

## DB Section 141.11 - Structures

**(a) Scope** - This Section covers the design and construction of new Bridges, Bridge replacements, permanent Bridge repairs, culvert Structures, and sign Structures. The goal of the design and construction of all structural systems and components is to provide functionality, durability, ease of maintenance, safety, and aesthetics consistent with the context of the Project Site.

**(b) Standards and References** - Design-Builder shall design and construct Structures in accordance with the requirements of this Section 141.11.

### (1) Standards

#### a. Design

- ODOT *Bridge Design and Drafting Manual (BDDM)*
- ODOT *Bridge Office Practice Manual*
- ODOT LRFR *Interim Scoping Load Rating Guidelines*
- ODOT *Bridge Section Load Rating Procedures*
- AASHTO LRFD *Bridge Design Specifications*
- AASHTO *Standard Specifications for Highway Bridges*
- AASHTO *Guide Specifications for Horizontally Curved Highway Bridges with Design Examples for I-Girder and Box-Girder Bridges*
- AASHTO *Guide Design Specifications for Bridge Temporary Works*
- AASHTO *Construction Handbook for Bridge Temporary Works*
- AASHTO *Guide Specifications for Distribution of Loads for Highway Bridges*
- AASHTO *Guide Specifications for Seismic Isolation Design*
- AASHTO *Guide Specifications for Strength Evaluation of Existing Steel and Concrete Bridges*
- AASHTO *Guide Specifications for Design and Construction of Segmental Concrete Bridges*
- AASHTO *Guide Specifications for Thermal Effects on Concrete Bridge Superstructures*
- AASHTO *Guide Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals*<sup>5</sup>
- AASHTO *Guidelines for Geometric Design of Very Low-Volume Local Roads* for "Rural Minor Access Road" classification
- AREMA *Manual for Railroad Engineering*
- ANSI/AASHTO/AWS D1.5 *Bridge Welding Code*
- ANSI/AASHTO/AWS D1.1 *Welding Code*
- AASHTO *Manual on Subsurface Investigations*
- ODOT *Bridge Inspection Coding Guide*

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- *Oregon Coding Guide for the Inventory and Appraisal of Oregon Bridges*
- *AASHTO Guide Manual for Condition Evaluation and Load and Resistance Factor Rating of Highway Bridges*
- *AASHTO Maintenance Manual for Roadways and Bridges*
- “Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation’s Bridges,” FHWA-PD-96-001, 1995
- *ODOT Hydraulics Manual*
- “Bridge Inspector’s Training Manual 90,” FHWA-PD-91-015 (1991; rev.1995)
- Appropriate ODOT/APWA Oregon Standard Construction Drawings from the following site: <http://www.odot.state.or.us/tsroadway/std-dwg-02.htm>
- *ODOT Bridge Section Load Rating Procedures*
- **DB Standard Specifications** (Parts 00200 through 03000 of the *Oregon Standard Specifications for Construction*)
- *ODOT Highway Design Manual*
- *ODOT Bicycle and Pedestrian Plan*
- *AASHTO Model Drainage Manual*
- AASHTO/FHWA Research Report RD-87-014, Bridge Deck Drainage Guidelines

**b. Construction**

- **DB Standard Specifications** (Parts 00200 through 03000 of the *Oregon Standard Specifications for Construction*)
- *AASHTO LRFD Bridge Construction Specifications*
- *AASHTO Construction Handbook for Bridge Temporary Works*
- *AASHTO Guide Specifications for Design and Construction of Segmental Concrete Bridges*
- *ODOT Construction Manual*

(Other Standards applicable to inspection and verification are found in the relevant text.)

**(2) References**

- ODOT Bridge Engineering Section, Bridge Log
- ODOT Qualified Products List (QPL) at the following site:  
<http://egov.oregon.gov/ODOT/HWY/CONSTRUCTION/QPL/Docs/QPL.pdf>
- “Improved Seismic Design Criteria for California Bridges: Provisional Recommendations,” ATC-32, Applied Technology Council, 1996

**(c) Requirements**

**(1) General** – Design-Builder shall follow the design, detailing and drafting practices identified in the *BDDM* and the *Bridge Office Practices Manual*, as well as the Standards cited herein.

**(2) Materials** – Any agency required Materials will be set forth in **DB Special Provisions**, SP141.11(c)(2).

**(3) Corrosion Protection** – Design-Builder shall confirm the elevation and location of Structures. Certain corrosion-protection measures apply when Structures are located in the coastal zone or snow/ice areas.

**(4) Aesthetics** – See **DB Special Provisions** for any specific Structure aesthetic requirements.

**(5) Bridge Replacement and New Bridges**

**a. General** – Bridge type will not be restricted to those traditionally proposed by Agency. Other types and components may be used if they have been generally accepted as appropriate within the Highway Bridge industry, and Design-Builder can demonstrate that its proposed design of the Bridge type and components will perform in accordance with Contract requirements under the Project's environmental conditions and life cycle expectations. Exceptions include: experimental Bridge types, timber Bridges, masonry Bridges, fiber-reinforced polymer Bridges, tied-arch trusses, and structural-plate arches, which are all not permitted.

Bridges shall be designed and constructed for a minimum 75-year service life (without significant, non-routine maintenance required) and shall meet Agency 4R design Standards.

In all cases where Bridges must be designed to enable future widening to accommodate one or more additional Traffic Lanes in each direction, the Bridge type and design shall be such that the future widening can be achieved without major modifications to the Bridge. Plans submitted at the Definitive Design stage for Agency review and Acceptance shall show the future widening aspects of the Bridges and be accompanied by a design narrative.

Design-Builder shall obtain Bridge numbers, drawing numbers, and calculation book numbers from Agency PM. Design-Builder shall use Bridge numbers on all Plans, calculation books and correspondence. Design-Builder shall be responsible for inputting all Structure and Project data for all Bridges into Agency's Bridge Data System.

**b. Geometry** – Horizontally-curved steel girder Bridges shall be designed in accordance with the *AASHTO Guide Specifications for Horizontally Curved Steel Highway Bridges*. Design-Builder shall locate supports radially for curved Structures where practicable.

Bridge skew shall be minimized wherever practicable. For Bridges located in snow zones (defined in BDDM), skews shall be limited to 45 degrees.

All fill and cut Slopes along the longitudinal axis of Bridges with spill-through abutments shall not be steeper than 1.5:1.

DB 141.11(c)(5)c.

**c. Seismic Loading** – Permanent Structures shall be designed for seismic loading according to the ODOT *Bridge Design and Drafting Manual*.

**d. Bridge Elements**

**1. Decks**

- All decks shall be high-performance concrete (HPC) (full-depth cast-in-place microsilica concrete with fly ash)
- The minimum deck thickness shall be in accordance with ODOT *Bridge Design and Drafting Manual*, Section 1.1.14.1, for concrete decks that are fully supported by precast slabs or precast box beams
- Deck systems shall be watertight
- Decks shall be designed for a future wearing surface allowance of 25 psf
- Open or filled grating decks and orthotropic decks shall not be allowed
- For deck construction, stay-in-place forms shall not be allowed

**2. Deck Joints and Bridge Bearings** – Bridges shall incorporate as few joints and bearings as possible, be continuous over supports, and use integral or semi-integral abutments wherever possible. It is highly desirable to have jointless Bridges. A jointless Bridge is considered to be one with the expansion movement occurring at the Roadway ends of the end panels.

**3. Bridge Railing**

- All Bridge railing shall be Type “F” concrete Bridge rail (ODOT/APWA Oregon Standard Construction Drawing BR256), unless otherwise identified in **DB Special Provisions**
- Railroad crossings must include protective fencing mounted on top of the concrete Bridge rail

**4. Deck Drainage**

- Direct deck drainage discharge is not allowed
- The number of deck drains shall be kept to a minimum consistent with the hydraulic requirements. If deck drains are used, Design-Builder shall provide a piping system to collect the deck drainage and convey it to a suitable treatment area. The piping system shall be designed to allow for ease of maintenance.

**5. Utilities** – Utilities shall not be placed on the Structures without Agency authorization. If authorized, Design-Builder shall have a Design Professional assess the Structure for stresses induced by the Utility on the Structure, and shall incorporate the resulting design into the Plans and Design-Builder Specifications.

Utility attachments, if any, to Structures shall not alter the appearance of the Structure, and shall be located only inside the girder line, as close as possible to the soffit, or as required to make the installation as inconspicuous as possible.

**6. End and Interior Bents** – For all support locations where integral or semi-integral abutments are used, the girders shall be seated upon permanent concrete pads. If precast, prestressed girders are used, a minimum embedment of eight (8) inches shall be provided at all bents to accommodate transverse dowels through the girders with appropriate concrete cover, and to provide adequate seat width.

Any bents that are within a distance of 30 feet from the edge of the Traveled Way shall be designed in compliance with either AASHTO *LRFD Bridge Design Specifications*, Section 3.6.5 or Section 1.6 of the BDDM.

The use of mechanically-stabilized earth (MSE) walls shall follow the provisions of *BDDM*, Section 1.1.8.4. Retaining walls may replace wingwalls at abutments.

**7. Foundations** – Design-Builder shall comply with the ODOT *Bridge Design and Drafting Manual*, Section 1.1.5 – Foundation Design, and shall provide a seismic design approach for all foundations. Differential settlement shall not exceed 0.5" within a bent or abutment, or between adjacent bents or abutments. Downdrag shall be investigated and included in the design.

Abutments adjacent to MSE walls require deep foundations. Design-Builder shall design for down drag on deep foundations where required by code.

**8. Scour** – See **DB General Provisions**, Section 141.13 Hydraulics.

**9. Bat Habitat** – See **DB General Provisions**, Section 141.51 Environmental Compliance.

**10. Protective Screening** – Design-Builder shall comply with the applicable provisions of the ODOT *Bridge Design and Drafting Manual*, Section 1.4.4.5.

**e. Bridge Removal** – Design-Builder shall use Bridge removal techniques conforming to the requirements of **DB Standard Specifications**, Section 00310 – Removal of Structures and Obstructions, and shall comply with the following:

1. Remove the existing Bridge spread footings completely if any portion of the footing is above the existing ground or is exposed.
2. Remove seals and grouted material to a minimum of three (3) feet below ground level.
3. Remove the existing columns, including drilled shafts, to a minimum of three (3) feet below the finished grade, or for those within the Ordinary High Water Elevation, to a minimum of three (3) feet below ground level or as required by permits.
4. Remove the existing Bridge pile caps and piles to a minimum of three (3) feet below the finished grade.
5. Underwater blasting and blasting within the Wetted Channel are prohibited.

DB 141.11(c)(5)e.5.

6. Disposal of rubble from demolition of the existing Bridge(s) on the bed or banks of any State waters or in any Wetlands is prohibited.

7. Submit a Demolition Plan to Agency PM for Review and Comment at least 10 Calendar Days prior to commencement of Bridge removal activities.

**f. Temporary Access and Detour Structures** - Temporary detour Bridges shall be designed and constructed according to **DB Standard Special Provisions**, Section 00250 – Temporary Bridges, and the *BDDM*, Sections 1.4.9 and 1.1.21.4.

If Design-Builder elects to reduce the existing Bridge (Structure) clearance by more than 0.5 inch, it must first receive permission to do so from Agency.

If the existing Bridge clearance is less than 17'-6" on interstate Highways or 17' for non-interstate Highways, or if Design-Builder plans to reduce the clearance below those levels, the Motor Carrier Over-Dimension (OD) Permit Unit must be notified in writing at least 28 Calendar Days prior to the performing any Work affected by, or associated with, the reduction. Planned reductions shall be detailed on Agency Permanent Reduction Form 734-2614, along with the expected date the reduction will occur. The completed form shall be faxed to Motor Carrier OD Permits at 503-378-2876. In addition, a copy shall be faxed to the ODOT Bridge Section at 503-986-3407 and to Agency PM.

Upon permit approval and clearance reduction, Design-Builder will measure and report to Agency PM the actual clearances. Measurements shall be accurate to the nearest 0.01' and recorded to 0.01'. The clearance shall be measured on both sides of the Structure and at locations required on the form.

Permanent Reduction Form 734-2614 is available on the ODOT Construction Section, Contract Administration Unit website at:

[www.oregon.gov/ODOT/HWY/CONSTRUCTION/ConstForms1.shtml](http://www.oregon.gov/ODOT/HWY/CONSTRUCTION/ConstForms1.shtml)

**g. Maintenance Accessibility** - Design-Builder shall provide inspection and maintenance accessibility to the key structural elements of the Bridge.

**h. Submittal Requirements**

**1. Definitive Design** - In addition to the requirements of **DB General Provisions**, Subsection 155.14, Design-Builder shall include, at a minimum, the following Plans with its Definitive Design submittal, in conformance with the sequence and content described below:

**a. Plan and Elevation sheet** - The purpose of this sheet is to provide the overall scope of structural Work for the Project. This sheet shall contain a Plan, elevation, and Typical Section for the final Bridge configuration. On the Plan, the existing and proposed ROW lines, the location of approach roadways, and the location of scour protection devices for piers and abutments shall be shown. On the elevation, OG and FG, along each EOD, shall be shown. On each of the Plan and elevation details, an outline of the

existing Structure shall be shown. In addition, gradeline diagrams, a hydraulics data table (if applicable) and Railroad clearance diagrams (if applicable) shall be shown on this sheet. Approximate design flood elevations shall be shown on the elevation and provided within a table on the sheet. The hydraulics data table shall show recurrence interval in years (50, 100, and the 500 or overtopping flood), discharge in CFS, water surface elevation, and Bridge backwater.

**b. Construction Staging sheet (as required)** – When needed, a construction staging diagram, depicting the location of maintained traffic, the extent of construction, and the extent of demolition, shall be prepared. Typical Sections of the Bridge should be used to depict the staging. Dimensions for the controlling layout lines, locations and types of barriers proposed, and method of connection shall be shown for each stage. The edge of saw-cut lines in the existing Bridge deck shall also be shown. The stages shall be placed vertically, in the order of the construction sequence, with the same scale.

**c. End Bent Plan and Elevation sheet** – The purpose of this sheet is to provide the overall concept for the end bents (abutments). This sheet shall contain a Plan, elevation (looking from the interior of the Bridge towards the exposed abutment face), footing plan (if piles are required), and section. Reinforcing details are not necessary. Aesthetic considerations shall be included on the details, where appropriate.

**d. Interior Bent Plan and Elevation sheet** – The purpose of this sheet is to provide the overall concept for the interior bents and columns. This sheet shall contain a Plan, elevation (looking up-station), and footing Plan (as required). Column or bent cap section cuts shall be provided if text cannot adequately describe the preferred condition.

**2. Readiness-for-Construction (RFC) Plans** – Design-Builder shall submit RFC Plans and Specifications for all structural elements in accordance with standard ODOT Bridge detailing practices, as identified in the *BDDM*, Section 2.

**3. As-Constructed Plans and Design-Builder Specifications** – refer to **DB General Provisions**, Section 155, for specific requirements.

**i. Bridge Inspection**

**1. Notification for Inspection** – Before any Bridge may be opened for public use, Design-Builder shall notify Agency PM that the Bridge is complete and ready for an Agency performed inspection. As part of such inspection notice, Design-Builder must submit redlined Readiness-for-Construction Plans and Specifications for the Bridge(s) to be inspected.

**2. Agency Inspection** – After notification by Design-Builder and prior to the opening of the Bridge for public use, Agency will perform an inspection of the Bridge.

DB 141.11(c)(6)

**(6) Permanent Bridge Repair**

**a. General** – The purpose of permanent Bridge repair is to restore or prolong the Bridge’s ability to carry specific live load levels. The service life shall be a minimum of 20 years without significant (non-routine) maintenance required to be performed on the repair.

Design-Builder shall determine the existing Bridge deficiencies based on the preparation and assessment of load-rating calculations. A “deficient” location is defined as any point in the superstructure or bent cap / crossbeam where the load - rating calculations show that an ODOT permit vehicle rating factor for moment or shear is less than 1.0. For all deficient members, Design-Builder shall design and construct a structural repair in conformance with the following Subsection, “Design Requirements.” In addition, Design-Builder shall perform a concrete crack injection, where required, in conformance with **DB Standard Special Provisions**, Section 00503 - Injecting Cracks in Existing Bridge. Concrete crack injection shall not be considered a structural repair. Materials and design schemes that shall not be utilized for permanent Bridge repair applications include fiber-reinforced polymers, external post-tensioning, and the shoring of major load-carrying members. See the **DB Special Provisions** for any specific permanent Bridge repair requirements.

**b. Design Requirements**

**1. Live Loading** – All permanent Bridge repairs shall be designed in accordance with the ODOT *Bridge Design and Drafting Manual*, Section 1.1.7.2(4).

**2. Load Rating and Inspection** – Design-Builder shall prepare a scoping load rating of the Bridge using the ODOT LRFR *Interim Scoping Load Rating Guidelines* and the AASHTO *Guide Manual for Condition Evaluation and Load and Resistance Factor Rating of Highway Bridges*. Design-Builder shall prepare the load-rating based on the current condition of the Bridge, as required. Load-rating instructions and guidance can be found at:  
<ftp://ftp.odot.state.or.us/Bridge/LoadRating/>

Design-Builder shall perform a load-rating that includes the current condition of the Bridge, as identified in the latest Bridge Inspection Report. Assessing the Bridge’s current condition may require additional detailed inspection. Design-Builder shall conduct such inspections according to the procedures outlined in the following Standards:

- ODOT *Bridge Inspection Coding Guide*
- *Oregon Coding Guide for the Inventory and Appraisal of Oregon Bridges*
- “Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation’s Bridges,” FHWA-PD-96-001, 1995
- “Bridge Inspector’s Training Manual 90,” FHWA-PD-91-015, 1991 (rev. 1995)

Changes to the ODOT Bridge Inspection Report, identified through Design-Builder inspections, which result in a reduction in the type or quantity of repairs, shall be Approved by Agency.

In its Definitive Design submittal for each Bridge to be repaired, Design-Builder shall include a load-rating calculation book that demonstrates conformance to load-rating procedures and associated ODOT technical memos.

**3. Materials** – Materials used for permanent Bridge repair (structural and non-structural) shall consist of any of the following:

- Epoxy for crack injection
- High-strength steel threaded rods
- Galvanized or Coated structural steel
- Stainless steel or epoxy-coated prestressing strand
- High-strength post-tensioning rods
- Concrete for concrete jacketing
- Bar reinforcement
- Resin for bonding bar reinforcement

**c. Permanent Repair Elements**

**1. Concrete Crack Sealing** – Concrete crack sealing, if required, shall be constructed according to **DB Standard Special Provisions**, Section 00503 - Injecting Cracks in Existing Bridge.

**2. Additional Elements** – If Design-Builder identifies additional elements (apart from the primary load-carrying elements and items listed by Bridge in the **DB Special Provisions**) that should be repaired or replaced, it shall promptly notify Agency. Any additional repair Work must be authorized by Agency via Change Order and will constitute Extra Work.

**d. Maintenance Accessibility** – Design-Builder shall provide inspection and maintenance accessibility to the key structural elements of the repair. The repair shall not restrict existing maintenance and inspection accessibility.

**e. Submittal Requirements**

**1. Definitive Design** – At a minimum, Design-Builder shall include in its Definitive Design submittal a Repair Plan Technical Memorandum. The Repair Plan Technical Memorandum shall describe the type of repair(s) to be performed, including plans that show the area(s) of the Bridge to be repaired, the type of construction staging required for the repairs, and any girder or bent cap details.

**2. Readiness-for-Construction (RFC)** – At a minimum, Design-Builder shall include the following in its Readiness-for-Construction submittal, in conformance with the sequence and content described below. It is Design-Builder's responsibility to add sheets not provided in this list, when needed. Unless

otherwise stated herein, Design-Builder shall submit RFC Plans and Specifications for all structural elements in accordance with standard ODOT Bridge detailing practice, as defined in the *BDDM*, Section 2.

- **Plan and Elevation** – The purpose of this sheet is to provide the overall scope of structural Work for the Project. This sheet shall contain a Plan, elevation, and Typical Section. ROW lines should be shown on the Plan.
- **General Notes** – All general notes and generic design notes pertaining to the Bridge shall be shown on this sheet.
- **Construction Staging (when needed)** – If applicable, a construction staging diagram depicting the location of maintained traffic, the extent of construction, and the extent of demolition shall be prepared. Typical Sections of the Bridge should be used to depict the staging. Dimensions for the controlling layout lines shall be shown for each stage. The edge of saw-cut lines in the existing Bridge deck shall also be shown.
- **Epoxy Injection Details (when needed)** – This sheet shall contain all necessary details and information to perform the crack injection. If space permits, these details may be placed on the general notes sheet, and this sheet may be eliminated.
- **Girder Repair Details (when needed)** – These sheets shall contain details pertaining to the specific girder repair scheme derived from the repair report.
- **Crossbeam (or Bent Cap) Repair Details (when needed)** – These sheets shall contain details pertaining to the specific crossbeam or bent cap repairs.
- **Miscellaneous Details (when needed)** – These sheets shall contain any miscellaneous details required for the construction of the project.

**3. As-Constructed Plans and Design-Builder Specifications** – refer to **DB General Provisions**, Section 155, for specific requirements.

### **(7) Culvert Structures**

**a. General** – This Subsection is applicable to all permanent culvert Structures having a minimum horizontal interior dimension of six (6) feet. See **DB General Provisions**, Section 141.13 – Hydraulics, Section 141.21 – Roadway Geometrics, and Section 141.22 – Drainage, for culvert drainage Structures that have a horizontal interior dimension of less than six (6) feet.

**b. Service Life** – Culvert Structures shall be designed and constructed for a minimum 75-year service life (without significant, non-routine maintenance required).

**c. Materials** – Acceptable culvert Structure Materials include:

- Precast and/or prestressed concrete
- Cast-in-place concrete
- Corrugated aluminum or aluminum alloy
- Corrugated Steel

- Galvanized structural steel, aluminum, or aluminum alloy plate arch

**d. Design & Loading** – Design-Builder shall design culvert Structures in accordance with the AASHTO *LRFD Bridge Design Specifications*.

**e. Geometry** – Culvert Structure type and size selection shall be based on hydraulic demands, biological demands (such as fish passage), maintenance requirements, and other requirements established in **DB General Provisions**, Section 141.13 – Hydraulics, and Section 141.51 – Environmental Compliance.

**f. Hydraulics** – Culvert Structures shall be designed in accordance with the ODOT *Hydraulics Manual*. See **DB General Provisions**, Section 141.13 - Hydraulics.

**g. Fish Passage** – Fish passage locations, if any, will be identified in the **DB Special Provisions**.

The ODF&W *Oregon Road/Stream Crossing Restoration Guide* includes requirements for water velocity, bottom conditions, stream width, inlets, outlets, and maintenance details. The culvert Structures that provide fish passage shall be designed and constructed to avoid high water velocity, shallow water depth within the culvert, excessive vertical drop at the culvert outlet, and debris blockages.

Culvert Structures that provide fish passage shall be open-bottom or embedded culverts and incorporate streambed simulation strategies. Culvert Structures providing fish passage may be straight, and shall incorporate rechannelization only as necessary. Embedded culverts shall implement streambed simulation strategies with minimum embedment conforming to the *Oregon Road/Stream Crossing Restoration Guide*.

Design-Builder shall provide trash racks at the culvert inlets above the Ordinary High Water Elevation that will allow for maintenance access.

**h. Culvert Removal** – Design-Builder shall use culvert removal techniques conforming to the requirements of **DB Standard Specifications**, Section 00310 - Removal of Structures Obstructions, and comply with the following:

- The culvert shall be removed in its entirety
- Underwater blasting and blasting within the Wetted Channel is prohibited
- Rubble from demolition of the existing culvert shall not be disposed of on the bed or banks of any State waters or in any Wetlands
- Streambed simulation strategies shall be implemented along the length of the removed culvert

**i. Maintenance Accessibility** – Design-Builder shall provide permanent access to culvert Structures for inspection and maintenance within the Project ROW. Maintenance access roads shall be designed in accordance with AASHTO *Guidelines for Geometric Design of Very Low-Volume Local Roads* for “Rural Minor Access Road” classification.

DB 141.11(c)(7)i.

Culvert Structure openings shall be sized to provide for maintenance access to clean out debris. Minimum culvert rise from Ordinary High Water Elevation shall be 7'-6" (measured at the centerline of the culvert).

**(8) Submittals**

**a. Demolition Plan** – Design-Builder shall submit a Demolition Plan to Agency PM for Review and Comment at least 10 Calendar Days prior to commencement of any Bridge removal activities.

**b. Bridge Replacements and Culverts** – Design-Builder shall submit the following Bridge replacement submittals:

- Definitive Design submittal
- Readiness-for-Construction submittal
- As-Constructed submittal (which includes "D" size mylars and electronic files in Microstation format placed on CD or DVD). Files shall be named per the BDDM Section 2.
- Final Bridge calculations book – with as-constructed submittal
- As-constructed load-rating calculations book – with as-constructed submittal

**c. Bridge Repairs** – Design-Builder shall submit the following Bridge repair submittals:

- Definitive Design submittal
- Readiness-for-Construction submittal
- As-Constructed submittal (which includes "D" size mylars and electronic files in Microstation format placed on CD or DVD). Files shall be named per the BDDM Section 2.
- Final Bridge calculations book – with as-constructed submittal
- As-constructed load-rating calculations book – with as-constructed submittal

**d. As-Constructed Load Rating Calculations** – Design-Builder shall submit to Agency PM load-rating reports that include the following:

1. One (1) CD for each Bridge containing load-rating electronic files (files shall be located under a directory whose name is the Bridge number); and
2. One (1) hard copy of the report, including supporting information, bound in a labeled pressboard report cover with provisions for CD storage. Reports shall be bound in the following order:
  - Posting Summary Sheet
  - Table of Contents
  - Load-Rating Summary Report
  - Reduced Copy of the Plans (or sketches)
  - Printout of FILELIST.TXT (this may be combined with the table of contents and omitted as a separate section)

- Preliminary (pre-BRASS) file(s)
- BRASS \_T (LRFD sTrength) output file for the 1st beam line and for each additional beam line investigated
- BRASS \_N (NBI Load Factor) output file for the 1st beam line and for each additional beam line investigated
- Cross Beam calculations completed for the 1st cross beam investigated and for each additional cross-beam investigated

All sheets after the Table of Contents shall be numbered consecutively in the upper right corner.

Load Rating Reports shall constitute Project Records and shall be prepared by, signed by, and stamped with the seal of a Design Professional.

