OHIO DEPARTMENT OF TRANSPORTATION

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

April 16, 2010

To: Users of the Bridge Design Manual

From: Tim Keller, Administrator, Office of Structural Engineering

By: Sean Meddles, Bridge Standards Engineer

Re: 2010 Second 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 1 plan submission date after April 16, 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
201.2.1	2-2	The Ordinary High Water Mark (OHWM) has been added to the list of requirements to be shown on the profiles for each bridge alternative. The definition for OHWM is provided in BDM Section 203.4
201.2.2	2-3	All information pertaining to temporary construction access fills has been moved from this section to BDM Section 203.4 and new BDM Section 203.5.
203.4	2-24 through 2-24.1	This section has been revised to include regulatory information for "Waters of the United States". Recently, the U.S. Army Corps of Engineers issued a Regional General Permit (RGP) granting ODOT limited oversight for project impacting these waters. These revisions address project management of this new RGP.
203.5	2-24.1 through 2-24.4	This new section of the BDM addresses temporary access fills within "Waters of the United States". This section provides recommendations for causeway sizing to aid the Office of Environmental Services – Waterway Permits Unit in the waterway permit determination process.
204.6	2-26	The height restriction on wall systems utilizing geogrid reinforcements has been removed to be consistent with SS840.
Fig. 201.2.2-1		This Figure has been eliminated.
Fig. 201.2.2-2		This Figure has been eliminated.
Fig. 203.5-1		This new figure provides an illustrative example of a plan; profile and cross-section for temporary access fill in a waterway. Similar information for will be required for all waterway crossings to assist the Office of Environmental Services – Waterway Permits Unit in the permit determination process.
Fig. 203.5-2		This checklist needs to be completed by the designer and submitted along with the information shown in Fig. 203.5-1 for the permit determination process.
301.4.3	3-3	This revision is in compliance with an FHWA Policy Memorandum dated 02/21/2001, "Railroad Guidelines for Design and Construction of Grade Separation Underpass and Overhead Structures".

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SECTION 200 - PRELIMINARY DESIGN

201 STRUCTURE TYPE STUDY

201.1 GENERAL

In conformance with Section 1400 of the ODOT Location and Design Manual, Volume Three, a Structure Type Study shall be included in the Preferred Alternative Verification Review Submission for a Major Project or in the Minor Project Preliminary Engineering Study Review Submission. The Structure Type Study is not required for projects classified as Minimal.

The project site should be studied in detail and evaluated to determine the best structure alternative. A site visit should be made. In many cases, it can be readily determined whether a particular bridge or culvert should be chosen for a particular site. If a bridge is the most appropriate structure for a particular site, then the Structure Type Study needs to be performed to determine the appropriate bridge type.

201.2 STRUCTURE TYPE STUDY SUBMISSION REQUIREMENTS

A Structure Type Study submission should include the following:

A. Profile for each bridge alternative.....Section 201.2.1

B. Preliminary Structure Site Plan (for preferred bridge alternative).....Section 201.2.2

C. Hydraulic Report.....Section 201.2.3

D. Narrative of Bridge Alternatives.....Section 201.2.4

E. Cost Analysis .....Section 201.2.5

F. Foundation Recommendation .....Section 201.2.6

G. Preliminary Maintenance of Traffic Plan .....Section 201.2.7

The Structure Type Study shall be included in the review submission made directly to the District Office. A concurrent review submission shall be made to the Office of Structural Engineering if the proposed structure type contains non-standard bridge railing types, non-redundant designs, or fracture critical designs. The Office of Structural Engineering will forward review comments for these items to the responsible District Office.

Additional structural related items that are required at this stage of the review process include:

A. Retaining Wall Justification (L&D Section 1404.2)

B. Noise Wall Justification (ODOT Policy #21-001 and Procedure #417-001)

C. Pedestrian Overpass Justification (L&D Section 1404.4)

201.2.1 PROFILE FOR EACH BRIDGE ALTERNATIVE

The profile for each bridge alternative considered shall generally be drawn to a scale of 1"=20' [1 to 200] and shall generally be taken along the proposed centerline of survey for the full length of the bridge. The profiles shall include: the existing and proposed profile grade lines; existing ground line; the cross-section of channel; an outline of the structure; highest known high water mark; normal water elevation; Ordinary High Water Mark (OHWM); flow line elevation (thalweg); design and 100 year highwater elevations including backwater; overtopping flood elevation and frequency; existing and proposed profile grade elevations at 25 ft [10 m] increments; and minimum and required vertical and horizontal clearances. Note: normal water elevation is the water elevation in the stream which has not been affected by a recent heavy rain runoff and could be found in the stream most of the year. Refer to BDM Section 203.4 for OHWM definition.

201.2.2 PRELIMINARY STRUCTURE SITE PLAN

The Site Plan scale generally should be 1" = 20' [1 to 200]. For some cases to get the entire bridge on one sheet a smaller scale may be provided, if all details can be clearly shown. For bridges where the 1" = 20' [1 to 200] scale is too small to clearly show the Site Plan details, a 1" = 10' [1 to 100] scale may be considered. The following general information should be shown on the Preliminary Structure Site Plan:

A. The plan view should show the existing structures (use dashed lines); contours at 2 foot [0.5 meter] intervals showing the existing surface of the ground (for steep slopes contours at 5 foot [2.0 meter] or greater intervals may be used); existing utility lines and their disposition; proposed structure; proposed temporary bridge; proposed channel improvements; a north arrow; and other pertinent features concerning the existing topography and proposed work in an assembled form.

   In case of a highway grade separation or a highway-railway grade separation, the required minimum and actual minimum horizontal and vertical clearances and their locations shall be shown in the plan and profile views.

   For a bridge over a railway, the vertical clearance shall be measured from a point level with the top of the highest rail and 6 feet [2 meters] from the centerline of those tracks, or greater if specified by the individual railroad. Reference shall be made to Chapter 15, Section 1.2.6(a), AREMA Specifications for increased lateral clearances required when tracks are on a horizontal curve.

B. A profile as described in Section 201.2.1. The profile scale shall be the same as the plan view.

C. Horizontal and vertical curve data.

D. Size of drainage area. The elevation, discharge and stream velocity through the structure and the backwater elevation for the 100-year frequency base flood, the design year flood and if necessary the overtopping flood. The clearance from the lowest elevation of the bottom of the superstructure to the design year water surface elevation (freeboard) should be provided.

E. In the existing structure block, provide a brief description of existing bridge. This should include type, length of spans and how measured (c/c of bearings, f/f of abutments), roadway width (t/t of barrier, t/t of curb, or f/f of railing), skew angle, original design loading or upgraded loading, type of deck and type of substructure, date when built, Structure File Number (SFN), approach slabs and wearing surface.

F. In the proposed structure block provide a brief description of proposed bridge. This should include type, length of spans and how measured (c/c of bearings), roadway width (t/t of barrier, t/t of curb, or f/f of railing), width of sidewalks, design loading, future wearing surface loading, skew angle, wearing surface, approach slabs, alignment, superelevation or crown and latitude and longitude bridge coordinates.

G. A cross section of the proposed superstructure, including an elevation of the proposed pier type(s) if applicable.

H. The design and current average daily traffic (ADT) and the design average daily truck traffic (ADTT).

I. For each substructure unit where a bearing is to be used, the bearing condition (fixed or expansion) shall be designated in the profile view (FIX or EXP). Semi-integral substructures shall be designated as expansion (EXP) and integral shall be designated as integral (INT).

J. Horizontal and vertical clearances and their locations shall be provided for navigable waterway crossings.

K. A cross section sketch at the abutments shall be submitted to provide information to help verify bridge limits.

201.2.3 HYDRAULIC REPORT

The Structure Type Study shall include a Hydraulic Report that includes the following information:

A. Supplemental Site Plan showing information necessary for the determination of the waterway opening. Information shown on the Supplemental Site Plan should not be repeated on the Structure Site Plan. The following information should be include on the Supplemental Site Plan:

1. A small scale area plan showing: approximate location of all stream cross sections used for the hydraulic analysis; an accurate waterway alignment at least 500 feet [150 meters] each way from the structure; and the alignment of the proposed and present highways, taken from actual surveys. Note location of dams or other regulatory work on the waterway above the site, and the pool level, if the bridge is in a pool area above a dam.
2. A stream profile at least 500 feet [150 meters] each way from the bridge showing waterway flow line elevations and low water profile (where materially different) and high water profile if such is obtainable. If a high water profile cannot be obtained, high water elevations, with their locations marked or described, should be shown both above and below the bridge. Show high water elevations with dates and location of reading with relation to the existing structure. The source of high water data should be noted on the Supplemental Site Plan. High water data should preferably be collected from at least two locations and preferably verified by interviewing two local residents.
3. A profile along the centerline of highway so that the overflow section may be computed. This profile should extend along the approach fill to an elevation well above high water. If there are bridges or large culverts located within 1000 feet [300 meters] upstream or downstream from the proposed bridge, show stream cross sections including the structure

The following table, relating bridge channel mean velocity of the design discharge versus rock type and thickness, shall apply as minimums. Special circumstances such as protection on the outside of curves or in northern regions of the state where ice flow is a concern may require greater rock thickness.

Velocity (ft/s)	Type	Thickness
0-8	C	2'-0"
8-10	B	2'-6"
above 10	A	3'-0"

Velocity (m/s)	Type	Thickness
0-2.4	C	600 mm
2.4-3.0	B	750 mm
above 3.0	A	1000 mm

The locations, length, and the top of slope elevations for the rock channel protection should be shown on the Site Plan. The rock should be shown in greater detail in the roadway section in conjunction with the channel plans. It will generally be economical to provide bank protection during the initial construction in order to provide sufficient embankment protection to minimize future maintenance.

A. Excavation for stream channel work shall be limited to that portion of the channel one foot [300 mm] above normal water elevation in order to minimize intrusion and to preserve the natural low water channel. Where the spill-thru slope infringes upon the natural low water channel, excavation should be made for placement of the rock channel slope protection at the toe of the slope.

B. Substructures for bridges over waterways shall be supported by piling or drilled shaft foundations unless the footings can be founded on bedrock. Substructures for precast reinforced concrete three-sided flat-topped and arch culverts are addressed in the Location and Design Manual, Volume 2.

C. For bridges over waterways where bedrock is determined to be at or close to the flow line,spread footings or drilled shafts shall be used. Spread footings shall be embedded into the bedrock in accordance with the requirements of Section 204.1, except in laminated bedrock such as interbedded shale and limestone, in which case drilled shaft foundations with sufficient embedment into the bedrock are preferred.

D. A scour evaluation shall be performed for all bridges not founded on scour resistant shale or bedrock. When evaluating scour for a replacement structure, review all inspection reports for evidence of stream degradation (lowering of stream bed), scour or previous scour countermeasures. Scour depths are to be calculated with the equations in HEC-18 (Hydraulic Engineering Circular No. 18, Pub. No. FHWA NHI 01-001), "Evaluating Scour at Bridges". The text of HEC-18 should be read in order to understand scour and river mechanics. The references cited in Chapter 3 of HEC-18 are also helpful in understanding the concepts of scour and river mechanics. Scour depths should be considered in the design of the substructures and the location of the bottom of footings and minimum tip elevations for piles and drilled shafts.

A value of Q500 should be used as the super flood is to be estimated by 1.3 x Q100.

203.4 BRIDGE AND WATERWAY PERMITS

Impacts to bridges or waterways may require legal authorization in the form of permits or certifications issued by various regulatory agencies, including:

A. U.S. Army Corps of Engineers ..... 404 Permit and/or Section 10 Permit

B. U.S. Coast Guard ..... Section 9 Bridge Permit

C. Ohio EPA ..... 401 Certification and/or Isolated Wetland Permit

The jurisdictional limit of the U.S. Army Corps of Engineers (USACE) is termed the "Waters of the United States" and, as noted in ODOT CMS 101.03, includes: rivers, streams, lakes and wetlands. For rivers and streams, the jurisdiction begins below the Ordinary High Water Mark (OHWM). The OHWM is defined as the elevation on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank; shelving; changes in the character of soil; destruction of terrestrial vegetation; the presence of litter and debris; or other appropriate means that consider the characteristics of the surrounding areas.

The USACE recently issued a Regional General Permit (RGP) for various activities conducted by ODOT within the "Waters of the United States". This RGP authorizes the Department the responsibility of ensuring compliance with Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act for transportation projects meeting prescribed conditions. Permitted activities within "Waters of the United States" allowed by the RGP include: construction of permanent fills or structures; rehabilitation of authorized fills or structures; and the temporary placement of fills or structures. A copy of the RGP may be downloaded at:

http://www.lrh.usace.army.mil/permits/

The ODOT Office of Environmental Services – Waterway Permits Unit (OES-WPU) assumes the responsibility for determining project eligibility for the RGP as well as all other bridge and waterway permits. The RGP will not be applicable to all ODOT projects such as those that impact navigable waterways and scenic rivers. When projects exceed the applicable limits of the RGP, the designer, project manager and ODOT District Environmental Coordinator (DEC) should meet with OES-WPU to determine the best course of action. The designer and project manager shall coordinate with the DEC and the OES-WPU throughout the permit determination process to ensure that the final waterway permit applications are indicative of the final project design. For more information refer to the Waterway Permits Manual available from the ODOT Office of Environmental Services.

Special Provisions are the method ODOT uses to attach the waterway permits and certifications to the project construction plans. The waterway permits Special Provisions Package (SPP) is prepared by the OES-WPU and may contain the following:

A. All pertinent waterway permits, certifications and related conditions

B. Drawings and/or mapping submitted with a permit application

C. Specialized plan notes associated with the waterway permits

The designer and the project manager shall confirm that the bridge design plans (e.g. the navigational clearances shown on the site plan, BDM Section 201.2.2.J; etc.) meet the requirements in the project waterway SPP (e.g. U.S. Coast Guard Section 9 Bridge Permit; U.S.A.C.E. 404 Permit; RGP; etc.) and shall ensure the project waterway SPP are submitted with the Final Plan Package.

203.5 TEMPORARY ACCESS FILLS

A Temporary Access Fill (TAF) is a fill or structure that allows a contractor access to work on roads or bridges located within bodies of water. Examples of TAF's include: cofferdams; temporary structures for maintaining traffic; causeways and workpads; and demolition debris. The placement of all TAF's in "Waters of the United States" must be performed according to permits issued by the USACE.

A contractor's means and methods of construction will dictate the TAF required for a project. However, the Department must estimate the potential impacts to "Waters of the United States" during project development to ensure all permits are in-place during contract letting. Furthermore, it is incumbent upon the Department that these permits provide all bidding contractors the ability to construct the project without resulting in expensive delays, change orders or fines. To that end, the Department partnered with the Ohio Contractor's Association to develop the following guidance to estimate the size of TAF's:

A. The TAF shall provide access to all piers located within the Ordinary High Water Mark (OHWM) of the waterway from at least one bank of the waterway.

   Access may be provided by construction staging of the TAF. When considering the constructability of staged TAF's, typical superstructure erection plans for lifting lengths of 50-ft or more require two cranes. Unless the access for member delivery is from an adjacent structure, the TAF must provide access to each end of the lift from one bank. In the case of staging, the permit application shall reflect the construction stage that impacts the largest area of the waterway.

B. The TAF shall be located directly beneath the superstructure. The surface width of the TAF shall be equal to the out-to-out width of the superstructure plus 50'-0" outboard on one side of the structure and 20'-0" outboard on the other side of the structure.

C. The TAF shall extend at least 40'-0" beyond the furthest pier accessed by the TAF.

D. Side slopes of the TAF shall be no steeper than 1.5:1 (H:V).

E. The top surface of the TAF shall be located 1'-0" above the OHWM.

F. The TAF shall be designed to maintain a flow equal to two times the highest average monthly flow (i.e. the largest of Q1, Q2, Q3, …Q12), as reported by the USGS web based application StreamStats (see BDM Section 203.1.A), such that no rise in the backwater above

OHWM is permitted.

This information is intended for permit application purposes only and should not be included in the project plan set. However, to assist the OES-WPU in the determination process, Designers should use the guidance above to develop a plan view and cross-section of a TAF. An example plan view and cross-section are shown in Figure 203.5-1. These details should be provided to the DEC along with a completed copy of the checklist shown in Figure 203.5-2. The minimum flow to be maintained during construction should be calculated according to item F above. Designers will need to estimate whether this flow can be maintained through conduits or if open channels will be required.

204 SUBSTRUCTURE INFORMATION

204.1 FOOTING ELEVATIONS

Substructure footing elevations should be shown on the Final Structure Site Plan. The top of footing should be a minimum of one foot [0.3 meters] below the finished ground line. The top of footing should be at least one foot [0.3 meters] below the bottom of any adjacent drainage ditch. The bottom of footing shall not be less than four feet [1.2 meters] below and measured normal to the finished groundline.

Due to possible stream meander, pier footings for waterway crossings in the overflow section should not be higher than the footings within the stream unless the channel slopes are well protected against scour. Founding pier footings at or above the flow line elevation is strongly discouraged.

Where footings are founded on bedrock (note that undisturbed shale is bedrock) the minimum depth of the bottom of the footing below the stream bed, D, in feet [meters], shall be as computed by the following:

$D = T + 0.50Y$

Where:

T = Thickness of footing in feet [meters]

Y = distance from bottom of stream bed to surface of bedrock in feet [meters]

The footing depth from the above formula shall place the footing not less than 3 inches [75 mm] into the bedrock.

204.2 EARTH BENCHES AND SLOPES

A bench at the face of abutment shall not be used.

Spill thru slopes should be 2:1, except where soil analysis or existing slopes dictates flatter slopes. The slope is measured normal to the face of the abutment.

For superelevated bridges over waterways, the intersection of the top of slope with the face of abutment shall be on a level line. For other superelevated structures the top of slope shall generally be made approximately parallel to the bridge seat. For structures over streets and roads having steep grades, the intersection of earth slope and face of abutment may be either level or sloping dependent upon which method fits local conditions and gives the most economical and

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aesthetically pleasing structure.

The spill-thru slope should intersect the face of abutment a minimum of one foot [300 mm], or as specified in a standard bridge drawing, below the bridge seat for stringer type bridges. For concrete slab and prestressed box beam bridges this distance should be 1'-6" [450 mm].

204.3 ABUTMENT TYPES

Preference should be given to the use of spill-thru type abutments. Generally for stub abutments on piling or drilled shafts the shortest distance from the surface of the embankment to the bottom of the toe of the footing should be at least 4'-0" [1200 mm]. For stub abutments on spread footing on soil, the minimum dimension shall be 5'-0" [1525 mm]. For any type of abutment, integral design shall be used where possible, see Section 205.8 for additional information.

Wall type abutments should be used only where site conditions dictate their use.

204.4 ABUTMENTS SUPPORTED ON MSE WALLS

When conditions are appropriate, the designer may consider stub type abutments with piling or spread footings supported on MSE walls. Use spread footings to support the abutment if the MSE wall is on bedrock or shale. If the MSE wall is on soil, then the selection of spread footings or piles to support the abutment should consider possible settlement of the MSE wall. Use piles to support the abutment if the bridge is a continuous multi-span structure, or if the bridge is constructed part width in phases. If the bridge is a single-span structure and is not constructed part width in phases, then either spread footings or piles may be used to support the abutment. Piles require a minimum 15-foot embedment below the MSE wall.

Refer to Sections 201.2.6, 202.2.3 and 204.6.2 for the staged review requirements for MSE walls. Consult the Office of Structural Engineering for additional design recommendations.

204.5 PIER TYPES

For highway grade separations, the pier type should generally be cap-and-column piers supported on a minimum of 3 columns. The purpose for this provision is to reduce the potential for total pier failure in the event of an impact involving a large vehicle or its cargo. This requirement may be waived for temporary conditions that require caps supported on less than 3 columns. Typically the pier cap ends should be cantilevered and have squared ends.

For bridges over railroads generally the pier type should be T-type, wall type or cap and column piers. Preference should be given to T-type piers. Where a cap and column pier is located within 25 feet [7.6 meters] from the centerline of tracks, crash walls will be required.

For waterway bridges the following pier type should be used:

A. Capped pile type piers; generally limited to an unsupported pile length of 20 feet [6 meters]. For unsupported pile lengths greater than 15 feet [4.5 meters], the designer should analyze the piles as columns above ground. Scour depths and the embedded depth to fixity of the driven piles shall be included in the determination of unsupported length.

B. Cap-and-column type piers.

C. Solid wall or T-type piers.

Note the use of T-type piers, or other pier types with large overhangs, makes the removal of debris at the pier face difficult to perform from the bridge deck. For low stream crossings with debris flow problems and where access to the piers from the stream is limited, T-type piers, or other similar pier types, should not be used.

For unusual conditions, other types may be acceptable. In the design of piers which are readily visible to the public, appearance should be given consideration if it does not add appreciably to the cost of the pier.

204.6 RETAINING WALLS

In conformance with Section 1400 of the ODOT Location and Design Manual, Volume Three, a Retaining Wall Justification shall be included in the Preferred Alternative Verification Review Submission for a Major Project or in the Minor Project Preliminary Engineering Study Review Submission. A description of the Retaining Wall Justification is provided in Section 1404 of the ODOT Location and Design Manual, Volume Three. Generally, the justification compares the practicality, constructability and economics of the various types of retailing walls listed below:

A. Cast-in-place reinforced concrete

B. Prestressed concrete

C. Tied-back

D. Adjacent drilled shafts

E. Sheet piling

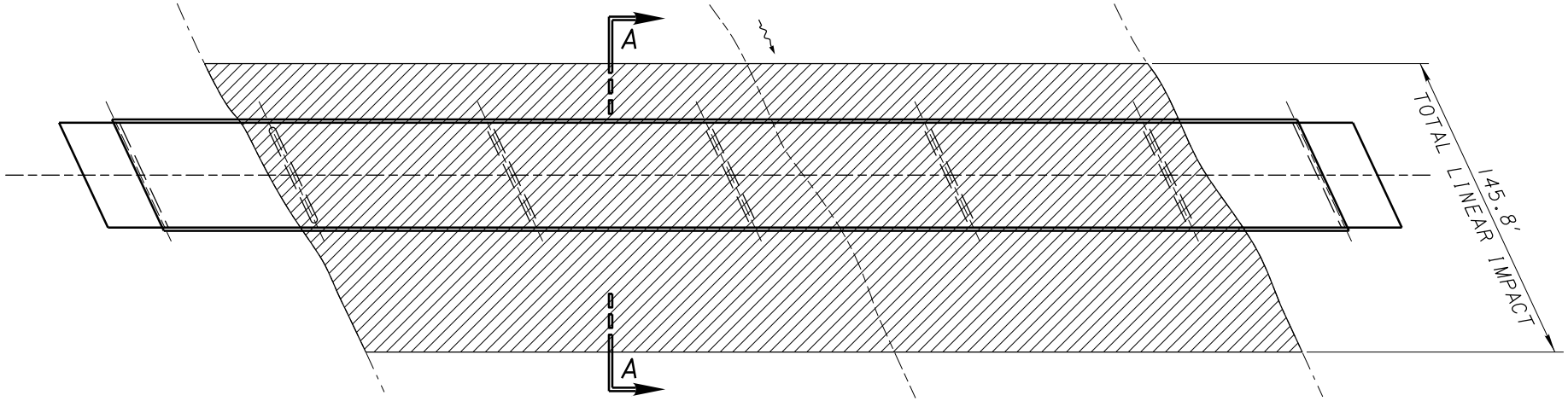
F. H-piling with lagging

G. Cellular (Block, Bin or Crib)

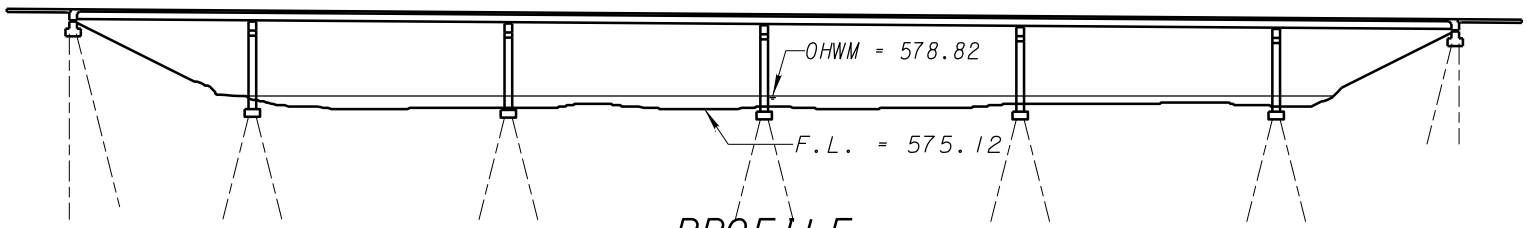
H. Soil nail

I. Mechanically Stabilized Earth (MSE)

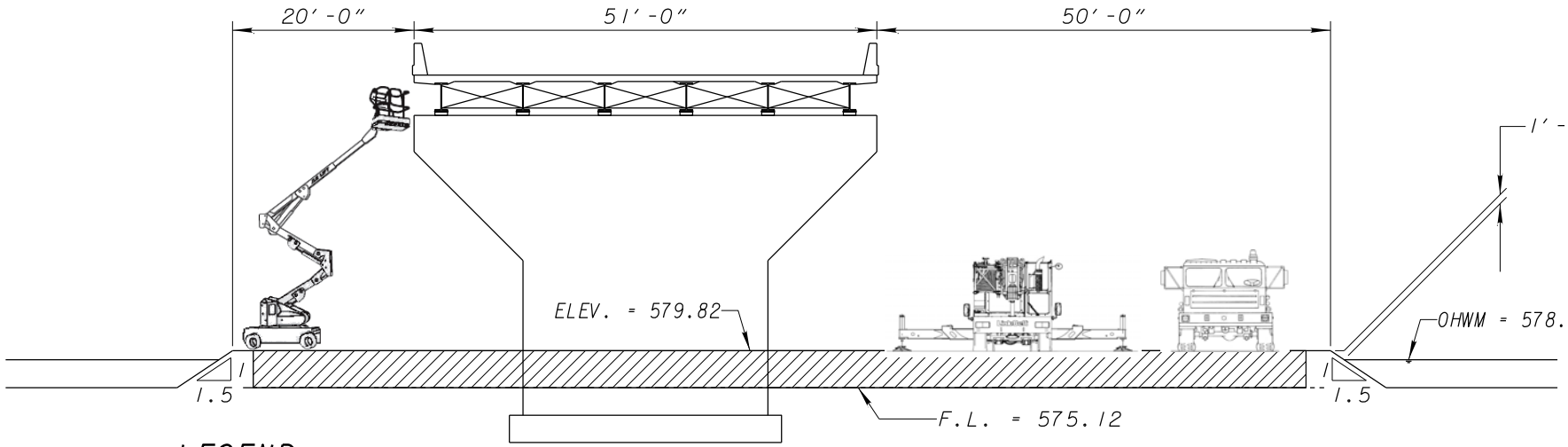
Refer to SS840 for accredited MSE wall systems. Contact the Office of Structural Engineering for modular block wall systems.



PLAN



PROFILE



LEGEND

OHWM = ORDINGARY HIGH WATER MARK
F.L. = FLOW LINE ELEV.
= TEMPORAY ACCESS FILL

SECTION A-A

The temporary access fill shall accommodate a flow rate (Q) equal to twice the highest mean monthly flow such that the backwater elevation does not exceed the OHWM. Q for this location is XXXX cfs.

Figure 203.5-1

Temporary Construction, Access and Dewatering Activities

ODOT Regional General Permit (RGP) (Part C) Determination Checklist

The purpose of this form is to aid the Office of Environmental Services – Waterway Permits Unit (OES-WPU) in the permit determination process and in determining eligibility for the ODOT RGP-Part C. A completed copy of this form and a temporary construction access plan shall be forwarded to the DEC to be included in the Permit Determination Package submitted to OES-WPU.

Co-Rte-Sec: _____PID: _____

Description:_____

During the construction of this project, the following activities in the waters of the United States are anticipated: (check all that apply)

- ☐ Temporary structure for maintaining traffic
- ☐ Cofferdams
- ☐ Temporary access fill (e.g. causeways and work pads)
- ☐ Demolition and debris removal

The RGP requires an authorized temporary activity to accommodate a minimum flow equal to twice the highest mean monthly flow without creating a rise in backwater above the OHWM. **The minimum flow to be maintained throughout construction for this location is _____ cfs**. The means that will most likely be implemented by the Contractor to maintain this flow will be:

- ☐ Conduit(s)
- ☐ Open channel(s)\Temporary Bridge

The RGP has limitations. Please read the limitations and provide the required measurement as it applies for this project.

- ☐ The maximum length of temporary impact, as measured upstream to downstream along one bank, cannot exceed 250-ft. **Proposed impact length for this project is ____ ft.**
- ☐ The proposed activity cannot be located within 2000-ft of a flood control facility or within 1000-ft of a stream gage. **Distance to flood control facility is _____ ft. Distance to stream gage is _____ ft.**
- ☐ The duration of the impact to waters of the United States cannot exceed 2 years. **Proposed temporary impact duration is ___ years.**

A complete copy of the RGP with the OEPA conditions may be downloaded at the following website: http://www.dot.state.oh.us/Divisions/TransSysDev/Environment/Ecological_Resources_Permits/WATERWAY_PERMITS/Pages/default.aspx

cc. District Environmental Coordinator (DEC)

301.4 LOADING REQUIREMENTS

301.4.1 HIGHWAY BRIDGES

All bridges designed to carry highway traffic shall be designed for an HL-93 loading as specified in *LRFD 3.6.1.2.1* and a future wearing surface (FWS) of 60 psf [2.87 kPa].

301.4.2 PEDESTRIAN AND BIKEWAY BRIDGES

Pedestrian and bikeway bridges shall be designed in accordance with the latest edition of the AASHTO LRFD Bridge Design Specifications; ODOT design guidelines; and this Manual. ODOT's most current design guidelines are available at ODOT'S Office of Local Projects website, www.dot.state.oh.us/local/.

Where sidewalks, pedestrian, and/or bicycle bridges are intended to be used by maintenance and/or other incidental vehicles, an H15-44 [M13.5] vehicle, as shown in Figure 301.4.2-1, shall be included in the design loading. The H15-44 lane loading should not be considered. The vehicle live load shall not be placed in combination with the pedestrian live load and the dynamic load allowance need not be applied to the H15 vehicle.

301.4.3 RAILROAD BRIDGES

Facilities that are operated and maintained by the railroad shall be designed according to the specifications and design standards used by the railroad in its normal practice. Facilities that are operated and maintained by ODOT or other local agency shall conform to the AASHTO LRFD Bridge Design Specifications and this Manual.

301.4.4 SEISMIC DESIGN

Seismic design shall be in accordance with the AASHTO LRFD Bridge Design Specifications and BDM Section 1000.

Abutment and pier designs with raised pedestal bearing seats shall not be used.

301.4.5 APPLICATION OF LONGITUDINAL FORCES

For bearing types that permit rotation about the transverse axis of the bridge, all longitudinal load types shall be applied at the bearing elevation and moments resulting from eccentricity shall be ignored. The total factored longitudinal loading applied to the substructure at each expansion bearing shall not exceed the bearing's nominal (i.e. **unfactored**) resistance to longitudinal loading. Resistance in this instance is nominal because it is applied to the substructure as a loading.

301.5 REINFORCING STEEL

Reinforcing steel - ASTM A615 or A996, Grade 60, F_y = 60,000 psi.

Reinforcing steel - ASTM A615M or A996M, Grade 420, F_y= 420 MPa

All reinforcing steel shall be epoxy coated.

301.5.1 MAXIMUM LENGTH

Generally maximum length of reinforcing steel should be 40 feet [12.2 meters]. This limit is for both transit purposes and construction convenience. The maximum length before a lap splice is required is 60 feet [18.4 meters]. To facilitate an economical design using 60 foot bar stock, where multiple sets of lapped bars are required (i.e. longitudinal slab reinforcement) consideration should be given to using multiple sets of 30 foot long bars.

The length of the short dimension of L-shaped bars should be limited in order not to extend beyond the sides of a highway vehicle of maximum legal width. The short dimension should preferably be not greater than 7'-6" [2300 mm], and in no case greater than 8'-0" [2450 mm].

301.5.2 BAR MARKS

Bar marks shall be used on detail plans to identify the bar's size and general location and to reference the bar to the reinforcing bar list.

Letters should be incorporated into the bar marks to help identify their location in the detail plans: "A" for abutments, "P" for piers, "S" for superstructure, “SP” for spirals, “DS” for drilled shafts, etc.

The following bar mark represents a #5 [16M] abutment bar .....A501 [A16M01]

The following bar mark represents a #4 [13M] spiral bar ..... SP401 [SP13M01]

The following bar mark represents a #9 [29M] drilled shaft bar..... DS901 [DS29M01]

A note or legend within the bar list sheet in the plans shall describe each bar mark's meaning. See Figure 301.5.2-1.

301.5.3 LAP SPLICES

Bar splice lengths shall be shown on the plans.

Development and splice lengths shall conform to AASHTO requirements.

Reinforcing steel at construction joints should extend into the next pour only by the required