drawings shall be updated to include all revisions to date.
- Design notes and checkers notes (for record purposes only)
- Original stamped and signed drawings, electronic files, and “As Constructed” information, etc. This data is required at the conclusion of the contract (see Engineering Consultant Guidelines for Highway and Bridge Projects – Volume 2 – Construction Contract Administration).

For further details of “Reporting and Submission Requirements” refer to Appendix “J1”.

10.12 MATERIAL FABRICATION AND BRIDGE CONSTRUCTION INSPECTION

The Consultant shall perform quality assurance checks; inspections and acceptance of plant fabricated materials in accordance with Department standards and guidelines. Refer to Appendix J2 for qualifications of materials inspectors.

The Consultant shall inspect the Contractor’s work and ensure that all construction work fully complies with the contract. Refer to Appendix J3 for qualifications of bridge construction inspectors.

For Requirements of Inspection, refer to “Engineering Consultant Guidelines for Highway and Bridge Projects – Volume 2 – Construction Contract Administration”.

10.12.1 SHOP DRAWINGS

Refer to “Engineering Consultant Guidelines for Highway and Bridge Projects – Volume 2 – Construction Contract Administration”.

10.12.2 AS-CONSTRUCTED DRAWINGS

Refer to “Engineering Consultant Guidelines for Highway and Bridge Projects – Volume 2 – Construction Contract Administration”.

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Current References for Section 10:

- A Guide to Electronic Surveying & Data Management, 1996, Alberta Transportation.
- A Policy on Geometric Design of Highways and Streets, 2001, AASHTO.
- Bridge Code on Fabrication of Structural Steel, 1996, AASHTO.
- Bridge File Maps (by Municipality) (photo grade paper), 1995, Alberta Transportation.
- Bridge File Maps (by NTS Grid) (photo grade paper), 1995, Alberta Transportation.
- Bridge Inspection Manual (BIM), 2001, Alberta Transportation.
- Bridge Inspection & Maintenance System Manual, 1990, Alberta Transportation.
- Bridge Rating - New Rating Truck Models Version 1.00, 1997, Alberta Transportation.
- Bridge Size Culverts (Installation Video), 1995, Alberta Transportation.
- Bridge Size Culverts Design & Draft Guidelines, 1995, Alberta Transportation.
- Bridge Structures Design Criteria Version 4.0, 2001, Alberta Transportation.
- Bridge Welding Code D1.5, 1996, A.W.S.
- Canada Transportation Act, Government of Canada.
- Canadian Highway Bridge Design Code, 2000, Canadian Standards Association.
- Cost Apportionment Guidelines - for railway crossings, 1990, Government of Canada.
- Engineering Consultant Guidelines for Highway and Bridge Projects – Volume 2 – Construction Contract Administration, 2001, Alberta Transportation.
- Fish Habitat Manual, 2001, Alberta Transportation.
- Guide to Bridge Hydraulics, 2001, TAC.
- Guide to Railway Works Cost Apportionment, April, 1997, Rail Infrastructure Directorate.
- Guidelines for Bridge Structures, Standards, Approvals, and Design (SAD Guidelines), 1992, Alberta Transportation.
- Highway Drainage Guidelines (Metric Versions), 1999, AASHTO.
- Highway Geometric Design Guide, 1999, Alberta Transportation.
- Navigable Waters Protection Act, Government of Canada.
- Road/Railway Crossing Guidelines, May 1997, Alberta Transportation.
- Specifications for Bridge Construction, 2001, Alberta Transportation.