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BRIDGE DETAIL PLAN REVIEW CHECKLIST

Good for the 1997 CMS

Bridge No:

Reviewer:

Date:

PID:

GENERAL

- All TS&L comments resolved and detailed design is as per approved TS&L.
- All correspondence has been reviewed?
- Title block okay on all sheets? (As shown on Figure 109 in the *Bridge Design Manual* [BDM]) Designed, checked and reviewed blocks complete on all sheets? (If not, or if it appears a thorough independent check and review has not occurred, plans should be returned)
- Project number and bridge number correct?
- All lettering No. 5 or larger? (Caps 5/32 inches in height)
- Sheets in an appropriate order? As per (BDM 105)
- Supplemental Site Plan, if prepared during TS&L has not been included in plans?
- Site Plan been checked with the final approved record print Site Plan? Deck transverse sections matches that approved as TS & L)
- Call-outs are consistent on all sheets? (Span designation number, pier numbers, etc.)
- North arrow shown on all plan views, all sheets
- Each pile/drilled shaft in the structure has been assigned a unique number?

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- Pier(s) and forward abutment elevations and the superstructure transverse section shown looking forward? Rear abutment elevation looking to the rear? (BDM 102)

GENERAL, (Cont.)

- Appropriate centerline/reference line used and referenced exclusively (consistent nomenclature) throughout the details.
- If an auxiliary reference line is established, is stationing given along this line only, in the vicinity of the bridge? Is a geometric diagram provided, if necessary?
- For bridge with variable super-elevation, has a super-elevation transition diagram been provided?
- Break over ($\frac{1}{2}$ inch per foot slope) provided on high side of superelevated decks for shoulder widths >6 feet? Rounding beginning at edge of roadway used when change in cross slope at breakover exceeds 3 percent (4 foot rounding for shoulders < 10 feet and 5 foot rounding for shoulders ≥ 10 feet)? (BDM 209.1) (Figure 204 & 205)
- Approach slabs have been detailed if Standard Drawing AS-1-81 is not applicable (i.e., unusual geometry, parapets mounted on approach slabs, etc.)? Typically, these sheets are not part of the bridge plans, but should be submitted for review.
- Items that should be included with roadway quantities (e.g., Rock Channel Protection, Portable Concrete Barrier, Temporary Guardrail) have been designated as such?
- Portions of existing structure that are to be removed have been properly indicated?
- “ \pm ” symbol used for existing structure dimensions? Dashed lines used to denote existing structures?
- Detail plans for temporary sheeting/shoring included if required by the Scope and (BDM 208.3).
- Detail plans for a temporary runaround bridge included if required by the Scope?
- Concrete surfaces sealed per (BDM 303.1.1).
- Epoxy only sealer not used.

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GENERAL PLAN AND ELEVATION

- Reference line shown for curved bridges, and stations should be shown where it intersects curve?
- Span lengths agree with Site Plan?
- Stage construction joint shown on appropriate plan views and details
- Highway lighting feature shown, if applicable?
- Scuppers shown, if applicable?

GENERAL NOTES/ESTIMATED QUANTITIES

A. GENERAL NOTES Refer to (BDM 600)

- All applicable general notes from (BDM 600) included?
- Wording of “standard” general notes review if necessary, to suit the project? (Do the notes make sense for this project?)
- General notes included where necessary to describe “as per plan” items?
- In addition to the typical general notes given in the BDM, general notes are usually included to describe any “non-standard” bid items or situations. Have these been included?
- For rehabilitation projects, is the scope work itemized and clearly described under a PROPOSED WORK note?
- Notes for granular material for embankment construction and/or abutment backfill included if appropriate (see Foundation Engineer)?

B. DETAIL NOTES

See Section 6 of the Bridge Design Manual for a reminder list of typical detail notes.

C. ESTIMATED QUANTITIES

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- Item description and extension code conform exactly with the terminology and format given in the most recent edition of the ODOT *Item Master*? (Additions at the end of an Item Description are allowed).
- All materials and/or work shown in the plans listed in the Estimated Quantities or otherwise accounted for?
- Foundation quantities agree with the foundation recommendations made during TS&L review (e.g., use of pre-bored holes/pile points, minimum bedrock socket depth, etc.)? If pile design load differs from the previously anticipated, the estimated pay lengths may need to be revised.
- Term “as per plan” used appropriately? Plan notes used to describe “as per plan” items where appropriate?
- Term “See Proposal Note” included with the applicable pay items (see Reminder List and List of Proposal Notes)?
- Units of measure in conformance with the Item master (lump sum, cubic yard, lineal foot, etc.) and in agreement with plan notes and proposal notes?
- Columnar breakdown provided in the quantity table (i.e. Abutments, Piers, Superstructures and General)?
- Quantities listed in the columnar breakdown add up to the total? (Check these)
- All Special items accompanied by plan notes or proposal notes that completely describes the item? If a “standard” proposal note does not exist, plan notes or a proposal note should contain:
 - A. Description of the item
 - B. Material requirements
 - C. Construction procedures
 - D. Submittal requirements (shop drawings, etc.)
 - E. Method of payment
- Quantity amounts make sense? Generally, they do not need to be checked; however, quick calculations may show if an obvious oversight has been made.
- Items to be paid 100 percent by other agencies properly identified (County/local governments, utilities, etc.)?

REINFORCING STEEL

A. REINFORCING DETAILS

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- Bar lengths conform to (BDM 301.4.1)? The maximum bar length should be approximately 40 feet. For longitudinal deck reinforcing, bar lengths of 30 feet are preferred, except for one odd length at end of run.
- Length of the short leg of L-shaped bars less than 8'-0"? (BDM 301.4.1)
- Minimum reinforcing steel provided in all faces of retaining walls and wall-type abutments and piers for shrinkage and temperature reinforcement? (BDM 301.4.8)
- Splice and development lengths for epoxy bars conform to current AASHTO requirements?
- All bar splice lengths shown by plan note, on plan details, combination or reference?
- Reinforcing steel clearances are shown, except where 2 inches?
- Bridge seat reinforcement adequately clear of bearing anchors?
- Treatment of reinforcing steel appropriate at all construction, contraction, and expansion joints?
- Reinforcing steel in footings comply with (BDM 303.4.1.3) (i.e., secondary rebars under main rebars, rebars at bottom of footing and not top of piles, dowel legs placed at bottom layer of footing rebars)?
- For cantilevered pier caps (T-type and cap and column), is the top layer of bars bent down the end face of the cap? Side faces adequately reinforced to resist longitudinal superstructure forces?
- Lateral ties in T-type and wall type piers as per section (BDM 303.3.2.8).
- All reinforcing epoxy coated? (Except certain bars in prestressed box beams) (BDM 302.5.1.8)
- Letter prefix A (abutments), P (piers), S (superstructure), SP (spirals), DS (drilled shafts) generally used in bar marks? (BDM 301.4.2)
- Mechanical connectors used where appropriate?
- Mechanical connectors designated as the non-protruding type where necessary?
- Splices avoided at pier horizontal construction joints, except at top of footing? (BDM 301.4.3)

B. STEEL LIST

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- Bar list conform with the format shown in (BDM Figure 302)
- Proper length deduction made for bent bars?
- For spirals, is core diameter, pitch, mark, number, height, and weight give? Spirals for 36-inch columns generally 30 inches outside diameter at 4 ½ inch pitch? (BDM 303.3.2.1)
- Spiral material given in the General Notes (Design Data)?
- Reinforcing bars that will utilize mechanical connectors noted as such? (For stage construction, etc. Required dowel bar connector length specified on the drawings as well as a plan note provided?)
- Details for drilled shaft reinforcing shown on list .

STAGE CONSTRUCTION

A. Typical Sections:

- Large scale typical sections of existing and proposed superstructures provided to show removal and construction stages?
- Location of cut lines and stage construction joints established with respect to primary survey line?
- Typical section of existing structure conform with current photographs and site inspection sketches?

B. Part Plan Views:

- Part Plan views provided to show the relative relationship of the existing and proposed abutments during Stage 1 construction and relevant basic dimensions and clearances?
- Sufficient room provided between temporary sheeting and proposed abutment for form construction and removal?
- Non-protruding mechanical connectors used if sufficient room is not available for lap splicing of reinforcing steel?
- Sufficient room provided for driving piling?

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C. Temporary Sheeting:

- Consultant designed sheeting details provided in the plan when traffic is being maintained and the height of the retained earth is over 8 feet (BDM 208.3).
- Temporary sheeting shown on the Site Plan and/or General Plan?
- Cofferdams, cribs, and sheeting item provided in quantities?
- Tentative location of temporary sheeting shown on abutment plan views to retain backfill and permit partial removal and excavation for proposed construction?

D. Temporary Railing:

- Reference for barrier details given to Standard Drawing PCB-91?
- Barrier anchors provided (not less than two per segment for barriers located less than 6'-0" from the edge of deck for bridges over roadways, railroad, or recreational areas: or less than 1'-3" from the edge of the deck for other bridge application (PCB-DD))?
- Complete details given for temporary steel railing?

E. Slab Bridges:

- Slab removal cut lines lie transverse to primary slab reinforcing steel?
- Temporary slab supports provided for such slabs (BDM 208.2.g)?
- Both stages of slab bridges supported by false work until second stage slab concrete has fully cured before false work is released (to avoid the use of a third stage closure section and high dead load shear forces on stage construction joints due to the premature release of false work)?

F. Lateral Restraint:

- Temporary lateral restraint provided to prevent rotational movement of the first stage superstructures of semi-integral bridges towards the unrestrained (no guide bearing) acute corners at stage construction joints?
- For redecking an existing structures without a closure section, a deck slab placement procedure provided requiring relatively complete second stage deck placement before placement of second stage integral end-diaphragms?

G. End Dams:

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- Full penetration butt-welded field splices provided at or near stage construction joints for superstructure portion of the end dams?
- Bolted field splices provided for the abutment portion?
- Offset between the two splices provided to facilitate butt-welding?
- Superstructure splice located to clear beam flanges and cross frames gusset plates?
- H. Miscellaneous:**
- Removal limits clearly shown or are apparent? Cross-hatching used to designate removal areas?
- Removal Cut lines: Full-depth saw cut-lines specified for deck slab removals where the integrity of the slab is needed to support temporary railing? Cut-lines shown on plan and/or elevation views of substructure?
- Construction Access: Adequate space provided between Stage 1 construction and the remainder of the existing structure for temporary sheeting and form construction?
- Closure Placements: 2'-6" minimum wide third stage closure section provided for "new" stringer superstructures? (BDM 302.2.9)
- Are stage construction joints shown in all relevant views?
- Cofferdam Sheeting: Clearance available under 20 ± feet) and/or adjacent to the existing structure to permit driving sheeting? Plan details shown tentative position of such sheeting where clearances are tight?
- Provisions made for the complete or partial removal of temporary railing anchors and the grouting of resulting voids?
- Roadway Item 614: Note provided referring to roadway plans for other temporary railing details and to Item 614 (roadway plans) for payment?
- Approach slab details provided showing the same railing type as used on the bridge and with the same limiting edge clearances and/or anchorage (unless a different type of anchorage has been provided)?
- Joint Type: An expansion or contraction joint used in lieu of a stage "construction" joint to simplify construction by eliminated lap splicing or mechanical connector splicing of reinforcing steel, where appropriate? (Abutment back walls, breast walls and certain pier walls, etc.)

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- Differential Shear: Vertical construction joints provided with shear keys and generous transverse reinforcement to resist the potentially high shear forces induced by differential deformation of foundations (piles, soil, etc)? Formed joint surfaces artificially roughened to improve shear resistance (AASHTO 8.15.5.4.7)?
- Battered Piles: Room adjacent to the existing structure to drive piles? Batter piles? New piles clear existing battered piles? Sufficient room available for pile length and leads to position batter piles for driving?
- Screed Elevations: The presence or absence of cross frames at stage construction joints on stringer deflection taken into account when establishing screed elevations at stage construction joints.
- Integral Construction: Closure sections provided in bridges for both the deck slab and integral end-diaphragms? (BDM 303.2.2.6 and 702.7)
- Elastomer Seals: Note provided requiring seals for each joint to be installed in one continuous piece?
- Drain Pipes: Abut porous backfill drain pipes terminated and capped on both sides of temporary sheeting?
- Utility conduits located clear of stage construction joints and temporary sheeting?
- Sleeve Nuts: Tie-bar sleeve nuts indicated at the stage construction joint between box beam bridge construction stages?
- Stage construction details sheet should include notes that detail the sequence of construction (BDM 302.2.9)

SUPERSTRUCTURE

A. SLAB BRIDGES

- Top reinforcing steel clearance of 2 ½ inches and bottom clearance of 1 ½ inches shown? (BDM 301.4.7)
- Sealing of concrete surfaces shown and appropriate? (BDM 302.1.1.3.c)
- Stainless steel drip strip (formed concrete drip strip in District 3) provided on decks with over-the-side drainage? (BDM 302.1.1.3.b)

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- For steel beam or girder bridges with skew less than 15 degrees the transverse bars parallel to abutment and for skew more than 15 degrees or interference with shear stud, transverse bars place perpendicular to the centerline of bridge. (BDM 302.2.4.2)
- For prestressed I-beam or composite box beam bridge deck, transverse bars perpendicular to the centerline of bridge. (BDM 302.2.4.2)
- Verify reinforcing steel accommodate HS25 loading.

B. PRESTRESSED CONCRETE BOX BEAMS

- For multiple span bridges, has the superstructure been detailed as continuous as per Standard Drawing PSBD-1-93? (BDM 302.5.1)
- Multiple span bridges of less than 200 foot total length with flexible piers and abutments fixed at all substructure units?
- Standard Drawings PSBD-1-93 has been reviewed and items required by it provided? It is not intended that details and notes shown on the Standard Drawing be repeated unnecessarily.
- All beams anchored? (BDM 302.5.1.6)
- Anchor dowels omitted near the pier stem/cantilever interface of T-type piers?
- Smooth dowel bars used at “fixed” anchor dowels?
- Either Type D or membrane waterproofing (Type 3) used on all non-composite box beam bridge? (BDM 302.5.1.4)
- For bridge with poured sealant joints, has waterproofing been extended 2 feet past the bridge limits?
- Two-inch spacing or multiple therefore provided between strands? (BDM 302.5.1.2.b) If space permits, place all strands in bottom row.
- Location, length, and number of debonded strands shown? (BDM 302.5.1.2)
- Additional strand debonding and supplemental mild reinforcing steel provided at beam ends for skews over 30°? Limit box beam to 30° skew or less except rare occasions approved by Office of Structural Engineering.
- Strands and rebars miss anchor and diaphragm holes? Are there any conflicts between strands, rebars, tie-rod holes, beam anchor rod holes, rail post anchors, joint armor, etc.?

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- PEJF specified as grout retainer at dowels and under beam connection at piers? (Standard Drawing PSBD-1-93)
- Two bearings provided for each box beam? (BDM 302.5.1)
- Proper camber/wearing surface notes used? (BDM 702.11)
- Wearing surface/composite topping thickness diagram shown? (BDM 302.5.1.4)
- If over the side drainage will occur, has a drip strip been specified? Reference should be made to Standard Drawing DS-1-92.
- Sealing of concrete surfaces provided as directed in (BDM 302.1.1.3.c)?
- Shear key mortar finishing detail shown? (Not required for composite concrete decks)
- Sufficient dimensions furnished for the beam fabricator to locate the railing post anchors? Have location of inserts for stage construction temporary railing shown? Has conflict between post anchors and tie rods and/or T-section been avoided? (BDM 302.5.1)
- Proper allowances for fit-up between beams accounted for and shown? (BDM 302.5.1)
- Maximum of three beams been tied together by one tie rod?
- Transverse tie-rods provided at abutment ends and located per (BDM 302.5.1.9) ?
- For non-composite design, is asphalt thickness 8 inches or less? (BDM 205.4)
- For multiple span bridges, has the same beam depth been specified for all spans? (BDM 205.4)
- Beam weight plus vehicle weight should not exceed 120,000 lbs? (BDM 205.4)
- Strand location and clearance consistent with PSBD-1-93
- Diaphragms and tie rods located (BDM 302.5.1.9)?
- For composite box beams (BDM 302.5.1.3) :
- Six-inch minimum slab thickness specified?
- Reinforcing top cover of 2 ½ inches shown?
- No. 6 at 18 inches longitudinal and No. 6 at 9 inches transverse bars specified?

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- Additional No. 6 bars over piers specified to meet the requirements of (BDM 302.5.1.3)?
- Epoxy coated bars (Grade 60) specified in the composite slab? (BDM 302.5.1.8)
- Bars projecting from beam into composite slab specified as epoxy coated? (BDM 302.5.2.9)
- Construction joint shown between the cast-in-place "T" section at piers and the composite slab?

C. PRESTRESSED CONCRETE I-BEAMS

- AASHTO beam shapes used exclusively (BDM 302.5.2)
- Low-relaxation, 270 ksi, ½ inch strands used? (Initial stretch = 0.75 f' s) (BDM302.5.2.2)
- Straight strands, debonded at ends if necessary, used? (BDM 302.5.2.2.d) Draped strands should be provided as per (BDM 302.5.2.2.e).
- No more than 25 % of the total strands debonded? (BDM 302.5.2.2.d)
- No more than 40 % of the strands in any row debonded
- Number and spacing of debonded strands, and the length of debonding, shown? (BDM 302.5.2.2.d)
- Strand location and spacing meet requirements of (BDM 302.5.2.2.b) ?
- Initial prestress loads shown in the plans (BDM 302.2.2.c)
- Strands completely enclosed by stirrups for length of beam? (BDM 302.5.2.9)
- Joint details appropriate? Details from Standard Drawings EXJ-6-95.
- Grade 60 mild reinforcing used? (BDM 302.5.2.9)
- Bars projecting from I-beam been epoxy coated? (BDM 302.5.2.9)
- Diaphragms spaced at intervals not exceeding 40 feet (BDM 302.5.2.6)
- Intermediate diaphragms do not make contact with the underside of the deck? (BDM 302.5.2.6)
- End diaphragms make complete contact with the underside of the deck? (BDM 302.5.2.6)

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- Threaded inserts used to connect diaphragm rebars to beams? Type and coating requirements for inserts shown? (BDM 302.5.2.6)
- Note provided restricting deck placement to a minimum of 48 hours after diaphragms are placed and cured? (BDM 302.5.2.6)
- Bridge seat elevations been computed as directed in (BDM 302.5.2.3)?
- Diagram provided showing slab thickness at center of each span and at each centerline of bearings? (BDM 302.5.2.3)
- Beam anchorage meet the requirements of (BDM 302.5.2.4)?
- Full-depth cast-in-place concrete deck specified/ Precast deck panels should not be used. (BDM 302.5.2.5)
- Threaded insert location shown on the beam elevation view for draped strands.

D. STEEL STRINGERS

1. General

- A588 steel shall be specified for un-coated weathering steel bridges, A572 specified for a coated steel bridge. (BDM 302.4.1.1)
- A588 structural steel within 10 feet from end of stringer adjacent to deck joint painted and note provided (BDM 302.4.1.5.a)
- Proper painting system used? (Generally, System IZEU on new steel and System OZEU on existing steel? (BDM 302.4.1.5.a)
- All main load carrying members such as rolled beams, girder web/flanges, moment plates, splice plates, and horizontally curved stringer cross frames designated as CVN for Charpy V-notch testing and plan note provided? (BDM 302.4.1.10 and 702.2)
- Steel fabricator certification given in pay item description as ASIC Category I for rolled beam bridges and Category III for all other types? (BDM 302.4.1.3)
- Cross frames and field splices for dog-legged (deflected) stringers conform with (BDM 302.4.1.14, 302.4.2.3, and 302.4.3.5)? Additional horizontal cross frames angle provided near top flange of horizontally curved strings?

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- Plan note provided specifying galvanized bolts for painted steel, plain bolts for unpainted steel? (BDM 702.3)
- Leg size specified for filled welds (1/4 inch minimum for material \leq 3/4 inch thick and 5/16 inch minimum for thicker material)? (BDM 302.4.2.4.a)
- Complete penetration groove welds designated as CP with weld configuration left unspecified? (Partial penetration groove welds not permitted on structural elements)(BDM 302.4.2.4) and ANSI/AASHTO / AWS D1.5-95 Bridge Welding Code)
- Stud shear connectors preferably 7/8 inch diameter and uniformly spaced transversely not closer than 4 diameters center to center with at least 1 inch clearance from flange edges? (Typically, three studs transversely for flanges 12 inches and wider)(BDM 302.4.1.15)
- Shear connector length penetrates at least 2 inches above bottom of slab and provides at least 2 inches top cover? (AASHTO 10.38.2.3)
- Shear connector maximum spacing generally not greater than 24 inches? (Usually, fatigue and strength criteria produce maximum spacing near piers, smallest spacing near abutments, and moderate spacing near mid spans)(AASHTO 10.38.5.1) No conflict near field splices or deck joint anchorage?
- Extra shear connectors provided at contraflexure points and longitudinal slab reinforcement properly extended if shear connectors are omitted over piers? (AASHTO 10.38.4.4 and 10.38.5.1.3)
- Field splices located near points of dead load contra flexure as appropriate to facilitate erection and to limit field section lengths to 90 feet maximum for rolled beams and 120 feet maximum for plate girders? (Additional optional field splices may be shown recognizing greater availability of short lengths) (BDM 302.4.1.4 and 302.4.1.14.c)
- Plate thicknesses specified in the following standard sizes (BDM 302.4.3.3.a):

7/8" to 3" In 1/8" Increments
3" And above 1/4" Increments
- Buoyant superstructures (typically integral or semi-integral designs) where inundation is possible details with appropriate countermeasures (e.g., holes drilled in stringer webs for egress of confined air, support anchorage, etc.)?
- Stringer top flange compression and tension zones shown and Welded Attachment Note provided? (BDM 702.15)

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- Camber and deflection table provided for information given at center of spans, splices points, and at 25 foot maximum intervals? (BDM 702.1)
- Camber diagram provided and blocking (dimension from bottom of stringer at each support to chord between end supports) shown?
- Camber adjustment provided for horizontally heat curved stringers (AASHTO 10.15.3) and for straight stringers on curved bridges?
- Sign (direction) of camber adjustment for vertical curve correct?
- 1-inch A325 bolts and 2-inch edge distances used for field splices? (BDM 302.4.1.14.a)
- Adequacy of splice checked if Standard Drawing BS-1-93 design is shown for structure using other than A36 steel, Working Stress Design ? (BDM 302.4.1.14)
- Field splices located so as not to interfere with other details (i.e., intermediate stiffeners, cross frames, etc.)?
- Fatigue prone details avoided if possible? (BDM 302.4.1.9.b)
- Cross frames provided at each support (AASHTO 10.20.1) and spaced at intervals not to exceed 25 feet (situated perpendicular to stringers and in line across structure)? (BDM 302.4.2.3)
- Cross frame connection stiffeners rigidly attached to stringer top and bottom flanges? (AASHTO 10.20.1 and Supplemental Specification 863.14).
- Lateral bracing provided only when required? (AASHTO 10.21)
- Curve girder with stage construction should be checked for deflection at each stage.

2. Rolled Beams

- Welded moment plates not used in areas of tensile stress? (BDM 302.4.2.5)
- Cross frame connection stiffeners provided only for Case I loading ($ADTT \geq 2,500$, one direction)? (BDM 302.4.2.2)
- Bearing stiffeners provided only when necessary? (AASHTO 10.33.2)
- Galvanized beams limited in length to 60 feet maximum and utilize bolted connections only? (BDM 302.4.2.1)

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3. Plate Girders

- Top flange width at least $d w/6 + 2.5$ inches \geq ? (BDM 302.4.3.3.a)
- Flange thickness at least 7/8 inch? (BDM 302.4.3.3a)
- Web thickness and stiffener thickness at least 3/8 inch? (BDM 302.4.3.3.b)
- Flange butt welds subject only to compressive stresses identified as FCM (Fracture Critical Member)? Proper pay item and plan note provided? (BDM 302.4.3.6.b)
- Non-redundant main steel members identified as FCM (Fracture Critical Member)? Proper pay item and plan note provided? (BMD 302.4.3.2)
- Longitudinal stiffeners not used? Transverse stiffeners preferably not used (except cross frame connection stiffeners)? (BDM 302.4.3.1)
- Transverse stiffeners (if used) placed on alternate sides of interior girders and inside face only of fascia girders (BDM 302.4.3.4), made same size throughout, and detailed per SS863.14?
- Cross frame connection stiffeners fillet welded to web and both flanges? (BDM 302.4.3.4)
- Bearing stiffeners made to extend as near as practicable to outer edges of flange plate and detailed as tight fit at top flange, mill to bear at bottom flange? (Rigid attachment to both flanges may be appropriate if used also as a connection plate) (SS863.14 and AASHTO 10.34.6.1)
- Intermediate cross frame angel size and connections conform with STD DWG GSD-1-96?
- Constant flange widths used whenever possible? (Make changes in flange width at field splice to facilitate fabrication) Changes in flange plate section appropriate based on cost criteria given in (BDM 302.4.3.3.a)?
- Erection bolts preferably 5/8 inches in diameter used in connection of cross frame to stiffener and plan note provided? Hole size in both members 3/16 inch larger than erection bolt? (Slotted hole used when skew produces differential dead load deflection between adjacent girders of 1/2 inch or more at a cross frame location) (BDM 702.14)
- Clearance between the bottom mat and top of the bolt over splice plate.

E. CONCRETE DECK ON CONCRETE I-BEAMS OR STEEL STRINGERS

- Top reinforcing steel clearance of 2 1/2 inches and bottom clearance of 1 1/2 inches shown? (BDM 301.4.7)

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- Sealing of concrete surfaces shown and appropriate? (BDM 302.1.1.3.c)
- Stainless steel drip strip (formed concrete drip strip in District 3) provided on decks with over-the-side drainage? (BDM 302.1.3.b)
- Deck slab depth over stringers shown to top of web for plate girders and to top of flange for rolled beams or prestressed concrete I-beams and plan note provided? (BDM 702.8). This will make concrete pay item "as per plan".
- 2-inch minimum concrete haunch depth used over stringers (top of thickest flange section to bottom of slab)? (BDM 302.2.5)
- Haunch width configuration shown and plan note provided? (BDM 702.9 and Figure 3.17)
- Slab thickness and reinforcement conform to (BDM Figure 3.13)?
- Top and bottom main (transverse) bars at same spacing and placed to coincide in a vertical plane? (BDM 302.2.4.2)
- Transverse bars placed parallel to abutments for non-composite designed bridges with skews less than 15 degrees? (BDM 302.2.4.2)
- Length of transverse bars without lap splices 5 inches shorter than deck to ensure adequate cover at ends of bar, allowing for shop cutting tolerances?
- No. 4 bars used for top full length longitudinal reinforcement? (BDM 302.2.4.1)
- Secondary (longitudinal) bars placed above main (transverse) bars? (BDM 302.2.4.1)
- Additional top longitudinal bars with ends staggered 3'-0" provided over piers on continuous structures? Total longitudinal reinforcement meets the requirements of AASHTO 10.38.4.3 for steel stringers or (BDM 302.5.2.9) for prestressed concrete I-beam? (Generally, No. 6 bars midspaced between top full length longitudinal bars will be adequate and will provide enough clearance between bars to facilitate concrete placement and vibration).
- Screed elevations given along curb lines/edges of deck, roadway crown, and all stringer lines at 25 foot maximum intervals, at all bearings and at splice points? (BDM 302.2.3)
- Slab pour sequence generally specified only when uplift during construction or differential deflections at intermediate expansion joints are of concern. (BDM 302.2.7)

F. RAILING/FENCE

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Deep Beam Railing:

- Deep beam guardrail should not be used on NHS or STATE system (BDM 304.3.2)

Twin Steel Tube Rail

- Reference to std. dwg. TST-1-99 Given.
- Pay limits for bridge railing measured center-to-center of the second posts on the approaches?
- Rail post spacing of 6'-3" c/c of post maintained except one post spacing on the bridge can be decreased to allow for construction clearances.
- Suitable clearances between posts and back walls and between post anchors and expansion joint armor anchors provided?
- Wing-wall mounted post used if necessary to provide suitable post and anchor bar clearances?
- Post locations on the structure and post stations given on the Site Plan agree?
- Stations to the centerline of the second post off the bridge shown on the site plan are correct.
- Enlarged details provided to describe post anchorage to composite box beams?

Sidewalk Railing with Concrete Parapet (BR-2-82 Type Railing:)

- This Railing should not be use on NHS or STATE system? (BDM304.3.6)

Sidewalk Railing with Concrete Parapet (BR-2-98 Type Railing:)

- Railing posts spaced to clear parapet deflection joints by at least 6 inches.
- Radius of curved railing not less than 20 feet without special details?
- All horizontal reinforcing steel should be detailed as continuous.
- Steel tubing has provision for Expansion and contraction.

Deflector parapet Type Railing:

- 3'-0" high minimum parapets provided?
- Complete details of the Deflector Parapet Type bridge railing shown on the plans?

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- Railing transition preferably mounted on turn back abutment wingwalls or approach slabs?
- For bridges with expansion joints and with parapets mounted on approach slabs, the 1'-1" high base portion of the parapets within the width of back walls are reinforced and placed as part of the abutments to provide an integral structure for mounting the expansion joint armor?
- Such parapets provided with special reinforcement and joint details to allow consolidation induced rotation of the approach slabs without parapet distress?
- Curb heights on approach slabs limited to 4 inches as shown in Section F-F on Deflector Parapet Type drawing?
- Details of filler between approach slab and turn back wing-wall at the base of the parapet made to conform with DETAIL F of Standard Drawing AS-1-81.
- Parapet length of 14'-0" or more provided to allow the standard transition length to be used?
- Reference made to the roadway plans for details and payment provisions for Bridge Terminal Assembly (see Standard Drawings GR-3.1 and GR-3.2)?

Parapet and Fence Type Railing:

- 2'-8" high parapets provided?
- Fence details conform with Standard Drawings VPF-1-90?
- For new bridges, a cast-in-place anchorage provided?

G. BEARINGS

Elastomeric Bearings:

- Steel load plate provided for attachment to steel members?
- Note provided requiring load plates to be bonded to elastomer during the molding process?
- Elastomer hardness specified?
- An elastomeric pad thickness of 1 inch or more provided (Such pads generally must be reinforced with steel laminates)?
- A tabulation of unfactored dead load, live load (excluding impact) and "Maximum Design Load" given?

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For bearings without external load plates, a sloping bridge seat, a tapered beam recess or a tapered bearing (tapered steel insert) specified to provide parallel loading surfaces (to account for the combined effect of grade and camber) for the bearings of concrete box or I-beam bridges?

(BDM Note no. 87) provided with bearing details.

Top and bottom cover layers should not be thicker than 70 % of internal layers (AASHTO 14.6.)

Anchor Bars:

Furnishing and placing anchor bars included with 865 (box beams or I-beams) for payment?

For steel bearings (i.e., RB-1-55 and FB-1-82), furnishing and placing anchor bars included with bearings for payment?

Details provided to prevent anchor bars from supporting any superstructure loads (bond breakers, preformed plugs, etc.)"?

Miscellaneous:

Movement Provisions: Bearing movement provisions (Fixed, expansion restrained) indicated on the Site Plan and General Plan?

Bearing designation (i.e., R-200) for each substructure unit indicated on the framing plan, beam elevation, or deck plan?

Bearing details or reference to standard drawings given? Separate pay item provided for other than standard steel bearings (steel bearings for steel bridges are usually included with structural steel for payment)?

Bearing types provided consistent with superstructure movement (longitudinal, lateral, rotational)?

Bearings/Joints: Bearing types compatible with deck joint characteristics (elastomeric bearings are not compatible with standard sliding plate joints)?

Bridge Seats: Bridge seats large enough for the size bearing used taken into account the need for edge clearances and construction tolerances (wider seats are usually provided for some bridges which are skewed greater than 30 degrees)?

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- Grade Considerations: Tapered sole plates provided for rocker and bolster bearings for grades of 2 percent or greater?
- Coatings: Are notes provided to specify the type of coating required, if other than bare ASTM steel?

H. DECK JOINTS

Terminal Details:

- To confine deck drainage, recessed joint seals, joints terminated as shown in Sections B-B and D-D of Standard Drawings EJ-2-81 and EJ-3-82; and Sections D-D and E-E of Standard Drawings EJ-4-87 and EJ-5-93?
- For new bridges with over the side drainage and wall-type abutments, abutment wing-walls or retaining walls positioned flush with the back wall to allow extension of sealed deck joints beyond the bridge seats?

Joint/Bearing Coordination:

- For bridges with elastomeric bearings and sliding plate type joints, bridging plates positioned (cantilevered from the abutment side of the joint) to prevent the plate from binding due to the compressive deflection of the bearings?
- For sliding plate type joints on grades, a bevel fill attached to the underside of the cantilever plate to provide a level sliding surface to parallel the direction of bearing movement?
- Sliding plate type joints avoided on structures with hanger type bearings?

Miscellaneous:

- Box Beams:** The use of joints generally follows the guidelines given in (BDM 306.3.5 and 306.3.5)
- Recessed Seals:** Joint seals recessed below the roadway surface (i.e. strip and compression), with channel deck drainage laterally, detailed to prevent discharge of deck drainage on bridge seats?
- Adjustment:** A joint width adjustment table, in 10 degree increments for 30 degrees to 90 degrees, given for setting joint widths other than the 60 degree installation temperature? The effect of joint skew taken into account when computing joint adjustment dimensions?

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- “Sawing and Sealing Bituminous Joints” detail sheet provided for box beam bridges with poured seal type joints at abutments?
- Prestressed concrete I-beam bridges follow the guidelines given in section (BDM 306.3.4)

I. DECK DRAINAGE

- Scuppers:** Is/was the use of scuppers avoided (refer to “Bridge Deck Drainage Guidelines,” FHWA Report RD-87/104)? Scuppers avoided over embankment slopes? Scuppers spaced to clear cross frames, places at least 6 feet from the face of piers and abutments; extended at least 8 inches below beams and girders; located inside of fascia beams of grade separation structures and other highly visible structures; not been placed through box beams unless such placement cannot be avoided?
- Approaches:** use made of parapet transitions and curbs on approach slabs to channel deck drainage away from structures towards approach inlets or embankment side slope flumes (see Standard Drawing MC-7)?
- Conductors:** These avoided? Where their use cannot be avoided, steepest possible slopes provided? Large sizes used to help avoid blockage? Convenient clean out provided? Type of field splices specified? Supports adequate to provide a rigid system?
- Elastomeric Troughs:** Reinforced elastomer required by performance specification? Joint made by vulcanization under heat and pressure? Steep slopes (2 inches per foot or more) used to increase drainage velocity? Large discharge openings (12 inch diameter minimum)? Fasteners for scuppers located outside of the trough for convenient access? Galvanized hardware used? Interior steel surfaces metalized and asphalt coated?
- Erosion Protection:** Ground surfaces below scuppers protected by crushed aggregate or concrete slope protection? Crushed aggregate or concrete slope protection extended (3'-0" minimum) beyond edges of open decks? At acute corners of bridges, slope protection extends normal to toe of slope?

J. UTILITIES (BDM 3.1.6)

- Documentation on file approved placement of utility on bridge?
- Concrete embedded utility conduits shown to clear construction joints by 1 inch minimum and other conduits by 2 inches minimum?
- Utilities not supported on fascia or below bottom of superstructure? On grade separation structures, no utilities in bay adjacent to fascia stringer?

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- Gas and water lines not embedded in concrete? No type embedded in section of deck supporting vehicular traffic?
- Expansion provisions for utilities shown if appropriate? (Sometimes shown only on utility sheets)
- Payment for utility supports clearly described by plan note and estimated quantities? (e.g., quantity table footnote stating portion of Item 863 Structural Steel to be paid for by the utility company)

SUBSTRUCTURE: PIERS

A. GENERAL

- For freestanding piers, is the footing width at least one-fourth the height where founded on soil, one-fifth the height where founded on rock, and one-fifth the height between centers of outside piles? (BDM 303.3.1)
- For cap and column piers on piles or bedrock, columns should generally have separate footings. (BDM 303.3.2.2)
- Pier cap terminate inside the fascia and drip groove? (BDM 302.5.1) (For box beam bridges, pier width should allow for 1/4 inch per joint fit-up between box beams)
- "Bearing Anchor Plan" shown? Are anchor bolt dimensions normal and parallel to the centerline of bearing?
- Cap and column piers preferably designed with a cantilevered cap? (BDM 303.3.2.1)
- For slab bridges, is a construction joint placed at the top of the pier cap?
- Piers in navigable waterways designed to resist collision forces based on AASHTO Guide Specification. (BDM 303.2.10)
- Ends of pier caps (all surfaces) under the edge of decks with over-the-side drainage sealed? (BDM 303.1.1)
- Appropriate surfaces of roadway shoulder piers sealed? (BDM 303.1.1)
- For phased construction, is each phase supported by a minimum of three piles or two drilled shafts? (BDM 303.3.1)

B. PILE FOUNDATIONS

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- Design strives to utilize maximum allowable pile spaces and maximum allowable design loads to minimize the number of piles (BDM 303.4.2.4)
- At least four piles per footing? (BDM 303.3.2.2)
- Battered piles required (BDM 303.4.2.3)
- Pile spacing a minimum of 2'-6" or 2.5 times the pile width/diameter? (AASHTO 4.5.15.1.1) A minimum of 3'-6" is preferable.
- Distance from center of piles to edge of footing at least 1'-6"? (BDM 303.3.3)
- Can piles be driven without interfering with sheeting, cofferdams, or other bridge or adjacent building components?

C. CAPPED-PILE PIERS

- Pile spacing less than or equal to 7.5 feet? (BDM 303.4.2.1)
- Height above flow line generally limited to 20 feet, or piles specially designed?
- Cap appear to have been designed for loss of support of any one pile (not including the end piles)? (BDM 303.3.2.5)
- Distance from edge of pile to face of pier cap is at least 8 inches? (BDM 303.3.2.5)
- Pile encasements specified and paid for (H-piles)? (BDM Note 34)
- Minimum of 1'-6" cover provided above the piles? (BDM 303.3.3)

D. CAP AND COLUMN PIERS

- Diameter of the pier column specified to be 3'-0" and the drilled shaft diameter a minimum of 3'-6"? (BDM 303.4.3)
- Location of the construction joint at the pier column/drilled shaft interface appropriate? (Usually 1 foot above normal water elevation, for piers in water, and 1 foot below the ground line elsewhere. (BDM 303.4.3)
- Reinforcing details at the column/drilled shaft construction joint appropriate? Typically, the reinforcing cage diameter is a common size between the column, drilled shaft, and bedrock socket.

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- Bedrock socket depth shown on the plans? (Bottom of socket elevation should generally not be given)
- Reinforcing list include the drilled shaft reinforcing bars and are these bars designated as included for payment with the drilled shafts?
- Spacing of the drilled shafts appropriate? Typically, spacings from 12 to 18 feet are used. Drilled shafts should be spaced to utilize the maximum bedrock end bearing pressures and a minimum number of drilled shafts.
- Design computations for the drilled shafts submitted and reviewed?
- Drill shaft inspection record included and reviewed? Inspection record contain sufficient entries for the number of drilled shafts in the structure?

SUBSTRUCTURE: ABUTMENTS

A. GENERAL

- Abutments easily located? Station and overall dimensions?
- Dimensions referenced from the proper working points? Beam/girder bridges (steel or concrete) intersection of centerline of survey and centerline of bearings. Concrete slab bridges - intersection of centerline of survey and face of abutments. (BDM 202.2)
- Footing elevations appropriate? (BDM 204.6) Stub abutments on piling or drilled shafts the shortest distance from embankment to toe of footing should be at least 4'-0". If on spread footings, distance shall be 5'-6" minimum.
- Wing-wall lengths checked?
- If ground lines are shown, are they appropriate?
- Earth benches not been used for new designs? (BDM 204.5 for CPA-5-94 abutments)
- Depth of approach slab seat Shown? Asphalt over approach slab taken into account?
- Clearance for No. 8 approach slab bars shown? (Standard Drawing AS-1-81)
- Bridge seat sloped to drain toward the face of abutment for beam or girder bridges on spill-through abutments (except at bearings)? (BDM 303.2.3.2) For grade separations on wall-type

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abutments, are the bridge seats sloped to drain toward the back wall, with a depressed gutter and drainage system provided?

- For box beam bridges, are provisions necessary to ensure proper fit of the elastomeric bearings (i.e., sloped bridge seats or tapered bearings)?
- For box beam bridges, is the bridge seat length adequate to support all bearings, accounting for ½-inch fit-up per beam joint? (BDM 302.2.5.1) Beam seat should not protrude from beneath deck edge when a fit-up allowance of 1/4 inch per foot is used.
- For box beam bridges, has the proper wearing surface thickness at the abutments being used to compute bridge seat elevations? (BDM 302.5.1)
- Dowel holes drilled parallel to a free edge clear concrete surface by at least 4 inches?
- Bearing anchor plan shown? Anchor bolt location dimensions normal and parallel to centerline of bearing?
- Joint filler shown between concrete box beams and wing-wall concrete? (BDM 302.5.1)
- Construction joint shown at the level of the approach slab seat for steel superstructures?
- Construction joint provided in wing-walls of box beam bridges at bridge seat elevation? (BDM 302.5.1)
- Plan note restricting placement of wing-wall concrete included for box beam bridges?
- Appropriate surfaces sealed using an epoxy-urethane sealer? (BDM 303.1.1)
- Type B waterproofing used at construction joints? (Typically used above ground at stage construction joints, or joints between existing and proposed concrete)
- Contraction joints provided as appropriate? (BDM 303.2.3.5) and note found on Standard Drawing RW-1-63) Generally, they should only be provided in wall-type abutments?
- Weep holes, when provided, have not been spaced closer than 6 feet nor more than 10 feet? (Construction and Material Specifications (CMS 508.02) (Typically used in wall-type abutments and retaining walls)
- Weep-holes located 6 inches to 1 foot above ground level or normal waterline? (BDM 303.2.3.3)
- Porous backfill shown 6 inches below weep holes (BDM 303.2.3.3), 3 to 6 inches below drain pipe unless pipe is at the bottom of footing (CMS 518.04)?

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- Filter fabric specified between the porous backfill and the approach fill? (BDM 303.2.3.1) has it been turned up 6 inches at the wall?
- Lateral limits of porous backfill (2'-0" thick) clearly indicated in the elevation view as described by (BDM Note 57 or 58)?
- End caps shown on drain pipes, except at outlets? (BDM 303.2.3.1)
- For wall-type abutments where strut action of the superstructure is relied upon for stability, has a plan note been provided limiting height of backfill until superstructure is placed?
- Pipe drainage system used? (BDM 303.2.3.1)
- For rehabilitation, does the connection between the new and existing concrete appear adequate? Existing reinforcing that is incorporated into the new work should generally be shown in the proposed cross-section.
- Vertical rustication, provided at 48 inch intervals for wall-type abutments? (BDM 303.2.2.1) Expansion/contraction joints in the wall located so as to correspond with this spacing?
- For phase construction, is each phase supported by a minimum of three piles or two drilled shafts? (BDM 303.2.2.3)

B. PILE FOUNDATIONS

- Flanges of piles parallel to face of rigid abutments; webs parallel to face of flexible abutment (including CPA-5-94/ICD-1-82 abutments and CPP-2-94 piers)?
- Battered piles required? (BDM 303.4.2.3) Rate of batter shown? 1:4 desirable, 1:3 acceptable)
- Pile embedment into footing shown as 1'-6" cover shown above piles? (BDM 303.3.3)
- Pile design load (not the allowable pile load) shown in the General Notes? Maximum design load for piles is as follows: (BDM 303.4.2.4)

55 tons for HP10 x 42
70 tons for HP12 x 53
50 tons for 12 inch CIP
70 tons for 14 inch CIP
90 tons for 16 inch CIP

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- Distance from center of piles to edge of footing at least 1'-6" (BDM 303.3.3)
- For abutments on a single row of piles, have closed ties been provided around the piles? (For example, see Standard Drawing ICD-1-82).
- Design utilize maximum allowable pile spacings and maximum allowable design loads to minimize the number of piles (BDM 303.4.2.4)
- For abutments on a single row of piles, has the footing been extended to the ends of the wingwalls and straight wing-walls used?

C. DRILLED SHAFTS

- Drills shaft diameter a minimum of 3'-0" (BDM 303.4.3)
- Bedrock socket depth shown on the plans? (Bottom of socket elevation should generally not be given)
- Spacing of the drilled shafts appropriate? Typically, spacings for 12 to 18 feet are used. Drilled shafts should attempt to be spaced to utilize the maximum bedrock end bearing pressures and a minimum number of drilled shafts.
- Design computations for the drilled shafts submitted and reviewed?
- Drilled shaft inspection record included and reviewed? Inspection record contain sufficient entries for the number of drilled shafts in the structure?

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