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, January 2004. 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 January 2004 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 January 2004 ODOT BDM

BDM Section	Affected Pages	Revision Description
208.1	2-35.1	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	3-38 through 3-38.2	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	3-75 through 3-75.2	This revision addresses an exception ODOT has taken to the AASHTO Standard Specifications for Highway Bridges, Article 4.6.6.2.1 regarding clear spacing around longitudinal and lateral steel in drilled shafts.
303.5.1	3-77 and 3-79	These revisions address a change in the C&MS pay item description from "Cofferdams, Cribs and Sheeting" to "Cofferdams and Excavation Bracing".
305.2	3-89	This revision provides clarification regarding the scoring criteria for fencing on bridges where pedestrian traffic is prohibited by the ORC 4511.051.
611.9	6-33 through 6-34	These revisions address a change in the C&MS pay item description from "Cofferdams, Cribs and Sheeting" to "Cofferdams and Excavation Bracing".
702.7.2	7-5 through 7-6.2	These revisions address the placement of semi-integral and integral abutment diaphragms with skew and phased construction considerations.
702.23	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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For the purposes of determining vertical clearances, “Reconstructed” shall refer to an improvement of an existing structure involving the replacement of the entire superstructure.

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.

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 using the two loading conditions that follow. The loading condition that produces the largest load effects shall govern.

1. Simple-span for non-composite dead loads; continuous span for live load and composite dead loads. The live load and future wearing surface shall be as defined in Section 301.4.

2. Simple-span for all loading conditions. Do not include future wearing surface. The live load 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

For box beam members, the live load distribution factors of AASHTO Section 3.23.4.3 shall be used.

Prestressed box beam design data sheets for non-composite designs are available on the Office of Structural Engineering website. The sheets are designed for TST-1-99 railing, a 60 lb/ft^2 future wearing surface and an HS25 or alternate military loading.

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.

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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	Restriking

303.4.3 DRILLED SHAFTS

3'-6" [1065 mm] diameter drilled shafts for piers and 3'-0" [915 mm] diameter shafts for abutments are normally used.

The diameter of bedrock sockets of a drilled shaft are generally 6 inches [150 mm] less in diameter than the diameter of the drilled shaft above the bedrock elevation. The 6 inch [150 mm] downsize can be eliminated for abutment shafts. Reinforcing steel cages should be based on the bedrock socket diameter.

The drilled shaft diameter for the abutment shafts can be shown as one constant diameter for the full length of the drilled shaft (through bedrock and through soil).

Spiral reinforcement used in the drilled shaft is normally a #4 [#13M] bar at a 4½ inch [115 mm] pitch with a spiral diameter of 6 inches [150 mm] less, out to out of spiral cage than the drilled shaft diameter. (Note AASHTO specifications do not recognize a 4½ inch [115 mm] pitch as meeting spiral requirements definition 8.18.2.2.3) When steel casing is left in place, a pitch of 12 inches [300 mm] should be used for the spiral reinforcing.

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.

Drilled shafts with diameters of less than 3'-0" [915 mm] are not recommended.

The diameter of the drilled shafts should be 6 inches [150 mm] larger than the pier column diameter so that if the drilled shaft is slightly misaligned, the pier column can still be placed at plan location, although the pier column would not be exactly centered on a misaligned-drilled shaft.

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

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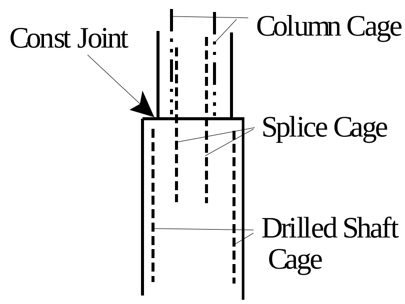
substructure plan sheet or on a separate drilled shaft foundation layout sheet.

A construction joint between the drilled shaft and any 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 inch [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. The Designer shall also specify the reinforcing steel to be epoxy coated according to 709.00.

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

The top of the drilled shaft is defined as 1 foot [0.3 meter] above normal water elevation, for piers in water, and 1 foot [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 329)

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 329)

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 330, 331, 332, 333, 333A & 333B)

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 backfill

   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. Allowable bearing capacity at the base of the reinforced soil mass

   2. Vertical dead and live loads, horizontal loads and actual bearing pressure applied to the reinforced soil mass from the bridge

   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.

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 bridge, the fence may be curved to overhang the sidewalk. For curved fence the posts should be vertical for approximately 8 feet [2450 mm] above the sidewalk before curving inward over the sidewalk. The overhang should be at least 1 foot [300 mm] less than the width of the sidewalk, with a maximum overhang of 3'-7" [1100 mm]. The slope of the straight overhanging portion should be 1 vertical to 4 horizontal. The radius of the connecting arc should be 32 inches [815 mm]. See Figures 326 & 327.

For narrow pedestrian bridges, bent pipe frames are generally used with pipe bend radii of 24" [600 mm] at the upper corners and the start of the radii about 8 feet [2450 mm] above the sidewalk surface. The fabric should start at the deck line, top of curb or parapet and may stop at the upper end of the bent portion of the frame.

Fabric on the top horizontal area of the frame is sometimes not installed because adventurous youngsters tend to walk on the top of the enclosure. See Figure 328 for an illustration of this configuration. To try to eliminate the adventurous youngster problem, some pedestrian bridges have used a frame design that comes to a peak at the center of the structure, similar to a house roofline.

Chain link fabric should not have an opening at the bottom through which large objects could be pushed. A detail to close the bottom of a fencing section is included on the standard bridge drawing. The closure plate detail is required for all fence configurations that have tension wire at the bottom of the fence fabric.

Posts and frames may be either plumb or perpendicular to the longitudinal grade of the bridge, subject to considerations of aesthetics or practicality of construction. Complete details of base plates, pipe inserts or other types of base anchorage shall be provided on the plans. If applicable to the specific project, details from the standard bridge drawing may be referred to in the project plans.

305.4 SPECIAL DESIGNS

The following information is given the designer as a basis for specialized designs. It is not intended for designers to develop their own requirements in lieu of the standard bridge drawing.

For fence installation projects on new structures, the installation of a traffic railing (steel tubing) is not required if the top concrete parapet or concrete wall is 32" [813 mm] above roadway for structures without sidewalks or 32" [813 mm] above the top of sidewalk for structures with sidewalks. See Figure 326.

For special fence designs, plan notes shall be required to define materials, traffic maintenance, construction procedures and other requirements. The designer should follow the example of standard bridge drawing for development of required notes.

305.5 FENCE DESIGN GENERAL REQUIREMENTS

Fencing mesh should consist of supported wire mesh of the chain- link variety with one inch [25 mm] diamonds. The core wire is to be 11 gage [3.05 mm] with a Polyvinyl chloride coating. (CMS 710.03)
Brace and bottom rails shall be clamped to posts or post frames.

The top rail, if any, of a free-standing fence should be continuous over two or more posts and suitable cap fittings provided.

Bent pipe frames for narrow pedestrian bridges are permitted. Bent pipe frames for narrow pedestrian bridges should be fabricated in two or more sections and field spliced at the top with sleeves bolted to the frame sections.

To prevent pipe blow-ups during galvanizing, both ends of pipe should be open. Therefore base plates should have holes in them almost equal to the pipes' inside diameter.

proper bearing. Furnish two shims per beam. The Department will measure this item by the total number supplied. The Department will pay for accepted quantities at the contract price for Item 516 - 1/8" [3 mm] Preformed Bearing Pads. Any unused shims will become the property of the State.

NOTE TO DESIGNER: The plan area of the shim pad shall be the same as the elastomeric bearing.

611.7 CLEANING STEEL IN PATCHES

Use this note with all concrete patching bid items that refer to the cleaning requirements specified in 519.04

[55a] ITEM 519 - PATCHING CONCRETE STRUCTURES, AS PER PLAN: Prior to the surface cleaning specified in 519.04 and within 24 hours of placing patching material, blast clean all surfaces to be patched including the exposed reinforcing steel. Acceptable methods include high-pressure water blasting with or without abrasives in the water, abrasive blasting with containment, or vacuum abrasive blasting.

611.8 CONVERSION OF STANDARD BRIDGE DRAWINGS

The Department's Standard Bridge Drawings are available in English units only. If the project scope has established that Contract Documents will be prepared in metric units, the Designer has two options:

A. Convert the English drawings to metric units. This means removing the standard title blocks and using the converted drawings as plan insert sheets directly in the project plans. In doing so, the Designer assumes responsibility for the accuracy to the converted drawings. CADD files may be downloaded from the ODOT, Office of Structural Engineering web site.

B. Specify the English Standard Bridge Drawings in the Plans and use the following note:

[55b] CONVERSION OF STANDARD BRIDGE DRAWINGS: The Standard Bridge Drawings referenced in this plan are in English units. Any conversion of dimensions required to construct the items shown on the standards is the responsibility of the Contractor. Refer to 109.02 for a listing of Conversion Factors. Conversions shall be appropriately precise and shall reflect standard industry metric values where suitable.

611.9 COFFERDAMS AND EXCAVATION BRACING

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

[101] 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.

611.10 DECK PLACEMENT NOTES

611.10.1 FALSEWORK AND FORMS

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

[102] 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.

611.10.2 DECK PLACEMENT DESIGN ASSUMPTIONS

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

[103] 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.

[71] 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.

702.7.2 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.

[71a] 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.

[71b] 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.

[71c] 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 **[71c]**

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.

[71d] 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 **[71d]**

702.8 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.

[72] 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 [mm] and a constant haunch width outside the edge of each beam/girder flange of 9 inches [230 mm]. 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 [75 mm].

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 existing structures or new structures whose beams/girders are not placed parallel to the profile grade line. In these special cases, the note shall be modified to fit the exact conditions.

[73] Note retired – see appendix

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702.17 STEEL DRIP STRIP

[84] Note retired - see appendix

[85] Note retired - see appendix

702.18 REINFORCING STEEL FOR REHABILITATION

[86] Note retired - see appendix

702.19 ELASTOMERIC BEARING MATERIAL REQUIREMENTS

[87] ELASTOMERIC BEARINGS: The elastomer shall have a hardness of ____ durometer. The bearings were designed under Division I, Section 14.6.___ (Method ___) of the AASHTO Standard Specifications for Highway Bridges.

NOTE TO DESIGNER: Design Method A is Section 14.6.6 and Method B is Section 14.6.5.

702.20 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.

[88] 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			

702.21 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.

[89] 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 Division II, Section 11.4.3.3.3 or provide a full penetration weld, with 100% radiographic inspection.

702.22 FRACTURE CRITICAL FABRICATION NOTE

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

[90] 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.

702.23 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.

[91] 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.