OHIO DEPARTMENT OF TRANSPORTATION
CENTRAL OFFICE, 1980 W. BROAD ST., COLUMBUS, OHIO 43216-0899

January 15, 2010

To: Users of the Bridge Design Manual

From: Tim Keller, Administrator, Office of Structural Engineering

By: Sean Meddles, Bridge Standards Engineer

Re: 2010 First Quarter Revisions

Revisions have been made to the ODOT Bridge Design Manual, July 2007. These revisions shall be implemented on all Department projects with a Stage 2 plan submission date after January 15, 2010.

This package contains the revised pages. The revised pages have been designed to replace the corresponding pages in the book and are numbered accordingly. Revisions, additions, and deletions are marked in the revised pages by the use of one vertical line in the right margin. The header of the revised pages is dated accordingly.

To keep your Manual correct and up-to-date, please replace the appropriate pages in the book with the pages in this package.

To ensure proper printing, make sure your printer is set to print in the 2-sided mode.

The July 2007 edition of the Bridge Design Manual may be downloaded at no cost using the following link:

http://www.dot.state.oh.us/Divisions/HighwayOps/Structures/standard/Pages/default.aspx

Attached is a brief description of each revision.

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Summary of Revisions to the July 2007 ODOT BDM

BDM Section	Affected Pages	Revision Description
208.1	2-36	This revision addresses a change in the C&MS pay item description from “Cofferdams, Cribs and Sheeting” to “Cofferdams and Excavation Bracing”.
302.5.1	3-36	This change came as a request from the fabricators. Failure to show this dimensional reference in the bridge plans, often results in project delays while the fabricator requests information in order to finalize the shop drawings.
303.4.3	3-68	This revision addresses an exception ODOT has taken to the AASHTO LRFD Bridge Design Specification, Article 5.13.4.5.2 regarding clear spacing around longitudinal and lateral steel in drilled shafts.
303.5.1	3-70 and 3-72	These revisions address a change in the C&MS pay item description from “Cofferdams, Cribs and Sheeting” to “Cofferdams and Excavation Bracing”.
305.2	3-78 through 3-78.2	This revision provides clarification regarding the scoring criteria for fencing on bridges where pedestrian traffic is prohibited by the ORC 4511.051.
605.5	6-10 through 6-10.2	This revision clarifies the application of horizontal earth pressures on MSE wall supported abutments.
610.6	6-25	These revisions address a change in the C&MS pay item description from “Cofferdams, Cribs and Sheeting” to “Cofferdams and Excavation Bracing”.
702.6.2	7-4 through 7-6.2	These revisions address the placement of semi-integral and integral abutment diaphragms with skew and phased construction considerations.
702.19	7-14	This revision addresses a reversal in policy enforcement by OSHA regarding tripping hazards on the working/walking surface of steel beams/girders.

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Volume Three, as projects that do not alter the basic highway cross section or geometry, require no additional right-of-way, are exempt from Categorical Exclusion documentation, and require little or no public involvement. Minimal project types include: bridge painting, deck overlays, scupper installations, barrier facings, concrete sealing, partial depth concrete repairs, etc. Minimal projects do not require a preliminary design submission.

207 BRIDGE GEOMETRICS

207.1 VERTICAL CLEARANCE

The "Required Minimum" and "Actual Minimum" Vertical Clearances and their locations shall be shown on the Preliminary Structure Site Plan, Section 201.2.2. The "Actual Minimum" Vertical Clearance is the minimum overhead clearance provided by the design plans. For new grade separation structures, the "Required Minimum" Vertical Clearance shall not be less than the preferred clearance specified in ODOT's Location and Design Manual, Figure 302-1 unless otherwise specified in the scope of services. A "Required Minimum" Vertical Clearance less than the L&D Manual minimum clearance will require a Design Exception in accordance with Section 105 of the L&D Manual.

207.2 BRIDGE SUPERSTRUCTURE

Bridge superstructure widths shall be established in accordance with ODOT's Location and Design Manual, Section 302, unless specified in the scope of services or other contract criteria.

207.3 LATERAL CLEARANCE

Divided highways having four or more lanes crossing under an intersecting highway shall be provided with a minimum lateral clearance of 30 feet [9000 mm] from the edge of traveled lane to the point where the 2:1 back slope intersects the radius at the toe of the 2:1 slope. Refer to ODOT's Location and Design Manual, Figure 307-2. To satisfy cost considerations or in order to maintain the typical roadway section (including roadway ditch) of the underpass through the structure, for four or more lane highways, wall abutments or the 2:1 slope of typical two-span grade separation structures may be located farther than 30 feet [9000 mm] from the near edge of traveled lane.

Lateral clearances for other roadway classifications shall be established in accordance with ODOT's Location and Design Manual, Section 302, unless specified in the scope of services or other contract criteria.

207.4 INTERFERENCE DUE TO EXISTING SUBSTRUCTURE

Where a new pier or abutment is placed at the location of an existing pier or abutment the usual

"Removal" note (and also the text of CMS 202.03) calls for sufficient removal of the old pier or abutment to permit construction of the new. However, a new pier or abutment preferably should not be located at an existing pier or abutment where the existing masonry may extend appreciably below the bottom of the proposed footing, or appreciably below the ground in case of capped-pile construction. This applies particularly where piles are to be driven. It is desirable to avoid the difficulty and expense of removing deep underground portions of the existing substructure and to avoid the resultant disturbance of the ground.

Where existing substructure units are shown on the Site Plan, the accuracy of the locations and extent should be carefully drawn. The existing substructure configuration should be shown based on existing plans or field verified dimensions, otherwise just a vertical line showing the approximate face of the abutment or pier widths should be shown. Misrepresentation of the location of the existing substructure units has resulted in expensive change orders during construction. Existing dimensions should be labeled as (+/-) plus or minus.

207.5 BRIDGE STRUCTURE, SKEW, CURVATURE AND SUPERELEVATION

During the Assessment of Feasible Alternatives, the location of the proposed structure should be studied to attempt to eliminate the presence of excessive skew, curves or extreme superelevation transitions within the actual bridge limits.

208 TEMPORARY SHORING

208.1 SUPPORT OF EXCAVATIONS

Provide a pay item for cofferdams and excavation bracing for the following conditions:

A. Excavation that extends below the water table or water surface.

B. Excavation of soil that supports adjacent structures, railroads or active roadways. Show the approximate locations of shoring in the plans.

For shoring that supports adjacent structures, railroads or active roadways with at least 8-ft of retained earth, the Design Agency shall provide a temporary shoring design in the plans. The designer shall consider the feasibility of this temporary shoring during the Structure Type Study.

For projects involving Railroads, the requirements will be different as each railroad company has their own specific requirements. The Design Agency is responsible for contacting the responsible railroad and obtaining the specific requirements for design and construction.

Following are some conceptual ideas for the design of temporary shoring:

A. A cantilever sheet pile wall should generally be used for excavation up to approximately 12 feet [3.5 meters] in height. Design computations are necessary.

B. For cuts greater than 12 feet [3.5 meters] in height, anchored or braced walls will generally predict stresses and deflections in all girders and diaphragms and to ensure that the structure is stable during all construction stages and loading conditions.

The Designer shall supply basic erection data on the contract plans. As a minimum, include the following information:

A. If temporary supports are required, provide the location of the assumed temporary support points, reactions and deflections for each construction stage and loading condition.

B. Instructions to the Contractor as to when and how to fasten connections for cross frames or diaphragms to assure stability during all temporary conditions.

Further design information for curved structures is contained in the "Guide Specifications for Horizontally Curved Highway Bridges", published by the American Association of State Highway and Transportation Officials.

302.5 PRESTRESSED CONCRETE BEAMS

Model multi-span, non-composite members as simple-span for all loading conditions. The live load and future wearing surface shall be as defined in Section 301.4.

Model multi-span, composite members as simple-span for non-composite dead loads and continuous span for live load and composite dead loads. The live load and future wearing surface shall be as defined in Section 301.4.

302.5.1 BOX BEAMS

Physical dimensions and section properties of box beam cross sections shall be as shown on the Prestressed Concrete Box Beam Bridge Details, Standard Bridge Drawing.

Box beams should be limited to a maximum skew of 30 degrees.

Multiple span box beam bridges shall be joined over the piers with a T-joint as shown in the Standard Bridge Drawing. Structurally, non-composite beams shall be designed as simple spans. Composite beams shall be designed as simple span for non-composite dead loads and continuous for live loads and composite dead loads.

Expansion at the piers shall be accommodated by elastomeric expansion bearings or by flexibility of the piers for integral designs.

The length of abutment seats of prestressed concrete box beam bridges should be long enough to accommodate the total width out-to-out of all beams including a fit-up allowance of ½ inch [12 mm] per joint between beams.

In order to keep the beam seat from extending beyond the fascia of any pier of a box beam bridge, the length of the pier seat should only include a fit-up allowance for the joints between the beams of 1/4 inch [6 mm] per joint.

For box beam bridges that have skew combined with grade or which have variable superelevation, beam seats shall be designed and dimensioned to provide support for the full width of the box beams.

If a bridge structure's geometry causes a bridge deck in an individual span to have a different cross slope at one bearing than at the other bearing, the difference should be evenly divided so that the box beam seat cross slopes at both bearings are made to be the same. This adjustment gives the box beam full support at the seat without creating any twist or torsion on the box beam. Any elevation differences created by this beam seat adjustment should be adjusted for in the overlay, whether asphaltic or concrete.

Prestressed box beam members shall be supported by two bearings at each support.

Abutment wingwalls above the bridge seat and backwalls should not be cast until after box beams have been erected. The cast in place wingwall and box beam should normally be separated by one inch [25 mm] joint filler, CMS 705.03. The designer should show both requirements in the plans. Casting the backwall and wingwalls after the box beams are erected eliminates installation problems associated with the actual physical dimensions of the box beam and the joint filler. Cracking and spalling of backwall and wingwall concrete due to movements of the elastomeric bearings is also alleviated.

For box beam bridges with steel railing, the post spacing and position of post anchorage shall be detailed on the plans. The dimensioning for the post spacing shall be referenced to each prestressed beam end. The designer shall check that the post anchor spacing does not interfere with tierod locations or the "T" joint over the pier. The designer should confirm that post anchors at the ends of skewed box beams have both adequate concrete cover and do not interfere with the tierods. If the designer finds that no post spacing option can comply with the above requirements, the option of relocating the tie rods may be chosen. See standard drawings for maximum allowable spacing of tie rods.

When the box beam ends are not completely encased in concrete, the Standard Bridge Drawing requires Type B waterproofing on the ends. When required, Designers shall include a pay item for Item 512, Type B Waterproofing, in the estimated quantities.

302.5.1.1 DESIGN REQUIREMENTS

In order to prevent fabrication mistakes for beam length, the effect that the longitudinal grade has on dimensions measured along a beam’s length should be addressed in the plans. When the beam length measured along the grade differs from the beam length measured horizontally by more than 3/8" [10 mm], all affected dimensions measured along the length of the beam should be clearly labeled so that the fabricator can make the necessary allowances in the shop drawings. A Typical Detail note is available in Section 700.

Pier 5 ~

52 - 14" C.I.P. Reinforced Concrete Piles

36 piles installed vertical & 16 piles battered

Ultimate Bearing Value = 270 kip

Estimated Length = 85 ft

Order Length = 90 ft (Total Length = 4680 ft)

The difference in Ultimate Bearing Value between piers 1, 2, 3 & 4 and pier 5 requires 1 dynamic testing item.

Forward Abutment ~

30 - 12" C.I.P. Reinforced Concrete Piles

20 piles installed vertical & 10 piles battered

Ultimate Bearing Value = 152 kip

Estimated Length = 75 ft

Order Length = 80 ft (Total Length = 2400 ft)

No additional dynamic load testing items are required.

For this example, the Designer should include notes **[606.2-1]**, **[606.2-4]** and **[606.2-5]** from Section 606.2 in the General Notes. Note **[606.2-1]** should be modified as follows:

PILE DESIGN LOADS (ULTIMATE BEARING VALUE): The Ultimate Bearing Value is 152 kip per pile for the rear and forward abutment piles. The Ultimate Bearing Value is 250 kip per pile for Pier 1, 2, 3, and 4 piles and 270 kip per pile for Pier 5 piles.

Abutment Piles:

30 piles 70 ft long, order length (Rear)

30 piles 80 ft long, order length (Forward)

1 dynamic load testing item

Pier 1, 2, 3, and 4 Piles:

320 piles 75 ft long, order length

1 static load test item

1 subsequent static load test item

4 dynamic load-testing items

4 restrike items

Pier 5 Piles:

52 piles 90 ft long, order length

1 dynamic load testing item

The Designer should provide the following items in the Estimated Quantities:

Item	Extension	Total	Unit	Description
506	11100	Lump	Sum	Static Load Test
506	12200	1	Each	Subsequent Static Load Test
507	00500	4200	ft	12" Cast-In-Place Reinforced Concrete Piles, Driven
507	00550	4500	ft	12" Cast-In-Place Reinforced Concrete Piles, Furnished
507	00600	26,820	ft	14" Cast-In-Place Reinforced Concrete Piles, Driven
507	00650	28,680	ft	14" Cast-In-Place Reinforced Concrete Piles, Furnished
523	20000	6	Each	Dynamic Load Testing
523	20500	4	Each	Restrike

303.4.3 DRILLED SHAFTS

To allow for the misalignment of drilled shafts that support single pier columns, the shaft diameter shall be 6 in. [150 mm] larger than the column diameter. To allow for misalignment of shafts into footings, footing widths shall be at least 1’-0” [305 mm] larger than the shaft diameter.

The diameter of bedrock sockets for drilled shafts are generally 6 in. [150 mm] less than the diameter of the shaft above the bedrock elevation. This downsize provides sufficient room is the shaft for the rock core barrel. Reinforcing steel cages should be based on the bedrock socket diameter.

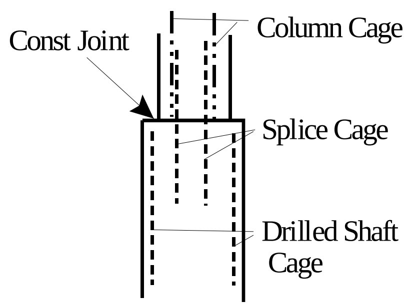
For un-cased or temporarily cased drilled shafts, the spiral reinforcement should be a #4 [#13M] bar with a 4½ in. [115 mm] pitch. (Note: the above requirement shall be met even if the 4½ in. [115 mm] pitch may not meet the spiral requirements of *LRFD 5.7.4.6*) For shaft diameters 4.0 ft. and less, the out-to-out spiral diameter shall be 6 in. [150 mm] less than the rock socket diameter. For shaft diameters greater than 4.0 ft., the out-to-out spiral diameter shall be 12 in. [300 mm] less than the rock socket diameter. When steel casing is left in place, the spiral reinforcing pitch shall be 12 in. [300 mm].

The minimum clear distance between longitudinal and lateral reinforcement shall not be less than 5 times the maximum aggregate size. Where heavy reinforcement is required, consideration may be given to an inner and outer reinforcing cage.

For record and project use, each drilled shaft for a structure shall be individually identified by a unique number. The designer may choose to number the drilled shafts on the individual substructure plan sheet or on a separate drilled shaft foundation layout sheet.

A construction joint between the top of a drilled shaft and the bottom of a column will be required. Therefore, the designer will need to specify reinforcing steel, incorporating the required lap splices, at the construction joint.

The designer should develop a lap splice that will allow both for required lap and minimum cover due to mis-alignment of the drilled shaft versus the column. Possible alternatives are two cages, one for the drilled shaft diameter and a second splice cage for the lap to the column.



When the exposed length of the pier columns is relatively short, one full length reinforcing steel cage, from the bottom of the drilled shaft up into the pier cap, should be designed. The steel cage should be designed to provide a 3 in. [75 mm] concrete cover within the pier column.

When the drilled shaft is socketed into bedrock, the quantity of the reinforcing steel in the drilled shaft, including the portion extending into the rock socket, should be included with Item 524 “Drilled Shaft, Above Bedrock” for payment. For drilled shafts with friction type design where the tip elevation is known, the reinforcing steel should be paid under Item 524, Drilled Shafts.

A general note as listed in Section 600 will be required.

The top of the drilled shaft shall be 1 ft. [0.3 meter] above normal water elevation, for piers in water, and 1 ft. [0.3 meter] below the ground surface for piers not in water.

303.5 DETAIL DESIGN REQUIREMENTS FOR PROPRIETARY RETAINING WALLS

Supplemental Specification 840 defines the requirements for construction and design for internal stability for Mechanically Stabilized Earth (MSE) walls. The project plans shall include a reference to SS 840 when MSE walls are shown. Special provisions are required for other types of proprietary walls.

303.5.1 WORK PERFORMED BY THE DESIGN AGENCY

The Design Agency is responsible for providing sufficient information in the plans such that, prior to submitting a bid, the Contractor can select a proprietary company to design the internal stability of the wall after the project is awarded. Detail each wall on a project separately. As a minimum, the project plans for each wall location shall provide the following:

A. Plan View of the wall showing: (Refer to Figure 303.5.1-1)

   1. Wall location with station and offset with respect to the centerline of construction for each critical point
   2. All complex geometry information
   3. Pay limits for wall and roadway quantities
   4. North Arrow
   5. Locations of typical sections for (C.) below
   6. Locations of abutment footing, piles, utilities, catch basins, and other possible obstructions (Refer to Section 209.3 for drainage and Section 301.7 for utility locations)
   7. Parapet/barrier locations
   8. Limits of proposed wall excavation
   9. Locations of sheeting and bracing

      If sheeting and bracing is required according to BDM Section 208, provide a pay item for Item 503 – Cofferdams and Excavation Bracing

   10. Select Granular Backfill drainage locations

      Perforated plastic pipe, CMS 707.33, wrapped with filter fabric shall be located as low as possible within the select granular backfill while still providing positive gravity flow in the pipe to an outlet. The pipe shall be located near the back side of the leveling pad and near the free end of the soil reinforcement. The pipe shall be continuous and sloped to provide a positive gravity flow to an outlet. The approximate location of the outlet shall be shown on the plan view. Drainage pipe without perforations shall be used outside the limits of the select granular backfill. If the proprietary wall supports an abutment, provide backfill drainage in accordance with Section 303.2.3.1.

B. Elevation of the wall showing: (Refer to Figure 303.5.1-1)

   1. Station and elevation for each critical point on the wall
   2. Finished ground surface elevations for each critical point on the wall
   3. Leveling pad showing the minimum dimension from the finished ground line to the top of the pad.
   4. Locations of abutment footing, piles, utilities, catch basins, and other possible obstructions
   5. Backfill drainage
   6. Approximate locations of slip joints

C. Typical Sections showing: (Refer to Figures 303.5.1-2, 303.5.1-3, 303.5.1-4 303.5.1-5, 303.5.1-6 & 303.5.1-7)

1. Coping details
2. Parapet and sleeper slab details
3. Abutment footing details including the dimensions from the back of the proprietary wall to the centerline of bearing at the abutment, dimensions from the back of the proprietary wall to the toe of the abutment footing, and dimensions from the back of the proprietary wall to the centerline of the nearest row of piles.
4. Minimum clearance between the bottom of the footing/sleeper slab and the uppermost wall reinforcement strap. Six inches [150 mm] is preferred.
5. Locations of abutment footing, piles, utilities, catch basins, and other possible obstructions
6. Backfill drainage
7. Soil reinforcements attached to abutments

   Regardless of abutment type and foundation type, one row of soil reinforcements shall be attached to the backside of the abutment footing. These additional reinforcements are necessary to resist horizontal bridge and backwall forces, and prevent load transfer to the coping and facing panels. To estimate select granular backfill quantities, Designers may assume these additional reinforcements are the same length as those attached to the facing panels.

8. Limits of select granular material

   Show the limit of the select granular. The top elevation of the select granular backfill shall be at least six inches above the uppermost layer of soil reinforcement, but not lower than six inches above the bottom of the abutment footing.

9. Limits of wall excavation

   Supplemental Specification 840 requires a minimum one foot undercut beneath the leveling pad elevation for all MSE walls. If more undercut is required, show it on the plans. The backfill material is specified in SS 840.

10. Pay limits of wall and roadway quantities
11. Pile sleeves (if required)

    Pile sleeves shall be shown extending from the bottom of the abutment footing to the bottom of the wall excavation

12. Location of sheeting and bracing (if required)

13. Limits of concrete sealer

D. Requirements for wall surface textures or other aesthetic treatments (i.e. show panel size and shape restrictions specific to the project in the plans)

E. Wall design criteria including:

1. Factored bearing resistance at the base of the reinforced soil mass
2. The following factored loads applied to the reinforced soil mass from the bridge: vertical dead and live loads, horizontal loads and total bearing load.

Plan notes are provided in Section 600.

F. Final copy of the Special Provisions for proprietary wall types other than MSE walls.

G. Estimated Quantities Table (list each wall on a project separately)

Include all pay items listed in SS 840. Also include as necessary; Item 203 – Embankment; Item 512 – Sealing of concrete surfaces (epoxy urethane); and Item 503 - Cofferdams and Excavation Bracing.

303.5.2 WORK PERFORMED BY THE PROPRIETARY WALL COMPANIES

The proprietary wall companies will be responsible for designing the internal stability of the wall in accordance with the project plans and either Supplemental Specification 840 for MSE walls or the special provisions for other proprietary wall types.

304 RAILING

304.1 GENERAL

All bridge railing shall meet acceptance criteria contained in NCHRP Report 350 or its successor. The minimum acceptance level shall be TL-3 unless supported by a rational selection procedure described herein.

Bridge railings that have been found acceptable under the crash testing acceptance criteria defined in NCHRP Report 230 and the AASHTO Guide Specification for Bridge Railing, 1989 including all interims, will be considered as meeting the requirements of NCHRP Report 350 without further testing as indicated in the following table.

On projects where maintaining minimum lane widths during a construction phase is not possible due to limited bridge width, the use of a top mounted steel post and tubular steel rail system, similar to the Twin Steel Tube bridge guardrail, may be justified. The railing, post and anchorage designs of these systems are to be in accordance with the *AASHTO LRFD Bridge Design Specifications, Sections A13.1-3*.

304.3.5 BRIDGE SIDEWALK RAILING WITH CONCRETE PARAPETS (BR-2-98)

This railing system is for use on bridges with sidewalks at least 5'-0" wide and a curb height of 8 inches. Although this system is essentially a combination railing system, it may also be used without a sidewalk in applications where pedestrian traffic is not a concern.

Where Vandal Protection Fencing is required, the fencing shall be installed behind the steel tubing as shown in Figure 305.3-2. However, the steel tubing may be omitted if the concrete parapet height is 32" or greater. See Figure 305.3-1. If the tubing is omitted, the fencing should extend the full length of the concrete parapet and the additional 18" parapet height at each end, as detailed in the standard, is not required.

The concrete parapet shall be designed and detailed as follows:

A. All horizontal reinforcing steel shall be detailed as continuous for the total length of the structure.

B. Crack control joints shall be sawed into the concrete parapets. The distance between the saw-cut joints on the structure shall be between 6'-0" and 10'-0". The detailed locations of the crack control joints and vertical reinforcing bars shall be shown in the contract plans.

C. The saw-cut crack control joint shall be detailed as 1 ¼ inch deep and shall be filled with a polyurethane or polymeric material conforming to ASTM C920, Type S. The bottom one-half inch of both the inside and outside face shall be left unsealed to allow any water that enters the joint to escape. This requirement is established in the Standard Bridge Drawing; however, a plan note is required for special designs. See Section 600.

305 FENCING

305.1 GENERAL

The primary purposes of protective fencing are to provide for the security of pedestrians and to discourage the throwing or dropping of objects from bridges onto lower roadways, railroads, boat lanes or occupied property. In addition, fence may be needed on high level bridges where wind may threaten to blow pedestrians or occasional stranded motorists off the bridge and on bridges where there is a danger that the outside parapet may be mistaken for a median barrier, causing persons to jump over the parapet in emergency situations in periods of darkness. These situations should be treated on a case-by-case basis.

Since a falling object problem could occur at any bridge accessible to pedestrians, it is necessary to consider installation of protective fencing at such locations.

Generally, fencing attached to bridge structures for the protection of traffic and pedestrians should conform to the Vandal Protection Fencing Standard Bridge Drawing. The designer may need to enhance this standard to deal with requirements for the specific structure.

305.2 WHEN TO USE

Designers shall investigate the need for fencing on all new overpass bridges. Pedestrian Fencing may be required when a total of 10 points or greater is achieved for a structure according to the following criteria. The designer should use this procedure as a general guide as to the need for fencing. The affected district should also be consulted for their input. The list is not to be construed as all-inclusive. Other rationale may be used on a case-by-case basis. Similarly, retrofitting of bridges that qualify according to the total index number is not mandatory if adequate justification for not doing so can be documented.

	JUSTIFICATION ITEM	INDEX POINTS
A.	Overpass within an urbanized area of 50,000 or more population	2
B.	Overpass with sidewalks but not in an urbanized area as defined in (A) (“Sidewalk” does not include safety curbs 2'-3" [685 mm] or less in width)	2
C.	Overpass which is unlighted	2
D.	Overpass not a main thoroughfare, i.e., on collectors or local streets	2
E.	Overpass within ½ mile [0.8 km] of another overpass exclusive of pedestrian bridges, having or requiring protection	2
F.	Overpass within ½ mile [0.8 km] of another overpass having previous reports of falling objects	4
G.	Overpass within 1 mile [1.6 km] of a school, playground or other pedestrian attraction	4
H.	Bridges over any feature which has a high count of boat, rail, vehicular or pedestrian traffic, or includes damage-sensitive property	4
I.	Overpass which has had prior reported incident of falling objects	6
J.	Overpass which is used exclusively by pedestrians	10

“OVERPASS” is a bridge over a highway or a railroad.

Justification Items (E), (F) and (G) do not apply to overpasses carrying Freeway routes, as defined in ORC 4511.01, where pedestrians are prohibited per ORC 4511.051.

305.3 FENCING CONFIGURATIONS

For structures with sidewalks, the top of fence should be a minimum height of 8 feet [2450 mm] above the sidewalk. For a greater degree of protection against objects being thrown from the

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[605.2-2] CONSTRUCTION CONSTRAINTS: Fill the void created by excavating for the abutment footings with Type B granular material, 703.16.C. After the footing and the breastwall have been constructed, fill the void behind each abutment up to the beam seat elevation and from the beam seat up on a 1:1 slope to the subgrade elevation prior to constructing the backwall and setting the beams on the abutment.

605.3 EMBANKMENT CONSTRUCTION NOTE

In an attempt to reduce settlements of the roadway approaches, specify the placement of embankment materials in 6 inch [150 mm] lifts. Include one of the following plan notes in the Project General Notes and make reference to the work defined below at the appropriate locations within the plans.

Note that Item 203 is a roadway quantity and coordination with the roadway plans is necessary.

To define the limits of measured pay quantities for bridges with wall-type abutments, provide excavation, backfill, and embankment diagrams (or a composite diagram, where suitable), using schematic abutment cross-sections, showing the boundaries between structure and roadway excavation, and between structure backfill and roadway embankment.

[605.3-1] ITEM 203 EMBANKMENT, AS PER PLAN: Place and compact embankment material in 6 inch lifts for the construction of the approach embankment between stations _**_ to _**_.

NOTE TO DESIGNER:

** The approximate limits should be 100 feet behind each abutment

[605.3-2] ITEM 203 EMBANKMENT, AS PER PLAN: Place and compact embankment material in 6 inch lifts for the construction of the approach embankment.

605.4 UNCLASSIFIED EXCAVATION

Compute and use pay items for Item 503 as follows:

When an excavation includes 10 yd^3 [m^3] or more of rock (or shale), itemize the quantity of rock excavation separately under:

Item 503 - Rock (or Shale) Excavation

When the rock (or shale) excavation is under 10 yd^3 [m^3], do not itemize the rock (or shale) excavation separately. Provide the following pay item:

Item 503 - Unclassified excavation, including rock (and/or shale)

When excavation includes no rock (or shale), provide the following pay item:

Item 503 - Unclassified excavation

In computing the quantity of Item 503 excavation, the designer should confirm that all removals under items 201, 202 or 203 have been excluded, according to CMS 503.01. Generally, the basis of payment for Item 503 should be yd^3 [m^3]. Lump sum quantities may be used if authorized by the District and with the understanding that cost may be higher than when specific quantities are used.

605.5 PROPRIETARY RETAINING WALLS

For projects with proprietary retaining wall systems supporting bridge abutments on spread footings, provide the following note and table:

[605.5-1] PROPRIETARY RETAINING WALL DATA:

The proprietary wall supplier shall design the internal stability of a mechanically stabilized earth (MSE) wall in accordance with SS840 to support loads from the abutment provided in the table below. All loads in the table are nominal (i.e. unfactored) applied to the reinforced soil mass at the base of the concrete footing. The loads in the table do not include earth pressure loads from the abutment backfill. However, the proprietary wall supplier shall include earth pressure loads from the abutment backfill in the design calculations. Refer to AASHTO LRFD Bridge Design Specifications, Section 3, for load definitions.

Wall Location	DC (k/ft)	DW (k/ft)	LL (k/ft)	PL (k/ft)	FR (k/ft)
#1					
#2					
#3					

For projects with proprietary retaining wall systems supporting bridge abutments on pile foundations, provide the following note:

[605.5-2] PROPRIETARY RETAINING WALL DATA:

The proprietary wall supplier shall design the internal stability of a mechanically stabilized earth (MSE) wall in accordance with SS840 to support the abutment. The design for internal stability shall include a nominal (i.e. unfactored) horizontal strip load due to friction (FR) from the superstructure of _____ k/ft applied perpendicular to the face of wall at the base of the concrete footing. This strip load does not include earth pressure loads from the abutment backfill. However, the proprietary wall supplier shall include earth pressure loads from the abutment backfill in the design calculations.

NOTE TO DESIGNER: Both notes above apply to the design of abutments supporting

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610.6 COFFERDAMS AND EXCAVATION BRACING

Use this note when the plans include detail designs for temporary shoring.

[610.6-1] ITEM 503, COFFERDAMS AND EXCAVATION BRACING, AS PER PLAN: The design shown on the plans for temporary support of excavation is one representative design that may be used to construct the project. The Contractor may construct the design shown on the plans or prepare an alternate design to support the sides of excavations. If constructing an alternate design for temporary support of excavation, prepare and provide plans in accordance with C&MS 501.05. The Department will pay for the temporary support of excavation at the contract lump sum price for Cofferdams and Excavation Bracing. No additional payment will be made for providing an alternate design.

610.7 DECK PLACEMENT NOTES

610.7.1 FALSEWORK AND FORMS

Use the following note when web depths greater than 84 in. are specified.

[610.7.1-1] ITEM 511, CLASS HP CONCRETE, SUPERSTRUCTURE, AS PER PLAN *

Locate the lower contact point of the overhang falsework at least _**_ inches ± 2 in. above the top of the girder's bottom flange. The bracket contact point location requirements of C&MS 508 do not apply.

NOTE TO DESIGNER:

* Modify the pay item description to fit the specific project requirements.

** The minimum dimension for the location for the lower point of contact should be 76 in. below the bottom of the top flange. Designers should verify the acceptability of the design within the range of tolerance specified.

610.7.2 DECK PLACEMENT DESIGN ASSUMPTIONS

Use the following note on all projects requiring mechanized finishing machines to place deck concrete.

[610.7.2] DECK PLACEMENT DESIGN ASSUMPTIONS:

The following assumptions of construction means and methods were made for the analysis and design of the superstructure. The Contractor is responsible for the design of the falsework support system within these parameters and will assume responsibility for superstructure analysis for deviation from these design assumptions.

An eight wheel finishing machine with a maximum wheel load of _____ kips for a total machine load of _____ kips.

A minimum out-to-out wheel spacing at each end of the machine of 103”.

A maximum spacing of overhang falsework brackets of 48 in.

A maximum distance from the centerline of the fascia girder to the face of the safety handrail of 65”.

NOTE TO DESIGNER:

Refer to BDM Section 302.2.7.2.c for design information regarding finishing machine loads.

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701.7 SEALING OF BEAM SEATS

Provide the following note when elastomeric bearings are to be placed on substructures with beam seats sealed with an epoxy or non-epoxy sealer:

[701.7-1] SEALING OF BEAM SEATS: If the beams seats are sealed with an epoxy or non-epoxy sealer prior to setting the bearings, do not apply sealer to the concrete surfaces under the proposed bearing locations. If these locations are sealed, remove the sealer to the satisfaction of the Engineer prior to setting the bearings. The Department will not pay for this removal.

702 SUPERSTRUCTURE DETAILS

702.1 STEEL BEAM DEFLECTION AND CAMBER

For steel beam or built-up girder bridges provide a table similar to Figure 702.1-1 on a structural steel detail sheet. Tabulation is required regardless of the amount of deflection and is required for all beams or girders, if the deflection is different.

Show the deflection and camber data as described in Section 302.4.1.8. The table is to include bearing points, quarter points, center of span, splice points, and maximum 30 foot [10.0 meter] increments. Unique geometry may require an even closer spacing.

702.2 STEEL NOTCH TOUGHNESS REQUIREMENT (CHARPY V-NOTCH)

CVN material is a requirement to help assure fracture toughness of main material. Designers using this note should understand not only why CVN is specified but what is a main member. Section 302.4.1.10 helps with the definition of main members and specially highlights that crossframes of curved steel structures, because they are actual designed members carrying liveload forces, are also main members. Designers are reminded they must indicate specific pieces, members, shapes, etc. that are main members.

Place the following note on a structural steel detail sheet for bridges having main load-carrying members that must meet minimum notch toughness requirements:

[702.2-1] CVN: Where a shape or plate is designated (CVN), furnish material that meets the minimum notch toughness requirements as specified in 711.01.

702.3 HIGH STRENGTH BOLTS

For all structural steel superstructures, place the following note on the structural detail sheet:

[702.3-1] HIGH STRENGTH BOLTS shall be ___________ diameter A325 unless otherwise noted.

702.4 ELASTOMERIC BEARING LOAD PLATE

Where the load plate of an elastomeric bearing is to be connected to the structure by welding, provide the following note with the pertinent bearing details:

[702.4-1] WELDING: Control welding so that the plate temperature at the elastomer bonded surface does not exceed 300° F as determined by use of pyrometric sticks or other temperature monitoring devices.

702.5 BEARING REPOSITIONING

Where elastomeric bearing repositioning is required for a steel beam or girder superstructure, provide the following plan note.

[702.5-1] BEARING REPOSITIONING: If the steel is erected at an ambient temperature higher than 80°F or lower than 40° F and the bearing shear deflection exceeds 1/6 of the bearing height at 60° F (+/-) 10° F, raise the beams or girders to allow the bearings to return to their undeformed shape at 60° F (+/-) 10° F.

702.6 CONCRETE PLACEMENT SEQUENCE NOTES

Also see section 701.5 notes.

702.6.1 CONCRETE INTERMEDIATE DIAPHRAGM FOR PRESTRESSED CONCRETE I-BEAMS

If the design plans do not reference Standard Bridge Drawing PSID-1-99, provide the following note.

[702.6.1-1] INTERMEDIATE DIAPHRAGMS: Do not place the deck concrete until all intermediate diaphragms have been properly installed. If concrete diaphragms are used, complete the installation of the intermediate diaphragms at least 48 hours before deck placement begins. Concrete shall be Class S.

702.6.2 SEMI-INTEGRAL OR INTEGRAL ABUTMENT CONCRETE PLACEMENT FOR DIAPHRAGMS

Hardened concrete end diaphragms restrain the movement and rotation of beam/girder ends that occur during deck placement. This restraint will increase stress in both the beam/girder and diaphragm. Factors that can contribute to detrimental stress increases include large structure skew and phased construction. When these factors exist, hardened diaphragms should be avoided during the deck placement. The following table provides guidelines for concrete diaphragm placement options.

Diaphragm Placement [3]		Skew < 30° (Steel) or <10° (I-beam) No Closure Pour	Skew < 30° (Steel) or <10° (I-beam) Closure Pour [2]	Skew ≥ 30° (Steel) or ≥10° (I-beam) No Closure Pour	Skew ≥ 30° or ≥10° (I-beam) Closure Pour [2]
Phase 1	Placed 48 hrs before deck placement	✓	✓		
	Placed with deck placement	✓	✓	✓ (1)	✓ (1)
	Placed after deck placement	✓	✓	✓	✓
Successive Phases	Placed 48 hrs before deck placement	✓	✓		
	Placed with deck placement	✓	✓	✓ (1)	✓ (1)
	Placed after deck placement	✓	✓	✓	✓

Notes:
✓= Diaphragm concrete placement option is acceptable
1. Requires submittal and Engineer approval
2. Place closure pour concrete in the diaphragm with or after deck placement.
3. For bridges built without phased construction, follow guidance for Phase 1 with No Closure Pour.

Designers should consider the absence of restraint at the diaphragm location and when calculating the unbraced length of beam/girder flanges. If necessary, temporary bracing details should be included in the plans. Temporary end bracing should be oriented perpendicular to beam/girder webs.

The following notes may be needed depending on whether the bridge superstructure is steel or prestressed concrete; requires phased construction; or is skewed a specific amount.

Use the following note for either steel superstructures skewed less than 30 degrees or I-beam superstructures skewed less than 10 degrees without phased construction.

[702.6.2-1] ABUTMENT DIAPHRAGM CONCRETE: Place the diaphragm concrete encasing the structural member ends with the deck concrete or at least 48 hours before placement of the deck concrete. If placed separately, locate the horizontal construction joint between the diaphragm and deck concrete at the approach slab seat.

Use the following note for either steel superstructures skewed 30 degrees or more or I-beam superstructures skewed 10 degrees or more without phased construction.

[702.6.2-2] ABUTMENT DIAPHRAGM CONCRETE: Place the diaphragm concrete encasing the structural member ends after the deck placement in the adjacent span is complete. Procedures that place the abutment diaphragm with the deck concrete may be approved by the Engineer if the placement submittal can assure that the deck concrete in the adjacent span will be placed before concrete in the diaphragm has reached its initial set.

Use the following note for either steel superstructures skewed less than 30 degrees or I-beam superstructures skewed less than 10 degrees with phased construction and closure pours required per BDM Section 302.2.9.

[702.6.2-3] ABUTMENT DIAPHRAGM CONCRETE, PHASED CONSTRUCTION: Place the diaphragm concrete encasing the structural member ends of an individual phase with the deck concrete or at least 48 hours before placement of the deck concrete. If placed separately, locate the horizontal construction joint between the diaphragm and deck concrete at the approach slab seat. Place closure pour concrete in the diaphragm and deck concurrently.

NOTE TO DESIGNER:

For bridges with phased construction that do not require closure pours according to BDM Section 302.2.9, omit the last sentence of note **[702.6.2-3]**

Use the following note for either steel superstructures skewed 30 degrees or more or I-beam superstructures skewed 10 degrees or more with phased construction and closure pours required per BDM Section 302.2.9.

[702.6.2-4] ABUTMENT DIAPHRAGM CONCRETE, PHASED CONSTRUCTION: Place the diaphragm concrete encasing the structural member ends of an individual phase after the deck placement in the adjacent span is complete. Procedures that place the abutment diaphragm with the deck concrete may be approved by the Engineer if the placement submittal can assure that the deck concrete in the adjacent span will be placed before concrete in the diaphragm has reached its initial set. Place closure pour concrete in the diaphragm and deck concurrently.

NOTE TO DESIGNER:

For bridges with phased construction that do not require closure pours according to BDM Section 302.2.9, omit the last sentence of note **[702.6.2-4]**

702.7 CONCRETE DECK SLAB DEPTH AND PAY QUANTITIES

For all steel beam and girder bridges with a concrete deck, provide the following note that describes how the quantity of deck concrete was calculated.

[702.7-1] DECK SLAB CONCRETE QUANTITY: The estimated quantity of deck slab concrete is based on the constant deck slab thickness, as shown, plus the quantity of concrete that forms each beam/girder haunch. The estimate assumes a constant haunch thickness of ___ inches and a constant haunch width outside the edge of each beam/girder flange of 9 inches. Deviate from this haunch thickness as necessary to place the deck surface at the finished grade. The allowable tolerance for the haunch width outside the edge of each beam/girder flange is ± 3 inches.

The haunch thickness was measured at the centerline of the beam/girder, from the surface of the deck to the bottom of the top flange minus the deck slab thickness. The area of all embedded steel plates has been deducted from the haunch quantity in accordance with 511.24.

NOTE TO DESIGNER: The note above applies to new structures with beams/girders placed parallel to the profile grade line. A constant depth haunch may not be practical for new structures whose beams/girders are not placed parallel to the profile grade line. In theses special cases, the note shall be modified to fit the exact conditions.

702.8 PRESTRESSED CONCRETE I-BEAM BRIDGES

For prestressed concrete I-beam bridges with concrete deck, compute the concrete topping depth over the top of the beams as follows:

A = Design slab thickness.

B = Anticipated total midspan camber due to the design prestressing force at time of release

C = Deflection at midspan due to the self weight of the beam

D = Deflection at midspan due to dead load of the slab, diaphragms and other non-composite loads.

E = Deflection due at midspan to dead load of railing, sidewalk and other composite dead loads not including future wearing surface

F = Adjustment for vertical curve. Positive for crest vertical curves

G = Sacrificial haunch depth (2")

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(Method B) of the AASHTO LRFD Bridge Design Specifications. Perform the Long-term Compression Proof Load Test in accordance with the AASHTO Standard Specifications for Highway Bridges, Division II, Section 18.7.2.6 and 18.7.4.5.

702.16 BEARING SEAT ADJUSTMENTS FOR SPECIAL BEARINGS

Provide the following plan note in project plans that specify specialized bearings such as pot, spherical or disc. This note is intended to ensure that the contractor builds the bearing seats to the proper elevation in the event that the bearing manufacturer adjusts the height of the bearing from the height assumed in the design plans.

[702.16-1] The pier and abutment beam seat elevations are based on bearing heights provided in the table below. If the Contractor's selected bearing manufacturer has a design that does not conform to the heights provided in the table, adjust the bearing seat elevations at no additional cost to the state. Adjust the location of reinforcing steel horizontally as necessary to avoid interference with the bearing anchor bolts. Maintain the minimum concrete cover and minimum spacing required by the project plans. If the reinforcing steel cannot be moved to provide the required position for the anchor bolts, the Contractor's bearing manufacturer shall re-design the bearings to accommodate an acceptable anchor bolt configuration.

	Rear Abutment	Pier No #	Forward Abutment
Member Line 1			
Member Line 2			
Member Line 3			
Member Line 4			

702.17 HAUNCHED GIRDER FABRICATION NOTE

For steel haunched girders, add the following note on the design plan sheet that shows an elevation view of the typical haunched girder section defining web size, flange size, depth of member, CVN, etc.

[702.17-1] HAUNCHED GIRDERS: Near the bearing, at the intersection of the horizontal bottom flange with the curved (haunched) portion of the bottom flange, the Contractor's fabricator shall hot bend the flange in accordance with AASHTO LRFD Bridge Construction Specifications, Section 11.4.3.3.3 or provide a full penetration weld, with 100% radiographic inspection.

702.18 FRACTURE CRITICAL FABRICATION NOTE

For structures that contain fracture critical components and members, place the following note in the design plans.

[702.18-1] FCM: All items designated FCM (, including ________)* are Fracture Critical Members and Components and shall be furnished and fabricated according to the requirements of Section 12 of the AASHTO/AWS Bridge Welding Code D1.5.

* - Include this additional wording if there exists fracture critical components such as welds, attachments, etc. that are not easily or clearly identified in the plan details. Write descriptions of such components as specific as necessary to prevent any possible confusion during fabrication.

702.19 WELDED SHEAR CONNECTORS ON GALVANIZED STRUCTURES

For galvanized structures with welded shear connectors, place the following note on the same plan sheet as the shear connector spacing.

[702.19-1] WELDED SHEAR CONNECTORS: Install shear connectors after the decking or other walking/working surface, has been installed. Remove the galvanic coating by grinding at each connector location prior to welding.

703 SITE PLAN REQUIREMENTS FOR SECTION 401 AND 404 OF THE CLEAN WATER ACT

For waterway crossing projects, include the following information on the Preliminary Structure Site Plan. Refer to Section 201.2.2 for additional information.

[703-1] For this project, permits for Sections 401 and 404 of the Clean Water Act, are based on the limits of temporary construction fill placed in "Waters of the United States" as shown below. If either of the limits provided are exceeded, then a 404/401 permit modification will be required. If a permit modification is required, refer to Supplemental Specification 832.09 for the application requirements.

Plan Area of Temporary Fill Material = ____ acres

Total Volume of Temporary Fill Material = ____ yd^3