General Notes:
All concrete for the bridge approach slab and sleeper slab shall be in accordance with Sec 303 (f'c = 4,000 psi).
The reinforcing steel in the bridge approach slab and the sleeper slab shall be epoxy coated Grade 60 with fy = 60,000 psi.

Drain pipe may be either 6" diameter corrugated metallic-coated pipe underdrain, 4" diameter corrugated polyvinyl chloride (PVC) drain pipe, or 4" diameter corrugated polyethylene (PE) drain pipe.

Minimum clearance to reinforcing steel shall be 3 1/2", unless otherwise shown.

The reinforcing steel in the bridge approach slab and the sleeper slab shall be continuous. The transverse reinforcing steel may be made continuous by providing a minimum top sally of 28 inches for #6 bars, or by mechanical bar splice.

Mechanical bar splices shall be in accordance with Sec 207.

All joint filler shall be in accordance with Sec 1057 for preformed fiber expansion joint filler except as noted.

For concrete approach pavement details, see roadway plans. See Missouri Standard Plan 800.20 for details of Type A curb.

Payment for furnishing all materials, labor and equipment necessary to construct the approach slab, including the timber header, sleeper slab, underdrain, Type 5 aggregate base, joint filler, and all other items shown in the plans, complete in place, will be considered completely covered by the contract unit price for Bridge Approach Slab (Major) per square yard.

Joint between geometrical face of approach slab and wing shall be aligned in accordance with Sec 713 for sidewall joint sealant for saw cut and formed joints.

All concrete for the bridge approach slab and sleeper slab shall be epoxy coated Grade 60 with fy = 60,000 psi.

The reinforcing steel in the bridge approach slab and the sleeper slab shall be epoxy coated Grade 60 with fy = 60,000 psi.

Drain pipe may be either 6" diameter corrugated metallic-coated pipe underdrain, 4" diameter corrugated polyvinyl chloride (PVC) drain pipe, or 4" diameter corrugated polyethylene (PE) drain pipe.

Minimum clearance to reinforcing steel shall be 3 1/2", unless otherwise shown.

The reinforcing steel in the bridge approach slab and the sleeper slab shall be continuous. The transverse reinforcing steel may be made continuous by providing a minimum top sally of 28 inches for #6 bars, or by mechanical bar splice.

Mechanical bar splices shall be in accordance with Sec 207.

All joint filler shall be in accordance with Sec 1057 for preformed fiber expansion joint filler except as noted.

For concrete approach pavement details, see roadway plans. See Missouri Standard Plan 800.20 for details of Type A curb.

Payment for furnishing all materials, labor and equipment necessary to construct the approach slab, including the timber header, sleeper slab, underdrain, Type 5 aggregate base, joint filler, and all other items shown in the plans, complete in place, will be considered completely covered by the contract unit price for Bridge Approach Slab (Major) per square yard.

Joint between geometrical face of approach slab and wing shall be aligned in accordance with Sec 713 for sidewall joint sealant for saw cut and formed joints.

All concrete for the bridge approach slab and sleeper slab shall be epoxy coated Grade 60 with fy = 60,000 psi.

The reinforcing steel in the bridge approach slab and the sleeper slab shall be epoxy coated Grade 60 with fy = 60,000 psi.

Drain pipe may be either 6" diameter corrugated metallic-coated pipe underdrain, 4" diameter corrugated polyvinyl chloride (PVC) drain pipe, or 4" diameter corrugated polyethylene (PE) drain pipe.

Minimum clearance to reinforcing steel shall be 3 1/2", unless otherwise shown.

The reinforcing steel in the bridge approach slab and the sleeper slab shall be continuous. The transverse reinforcing steel may be made continuous by providing a minimum top sally of 28 inches for #6 bars, or by mechanical bar splice.

Mechanical bar splices shall be in accordance with Sec 207.

All joint filler shall be in accordance with Sec 1057 for preformed fiber expansion joint filler except as noted.

For concrete approach pavement details, see roadway plans. See Missouri Standard Plan 800.20 for details of Type A curb.

Payment for furnishing all materials, labor and equipment necessary to construct the approach slab, including the timber header, sleeper slab, underdrain, Type 5 aggregate base, joint filler, and all other items shown in the plans, complete in place, will be considered completely covered by the contract unit price for Bridge Approach Slab (Major) per square yard.

Joint between geometrical face of approach slab and wing shall be aligned in accordance with Sec 713 for sidewall joint sealant for saw cut and formed joints.

All concrete for the bridge approach slab and sleeper slab shall be epoxy coated Grade 60 with fy = 60,000 psi.

The reinforcing steel in the bridge approach slab and the sleeper slab shall be epoxy coated Grade 60 with fy = 60,000 psi.

Drain pipe may be either 6" diameter corrugated metallic-coated pipe underdrain, 4" diameter corrugated polyvinyl chloride (PVC) drain pipe, or 4" diameter corrugated polyethylene (PE) drain pipe.

Minimum clearance to reinforcing steel shall be 3 1/2", unless otherwise shown.

The reinforcing steel in the bridge approach slab and the sleeper slab shall be continuous. The transverse reinforcing steel may be made continuous by providing a minimum top sally of 28 inches for #6 bars, or by mechanical bar splice.

Mechanical bar splices shall be in accordance with Sec 207.

All joint filler shall be in accordance with Sec 1057 for preformed fiber expansion joint filler except as noted.

For concrete approach pavement details, see roadway plans. See Missouri Standard Plan 800.20 for details of Type A curb.

Payment for furnishing all materials, labor and equipment necessary to construct the approach slab, including the timber header, sleeper slab, underdrain, Type 5 aggregate base, joint filler, and all other items shown in the plans, complete in place, will be considered completely covered by the contract unit price for Bridge Approach Slab (Major) per square yard.

Joint between geometrical face of approach slab and wing shall be aligned in accordance with Sec 713 for sidewall joint sealant for saw cut and formed joints.

All concrete for the bridge approach slab and sleeper slab shall be epoxy coated Grade 60 with fy = 60,000 psi.

The reinforcing steel in the bridge approach slab and the sleeper slab shall be epoxy coated Grade 60 with fy = 60,000 psi.

Drain pipe may be either 6" diameter corrugated metallic-coated pipe underdrain, 4" diameter corrugated polyvinyl chloride (PVC) drain pipe, or 4" diameter corrugated polyethylene (PE) drain pipe.

Minimum clearance to reinforcing steel shall be 3 1/2", unless otherwise shown.

The reinforcing steel in the bridge approach slab and the sleeper slab shall be continuous. The transverse reinforcing steel may be made continuous by providing a minimum top sally of 28 inches for #6 bars, or by mechanical bar splice.

Mechanical bar splices shall be in accordance with Sec 207.

All joint filler shall be in accordance with Sec 1057 for preformed fiber expansion joint filler except as noted.

For concrete approach pavement details, see roadway plans. See Missouri Standard Plan 800.20 for details of Type A curb.

Payment for furnishing all materials, labor and equipment necessary to construct the approach slab, including the timber header, sleeper slab, underdrain, Type 5 aggregate base, joint filler, and all other items shown in the plans, complete in place, will be considered completely covered by the contract unit price for Bridge Approach Slab (Major) per square yard.

Joint between geometrical face of approach slab and wing shall be aligned in accordance with Sec 713 for sidewall joint sealant for saw cut and formed joints.

All concrete for the bridge approach slab and sleeper slab shall be epoxy coated Grade 60 with fy = 60,000 psi.

The reinforcing steel in the bridge approach slab and the sleeper slab shall be epoxy coated Grade 60 with fy = 60,000 psi.

Drain pipe may be either 6" diameter corrugated metallic-coated pipe underdrain, 4" diameter corrugated polyvinyl chloride (PVC) drain pipe, or 4" diameter corrugated polyethylene (PE) drain pipe.

Minimum clearance to reinforcing steel shall be 3 1/2", unless otherwise shown.

The reinforcing steel in the bridge approach slab and the sleeper slab shall be continuous. The transverse reinforcing steel may be made continuous by providing a minimum top sally of 28 inches for #6 bars, or by mechanical bar splice.

Mechanical bar splices shall be in accordance with Sec 207.

All joint filler shall be in accordance with Sec 1057 for preformed fiber expansion joint filler except as noted.

For concrete approach pavement details, see roadway plans. See Missouri Standard Plan 800.20 for details of Type A curb.

Payment for furnishing all materials, labor and equipment necessary to construct the approach slab, including the timber header, sleeper slab, underdrain, Type 5 aggregate base, joint filler, and all other items shown in the plans, complete in place, will be considered completely covered by the contract unit price for Bridge Approach Slab (Major) per square yard.

Joint between geometrical face of approach slab and wing shall be aligned in accordance with Sec 713 for sidewall joint sealant for saw cut and formed joints.

All concrete for the bridge approach slab and sleeper slab shall be epoxy coated Grade 60 with fy = 60,000 psi.

The reinforcing steel in the bridge approach slab and the sleeper slab shall be epoxy coated Grade 60 with fy = 60,000 psi.

Drain pipe may be either 6" diameter corrugated metallic-coated pipe underdrain, 4" diameter corrugated polyvinyl chloride (PVC) drain pipe, or 4" diameter corrugated polyethylene (PE) drain pipe.
Standard Drawing Guidance (do not show on plans):

1. When mechanical bar splices are required due to staged construction, add the following after the indicated note:

   Estimate ___ splices per slab

   Input the estimated number of required mechanical bar splices including those in the sleeper slab.

2. See Notes K1.11 and K1.12 in EPG 751.50 for wording of notes when semi-deep abutments are used.

3. If the end of a wing wall extends beyond the end of the bridge approach slab, it will be necessary to revise the length of the sleeper slab shown and to redirect the perforated drain pipe adjacent to the sleeper slab to go under the sleeper slab and then turn to daylight. This should be nonperforated drain pipe at this point.

4. When mechanical bar splices are required due to staged construction, add the following after the indicated note:

   Estimate ___ splices per slab

   Input the estimated number of required mechanical bar splices including those in the sleeper slab.

5. If the end of a wing wall extends beyond the end of the bridge approach slab, it will be necessary to revise the length of the sleeper slab shown and to redirect the perforated drain pipe adjacent to the sleeper slab to go under the sleeper slab and then turn to daylight. This should be nonperforated drain pipe at this point.

ALTERNATE DETAILS FOR TYPE B BARRIER (SBC)
Performance Class A in accordance with ASTM E 1745

#6 Bars at 5" cts. (Top and bottom)

#6 Bars at 5" cts. (Bottom)

Seal joint between vertical face of approach slab and wing with sealant in accordance with Sec 717 for all concrete joints. Joint filler except as noted. Joint filler shall be in accordance with Sec 1053 for preformed fiber expansion joint filler and shall be continuous. The transverse reinforcing steel may be made continuous by providing a minimum lap splice of 24 inches for #5 bars and 60 inches for #6 bars, or by mechanical bar splice.

NOTE: This drawing is not to scale. Follow dimensions.

General Notes:

All concrete for the bridge approach slab and sleeper slab shall be in accordance with Sec 503 (f'c = 4,000 psi).

The reinforcing steel in the bridge approach slab and the sleeper slab shall be epoxy coated Grade 60 with fpy = 60,000 psi.

Drain pipe may be either 6" diameter corrugated metallic coated pipe underdrain, 4" diameter corrugated polyethylene (PE) drain pipe, or 4" diameter corrugated polyvinyl chloride (PVC) drain pipe.

Minimum clearance to reinforcing steel shall be 1/2", unless otherwise shown.

The reinforcing steel in the bridge approach slab and the sleeper slab shall be continuous. The transverse reinforcing steel may be made continuous by providing a minimum lap splice of 24 inches for #5 bars and 60 inches for #6 bars, or by mechanical bar splice.

Mechanical bar splices shall be in accordance with Sec 510.

All joint filler shall be in accordance with Sec 1053 for preformed fiber expansion joint filler and shall be continuous. The transverse reinforcing steel may be made continuous by providing a minimum lap splice of 24 inches for #5 bars and 60 inches for #6 bars, or by mechanical bar splice.

For concrete approach pavement details, see roadway plans.

See Missouri Standard Plan 609.00 for details of Type A Curb.

Payment for furnishing all materials, labor, and equipment necessary to construct the approach slab, including the timber header, sleeper slab, underdrain, Type 5 aggregate base, joint filler and all other appurtenances and incidental work as shown on this sheet, shall be made to the contractor at the contract unit price for Bridge Approach Slab (Major) per square yard.

* See joint between vertical face of approach slab and wing with sealant in accordance with Sec 717 for all concrete joints.

All concrete for the bridge approach slab and sleeper slab shall be continuous. The transverse reinforcing steel may be made continuous by providing a minimum lap splice of 24 inches for #5 bars and 60 inches for #6 bars, or by mechanical bar splice.

Mechanical bar splices shall be in accordance with Sec 510.

All joint filler shall be in accordance with Sec 1053 for preformed fiber expansion joint filler and shall be continuous. The transverse reinforcing steel may be made continuous by providing a minimum lap splice of 24 inches for #5 bars and 60 inches for #6 bars, or by mechanical bar splice.

For concrete approach pavement details, see roadway plans.

See Missouri Standard Plan 609.00 for details of Type A Curb.

Payment for furnishing all materials, labor, and equipment necessary to construct the approach slab, including the timber header, sleeper slab, underdrain, Type 5 aggregate base, joint filler and all other appurtenances and incidental work as shown on this sheet, shall be made to the contractor at the contract unit price for Bridge Approach Slab (Major) per square yard.

Removable header when concrete pavement is placed.

Note: This drawing is not to scale. Follow dimensions. Sheet No. 6/1.
Standard Drawing Guidance (do not show on plans):

- See Structural Project Manager or Liaison for preference on revising details to specify staged construction.
- Show all required staged construction joints.
- Show any required construction joints and show and call out any mechanical bar splices.

When mechanical bar splices are required due to staged construction, and the following after the indicated note:

Estimated ___ splices per slab

Input the estimated number of required mechanical bar splices including those in the sleeper slab.

See Notes K1.11 and K1.12 in EPG 751.50 for wording of notes when semi-deep abutments are used.

If the end of a wing wall extends beyond the end of the bridge approach slab, it will be necessary to revise the length of the sleeper slab shown and to redirect the perforated drain pipe adjacent to the sleeper slab to go under the sleeper slab and then turn to daylight. This should be nonperforated drain pipe at this point.

ALTERNATE DETAILS FOR TYPE B BARRIER (SBC)
Note: This drawing is not to scale. Follow dimensions.
Standard Drawing Guidance (do not show on plans):
See Structural Project Manager or Liaison for preference on revising details as follows to specify staged construction:

1. Show & call out any required staged construction joints.
2. Show any required construction joints and show and call out any mechanical bar splices.

When mechanical bar splices are required due to staged construction, add the following after the indicated note:

(Estimated ___ splices per slab)
Input the estimated number of required mechanical bar splices including those in the sleeper slab.

See Notes K1.11 and K1.12 in EPG 751.50 for wording of notes when semi-deep abutments are used.

If the end of a wing wall extends beyond the end of the bridge approach slab, it will be necessary to revise the length of the sleeper slab shown and to redirect the perforated drain pipe adjacent to the sleeper slab to go under the sleeper slab and then turn to daylight. This should be nonperforated drain pipe at this point.

ALTERNATE DETAILS FOR TYPE B BARRIER (SBC)
ALTERNATE DETAILS FOR TYPE B BARRIER (SBC)

Standard Drawing Guidance (do not show on plans):
See Structural Project Manager or Liaison for preference on revising details as follows to specify staged construction:
1. Show & call out any required staged construction joints.
2. Show any required construction joints and show and call out any mechanical bar splices.

1. When mechanical bar splices are required due to staged construction, add the following after the indicated note:
   (Estimated ___ splices per slab)
   Input the estimated number of required mechanical bar splices including those in the sleeper slab.
3. See Notes K1.11 and K1.12 in EPG 751.50 for wording of notes when semi-deep abutments are used.

4. If the end of a wing wall extends beyond the end of the bridge approach slab, it will be necessary to revise the length of the sleeper slab shown and to redirect the perforated drain pipe adjacent to the sleeper slab to go under the sleeper slab and then turn to daylight. This should be nonperforated drain pipe at this point.
General Notes:

All concrete for the bridge approach slab and sleeper slab shall be in accordance with Sec 303 if f'c = 4,000 psi.

The reinforcing steel in the bridge approach slab and the sleeper slab shall be epoxy coated Grade 60 with f_y = 60,000 psi.

Drain pipe may be either 6" diameter corrugated metallic, coated pipe underdrain, 4" diameter corrugated polyvinyl chloride (PVC) drain pipe, or 4" diameter corrugated polyethylene (PE) drain pipe.

Minimum clearance to reinforcing steel shall be 3 1/2", unless otherwise shown.

The reinforcing steel in the bridge approach slab and the sleeper slab shall be continuous. The transverse reinforcing steel may be made continuous by providing a minimum lap splice of 24 inches for #5 bars and 44 inches for #6 bars, or by mechanical bar splice.

Mechanical bar splices shall be in accordance with Sec 310.

All joint filler shall be in accordance with Sec 1053 for preformed fiber expanson joint filler except as noted.

Longitudinal construction joints in bridge slab shall be aligned with longitudinal construction joints in bridge slab.

For concrete approach pavement details, see roadway plans.

See Missouri Standard Plan 609.00 for details of Type A curb.

Payment for furnishing all materials, labor and equipment necessary to construct the approach slab, including the timber header, sleeper slab, underdrain, Type 5 aggregate base, joint filler and all other construction necessary to construct the approach slab, shall be made in accordance with the contract unit price for Bridge Approach Slab (Major) per square yard.

See joint between edging tool face of sleeper slab and edging tool with sealant in accordance with Sec 717 for silicone joint sealant for saw cut and formed joints.

Remove timber header when concrete pavement is placed.
### ALTERNATE DETAILS FOR TYPE B BARRIER (SBC)

1. Show & call out any required staged construction joints.
2. Show any required construction joints and show and call out any mechanical bar splices.

#### Section A-A
- Transition from roadway crown to bridge crown as necessary
- #5 Bars at 12" cts.
- #6 Bars at 5" cts.

#### Section Between Barrier and Curb
- Transition chamfer to zero at Type A curb for gutter line to match
- #5 Bars at 12" cts.
- Joint filler
- End of Wing
- 1" Chamfer
- 4" Type A Curb
- Gutter line of Type A curb aligns with the chamfer at the transition end of barrier

### Standard Drawing Guidance (do not show on plans):

- See Structural Project Manager or Liaison for preference on revising details as follows to specify staged construction:
  1. Show & call out any required staged construction joints.
  2. Show any required construction joints and show and call out any mechanical bar splices.

### Notes:

1. Show & call out any required staged construction joints.
2. Show any required construction joints and show and call out any mechanical bar splices.
3. See Notes K1.11 and K1.12 in EPG 751.50 for wording of notes when semi-deep abutments are used.
4. When mechanical bar splices are required due to staged construction, add the following after the indicated note:
   (Estimated ___ splices per slab)
   Input the estimated number of required mechanical bar splices including those in the sleeper slab.
5. If the end of a wing wall extends beyond the end of the bridge approach slab, it will be necessary to revise the length of the sleeper slab shown and to redirect the perforated drain pipe adjacent to the sleeper slab to go under the sleeper slab and then turn to daylight. This should be nonperforated drain pipe at this point.

### Input:

- Add the estimated number of required mechanical bar splices including those in the sleeper slab.
- Nonperforated drain pipe at daylight point.
General Notes:
A: All concrete for the bridge approach slab and sleeper slab shall be in accordance with Sec 503. 
The reinforcing steel in the bridge approach slab and the sleeper slab shall be epoxy coated Grade 60 with 
y = 60,000 psi. 
Dstate pipe may be either 6" diameter corrugated metallic 
soaped pipe underdrain, 4" diameter corrugated poly: 
chloride (PVC) drain pipe, or 4" diameter corrugated 
polyethylene (PE) drain pipe. 
Minimum clearance to reinforcing steel shall be 1.5", 
unless otherwise shown.
The reinforcing steel in the bridge approach slab and the 
sleeper slab shall be continuous. The transverse 
reinforcing steel may be made continuous by providing 
a minimum lap splice of 24 inches for #5 bars and 60 inches 
for #6 bars, or by mechanical bar splice.
Mechanical bar splices shall be in accordance with Sec 710. 
All joint filler shall be in accordance with Sec 1053 for 
preformed fiber expansion joint filler except as noted.

PART PLAN SHOWING REINFORCEMENT

SECTION B-B

Detailed
Checked

BRIDGE APPROACH SLAB (MAJOR)

Note: This drawing is not to scale. Follow dimensions.
ALTERNATE DETAILS FOR TYPE B BARRIER (SBC)
With the approval of the engineer, the contractor may crown the End of Slab (Non-integral end bent) to bridge crown as necessary.

Payment for furnishing all materials, labor, and excavation necessary to construct the integral bridge approach slab, including the curb, and Type 5 aggregate base within the pay limits shown, in complete base will be considered completely covered by the contract unit price for Bridge Approach Slab (Minor) per square yard.

Application of tack shall be required between lifts as per Sec. 623.

Notes for Asphalts Slab Only:
- Payment for furnishing all materials, labor, and excavation necessary to construct the integral bridge approach slab, including the curb, and Type 5 aggregate base within the pay limits shown, in complete base will be considered completely covered by the contract unit price for Bridge Approach Slab (Minor) per square yard.

Application of tack shall be required between lifts as per Sec. 623.
APP07_minor Guidance and Alternate Details

Standard Drawing Guidance
(do not show on plans):

Asphalt approach slab should not be used for rehabilitation projects unless a vertical drain system is installed or is in place at end bent fill face.

Roadway drainage should be addressed by the core team & the consensus decision noted on the Bridge Memorandum. For roadway drainage options for Bridge Approach Slab (Typ.), see EPG 503 Bridge Approach Slab.

See Project Manager or Liaison for preference on revising details as follows to specify staged construction:

1. Show & call out any required staged construction joints.

2. When mechanical bar splices are required due to staged construction, add the following after note:
   (Estimated ___ splices per slab)
   Input estimated number of required mechanical bar splices.

3. If the end of a wing wall extends beyond the end of the bridge approach slab, it will be necessary to redirect the perforated drain pipe at the end of the bridge approach slab to turn to daylight. This should be nonperforated drain pipe at this point.

If either slab option is not required, either delete or cross out the option not used and delete or modify the first general note.

All wing lengths should have the curbs extended beyond their ends as shown to assist with directing bridge end drainage away from bridge ends. The standard drawing will work for most bridges with average wing lengths. For long wings, adjustments to the length of curbs may be necessary when the length of wings would prevent extending a full 5'-6" of curb length from the end of the wing to the end of the bridge approach slab. It may be necessary to extend the curb beyond the end of the bridge approach slab integral with concrete pavement or adjacent to asphalt pavement. Work any adjustments to the curb lengths with the details as shown on Standard Plan 609.40 & modify those details as necessary by either a note or detail.

See Notes K1.11 & K1.12 in EPG 751.50 for wording of notes when semi-deep abutments are used.

If end of a wing extends beyond the end of the bridge approach slab, it will be necessary to redirect the perforated drain pipe at the end of the bridge approach slab to turn to daylight. This should be nonperforated drain pipe at this point.

When mechanical bar splices are required due to staged construction, add the following after note:

(Estimated ___ splices per slab)
Input estimated number of required mechanical bar splices.

If the end of a wing wall extends beyond the end of the bridge approach slab, it will be necessary to redirect the perforated drain pipe at the end of the bridge approach slab to turn to daylight. This should be nonperforated drain pipe at this point.

If either slab option is not required, either delete or cross out the option not used and delete or modify the first general note.

All wing lengths should have the curbs extended beyond their ends as shown to assist with directing bridge end drainage away from bridge ends. The standard drawing will work for most bridges with average wing lengths. For long wings, adjustments to the length of curbs may be necessary when the length of wings would prevent extending a full 5'-6" of curb length from the end of the wing to the end of the bridge approach slab. It may be necessary to extend the curb beyond the end of the bridge approach slab integral with concrete pavement or adjacent to asphalt pavement. Work any adjustments to the curb lengths with the details as shown on Standard Plan 609.40 & modify those details as necessary by either a note or detail.

ALTERNATE DETAILS FOR TYPE B BARRIER (SBC)
PART PLAN OF POSTTENSIONED BRIDGE APPROACH SLAB

SECTION THRU POSTTENSIONED APPROACH SLAB

LONGITUDINAL JOINT BETWEEN PRETENSIONED BEAMS

PRESTRESSED BRIDGE APPROACH SLAB (20 FEET)

General Notes (Posttensioned Slab):

- Contractor shall verify all dimensions in field before finalizing the shop drawings.
- Concrete for the sleeper slab shall be in accordance with Sec 508 (f'c = 4,000 psi).
- Reinforcing steel in the sleeper slab shall be epoxy coated Grade 60 with fy = 60,000 psi.
- Tie rod plates shall be ASTM A325 Grade 60.
- Sleeves, nuts, and 1 inch diameter tie rods shall be ASTM A307.
- All tie rods, plates, sleeves, and nuts shall be galvanized in accordance with ASTM A153.
- Minimum clearance to reinforcing steel shall be 1-1/2 inch, unless otherwise shown.
- Holes and bends shall be in accordance with the CRSI Manual of Standard Practice for Detailing Reinforced Concrete Structures. Stirrup and Tie Dimensions.
- All joint filler shall be in accordance with Sec 507 for prestressed fiber expansion joint or equivalent as noted.
- Drain pipe may be either 6 inch diameter corrugated polyvinyl chloride (PVC) drain pipe, or 4 inch diameter corrugated polyethylene (PE) drain pipe.
- Resin Anchor System: An epoxy coated #6 Grade 60 reinforcing steel shall be substituted for the 3/4 inch diameter tie rod.
- To ensure proper grouting, each end must be kept face up at all times. Beams shall be supported within 12 inches of the ends only.
- Use non-shrink grout for filling the keyways.
- For approach pavement details, see roadway plans.
- Payment for furnishing all materials, labor and excavation necessary to construct the prestressed approach slab, including the concrete approach slab, grout, joint filler and all other appurtenances and incidental work as shown in this sheet, complete in place, is necessary to construct the prestressed concrete approach slab. The cost is covered by the contract unit price for Prestressed Bridge Approach Slab per square yard.
- Contractor may adjust dimensions based on actual field measurements with approval of the engineer.

Placement and Partial Width Posttensioning Instructions:

- Top of aggregate base shall be made flush with top of bridge approach slab and top of sleeper slab, and uniformly graded at all points in between.
- Place first exterior beam.
- Place adjacent interior beam.
- Place partial width tie rods through both beams and connect to hex sleeve.
- Tighten all tie rods in the beam to about one half of the specified tension before proceeding with the final tensioning. Begin with nearest centered tie rod in span.
- Fill keyway with grout. See "Longitudinal Joint Between Pretensioned Beams". (Fill tie rod openings.)
- Tie rod nuts shall be tightened to provide a final tension of one half that specified for ASTM A325 Grade 60 bolts in Section 512.7.3 of the Missouri Standard Specifications.
- Use non-shrink grout for filling the keyways.
- Use non-shrink grout for filling the keyways.
- Use non-shrink grout for filling the keyways.

Access Hole Notes:

- Voids Under Completed Prestressed Concrete Approach Slabs, official to acceptance of the work, all underseal access holes shall be opened by the contractor to permit investigation or after the engineer or cavities found to be filled by the contractor, to provide access for inspection, repair, and removal of non-shrink grout. The work shall be in accordance with Missouri Standard Specifications for Prestressed Bridge Approach Slab.
- No direct payment will be made for investigating void conditions under the completed slab or for filling any voids found for prestressed bridge approach slabs.
- For access and emergency access, see roadway plans.
- For approach pavement details, see roadway plans.
- Payment for furnishing all materials, labor and excavation necessary to construct the prestressed approach slab, including the concrete approach slab, grout, joint filler and all other appurtenances and incidental work as shown in this sheet, complete in place, is necessary to construct the prestressed concrete approach slab. The cost is covered by the contract unit price for Prestressed Bridge Approach Slab per square yard.
Standard Drawing Guidance (do not show on plans):

Turn off Bridge-Guidance level to hide all guidance.

Prestressed bridge approach slab is to be used for approach slab replacement only.

Roadway drainage should be addressed by the core team and the consensus noted on the Bridge Memorandum and the Standard Drawing. For roadway drainage options, see EPG 503 Bridge Approach Slab.

1. Replace “Skew” with actual skew angle.
2. Top of approach notch must be flat or uniformly sloped (no crown) and sleeper slab must be parallel in elevation to top of approach notch.
3. Identify asphalt overlay and thickness. Coordinate with district if better to make a roadway item and then note accordingly and revise pay item note.
4. Waterproof membrane is required when slab is overlaid with asphalt. Omit “Special Provisions” as needed.
5. Timber Header will not normally be needed, since prestressed beams will be used for replacements only. Use only if requested by District RE to protect ends of beams during construction.
6. Request field measurements between wings at end of slab and end of wings before dimensioning width of approach slab and determining beam widths to be used.
7. The 22” x 8” slab dimension can be changed to 25’-0”, the title can then be changed from (20 FEET) to (25 FEET).
8. Modify or remove based on actual conditions of the job.
9. Fill with asphalt or seal.
10. For “Placement and Full Width Posttensioning Instructions” — see Development Section. Partial width posttensioning is preferred.
11a. Tie rods shall be placed along skew since shifting the beams longitudinally relative to each other during the tightening operation is prevented due to the anchorage of the beams to the end bent and the development of friction at the beam-aggregate interface.
12. Unlike conventional bridge approach slabs, prestressed concrete bridge approach slabs still require formed access holes for required investigation as specified prior to 2010 Standard Specifications.
**Bill of Reinforcing Steel - Each Beam**

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<td></td>
</tr>
</tbody>
</table>

All dimensions are out to out.

Hoops and bands shall be in accordance with the AASHTO Manual of Standard Practice for Detailing Reinforced Concrete Structures, Stirrup and Tie Dimensions.

Actual lengths are measured along centerline of bar to the nearest inch.

Minimum clearance to reinforcing steel shall be 1 1/2" unless otherwise shown.

All reinforcement shall be epoxy coated Grade 60 with tv = 60,000.

**General Notes (Pretensioned Beams):**

Concrete for pretensioned beams shall be Class A-1 with f'c = 6,000 psi, f'ci = 3,500 psi.

(+) indicates pretensioning strand.

Initial prestressing force = 31 kips/strand.

Pretensioning tendons shall be uncoated seven-wire low-relaxation strands for pretensioned concrete in accordance with AASHTO M 203 Grade 270, with nominal diameter of strand = 0.25", nominal area = 0.151 sq. in., and minimum ultimate strength = 19.29 kips (200 ksi). Larger strands may be used with the same spacing and load limits.

The method and sequence of releasing the strands shall be shown on the shop drawings.

Pretensioning strands at ends of beams shall be trimmed to within 1/8" of concrete. Ends of beams shall be given 2 coats of an approved bituminous paint. Lifting devices may be cast in beams. The device shall be shown on the shop drawings and approved by the engineer.

The top surface of all beams shall receive a smooth finish.

All holes in beams shall be cast. Drilling is not allowed.

Keyway surface shall be cleaned to remove all or other bond breaking material prior to shipment of the pretensioned concrete approach slab. Cleaning shall be done by sandblasting the keyway areas between top of the beam and the bottom edge of the slab.

Three 2 1/4" diameter (clear opening) under slab access holes shall be cast into each beam near the centerline of the beam, clearing pretensioning strands and 2-inch diameter conduit by at least 1 1/2 inches. Shift reinforcement as needed to clear access holes by 1 1/2 inches minimum. Drilling is not allowed.

* Contractor may adjust dimensions based on actual field measurements with approval of the engineer.

**Concrete Design:**

Stress = 46.31 kips (270 ksi). Larger strands may be used with the same prestressed concrete in accordance with AASHTO M 203 Grade 270, with nominal design strength = 19.29 kips (200 ksi).

**Reinforcing Steel:**

- #4-U101 @ 20'
- #5-U100 @ 20'
- #5-U100 @ 20'
- #5-U100 @ 20'
- #5-U100 @ 20'
- #5-U100 @ 20'
- #5-U100 @ 20'
- #5-U100 @ 20'

**Dimensions:**

All dimensions are out to out.

Minimum clearance to reinforcing steel shall be 1 1/2" unless otherwise shown.

All reinforcement shall be epoxy coated Grade 60 with tv = 60,000.

**Concrete Design:**

Stress = 46.31 kips (270 ksi). Larger strands may be used with the same prestressed concrete in accordance with AASHTO M 203 Grade 270, with nominal design strength = 19.29 kips (200 ksi).

**Reinforcing Steel:**

- #4-U101 @ 20'
- #5-U100 @ 20'
- #5-U100 @ 20'
- #5-U100 @ 20'
- #5-U100 @ 20'
- #5-U100 @ 20'
- #5-U100 @ 20'
- #5-U100 @ 20'

**Dimensions:**

All dimensions are out to out.

Minimum clearance to reinforcing steel shall be 1 1/2" unless otherwise shown.

All reinforcement shall be epoxy coated Grade 60 with tv = 60,000.

**Concrete Design:**

Stress = 46.31 kips (270 ksi). Larger strands may be used with the same prestressed concrete in accordance with AASHTO M 203 Grade 270, with nominal design strength = 19.29 kips (200 ksi).
APP09_precast2 Guidance

Standard Drawing Guidance (do not show on plans):

Turn off level "Bridge-Guidance" to hide.

1. Replace "skew" with actual skew angle.
2. Use "smooth finish" if slab is to be overlaid with membrane and asphalt. When slab is to be overlaid with concrete wearing surface, use "surface finish in accordance with Sec 1029.6.16."
3. Standard beam widths are 6' and 8', and should be used wherever possible. The 8' beam is the fabricator's preferred width. However, beam widths may be reduced up to 6" to get them to fit with 3/2" clearance to wing wall. Use same strands and reinforcing steel and adjust spacing.
4. A beam width that is less than the standard beam widths should be shown with adjusted spacing.
5. Calculate dimension using guidelines shown here (8'-0" Max.).

For squared structures, use Shape 10.

The 20'-0" slab dimension can be changed to 25'-0", the title can be changed from (20 FEET) to (25 FEET) and the "Bill of Reinforcing Steel" dimensions shall be changed accordingly.

Number of tie rods: Ideally, install 3 tie rods at midpoint and quarter points; one will have to go through wing wall; drill hole in wing, install, grout and seal. Realistically, install 2 tie rods as shown. (Only 2 tie rods were used successfully with favorable results in the correlated research.)

For 25-foot prestressed bridge approach slab, use four access holes at spacings of 3'-0" - 6'-0" - 6'-0" - 6'-0" - 4'-0".
ELEVATION OF BARRIER

(Left barrier shown, right barrier similar)

Longitudinal dimensions are horizontal.

General Notes:

1. Slip-formed option only.

2. Conventional forming or slip forming may be used. Saw cut joints may be used with conventional forming.

3. Top of barrier shall be built parallel to grade with barrier joints fronting or transversely normal to grade.

4. All exposed edges of barrier shall have a 1/2-inch radius or a 3/8-inch bevel, unless otherwise noted.

5. Payment for all concrete and/or reinforcement in place, will be considered completely covered by the contract unit price for Type B Barrier.

Concrete in the barrier shall be Class B-1.

Measurement of barrier is to the nearest linear foot for each structure, measured along the outside top of slab from end of wing to end of wing.

Concrete traffic barrier delineators shall be placed on top of the barrier as shown on Missouri Standard Plan 617.20 and in accordance with Sec 617.20. Two-way traffic shall have retroreflective sheeting on both sides.

Payment for all concrete, reinforcement, and/or joint material placed by the contractor shall be considered completely covered by the contract unit price for Type B Barrier.

Joint sealant and barrier rods shall be in accordance with Sec 717 for silicone joint sealant for saw cut and formed joints.

For slip-formed option, both sides of barrier shall have a vertically broomed finish and the top shall have a transversely broomed finish.

Plastic waterstop shall not be used with saw cut joints.

Note: This drawing is not to scale. Follow dimensions.
BAC01_elev  Guidance & Alternate Details

Standard Drawing Guidance (do not show on plans):

- In the available space, draw the elevation of the left barrier showing:
  - Span ranges.
  - All horizontal #5-R bars in each span with all specified by bar marks.
  - First & last vertical #5-R bars dimensioned with total number in barrier.
  - All joints and joint-filler jointed and centered with one centerline labeled as:
    - 1/4" Joint (Barrier only) (Typ.)

If slip forming is allowed then add the following two items:

- All #4 C bars in each span with all specified by bar marks (include asterisk)
- All fiber glass bars with bars at one location labeled as:
  - #4 Textured Fiberglass Bars (Typ.) +

Adjust longitudinal dimensions note under elevation title as necessary.

If right barrier differs from left (typical with curved bridges), show both Elevation of Left Barrier and Elevation of Right Barrier. The longitudinal dimensions note can be relocated as the first note under the General Notes.

Dimensions are based on a 2.0%-sloped deck. Modify accordingly the outside dimensions in:
- # Bar Permissible Alternate Shape and Section A-A, and the 2.27 sq. ft. area in Section A-A for superelevated decks.

If conduit is required, indicate left or right or both barriers in a note.

EXAMPLE (SINGLE SPAN)

- For barrier ending at end of slab:
  - Exclude "(except at end bents)"

- Remove measurement to "end of slab to end of slab".

- Plastic waterstop detail and notes are required for all grade separations except over railroads and county roads. Remove if not required.

- List C bars in the Bill of Reinforcing Steel and note that bars are for the slip-formed option only.

- Refer to EPG 731-2:2.2.1 for lengths of C bars.

- Subtract 1/8" for a 3/16"-per-foot sloped deck.

- Based on $|$" slab. Adjust for different slab thickness.

- Remove for CIP slab.

ALTERNATE DETAIL FOR SINGLE SPAN
General Notes:

Reinforcing Steel:
Concrete traffic barrier delineators shall be placed on top of the barrier as shown on Missouri Standard Plan 617.10 and in accordance with Sec 617. Concrete traffic barrier delineators shall be considered completely covered by the contract unit price for Type B retroreflective sheeting on both sides. Concrete traffic barrier delineators shall be placed on top of the barrier as shown on Missouri Standard Plan 617.10 and in accordance with Sec 617.

Minimum clearance to reinforcing steel shall be 3/16" except as shown for bars embedded into end bent.

Use a minimum lap of 2'-7" between K9 and K10 or K13 bars.

K1-K2 Bar Permissible Alternate Shape
(K3 or K4 thru K8 bars not shown for clarity)
The K1-K2 bar combination may be furnished as one bar as shown, or at the contractor’s option.

All dimensions are out to out.
Note: This drawing is not to scale. Follow dimensions.
Details of Guard Rail Attachment

General Notes:

Concrete traffic barrier delineators shall be placed on top of the barrier as shown on Missouri Standard Plan 671-15 and in accordance with Sec. 617. Delineators on bridges with two lane, two-way traffic shall have reflective painting on both sides. Concrete traffic barrier delineators will be considered completely covered by the contract unit price for Type B Barrier.

Reinforcing Steel:

Minimum clearance to reinforcing steel shall be 1 1/2" except as shown for bars embedded into end bent.

Use a minimum lap of 2'-7" between K9 and K10 or K13 bars.

Embedded into end bent.

Minimum clearance to reinforcing steel shall be 1 1/2" except as shown for bars embedded into end bent.

Note: This drawing is not to scale. Follow dimensions.
General Notes:

1. Conventional forming shall be used, and saw cut joints may be used.

2. All exposed edges of barrier shall have either a 1/2-inch radius or a 3/8-inch bevel, unless otherwise noted.

3. Payment for all concrete and reinforcement, complete in place, will be considered completely covered by the contract unit price for Type B Barrier per linear foot.

4. Concrete in the barrier shall be Class B-1.

5. Measurement of barrier is to the nearest linear foot for each structure, measured along the outside top of slab from end of wing to end of wing.

6. Concrete traffic barrier delineators shall be placed on top of the barrier as shown on Missouri Standard Plan 617.10 and in accordance with Sec 617. Delineators on bridges with two-lane, two-way traffic shall have retroreflective sheeting on both sides. Concrete traffic barrier delineators will be considered completely covered by the contract unit price for Type B Barrier.

7. Joint sealant and backer rods shall be in accordance with Sec 717 for silicone joint sealant for saw cut and formed joints. Plastic waterstop shall not be used with saw cut joints.

8. Coil inserts shall have a concrete ultimate pullout strength of not less than 36,000 pounds in 5,000 psi concrete and an ultimate tensile strength of not less than 36,000 pounds.

9. Joint sealant and backer rods shall be in accordance with Sec 717 for silicone joint sealant for saw cut and formed joints.

10. Threaded coil rods shall have an ultimate capacity of 36,000 pounds. All coil inserts and threaded coil rods shall be galvanized in accordance with AASHTO M 232 (ASTM A153), Class C.

11. Payment for furnishing and installing coil inserts and threaded coil rods will be considered completely covered by the contract unit price for Type B Barrier.
Standard Drawing Guidance (do not show on plans):

- In the available space, draw the elevation of the left barrier showing:
  - Span ranges.
  - All horizontal #5-A bars in each span with all specified by bar marks.
  - First & last vertical #5-A bars dimensioned with total number in barrier.
  - All joints (as joint filler joints) and centerlines with one centerline labeled as:
    - 1/4" Joint (Barrier only) (Typ.)

Adjust longitudinal dimensions note under elevation title as necessary.

If right barrier differs from left (typical with curved bridges), show both Elevation of Left Barrier and Elevation of Right Barrier. The longitudinal dimensions note can be relocated as the first note under the General Notes.

Dimensions are based on a 2.0%-sloped deck. Modify accordingly in Section A-A and the 2.27 sq. ft. area in Section A-A for superelevated decks.

If conduit is required, indicate left or right or both barriers in a note.

1. For barrier ending at end of slab:
   - Exclude "(except at end bents)" in first note.
   - Revise measurement to "end of slab to end of slab" in second note.

2. Plastic waterstop detail and notes are required for all grade separations

3. Subtract 1/4" for a 3"-per-foot sloped deck.

4. Plastic waterstop shall be placed in all formed joints, except structures with superelevation, use on lower joints only.

Cost of plastic waterstop, complete in place, will be considered completely covered by the contract unit price for Type B Barrier.

(Use when conduit is required)
Use when distance between upper and lower construction joint in wings is less than 28 1/2".
ALTERNATE DETAILS FOR SKEWED BRIDGES REQUIRING K3 BARS

Standard Drawing Guidance: (do not show on plans)

- For skews greater than 3 degrees, use alternate details above, which substitutes a K3 bar for the end K2 bar. For skews greater than 41 degrees, two K3 bars are required.

- Dimensions are based on a 2.0% sloped deck. Subtract 1/8” for a 3/16” per foot sloped deck.

For skews greater than 3 degrees, use alternate details above, which substitutes a K3 bar for the end K2 bar. For skews greater than 41 degrees, two K3 bars are required.

Dimensions are based on a 2.0% sloped deck. Subtract 1/8” for a 3/16” per foot sloped deck.
Use the following formulas for determining bar dimensions. These formulas work for all cross slopes.

**K3 BARS**
\[ B = \text{SLAB} (t) + \text{W.S.} (t) + 10\frac{1}{2}'' \]
\[ E = \text{SLAB} (t) + \text{W.S.} (t) - \frac{3}{4}'' \]

**K4 BARS**
\[ C = \text{SLAB} (t) + \text{W.S.} (t) + 10'' \]

**K5, K6, K7 & K8 BARS**
\[ E = \text{SLAB} (t) + \text{W.S.} (t) + \frac{1}{2}'' \]

**R3 BARS**
\[ B = \text{SLAB} (t) + \text{W.S.} (t) + 9\frac{1}{2}'' \]

**R4 BARS**
\[ E = \text{SLAB} (t) + \text{W.S.} (t) - \frac{3}{4}'' \]

Add Standard Note H9.1a, or H9.1b or H10.7.1 depending upon the use of guardrail or barrier system.
General Notes:
- Cover plates shall be 3/16 inch thick.
- Stiffener plates shall be 1/4 inch thick.
- Connector plates shall be fabricated from ASTM Grade A36.
- All welds shall be one inch long spaced at 2 inches.
- All hole diameters shall be one inch.

Cover plates shall be 3/16 inch thick.
Stiffener plates shall be 1/4 inch thick.
Connector plates shall be fabricated from ASTM Grade A36.
All welds shall be one inch long spaced at 2 inches.
All hole diameters shall be one inch.
If conduit is required, indicate left or right or both barriers in a note. A for superelevated decks.

R-Bar Permissible Alternate Shape and Section A-A, and the 3.52 sq. ft. area in Section A-relocated as the first note under the General Notes. Left Barrier and Elevation of Right Barrier. The longitudinal dimensions note can be adjusted as necessary.

- All fiberglass bars with bars at one location labeled as:
- All #5-C bars in each span with all specified by bar marks (include asterisk)

If slip forming is allowed then add the following two items:

- All joints (as joint-filler joints) and centerlines with one centerline labeled as:
- First & last vertical #5-R bars dimensioned with total number in barrier.

In the available space, draw the elevation of the left barrier showing:

5-#5-R Bars (Typ.)
3" @ 8
1
2"

B
SAW CUT JOINT
SECTION THRU
Saw cut joint (typ.)

PART ELEVATION AT FORMED JOINT

SECTION A-A

#5-R1, R2 and R3 "Joint (Barrier only) (Typ.)
@ abt. 12" cts.

#5-R1, R2 and R3 #4 Textured Fiberglass Bars (Typ.)
@ 1/4" Joint

Concrete joints shall be in accordance with Sec 1057 for slip-formed option. Concrete in barrier shall be Class A-1.

Concrete traffic barrier delineators shall be placed on top of the barrier as shown on Missouri Standard Plan 617.10 and in accordance with Sec 417.32. For slip-formed option, both sides of barrier shall have a vertically beveled finish and the top shall have a transversely broomed finish.

Plastic waterstop shall not be used with conventional forming or slip forming. Saw cut joints may be used with conventional forming.

Top of barrier shall be built parallel to grade and barrier joints (except at end bents) normal to grade and barrier joints (except at end bents) normal to grade.

All exposed edges of barrier shall have either a 1/2-inch radius or a 3/8-inch bevel, unless otherwise noted.

Payment for all concrete and reinforcement complete in place, will be considered completely covered by the contract unit price for Type D Barrier per linear foot.

Concrete in barrier shall be Class A-1. Measurement of barrier is to the nearest linear foot for each structure, measured along the outside top of slab from end to end of wing.

Concrete traffic barrier delineators shall be placed on top of the barrier as shown on Missouri Standard Plan 617.10.

Concrete traffic barrier delineators shall be placed on top of the barrier as shown on Missouri Standard Plan 617.10.

Concrete traffic barrier delineators shall be placed on top of the barrier as shown on Missouri Standard Plan 617.10.
Plastic waterstop shall be placed in all formed joints, except structures with superelevation, use on lower joints only.

Cost of plastic waterstop, complete in place, will be considered completely covered by the contract unit price for Type D Barrier.

Waterstop Detail:
Plastic waterstop shall be placed in all formed joints, except structures with superelevation, use on lower joints only.
Cost of plastic waterstop, complete in place, will be considered completely covered by the contract unit price for Type D Barrier.
(Use for grade separation)

Example - Redeck

Example - New Bridge

Section Thru Saw Cut Joint:
(Use when conduit is required)

Part Plan Showing Joint Location:
(For skewed structures only)

Alternate Detail for Single Span:
(1) Four feet long, centered on joint, all-pumped option only

Part Elevation of Barrier:
(1) Four feet long, centered on joint, slip-formed option only

BAR01_D_elev Alternate Details
Standard Drawing Guidance: (do not show on plans)

For skews greater than 2 degrees, use alternate details, which substitute a K3 bar for the end K2 bar. For skews greater than 41 degrees, two K3 bars are required.

Dimensions are based on a 2.0% sloped deck. Subtract 1/8" for a 3/16" per foot sloped deck.

Alternate Details for Skewed Bridges Requiring K3 Bars

PART ELEVATION

PART PLAN

SECTION H-H

SECTION I-I
**TYPE D BARRIER AT END BENTS**

(Left barrier shown, right barrier similar)

**Integral End Bent with Shallow Superstructure**

Use when distance between upper and lower construction joints in wings is less than 28 1/2".

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**General Notes:**

- Use Type A curb for gutter lines to match.
- Transition to zero of Type A curb for gutter lines to match.
- Note: This drawing is not to scale. Follow dimensions.

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**DETAILS OF GUARD RAIL ATTACHMENT**

- Use K10-K12 bar permissible alternate shape (left barrier shown, right barrier similar)
ALTERNATE DETAILS FOR SKEWED BRIDGES REQUIRING K3 BARS

Standard Drawing Guidance: (do not show on plans)

For skews greater than 3 degrees, use alternate details above, which substitutes a K3 bar for the end K2 bar. For skews greater than 41 degrees, two K3 bars are required.

Dimensions are based on a 2.0% sloped deck. Subtract 1/8" for a 3/16" per foot sloped deck.
General Notes:
Concrete traffic barrier delineators shall be placed on top of the barrier as shown in Missouri Standard Plan #11 (B) and (C) to those shown in Sections A-A and F-F.
Reinforcing Steel: Minimum clearance to reinforcing steel shall be 1 1/2".
Use a minimum lap of 3'-1" between horizontal K bars and R bars.

Standard Drawing Guidance: (Do not show on plans)
(1) 6-#5-K @ 6" cts.
(2) 2 spaces @ 4'
(3) 5-#5-K6 & K7
(4) 5-#5-K6 & K7
(5) 2-#5-K13 @ 4" cts., each face
(6) 3-#5-K6 @ 4" cts., each face
(7) Spaced as shown, each face
(8) 2-#5-K13 (roadway face)
(9) To top of bar

Concrete traffic barrier delineators shall be placed on top of the barrier, as shown in Missouri Standard Plan #11 (B) and (C). Clusters on bridges with two-lane, two-way traffic shall have retroreflective sheeting on both sides. Concrete traffic barrier delineators shall be placed on top of the barrier, as shown in Missouri Standard Plan #11 (B) and (C). Clusters on bridges with two-lane, two-way traffic shall have retroreflective sheeting on both sides. (Other K bars not shown for clarity).

The top two parts shall be kept with positions shown.

Type D Barrier at End Bents
(Left barrier shown, right barrier similar)

Details of Guard Rail Attachment
1" Channel
K10-K11 Bar Permissible Alternate Shape
(Other K bars not shown for clarity)

All dimensions are out to out.
Detailed
Checked
Note: This drawing is not to scale. Follow dimensions.
Sheet No. of

GENERAL NOTES:
• Slip-formed option only.
• Conventional forming or slip forming may be used. Saw cut joints may be used with conventional forming.
• Top of barrier shall be built parallel to grade and barrier joints (except at end bents) normal to grade.
• All exposed edges of barrier shall have a minimum radius of 7/16-inch radius. A 3/8-inch bevel may be otherwise noted.
• Payment for all concrete and reinforcement, 3.5 ft. or more, will be considered completely covered by the contract unit price for Type H Barrier per linear foot.
• Concrete in barrier shall be Class B-1.
• Measurement of barrier is to the nearest linear foot for each structure, measured along the outside top of slab from end to end and to end bents.
• Concrete traffic barrier delineators shall be placed on top of the barrier as shown on Missouri Standard Plan 612.10 and in accordance with Sec. 612.10. Detectors of all types are to have retroreflective sheeting on both sides. Concrete traffic barrier delineators will be considered completely covered by the contract unit price for Type H Barrier.
• Joint sealant and backer rods shall be in accordance with Sec. 612.10 for slip-formed option, except when slip forming is not used.
• Plastic waterstop shall not be used with saw cut joints.

ELEVATION OF BARRIER
(Left barrier shown. Right barrier similar)

Dimensions are horizontal.
Longitudinal dimensions note can be relocated as necessary.

Adjust longitudinal dimensions note under title as necessary.

4-#5-R Bars @ 8" cts.

 wsz CUT JOINT

PART ELEVATION AT FORMED JOINT

SECTION A-A

Use a minimum lap of 3'-1" for #5 horizontal barrier bars.
The cross sectional area above the slab is 2.89 square feet.

1. 15" Joint (Barrier only) (Typ.) slip-formed option only
2. 3/8" Joint (Barrier only) (Sec 1057)

Filler
1/4" Joint @ abt. 12" cts.

#5-R1, R2 & R3

AT FORMED JOINT

PART ELEVATION OF BARRIER

(2) To top of bar

#5-R1, R2 & R3

(3) The R1 bar may be separated into two bars as shown, at the contractor's option, only when slip forming is not used. Saw cut joints may be used with conventional forming.

(4) The R2 bar and #5 bottom transverse slab bar in center lever (prestressed panels only) combination may be furnished as one bar as shown, at the contractor's option.

R-BAR PERMISSIBLE ALTERNATE SHAPE

(5) The #5 bar may be separated into two bars as shown, at the contractor's option.

(6) Remove for CIP slab.

Saw cut joints.

Concrete traffic barrier delineators shall be placed on top of the barrier as shown on Missouri Standard Plan 612.10 and in accordance with Sec. 612.10. Detectors of all types are to have retroreflective sheeting on both sides. Concrete traffic barrier delineators will be considered completely covered by the contract unit price for Type H Barrier.

Concrete in barrier shall be Class B-1.
Measurement of barrier is to the nearest linear foot for each structure, measured along the outside top of slab from end to end and to end bents.
Concrete traffic barrier delineators shall be placed on top of the barrier as shown on Missouri Standard Plan 612.10 and in accordance with Sec. 612.10. Detectors of all types are to have retroreflective sheeting on both sides. Concrete traffic barrier delineators will be considered completely covered by the contract unit price for Type H Barrier.
Joint sealant and backer rods shall be in accordance with Sec. 612.10 for slip-formed option, except when slip forming is not used.
Plastic waterstop shall not be used with saw cut joints.

STATE DESCRIPTION

C l.

"#5-R3

BAR06_H_elev     Effective: Sep. 2021     Supersedes: Nov. 2020

Checked
Detailed
Permissible Alternate Shape and Section A-A, and the 2.89 sq. ft. area in Section A-A for Dimensions are based on a 2.0%-sloped deck. Modify accordingly the outside dimensions in R-Bar first note under the General Notes.

If right barrier differs from left (typical with curved bridges), show both Elevation of Left Barrier and Elevation of Right Barrier. The longitudinal dimensions note can be relocated as necessary.

- All fiberglass bars with bars at one location labeled as:
- All joints (as joint-filler joints) and centerlines with one centerline labeled as:
- First & last vertical #5-R bars dimensioned with total number in barrier.
- All horizontal #5-R bars in each span with all specified by bar marks.
- Span ranges.

In the available space, draw the elevation of the left barrier showing:

(Typ.)

4-#5-R Bars @ 8" cts.

Saw cut full (Formed or Saw Cut) 1/4" Joint

#4 Textured Fiberglass Bars (Typ.) ?

Silicone Joint Sealant

4" Joint (Barrier only) (Typ.) slip-formed option only

Concrete traffic barrier delineators shall be placed on top of the barrier as shown on Missouri Standard Plan 612.10 and in accordance with Sec. 612.10. Detectors of all types are to have retroreflective sheeting on both sides. Concrete traffic barrier delineators will be considered completely covered by the contract unit price for Type H Barrier.

Concrete in barrier shall be Class B-1.
Measurement of barrier is to the nearest linear foot for each structure, measured along the outside top of slab from end to end and to end bents.
Concrete traffic barrier delineators shall be placed on top of the barrier as shown on Missouri Standard Plan 612.10 and in accordance with Sec. 612.10. Detectors of all types are to have retroreflective sheeting on both sides. Concrete traffic barrier delineators will be considered completely covered by the contract unit price for Type H Barrier.
Joint sealant and backer rods shall be in accordance with Sec. 612.10 for slip-formed option, except when slip forming is not used.
Plastic waterstop shall not be used with saw cut joints.
Plastic waterstop shall be placed in all formed joints, except structures with super elevation. Use on lower joints only.

Cost of plastic waterstop, complete in place, will be considered completely covered by the contract unit price for Type H Barrier.
Detailed
Checked
Note: This drawing is not to scale. Follow dimensions.
Sheet No. of

PERMISSIBLE ALTERNATE SHAPES

(Other K bars not shown for clarity)

The top two bars shall be kept with positive close to those shown. If using K4-K5, use K5-K6.

All dimensions are out to out.
Alternate Details for Skewed Bridges Requiring K3 Bars
TYPE H BARRIER AT END BENTS

(EFFECTIVE: SEP. 2021)

(Left Barrier shown, right barrier similar)

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1 1/2" EXCEPT AS SHOWN FOR BARS EMBEDDED INTO END BENT.

REINFORCING STEEL:
Minimum clearance to reinforcing steel shall be 1 1/2" except as shown for bars embedded into end bent.

PERMISSIBLE ALTERNATE SHAPES:
(Other K bars not shown for clarity)
The #4-#6 and #6-#8 bar configuration may be furnished as one bar as shown, at the contractor's option.

All dimensions are out to out.

Delineators on bridges with two-lane, two-way traffic shall have retroreflective sheeting on both sides. Concrete traffic barrier delineators shall be placed on top of the barrier as shown on Missouri Standard Plan 617.10 and in accordance with Sec 617.

Concrete traffic barrier delineators shall be placed on top of the barrier as shown on Missouri Standard Plan 617.10 and in accordance with Sec 617.

General Notes:
Concrete traffic barrier delineators shall be placed on top of the barrier as shown on Missouri Standard Plan 617.10 and in accordance with Sec 617.

Retroreflective sheeting on both sides. Concrete traffic barrier delineators will be considered completely covered by the contract unit price for Type H.
Standard Drawing Guidance: (do not show on plans)

For skew greater than 3 degrees, use alternate details above, which substitutes a K3 bar for the end K2 bar. For skews greater than 41 degrees, two K3 bars are required.

1. Dimensions are based on a 2.0% sloped deck. Subtract 1/8" for a 3/16" per foot sloped deck.
2. Based on 8 1/2" slab. Adjust for different slab thickness.

Alternate Details for Skewed Bridges Requiring K3 Bars
Standard Drawing Guidance: (Do not show on plans)
1. Dimensions are based on a 2% sloped deck. Subtract 1/8" for a 3/16" per foot sloped deck.
2. Based on 8 1/2" slab. Adjust for different slab thickness.

General Notes:
Concrete traffic barrier delineators shall be placed on top of the Barrier as shown on Missouri Standard Plan K17.4. They shall be in accordance with bar K5. Barriers on bridges with travel lanes, two-way traffic shall have retroreflective sheeting on both sides. Concrete traffic barrier delineators will be considered completely covered by the contract unit.

Reinforcing Steel:
Minimum clearance to reinforcing steel shall be 1 1/2" except as shown for bars embedded into end bent.

PERMISSIBLE ALTERNATE SHAPES
(Other K bars not shown for clarity)
The K4-K5 and K4-K6 bar combination may be furnished as one bar as shown, at the contractor’s option. All dimensions are set to scale.
Note: This drawing is not to scale. Follow dimensions.

**General Notes:**
Concrete traffic barrier delineators shall be placed on top of the barrier as shown on Missouri Standard Part 617.10 and in accordance with Sec. 617. Delineators on bridges with two-lane, two-way traffic shall be placed on top of the barrier as shown on Missouri Standard Plan 617.10 and in accordance with Sec. 617. Delineators on bridges with two-lane, two-way traffic shall be placed on the side of the barrier as shown.

**Reinforcing Steel:**
Minimum clearance to reinforcing steel shall be 1 1/2".
Use a minimum lap of 3-1/2" between K7 bars and R bars.

**Permissible Alternate Shapes**
(Other K bars not shown for clarity)
The K4-K5 and K6-KA bar combination may be furnished as one bar as shown, at the contractor's option.
All dimensions are out to out.

**Type H Barrier at End Bents**

(Left barrier shown, right barrier similar)

- Transition to zero at Type A curb for gutter line to drain.
- Use a minimum lap of 3-1/2" between K7 bars and R bars.
- The top two bars shall be kept with position close to those shown in Sections A-A thru B-B.
- K4-K5
- K4-K6

**Standard Drawing Guidelines:**
(Do not show on plans)
1. Show part of existing end bent.
2. Show part of existing end bent.
3. Show part of existing end bent.
4. Show part of existing end bent.
5. Show part of existing end bent.

**Details of Guard Rail Attachment**

Note: This drawing is not to scale. Follow dimensions.

**Type H Barrier at End Bents**

(Left barrier shown, right barrier similar)
**ELEVATION OF BARRIER**

**Longitudinal dimensions are horizontal.**

---

**General Notes:**

- Slip-formed option only.

Concrete traffic forming or slip forming may be used. Saw cut joints may be used with conventional forming.

Top of barrier shall be built parallel to grade with barrier joint normal to grade.

All exposed edges of barrier shall have either a 1/2-inch radius or a 3/8-inch bevel, unless otherwise noted.

Payment for all concrete and reinforcement shall be made at the contract unit price for Type C Barrier per linear foot.

Concrete in the barrier shall be Class B-1.

Measurement of barrier is to the nearest linear foot. Measured along the top of slab at centerline median from end of bridge approach slab to end of bridge approach slab.

Concrete traffic barrier delineators shall be placed on top of the barrier as shown in Missouri Standard Plan 617.10 and in accordance with Sec. 1057. Delineators shall have retroreflective sheeting on both sides. Concrete traffic barrier delineators shall be considered completely covered by saw-cut and slip-formed joints.

Joint sealant and backer rods shall be in accordance with Sec. 717 for silicone joint sealant for saw cut and slip-formed joints.

For slip-formed option, both sides of barrier shall have a vertically broomed finish and the top shall have a transversely broomed finish.

The contractor shall use one of the qualified resin anchor systems in accordance with 1039.

Cost of furnishing and installing the resin anchor system, complete in place, will be considered completely covered by the contract unit price for Type C Barrier.

The minimum embedment depth in concrete with f'c = 4,000 psi for the resin anchor system shall be 12 inches and the resin anchor system shall be assumed to be installed in accordance with Sec. 1039 but shall not be less than 8 inches.

An epoxy coated #5 Grade 60 reinforcing bar shall be considered completely covered by the contract unit price for Type C Barrier.

---

**Standard Plan 617.10:**

Concrete traffic barrier delineators shall be considered completely covered by the contract unit price for Type C Barrier.

---

**Detailed Notes:**

- This drawing is not to scale. Follow dimensions.
- Unit price for Type C Barrier.
SECTION THRU SAW CUT JOINT

(Use when conduit is required)

EXAMPLE ELEVATION

PART PLAN SHOWING JOINT LOCATION

PART PLAN SHOWING JOINT LOCATION

(For skewed structures only)
If slip forming is allowed then add the following two items:

- All joints (as joint-filler joints) and centerlines with one centerline labeled as:
  - Span ranges.

Fiberglass:

Standard Drawing Guidance (do not show on plans):

Deck or Bridge (Typ.)

PART PLAN SHOWING JOINT LOCATION

Bar (1)
Fiberglass
#4 Textured

Joint
Sealant
Silicone Joint
to this line

Saw cut full

" Backer Rod

3" 5 - # 5 - M 4

Face

Note: This drawing is not to scale. Follow dimensions.

General Notes:

#5 bars for resin anchors in the bar bill.

The cross-sectional area above #5 horizontal barrier bars.

Use a minimum lap of 3'-1" for #5 joint-filler barrier bars.

The cross-sectional area above the slip is 4.54 square feet.

Bar (1)
Fiberglass
#4 Textured

Joint
Sealant
Silicone Joint
to this line

Saw cut full

" Backer Rod

3" 5 - # 5 - M 4

Face

Note: This drawing is not to scale. Follow dimensions.

General Notes:

#5 bars for resin anchors in the bar bill.

The cross-sectional area above #5 horizontal barrier bars.

Use a minimum lap of 3'-1" for #5 joint-filler barrier bars.

The cross-sectional area above the slip is 4.54 square feet.

Bar (1)
Fiberglass
#4 Textured

Joint
Sealant
Silicone Joint
to this line

Saw cut full

" Backer Rod

3" 5 - # 5 - M 4

Face

Note: This drawing is not to scale. Follow dimensions.
### BILL OF REINFORCING STEEL

**EPOXY (E)**

**SHAPE NO.**

**STIRRUP (S)**

**VARIANCE (V)**

**NO. EACH**

<table>
<thead>
<tr>
<th>No.</th>
<th>Mark</th>
<th>Dimensions</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>F</th>
<th>E</th>
<th>H</th>
<th>K</th>
<th>Lbs.</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
</tbody>
</table>

**BILL OF REINFORCING STEEL**

**LENGTH**

**NOMINAL LENGTH**

**ACTUAL LENGTH**

**FT.**

**IN.**

**or**

**FT.**

**IN.**

**END HOOK DIMENSIONS**

**180° HOOKS**

**BAR SIZE**

**D** (IN.)

<table>
<thead>
<tr>
<th>Bar Size</th>
<th>90° Hooks</th>
<th>135° Hooks</th>
</tr>
</thead>
<tbody>
<tr>
<td>#4</td>
<td>3&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>#8</td>
<td>6&quot;</td>
<td>11&quot;</td>
</tr>
<tr>
<td>#5</td>
<td>3 3/4&quot;</td>
<td>7&quot;</td>
</tr>
<tr>
<td>#6</td>
<td>4 1/2&quot;</td>
<td>8&quot;</td>
</tr>
<tr>
<td>#7</td>
<td>5 1/4&quot;</td>
<td>10&quot;</td>
</tr>
<tr>
<td>#9</td>
<td>9 1/2&quot;</td>
<td>15&quot;</td>
</tr>
<tr>
<td>#10</td>
<td>10 3/4&quot;</td>
<td>17&quot;</td>
</tr>
<tr>
<td>#11</td>
<td>12&quot;</td>
<td>19&quot;</td>
</tr>
</tbody>
</table>

**PROCEDURE AS FOR 90° STANDARD HOOKS.**

**ALL STANDARD HOOKS AND BENDS OTHER THAN 180°**

**ARE TO BE BENT WITH SAME FOR FABRICATORS USE.**

**NOTE:**

- **FB = BARS MAY BE BENT IN FIELD TO FIT.**
- **LENGTH WHICH EXCEEDS ITS MAXIMUM ALLOWABLE LENGTH.**
- **IN THE FIRST LINE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ADD A SPLICE LENGTH TO A BAR AND THE FOLLOWING LINE. A BLANK IN THE SECOND LINE REPRESENTS THE SAME BAR DIMENSION AS THAT V.**
- **BAR DIMENSIONS VARY IN EQUAL INCREMENTS BETWEEN DIMENSIONS SHOWN ON THIS LINE.**
- **NO. EA. = NUMBER OF BARS OF EACH LENGTH.**
- **ACTUAL LENGTHS ARE MEASURED ALONG CENTERLINE BAR TO THE NEAREST INCH.**
- **PAYWEIGHTS ARE BASED ON ACTUAL LENGTHS.**
- **FOR FABRICATORS USE. (NEAREST INCH) NOMINAL LENGTHS ARE BASED ON OUT TO OUT DIMENSIONS SHOWN IN BENDING DIAGRAMS AND ARE LISTED OR MODIFIED BY THE CONTRACTOR.**
- **VERIFIED OR MODIFIED BY THE CONTRACTOR. ESTIMATION PURPOSE ONLY AND SHALL BE THIS BAR LIST IS FOR QUANTITY STANDARDS PLANS. THE BAR LIST IS BASED ON THE MISSOURI COUNTY JOB NO. CONTRACT ID.**

**GRADE 60 FY = 60,000 PSI.**

**PROCEDURE AS FOR 90 DEGREE STANDARD HOOKS.**

**NOTE:**

- **120° HOOKS**
- **APPROX. H**
- **D** (IN.)
- **BAR SIZE**
- **STIRRUP HOOK DIMENSIONS**
- **90° HOOK**
- **135° HOOK**
- **NOTE: UNLESS OTHERWISE NOTED, DIAMETER OF WEIGHTED TO THE CONTRACTOR.**

**Singleboxculvert.dgn**

**Date Prepared:** 6/13/2013

**Document:** Singleboxculvert

**Checked:** [Signature]

**Effective:** June 2013

**Supercedes:** Aug. 2008

**Details:**

- **Note:** This drawing is not to scale. Follow dimensions.
### BILL OF REINFORCING STEEL

**NOTE:**
- This drawing is not to scale. Follow dimensions.
- The bar list is for quantity estimation purposes only and shall be verified or modified by the contractor.
- The bar list is based on the Missouri Standard Plans.
- **E = Epoxy Coated Reinforcement.**
- **S = Stirrup.**
- **NO. EA. = Number of Bars of Each Length.**
- Actual lengths are measured along centerline bar to the nearest inch.
- Payweights are based on actual lengths.
- 180° hooks shall be in accordance with the procedures as shown on this sheet.
- All standard hooks and bends other than 180° are to be bent with the same procedure as for 90° standard hooks.
- **FB = bars may be bent in field to fit.**
- **V = bar dimensions vary in equal increments between dimensions shown on this line.**
- **Non-Epoxy**Splinter Length:
  - Size
  - 1.26 In.
  - 31 In.
  - 39 In.
  - 51 In.
  - 65 In.
  - 82 In.
  - 101 In.
  - 120 In.

### STIRRUP HOOK DIMENSIONS

<table>
<thead>
<tr>
<th>BAR SIZE</th>
<th>90° HOOK</th>
<th>135° HOOK</th>
</tr>
</thead>
<tbody>
<tr>
<td>#4</td>
<td>2&quot;</td>
<td>4 1/2&quot;</td>
</tr>
<tr>
<td>#5</td>
<td>2 1/2&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>#6</td>
<td>4 1/2&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>#7</td>
<td>5 1/4&quot;</td>
<td>10&quot;</td>
</tr>
<tr>
<td>#8</td>
<td>9 1/2&quot;</td>
<td>15&quot;</td>
</tr>
<tr>
<td>#9</td>
<td>10 3/4&quot;</td>
<td>17&quot;</td>
</tr>
<tr>
<td>#10</td>
<td>12&quot;</td>
<td>19&quot;</td>
</tr>
<tr>
<td>#11</td>
<td>12&quot;</td>
<td>19&quot;</td>
</tr>
</tbody>
</table>

### END HOOK DIMENSIONS

<table>
<thead>
<tr>
<th>BAR SIZE</th>
<th>90° HOOK</th>
<th>135° HOOK</th>
</tr>
</thead>
<tbody>
<tr>
<td>#4 and #5</td>
<td>APPROX. 6&quot;</td>
<td>APPROX. 6&quot;</td>
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<tr>
<td>#6</td>
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</tr>
<tr>
<td>#11</td>
<td>18&quot;</td>
<td>18&quot;</td>
</tr>
</tbody>
</table>

### GRADE 60 REINFORCING STEEL FY = 60,000 PSI.

### PAYMENTS

All payments are to be made on the basis of the actual amount on the final certificate submitted as provided by the contractor.
### Bill of Reinforcing Steel

#### Epoxy  (E)

**Shape No.**
- Stirrup (S) Varies (V)
- No. Each

**No.**

<table>
<thead>
<tr>
<th>Location</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>F</th>
<th>E</th>
<th>H</th>
<th>K</th>
<th>Length</th>
<th>Nominal Length</th>
<th>Actual Length</th>
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</thead>
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</tbody>
</table>

#### Stirrup Hooks Dimensions

- **90° Hook**
  - #4: 2" 4 1/2" 4 1/2" 3"
  - #5: 2 1/2" 6" 5 1/2" 3 3/4"
  - #6: 4 1/2" 12" 8" 4 1/2"

- **135° Hook**
  - #4: 2" 4 1/2" 4 1/2" 3"
  - #5: 2 1/2" 6" 5 1/2" 3 3/4"
  - #6: 4 1/2" 12" 8" 4 1/2"

#### End Hook Dimensions

- 180° Hooks
  - Bar Size: D (IN.)
  - #4: 9 1/2" 15" 11 3/4" 19"
  - #5: 10 3/4" 17" 13 1/4" 22"
  - #6: 12" 19" 14 3/4" 24"

- 90° Hooks
  - A OR G
  - #4: 1 1/2" 3" 2" 1 1/2"
  - #5: 2 1/2" 6" 5 1/2" 3 3/4"
  - #6: 4 1/2" 12" 8" 4 1/2"

#### Notes:

- This drawing is not to scale. Follow dimensions.
- Payweights are based on actual lengths.
- Actual lengths are measured along centerline bar to the nearest inch.
- End hooks are bent to fit.
- Lengths which exceed its maximum allowable length.
- All standard hooks and bends other than 180° are to be bent with same for 90° standard hooks.

### Epoxy Coated Reinforcement
- E = Epoxy coated reinforcement.
- S = Stirrup.

### Miscellaneous

- Number of bars of each length.
- Nominal lengths are based on out to out dimensions shown in bending diagrams and are listed.
- Actual lengths are measured along centerline bar to the nearest inch.
- End hooks are bent to fit.

#### Verification

- Verified or modified by the contractor.
- Estimation purpose only and shall be based on Missouri standard plans.

### Details

- Bridge No.
- Project No.
- Contract ID.
- Sheet No.
- District
- Route
- State
- Job No.

### Specifications

- Bars may be bent in field to fit.
- Diameter (IN.)
- Non-epoxy 26 IN.
- Max. bar length 60 FT.

### Certification

- A certified seal is present on this sheet it has been electronically sealed and dated.

### Descriptions

- The bar list is for quantity standard plans.
- The bar list is based on the Missouri county job.

### Date

- June 2013
- Supersedes: Aug. 2008
U.I.P. & REHABILITATE EXISTING (x', x') X SPANS

PART ELEVATION SHOWING CONCRETE REMOVAL

PLAN (3)

ELEVATION SHOWING REINFORCEMENT (3)

ELEVATION A-A

SECTION B-B (4)

SECTION C-C (4)

BARRIER MODIFICATION FOR GUARDRAIL ATTACHMENT

Note: This drawing is not to scale. Follow dimensions.

General Notes:

Design Specifications:
2002 AASHTO LFD (17th Ed.) Standard Specifications

Design Unit Stresses:
Class B-2 Concrete  f'c = 4,000 psi
Reinforcing Steel (Grade 60) Ty = 60,000 psi

Reinforcing Steel:
Minimum cover to reinforcing steel shall be 1 1/2" unless otherwise shown.

Miscellaneous:
One lane of traffic shall remain open during construction. See roadway plans for traffic control.

All exposed edges of barrier shall have either a 1 1/2" inch radius or a 3/8-inch bevel, unless otherwise shown.

Outline of existing work is indicated by light dashed lines. Heavy lines indicate new work.

Reinforcement in barriers and modification shall be epoxy coated.

Bars bonded in existing concrete not removed shall be cleaned stripped and embedded into new concrete where required. All bars removed shall extend into new concrete at least 40 diameters for plain bars and 50 diameters for deformed bars, unless otherwise noted.

The area exposed by the removal of concrete and not covered with new concrete shall be coated with a qualified special mortar in accordance with Sec 704.

Cost of removing existing barrier concrete, and cost of furnishing and installing new concrete, new reinforcing steel, and any special work incident to removal of existing concrete shall be reimbursed and completed covered by the contract unit price for Barrier End Modification.

No Wearing Surface
Guidance: (Do not show on plans.) Substitute alternate Plan for skewed structures, Modify details as needed to suit your structure. Use with DMD01-2 (Bill of Reinforcing Steel).

Estimated Quantities

<table>
<thead>
<tr>
<th>Item</th>
<th>Barrier End Modification</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

REPAIRS TO BRIDGE:
ROUTE OVER
ROUTE FROM ROUTE TO ROUTE ABOUT MILES OF ROUTE
BEGINNING STATION SEE MATCH EXISTING|
Skewed Plan
BEM01-2_EndMod_NoWS-BB

Effective: July 2021

Supersedes: Feb. 2021
C

E

K

BILL OF REINFORCING STEEL

IN. FT.

LBS.

D

E

F

H

K

B

IN. FT.

IN. FT.

IN. FT.

IN. FT.

IN. FT.

IN. FT.

B

WEIGHT
K

C

SHAPE 6

FT.

H

D

B

B

LENGTH

C

ACTUAL

B

LENGTH

NOMINAL

(V)

NO. EACH

(E)

SHAPE NO.

MARK

SIZE

LENGTH

IN.FT.IN.FT.IN.

LOCATION

DIMENSIONS

IN.FT.IN.FT.IN.

SHAPE 7

SHAPE 8
B

B

LBS.

K

E

B

B

IN. FT.

K

VARIES

IN. FT.

H

SUBSTR. (X)

IN. FT.

F

NO.

STIRRUP (S)

IN. FT.

E

MARK

EPOXY

IN. FT.

D

WEIGHT

NO. REQ'D.

FT.

C

ACTUAL

B

LENGTH

NOMINAL

(V)

DIMENSIONS
NO. EACH

VARIES

SUBSTR. (X)

LOCATION

STIRRUP (S)

SIZE

MARK

NO.

SHAPE NO.

(E)

MARK

EPOXY

NO. REQ'D.

H

BILL OF REINFORCING STEEL

8.000

7.000

9.000

20

5 R3

MODIFIED END E 10 S

12

5 R4

MODIFIED END E 10 S

2
V

4

5.000

2

INCREMENT =

2

6.000

4.750

2.250

0

22

0

21

4

5

2

5

8.500

5

20

0

5

7.000

0

23

5
1

5

4

7

C

44

E

D

D

11

SHAPE 9

SHAPE 10

SHAPE 11

63

STATE

DISTRICT

SHEET NO.

MO

B

2

A

MODIFIED END E 20

4

MODIFIED END E 15 S

9.000

11.375

2

4
1.500

1.250

11.250

9
3

4
1

9
3

1

COUNTY

G

198
D

5 R6

ROUTE

108

2

B

12

5 R5

DATE PREPARED

10/13/2023

1.500 INCH
40

E

7.000

MODIFIED END E 10 S

C

MODIFIED END E 10 S

39

A

C

E

5 R2

C

5 R1

D

4
24

C

H

BARRIER

JOB NO.

CONTRACT ID.

C

D

SHAPE 12

SHAPE 13
PROJECT NO.

E

H

D

BRIDGE NO.

459

TOTAL

0

TOTAL

E

D

B

E

C

459

K

F

C

K

SHAPE 14

SHAPE 15
B

C

L
A
P

A
VERTICAL

A

LEG

B

SHAPE 17
G

SHAPE 18
B

C

SHAPE 16

SHAPE 20

K

D

SHAPE 19

SPOT WELD

DESCRIPTION

5

H

B

TOTALS

AASHTO M32
SIZE W5 WIRE

H

(TYP.)

F

VERTICAL

K

LEG

H

C

C

H

H

B

B

B

SHAPE 22

C

K

D

D

K

SHAPE 25

SHAPE 24

H

B

D

B

H

E

F

D

C

K

C

SHAPE 26

H
E
D

B

B

D

K

C

C

SHAPE 28

4 1/2"

90°

3"

A OR G

#5

2 1/2"

#6

4 1/2"

6"

5 1/2"

3 3/4"

DETAILING DIMENSION

d

12"

8"

4 1/2"

HOOK
A OR G

2 1/4"

#4

3"

#5

3 3/4"

5"

A OR G

3"

6"

6"

4"

8"

7"

5"

10"

J

180°
4d OR 2 1/2" MIN.

X = BAR IS INCLUDED IN SUBSTRUCTURE QUANTITIES.

F

8"

6"

12"

AND THE FOLLOWING LINE.

10"

7"

14"

NO. EA. = NUMBER OF BARS OF EACH LENGTH.

8"

16"

#9

9 1/2"

11"

#10

10 3/4"

15"
17"

11 3/4"
13 1/4"

12"

#14

18 1/4"

19"

D

B
H

SHAPE 32

NOMINAL LENGTHS ARE BASED ON OUT TO OUT DIMENSIONS SHOWN IN BENDING DIAGRAMS AND

19"

ARE LISTED FOR FABRICATORS USE. (NEAREST INCH)
ACTUAL LENGTHS ARE MEASURED ALONG CENTERLINE BAR TO THE NEAREST INCH.

22"

PAYWEIGHTS ARE BASED ON ACTUAL LENGTHS.

HOOK
K
B
B
B
A

FOUR ANGLE OR CHANNEL SPACERS ARE REQUIRED FOR EACH COLUMN SPIRAL. SPACERS ARE TO
#11

SHAPE 31

135°

V = BAR DIMENSIONS VARY IN EQUAL INCREMENTS BETWEEN DIMENSIONS SHOWN ON THIS LINE
4 1/2"

6"

C

SHAPE 30

S = STIRRUP.

5 1/4"

D

d

ON A BAR.

C

C

C

E = EPOXY COATED REINFORCEMENT.

#6

#8

"D" IS THE SAME FOR ALL BENDS AND HOOKS

135° STIRRUP

PROCEDURE AS FOR 90 DEGREE STANDARD HOOKS.

#7

D

NOTE: UNLESS OTHERWISE NOTED, DIAMETER

90° STIRRUP

J

ALL STANDARD HOOKS AND BENDS OTHER THAN 180 DEGREE ARE TO BE BENT WITH SAME
HOOKS AND BENDS SHALL BE IN ACCORDANCE WITH THE PROCEDURES AS SHOWN ON THIS SHEET.

#3

14 3/4"

2'-0"

BE PLACED ON INSIDE OF SPIRALS. LENGTH AND WEIGHT OF COLUMN SPIRALS DO NOT INCLUDE

2'-3" 21 3/4"

2'-7"

SPLICES OR SPACERS.
REINFORCING STEEL (GRADE 60) FY = 60,000 PSI.

C

D

B

SHAPE 34
(SHAPE 35 SHALL BE A
DEFORMED OR PLAIN

SHAPE 33

Detailed
Checked

SPIRAL BAR OR WIRE.)

SHAPE 35

Note: This drawing is not to scale. Follow dimensions.

D

NOTE:

180° HOOKS 90° HOOKS

D

4 1/2"

H

K

Sheet No. 2 of 2

BENDING DIAGRAMS

1-1/2 TURNS

2"

APPROX.

D

#4

HOOK
A OR G

D
(IN.)

C PITCH

A OR G

SIZE

H

HOOK

(IN.)

HOOK

12d

H
DIMENSION

DETAILING

DIMENSION

DETAILING

A OR G

D

SIZE

135

A OR G

BAR

HOOK

d

d
6

D

BAR

D
90

K

B

ALL GRADES

GRADES 40 - 50 - 60 KSI

D

d

END HOOK DIMENSIONS

DETAILING DIMENSION

E

STIRRUP HOOK DIMENSIONS

G

E
D

K

H

A OR G

HOOK

12d FOR #6

B

SHAPE 29

H

A
6d FOR #4 AND #5,

K

SHAPE 27
E

G

SHAPE 36

105 WEST CAPITOL

C

SHAPE 23

JEFFERSON CITY, MO 65102

B
K

1-888-ASK-MODOT (1-888-275-6636)

1-1/2 TURNS

B

3" PITCH

E

H

D

COMMISSION

C

C

SHAPE 21

MISSOURI HIGHWAYS AND TRANSPORTATION

DATE

B


BIM2-2 EndMod WS-BB  Effective: July 2021  Supersedes: Feb. 2021

BILL OF REINFORCING STEEL

No. Req'd.  Dimension  No. EA.  Weight  Bill of Rebar

<table>
<thead>
<tr>
<th>No.</th>
<th>Size</th>
<th>EA.</th>
<th>Nominal</th>
<th>ACTUAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>1/2</td>
<td>1</td>
<td>1.5</td>
<td>1.0</td>
</tr>
<tr>
<td>#2</td>
<td>3/4</td>
<td>2</td>
<td>2.0</td>
<td>1.5</td>
</tr>
<tr>
<td>#3</td>
<td>1</td>
<td>4</td>
<td>4.0</td>
<td>3.5</td>
</tr>
<tr>
<td>#4</td>
<td>1-1/4</td>
<td>8</td>
<td>8.0</td>
<td>7.5</td>
</tr>
<tr>
<td>#5</td>
<td>1-3/4</td>
<td>16</td>
<td>16.0</td>
<td>15.5</td>
</tr>
<tr>
<td>#6</td>
<td>2</td>
<td>32</td>
<td>32.0</td>
<td>31.5</td>
</tr>
<tr>
<td>#7</td>
<td>3</td>
<td>64</td>
<td>64.0</td>
<td>63.5</td>
</tr>
</tbody>
</table>

Note: This drawing is not to scale. Follow dimensions.
Standard Drawing Guidance:
(Do not show on plans)

See Technician Info/TipsAndHelp/AttachBoringPDFsToBridgePlans on Development Section SharePoint page for instructions for attaching PDFs as rasters.

For one 11x17 Geotechnical Data sheet, snap to top left corner of left guidance box and snap anywhere for other corner, filling as much of the available space as possible. Delete boxes or turn off Constructions level.
Construction joint key not shown for clarity. See standard plans for details.

Note: This drawing is not to scale. Follow dimensions.
Standard Drawing Guidance
(Do not show on plans. Turn off the Bridge Construction level to hide)

Some details have been grouped together listing multiple details with the same fill heights. To edit grouped details, select them and press Ctrl + U.

1. Ahead station is shown for streams flowing left to right. Arrow must be flipped for streams that flow right to left.

2. Modify Estimated Quantities as required. Don't leave blank rows but leave space between Estimated Quantities and General Notes for at least one pay item to be added during construction. See Alternate Details for culvert extensions, or if five items are required.

3. Add any required transverse joints proportionally spaced along the barrel. Label units and add actual lengths of units along the barrel.

4. Insert 5/D 703.47 when pipe inlets are required. Add pipe inlets to Plan of Layout Dimensions at appropriate locations and to Elevation A-A if visible from elevation. Add inlet data using notes where space allows, or use tables.

5. For nonstandard culverts with only one design fill height, add supplemental reinforcement table.

6. No need to revise General Elevation A-A for dual roadways. In Fill Heights table, add lane designation after Rdwy and insert another row for the other lane.

*** VARIABLE DESIGN FILL HEIGHTS ***

Select and delete the details grouped with the fill heights listed. Select and move alternate grouped details to drawing.

Pipes With Same Diameter

<table>
<thead>
<tr>
<th>Station</th>
<th>Offset</th>
<th>F.L. Elev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>xx+xx.xx</td>
<td>xx.xx</td>
<td>xxx.xx</td>
</tr>
</tbody>
</table>

Pipes With Different Diameters

<table>
<thead>
<tr>
<th>Station</th>
<th>Offset</th>
<th>Dia.</th>
<th>F.L. Elev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>xx+xx.xx</td>
<td>xx.xx</td>
<td>xx&quot;</td>
<td>xxx.xx</td>
</tr>
</tbody>
</table>

Ex. Use 0.5 detail for 36" pipe into a 6' tall culvert.

Substitute table for tables shown on Standard Plan 703.47.
If any part of the barrel is exposed, the roadway fill shall be warped to provide 12 inches minimum cover. [Roadway Item]

Construction joint key not shown for clarity. See standard plans for details.

If unsuitable material is encountered, excavation of unsuitable material and furnishing and placing of granular backfill shall be in accordance with Sec 206.

If any part of the barrel is exposed, the roadway fill shall be warped to provide 12 inches minimum cover. [Roadway Item]

Construction joint key not shown for clarity. See standard plans for details.

If unsuitable material is encountered, excavation of unsuitable material and furnishing and placing of granular backfill shall be in accordance with Sec 206.

Dimensions are based on end units, except AA is based on Unit. Fill heights are measured from the top of top slab to the top of earth fill or roadway.

Fill Heights

<table>
<thead>
<tr>
<th>Unit No</th>
<th>Length</th>
<th>Barrels Length</th>
<th>Granular Backfill Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Alternate Details for Multiple Design Fill Heights

Estimated Quantities

<table>
<thead>
<tr>
<th>Unit No</th>
<th>Length</th>
<th>Barrels Length</th>
<th>Granular Backfill Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Substitute table for tables shown on Standard Plan 703.47
2( 'x ' ) CONCRETE BOX CULVERT

**Hydrologic Data**

- **Drainage Area**: 703.37, 703.42, 703.46, 703.47
- **Standard Plans**: Miss.
- **Reinforcing Steel (Grade 60)**: fy = 60,000 psi
- **Class B-1 Concrete (Box Culvert)**: f'c = 4,000 psi
- **Design Loading**: Vehicular = HL-93 minus lane load, Earth = 120 lb/cf

**Design Specifications**

- **2010 AASHTO LRFD Bridge Design Specifications and 2010 Interim Revisions**
- **Interim Revisions**: 2010 AASHTO LRFD Bridge Design Specifications and 2010 Interim Revisions
- **General Notes**: Design Specifications:

**Estimated Quantities**

- **Class 6 Excavation**: cu. yard
- **Reinforcing Steel (Concrete Culvert)**: cu. yard
- **Reinforcing Steel (Concrete Box)**: cu. yard

**General Notes**

- **Culvert-Bridge**: H-L-93 minus lane load, Earth = 120 lb/cf
- **Equivalent Fluid Pressure**: 30 lb/cf (min.), 60 lb/cf (max.)
- **Reinforcement and dimensions for wings and headwalls shall be in accordance with MoDOT Construction personnel will indicate the type of box culvert constructed.
- **Class B-1 Concrete (Box Culvert)**: f'c = 4,000 psi
- **Reinforcing Steel (Grade 60)**: fy = 60,000 psi
- **Equivalent Fluid Pressure**: 30 lb/cf (min.), 60 lb/cf (max.)
- **Reinforcing Steel (Concrete Culvert)**: cu. yard
- **Reinforcing Steel (Concrete Box)**: cu. yard
Some details have been grouped together to allow easy substitution with alternate details. To edit grouped details, select them and press <Ctrl> U.

1. Ahead station is shown for streams flowing left to right. Arrow must be flipped for streams that flow right to left.

2. Modify Estimated Quantities as required. Don't leave blank rows but leave space between Estimated Quantities and General Notes for at least one pay item to be added during construction. See Alternate Details for Culvert Extensions, or if five items are required.

3. Add any required transverse joints proportionally spaced along the barrel. Label units and add actual lengths of the units along the barrel.

4. Insert STD 703.60 when pipe inlets are required. Add pipe inlets to Plan of Layout Dimensions at appropriate locations and to Elevation A-A if visible from elevation. Add inlet data to alternate details where space allows, or use tables.

5. For nonstandard culverts with only one design fill height, add supplemental reinforcement table.

6. No need to revise General Elevation A-A for dual roadways. In Fill Heights table add a lane designation after Rdwy and insert another row for the other lane.

---

*** VARIABLE DESIGN FILL HEIGHTS ***

1. Select and delete the details grouped with the fill heights table. Select and move the alternate grouped details to drawing.

2. Place "See Member Thickness table" in the operation column and place "Varies" in the dim. column. If dimension F varies, place "Varies" in the dim. column.

3. Remove blank rows. End units may have different design fill heights but both units need to have the same member thicknesses.

4. Insert STD 703.60 when pipe inlets are required. Add pipe inlets to Plan of Layout Dimensions at appropriate locations and to Elevation A-A if visible from elevation. Add inlet data to alternate details where space allows, or use tables.

---

Supplemental Pipe Inlet Details

---

Alternate Plan of Transverse Joints
If any part of the barrel is exposed, the roadway fill shall be warped to provide 12 inches minimum.
2(‘x’ ) CONCRETE BOX CULVERT

**General Elevation A-A**

- **Elevations**
  - **Fill Heights**
  - **Class 6 Excavation**
  - **Class B-1 Concrete (Culverts-Bridge)**

- **Hydraulic Data**
  - **Design Flow Frequency**
  - **Design Flood (50-year) Elevation**
  - **Base Flood Elevation**
  - **Design Flood (100-year) Elevation**
  - **Estimated Backwater**
  - **Overtopping Flood Discharge**
  - **Design Flood Discharge**

- **General Notes**
  - **Design Specifications**
  - **Design Loading**
  - **Design Unit Stresses**
  - **Equivalent Fluid Pressure**

**Estimated Quantities**

**Miscellaneous**

**Note:** This drawing is not to scale. Follow dimensions.
Standard Drawing Guidance

- Do not show on plans. Turn off the Bridge Construction level to hide.

Some details have been grouped together to allow easy substitution with alternate details. To edit grouped details, select them and press Ctrl+U.

1. Ahead station is shown for streams flowing left to right. Arrow must be flipped for streams that flow right to left.

2. Modify Estimated Quantities as required. Don't leave blank rows but leave space between Estimated Quantities and General Notes for at least one pay item to be considered. If two pay items are shown under Fill Height, supplement alternate groups of details to drawing.

3. Add any required transverse joints proportionally spaced along barrel. Label units and add actual lengths of units along the barrel.

4. Insert STD 703.60 when pipe inlets are required. Add pipe inlets to plan of layout dimensions at appropriate locations and to Elevation A-A if visible from elevation. Add inlet data using notes where space allows, or use tables.

5. No need to revise General Elevation A-A for dual roadways. In Fill Heights table add a lane designation after $Rdwy and insert another row for the other lane.

### VARIABLE DESIGN FILL HEIGHTS ***

1. For nonstandard culverts with only one design fill height, add supplemental reinforcement table.

2. Insert and delete the details grouped with the fill height table and replace alternate details to drawing.

3. Place "See Member Thickness table" in the Dimension column and place "Varies" in the Dim. column, if Dimension F varies, place "Varies" in the Dim. column.

4. Use 0.5 detail for 36" pipe into a 6' tall culvert.

5. Insert STD 703.60 when culverts are required. Add pipe inlets to Plan of Layout Dimensions at appropriate locations and to Elevation A-A if visible from elevation. Add inlet data using notes where space allows, or use tables.

### Alternate Plan of Transverse Joints

---

### Inlets Sized for Elevation A-A (Pipe Diameter/Culvert HT)

<table>
<thead>
<tr>
<th>Station</th>
<th>Offset</th>
<th>F.L. Elev.</th>
<th>Dia.</th>
</tr>
</thead>
<tbody>
<tr>
<td>xx</td>
<td>xx.xx</td>
<td>xx.xx' XX</td>
<td>xx</td>
</tr>
<tr>
<td>xx</td>
<td>xx.xx</td>
<td>xx.xx' XX</td>
<td>xx</td>
</tr>
<tr>
<td>xx</td>
<td>xx.xx</td>
<td>xx.xx' XX</td>
<td>xx</td>
</tr>
</tbody>
</table>

### Supplemental Pipe Inlet Details

<table>
<thead>
<tr>
<th>Station</th>
<th>Offset</th>
<th>F.L. Elev.</th>
<th>Dia.</th>
</tr>
</thead>
<tbody>
<tr>
<td>xx</td>
<td>xx.xx</td>
<td>xx.xx' XX</td>
<td>xx</td>
</tr>
<tr>
<td>xx</td>
<td>xx.xx</td>
<td>xx.xx' XX</td>
<td>xx</td>
</tr>
<tr>
<td>xx</td>
<td>xx.xx</td>
<td>xx.xx' XX</td>
<td>xx</td>
</tr>
</tbody>
</table>

### Top Slab Reinforcement

<table>
<thead>
<tr>
<th>Slant Bar</th>
<th>B1 Bars</th>
<th>B2 Bars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sz.</td>
<td>Spa.</td>
<td>Sz.</td>
</tr>
</tbody>
</table>

### Bottom Slab Reinforcement

<table>
<thead>
<tr>
<th>H1 Bars</th>
<th>H2 Bars</th>
<th>H3 Bars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spa.</td>
<td>Sz.</td>
<td>Spa.</td>
</tr>
</tbody>
</table>

### Wall Reinforcement

<table>
<thead>
<tr>
<th>J1 Bars</th>
<th>J2 Bars</th>
<th>J3 Bars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spa.</td>
<td>Sz.</td>
<td>Spa.</td>
</tr>
</tbody>
</table>

---

### Substitute table for tables shown on Standard Plan 703.40

---

### Supplemental Reinforcement Table (Nonstandard culverts with only one design fill height)

<table>
<thead>
<tr>
<th>Slant Bar</th>
<th>B1 Bars</th>
<th>B2 Bars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sz.</td>
<td>Spa.</td>
<td>Sz.</td>
</tr>
</tbody>
</table>

---

### Alternate Plan of Transverse Joints

---

### Inlets Sized for Elevation A-A (Pipe Diameter/Culvert HT)

<table>
<thead>
<tr>
<th>Station</th>
<th>Offset</th>
<th>F.L. Elev.</th>
<th>Dia.</th>
</tr>
</thead>
<tbody>
<tr>
<td>xx</td>
<td>xx.xx</td>
<td>xx.xx' XX</td>
<td>xx</td>
</tr>
<tr>
<td>xx</td>
<td>xx.xx</td>
<td>xx.xx' XX</td>
<td>xx</td>
</tr>
<tr>
<td>xx</td>
<td>xx.xx</td>
<td>xx.xx' XX</td>
<td>xx</td>
</tr>
</tbody>
</table>

### Supplemental Pipe Inlet Details

<table>
<thead>
<tr>
<th>Station</th>
<th>Offset</th>
<th>F.L. Elev.</th>
<th>Dia.</th>
</tr>
</thead>
<tbody>
<tr>
<td>xx</td>
<td>xx.xx</td>
<td>xx.xx' XX</td>
<td>xx</td>
</tr>
<tr>
<td>xx</td>
<td>xx.xx</td>
<td>xx.xx' XX</td>
<td>xx</td>
</tr>
<tr>
<td>xx</td>
<td>xx.xx</td>
<td>xx.xx' XX</td>
<td>xx</td>
</tr>
</tbody>
</table>

### Top Slab Reinforcement

<table>
<thead>
<tr>
<th>Slant Bar</th>
<th>B1 Bars</th>
<th>B2 Bars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sz.</td>
<td>Spa.</td>
<td>Sz.</td>
</tr>
</tbody>
</table>

### Bottom Slab Reinforcement

<table>
<thead>
<tr>
<th>H1 Bars</th>
<th>H2 Bars</th>
<th>H3 Bars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spa.</td>
<td>Sz.</td>
<td>Spa.</td>
</tr>
</tbody>
</table>

### Wall Reinforcement

<table>
<thead>
<tr>
<th>J1 Bars</th>
<th>J2 Bars</th>
<th>J3 Bars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spa.</td>
<td>Sz.</td>
<td>Spa.</td>
</tr>
</tbody>
</table>
If any part of the barrel is exposed, the roadway fill shall be warped to provide 12 inches minimum cover. (Roadway Item)

Construction joint key not shown for clarity, see standard plans for details.

If unsuitable material is encountered, excavation of unsuitable material and furnishing and placing of granular backfill shall be in accordance with Sec 206.

---

**Estimated Quantities**

<table>
<thead>
<tr>
<th>Item</th>
<th>Class 4 Excavation</th>
<th>Class B-1 Concrete</th>
<th>Reinforcing Steel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partial Removal of Culvert-Bridge Concrete</td>
<td>cu. yard</td>
<td>lump sum</td>
<td>pound</td>
</tr>
<tr>
<td>Partial Removal of Culvert-Bridge Concrete (Concrete)</td>
<td>cu. yard</td>
<td>lump sum</td>
<td>pound</td>
</tr>
<tr>
<td>Substitution for tables shown on Standard Plan 703.47</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Fill Heights**

<table>
<thead>
<tr>
<th>ndy at Culvert</th>
<th>ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design Units 1 &amp; 2</td>
<td>ft</td>
</tr>
<tr>
<td>Design Units 3 &amp; 4</td>
<td>ft</td>
</tr>
</tbody>
</table>

**Alternate Estimated Quantities for Culvert Extensions or when Five Items are Required**

---

**Plan of Layout Dimensions**

- **Plan of Transverse Joints and Stage Construction**
- **Alternate Details for Multiple Design Fill Heights**
- **Alternate Details for Multiple Design Fill Heights**

---

**Unit No.**

- **Length**
- **Member Thickness**
- **Top Slab Reinforcement**
- **Bottom Slab Reinforcement**
- **Wall Reinforcement**

---

**Corresponds to the border of the standard drawing for ease in moving alternate details (Snap to corner).**
GENERAL ELEVATION A-A

**Hydrologic Data**

<table>
<thead>
<tr>
<th>Hydrographic Area</th>
<th>Design Flood Frequency</th>
<th>Design Flood Discharge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Downstream (Elev. 2)</td>
<td>100 years</td>
<td>1200 cfs</td>
</tr>
<tr>
<td>Upstream (Elev. 1)</td>
<td>100 years</td>
<td>1200 cfs</td>
</tr>
</tbody>
</table>

**Location Sketch**

<table>
<thead>
<tr>
<th>Location Sketch Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Notes:</td>
</tr>
<tr>
<td>Design Specifications:</td>
</tr>
<tr>
<td>2010 AASHTO LRFD Bridge Design Specifications and 2010 Interim Revisions</td>
</tr>
<tr>
<td>Design Loading:</td>
</tr>
<tr>
<td>Vehicle = 13 ton, 3.2% grade, 10 mph</td>
</tr>
<tr>
<td>Equivalent Fluid Pressure = 60 lb/cf (min.), 90 lb/cf (max)</td>
</tr>
<tr>
<td>Design Unit Stresses:</td>
</tr>
<tr>
<td>Reinforcing Steel (Culverts-Bridge) fy = 60,000 psi</td>
</tr>
<tr>
<td>Design Loading:</td>
</tr>
<tr>
<td>Vehicular = HL-93 minus lane load, Earth = 120 lb/cf</td>
</tr>
<tr>
<td>Design Loading:</td>
</tr>
<tr>
<td>Interim Revisions:</td>
</tr>
<tr>
<td>2010 AASHTO LRFD Bridge Design Specifications and 2010 Interim Revisions</td>
</tr>
<tr>
<td>General Notes:</td>
</tr>
<tr>
<td>Design Specifications:</td>
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<tr>
<td>Design Loading:</td>
</tr>
<tr>
<td>Interim Revisions:</td>
</tr>
<tr>
<td>2010 AASHTO LRFD Bridge Design Specifications and 2010 Interim Revisions</td>
</tr>
</tbody>
</table>

**Concrete Box Culvert Specifications**

<table>
<thead>
<tr>
<th>Concrete Box Culvert Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Culvert Specifications</td>
</tr>
<tr>
<td>2010 AASHTO LRFD Bridge Design Specifications and 2010 Interim Revisions</td>
</tr>
<tr>
<td>Design Loading:</td>
</tr>
<tr>
<td>Vehicle = 13 ton, 3.2% grade, 10 mph</td>
</tr>
<tr>
<td>Equivalent Fluid Pressure = 60 lb/cf (min.), 90 lb/cf (max)</td>
</tr>
<tr>
<td>Design Unit Stresses:</td>
</tr>
<tr>
<td>Reinforcing Steel (Culverts-Bridge) fy = 60,000 psi</td>
</tr>
<tr>
<td>Design Loading:</td>
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<tr>
<td>Vehicular = HL-93 minus lane load, Earth = 120 lb/cf</td>
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<td>Design Loading:</td>
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<tr>
<td>Interim Revisions:</td>
</tr>
<tr>
<td>2010 AASHTO LRFD Bridge Design Specifications and 2010 Interim Revisions</td>
</tr>
</tbody>
</table>

**Concrete Box Culvert Specifications**

<table>
<thead>
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<tbody>
<tr>
<td>Culvert Specifications</td>
</tr>
<tr>
<td>2010 AASHTO LRFD Bridge Design Specifications and 2010 Interim Revisions</td>
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</tr>
<tr>
<td>Reinforcing Steel (Culverts-Bridge) fy = 60,000 psi</td>
</tr>
<tr>
<td>Design Loading:</td>
</tr>
<tr>
<td>Vehicular = HL-93 minus lane load, Earth = 120 lb/cf</td>
</tr>
<tr>
<td>Design Loading:</td>
</tr>
<tr>
<td>Interim Revisions:</td>
</tr>
<tr>
<td>2010 AASHTO LRFD Bridge Design Specifications and 2010 Interim Revisions</td>
</tr>
</tbody>
</table>
Standard Drawing Guidance
Do not show on plans. Turn off the Bridge Construction level to hide.

Some details have been grouped together to allow easy substitution with alternate details. To edit grouped details, select them and press <Ctrl> U.

1. Ahead station is shown for streams flowing left to right. Arrow must be flipped for streams that flow right to left.

2. Modify Estimated Quantities as required. Don't leave blank rows but leave space between Estimated Quantities and General Notes for at least one pay item to be added during construction. See Alternate Details for culvert extensions, or if five items are required.

3. Add any required transverse joints proportionately spaced along the barrel. Label units and add actual lengths of units along the barrel.

4. Insert STD 703.60 when pipe inlets are required. Add pipe inlets to Plan of Layout Dimensions at appropriate locations and to Elevation A-A if visible from elevation. Add notes where space allows, or use tables.

5. For nonstandard culverts with only one design fill height, add supplemental reinforcement table.

6. No need to revise General Elevation A-A for dual roadways. If fill heights table add a lane designation after Rdwy and insert another row for the other lane.

*** VARIABLE DESIGN FILL HEIGHTS ***

4. Select and delete the details grouped with the fill heights table. Select and move the alternate grouped details to drawing.

5. Place "See Member Thickness table" in the Dim. column and place "Varies" in the Dim. column. If Dimension F varies, place "Varies" in the Dim. column.

6. This portion of table required when design fill height exceeds limits of the standard plans or when culvert cell height or span is not standard. If only a portion of the units have different design fill heights but both units need to have the same member thicknesses.

7. Substitute table for tables shown on Standard Plan 703.47.
If any part of the barrel is exposed, the roadway fill shall be warped to provide 12 inches minimum cover. (Roadway Items)

Construction joint key not shown for clarity. See standard plans for details.

If unsuitable material is encountered, excavation of unsuitable material and furnishing and placing of granular backfill shall be in accordance with Sec 206.

Dimensions are based on end units, except AA is based on Unit  . Fill heights are measured from the top of top slab to the top of earth fill or roadway.

Remove if not applicable.

Corresponds to the border of the standard drawing for ease in moving alternate details (Snap to corner).

**Estimated Quantities**

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Final</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class &amp; Excavation</td>
<td>cu. yard</td>
</tr>
<tr>
<td>Temporary Shoring</td>
<td>lump sum</td>
</tr>
<tr>
<td>Partial Removal of Culvert-Bridge Concrete</td>
<td>lump sum</td>
</tr>
<tr>
<td>Class B) Concrete (Culverts-Bridge)</td>
<td>cu. yard</td>
</tr>
<tr>
<td>Re-Harding Steel (Culverts-Bridge)</td>
<td>pound</td>
</tr>
</tbody>
</table>

Substitute table for tables shown on Standard Plan 703.47
**Missouri Highways and Transportation Commission**

**Design Specifications:**
- 2020 MISSOURI LAKE BRIDGE Design Specifications and 2006 Interim Revisions
- Design Loading: 4000 Ib, 100 mile lane load, Earth = 120 lb/ft, Live = 240 lb/ft
- Design Unit Stresses: Vehicular = HL-93 minus lane load, Earth = 120 lb/cf, Live = 240 lb/cf
- Design Unit Stresses: Class C, Concrete (Box Culvert) f'c = 4,000 psi
- Design Unit Stresses: Class B-1 Concrete (Culverts-Bridge) f'c = 4,000 psi
- Design Unit Stresses: Class 4 Excavation
- Design Unit Stresses: Vehicular = HL-93 minus lane load, Earth = 120 lb/cf, Live = 240 lb/cf
- Design Unit Stresses: Class B-1 Concrete (Box Culvert)
- Class C, Concrete (Box Culvert)
- Class B-1, Concrete (Culverts-Bridge)
- Reinforcing Steel (Culverts-Bridge) 20 gage

**General Notes:**
- Design Specifications: 2020 MISSOURI LAKE BRIDGE Design Specifications and 2006 Interim Revisions
- Design Loading: 4000 Ib, 100 mile lane load, Earth = 120 lb/ft, Live = 240 lb/ft
- Design Unit Stresses: Vehicular = HL-93 minus lane load, Earth = 120 lb/cf, Live = 240 lb/cf
- Design Unit Stresses: Class C, Concrete (Box Culvert)
- Design Unit Stresses: Class B-1 Concrete (Box Culvert)
- Design Unit Stresses: Class B-1 Concrete (Culverts-Bridge)
- Design Unit Stresses: Class C, Concrete (Culverts-Bridge)
- Design Unit Stresses: Class B-1, Concrete (Culverts-Bridge)
- Reinforcing Steel (Culverts-Bridge) 20 gage

**Estimates Quantities:**
- Estimated Backwater = 4 ft
- Estimated Overtopping Flood (years) = 10
- Estimated Overtopping Flood Discharge = 100 cfs
- Estimated Outlet Velocity = 5 ft/s
- Estimated Estimated Backwater = 4 ft
- Estimated Overtopping Flood (years) = 10
- Estimated Overtopping Flood Discharge = 100 cfs
- Estimated Outlet Velocity = 5 ft/s

**Elevations:**
- Upstream Elev. = 10 ft
- Downstream Elev. = 10 ft
- Design Flood Elevation = 10 ft
- Design Flood Discharge = 100 cfs
- Design Flood Frequency = 100 years

**Hydrologic Data:**
- Drainage Area = 100 sq ft
- Design Flood Frequency = 100 years
- Design Flood Discharge = 100 cfs
- Design Flood Elevation = 10 ft

**Location Sketch:**
- Culvert-Bridge: Route * Over *
- Route * From * To *
- ADOT * MILLS * OR *
- TIE STA.

**General: Note:**
- This drawing is not to scale. Follow dimensions.

**DATE**
- 10/13/2023

**LOCATION SKETCH**
- *Miles * of * Route * from * to *

**CULVERT-BRIDGE: ROUTE * OVER *
- ROUTE * FROM * TO *
- ADOT * MILLS * OR *
- TIE STA.
Standard Drawing Guidance

Do not show on plans. Turn off the Bridge Construction level (adv hide).

Some details have been grouped together to allow easy substitution with alternate details. To edit grouped details, select them and press <Ctrl> U.

1 Ahead station is shown for streams flowing left to right. Arrow must be flipped for streams that flow right to left.

2 Modify Estimated Quantities as required. Don't leave blank rows but leave space between estimated quantities and General Notes for at least one pay item to be added during construction. See Alternate Details for culvert extensions, or if five items are required.

3 Add any required transverse joints proportionally spaced along the barrel. Label units and add actual lengths of units along the barrel.

4 Insert STD 703.60 when pipe inlets are required. Add pipe inlets to Plan of Layout Dimensions at appropriate locations and to elevation A-A if visible from elevation. Add inlet data using notes where space allows, or use tables.

5 For nonstandard culverts with only one design fill height, add supplemental reinforcement table. Substitute table for tables shown on Standard Plan 703.47.

6 No need to revise General Elevation A-A for dual roadways. In Fill Heights table add a lane designation after each new and insert another row for the other lane.

7 For slopes 25° or more, remove Detail C, remove TT from the equation for D and place "N/A" in the Dim. column for Dim. TT. Will first need to drop Detail C from group by selecting it, then pressing <Ctrl> U.

8 For standard culverts with only one design fill height, add supplemental reinforcement table. Substitute table for tables shown on Standard Plan 703.47.

9 For nonstandard culverts with only one design fill height, add supplemental reinforcement table. Substitute table for tables shown on Standard Plan 703.47.

10 For nonstandard culverts with only one design fill height, add supplemental reinforcement table. Substitute table for tables shown on Standard Plan 703.47.
If any part of the barrel is exposed, the roadway fill shall be warped to provide 12 inches minimum cover. (Roadway Item)

Construction joint key not shown for clarity, see standard plans for details.

If unsuitable material is encountered, excavation of unsuitable material and furnishing and placing of granular backfill shall be in accordance with Sec 206.

Dimensions are based on end units, except AA is based on Unit 1. Fill heights are measured from the top of top slab to the top of earth fill or roadway.

Fill Heights

- A + B
- A + C

Alternate Estimated Quantities for Culvert Extensions or when Five Items are Required

Estimated Quantities

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Final</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class A Excavation</td>
<td>cu. yard</td>
</tr>
<tr>
<td>Temporary Shoring</td>
<td>lump sum</td>
</tr>
<tr>
<td>Partial Removal of Culvert-Bridge Concrete</td>
<td>lump sum</td>
</tr>
<tr>
<td>Class B-1 Concrete (Culverts-Bridge)</td>
<td>cu. yard</td>
</tr>
<tr>
<td>Reinforcing Steel (Culverts-Bridge)</td>
<td>pound</td>
</tr>
</tbody>
</table>

Alternate Estimated Quantities for Culvert Extensions or when Five Items are Required

Remove if not applicable.

Tie Station

Detailed Tolerances

- Top Slab Reinforcement
- Bottom Slab Reinforcement
- Wall Reinforcement

Substitute table for tables shown on Standard Plan 703.47
1. Ahead station is shown for streams flowing left to right. Arrow must be flipped for streams that flow right to left.

2. Remove blank rows. End units may have different design fill heights but both units need to have the same member thicknesses.

3. Place "See Member Thickness table" in the Equation column and place "Varies" in the Dim. column. If Dimension F varies, place "Varies" in the Dim. column. Ex: Use 0.5 detail for 36" pipe into a 6' tall culvert.

4. Insert STD 703.60 when pipe inlets are required. Add pipe inlets to Plan of Layout Dimensions at appropriate locations and to Elevation A-A if visible from elevation. Add inlet data using notes where space allows, or use tables.

5. For nonstandard culverts with only one design fill height, add supplemental reinforcement table.

6. Select and delete the details grouped with the Fill Heights table. Select and move the alternate grouped details to drawing. This portion of table required when design fill height exceeds limits of the standard plans or when culvert cell height or span is not standard. If only a portion of the units are nonstandard, fill out entire table using the values from the standard table where applicable. Omit if not required.

7. Add any required transverse joints proportionally spaced along the barrel. Label units and add actual lengths of units along the barrel.

8. No need to revise General Elevation A-A for dual roadways. In Fill Heights table add a lane designation after Rdwy and insert another row for the other lane.

### Pipes With Same Diameter

<table>
<thead>
<tr>
<th>Station</th>
<th>Offset</th>
<th>F.L. Elev.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Pipes With Different Diameters

<table>
<thead>
<tr>
<th>Station</th>
<th>Offset</th>
<th>F.L. Elev.</th>
<th>Dia.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Inlets Sized for Elevation A-A

<table>
<thead>
<tr>
<th>Station</th>
<th>Offset</th>
<th>F.L. Elev.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Supplemental Pipe Inlet Details

<table>
<thead>
<tr>
<th>XX&quot; Pipe Inlet Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Station</td>
</tr>
<tr>
<td>Offset</td>
</tr>
<tr>
<td>F.L. Elev.</td>
</tr>
<tr>
<td>XX&quot;</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

### Alternate Plan of Transverse Joints

<table>
<thead>
<tr>
<th>Unit No.</th>
<th>Trans. Jt.</th>
<th>Culvert</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### General Notes

- Modify Estimated Quantities as required. Don’t leave blank rows but leave space between Estimated Quantities and General Notes for at least one pay item to be added during construction. See Alternate Details for culvert extensions, or if five items are required.
If any part of the barrel is exposed, the roadway fill shall be warped to provide 12 inches minimum cover. (Roadway Items)

Construction joint key not shown for clarity, see standard plans for details.

If unsuitable material is encountered, excavation of unsuitable material and furnishing and placing of granular backfill shall be in accordance with Sec 206.

Alternate Estimated Quantities for Culvert Extensions or when five items are required

Fill Heights

Dimensions are based on end units, except AA is based on Unit.

Fill Heights are measured from the top of top slab to the top of earth fill or roadway.

---

Alternate Estimated Quantities for Culvert Extensions or when five items are required

Location Sketch
Granular Backfill Limits

W = Total length normal to roadway or median

W = 3(4'x') ConcreCe Box Culvert

Hydrologie Data

Drainage Area = ft²

Design Flood Frequency = years

Design Flood Discharge = cfs

Base Flood Discharge = cfs

Design Flood Elevation = ft

Design Flood Frequency = years

Overtopping Flood Discharge = cfs

Overtopping Flood Frequency = years

Base Flood Elevation = ft

Flood Elevation = ft

Design Flood Elevation = ft

Design Flood Discharge = cfs

Drainage Area = mi²

General Notes:

Design Specifications:

General Notes:

Reinforcing Steel (Grade 60) fy = 60,000 psi

Junctions:

Government = 600 lbs per ft

Roadway = 600 lbs per ft

Class B-1 Concrete (Box Culvert) f'c = 4,000 psi

Design Loading:

Vehicular = HL-93 minus lane load, Earth = 120 lb/cf

Equivalent Fluid Pressure = 30 lb/ft³ (min.), 60 lb/ft³ (max.)

Design Units:

Vehicles = 60 tons, 10 axles

Concrete:

Design Unit Stresses:

Reinforcement and dimensions for wings and headwalls shall be in accordance with Sec. 206

Removal of Bridges

(See Roadway Plans)

Construction joint key not shown for clarity, see standard plans for details.

Unsuitable material encountered: excavation of unsuitable material and placement of granular backfill shall be in accordance with Sec. 206.

Any part of the barrel is exposed, the roadway fill shall be tapered to match culvert openings. (Roadway Item)

Is unsuitable material encountered, excavation of unsuitable material and provision of 12 inches minimum cover. (Roadway Item)

If unsuitable material is encountered, excavation of unsuitable material and provision of 12 inches minimum cover. (Roadway Item)

Construction joint key not shown for clarity, see standard plans for details.

If any part of the barrel is exposed, the roadway fill shall be tapered to match culvert openings. (Roadway Item)

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Construction joint key not shown for clarity, see standard plans for details.
If any part of the barrel is exposed, the roadway fill shall be warped to provide 12 inches minimum cover (roadway item).

Construction joint key not shown for clarity, see standard plans for details.

If unsuitable material is encountered, excavation of unsuitable material and furnishing and placing of granular backfill shall be in accordance with Sec 206.

Dimensions are based on end units, except AA is based on Unit 1. Fill heights are measured from the top of top slab to the top of earth fill or roadway.

Fill Heights

- Rdwy at Culvert = ft
- Design Units 1 & 2 = ft
- Design Units 3 & = ft

Fill heights are measured from the top of top slab to the top of earth fill of roadway.

Estimated Quantities

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Final</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class A Excavation</td>
<td>cu. yard</td>
</tr>
<tr>
<td>Temporary Shoring</td>
<td>lump sum</td>
</tr>
<tr>
<td>Partial Removal of Culvert-Bridge Concrete</td>
<td>cu. yard</td>
</tr>
<tr>
<td>Class B-1 Concrete (Culverts-Bridge)</td>
<td>cu. yard</td>
</tr>
<tr>
<td>Re-enforcing Steel (Culverts-Bridge)</td>
<td>pound</td>
</tr>
<tr>
<td>Partial Removal of Culvert-Bridge Concrete</td>
<td>lump sum</td>
</tr>
</tbody>
</table>

Plan of Transverse Joints and Stage Construction

Remove if not applicable.

Alternate Estimated Quantities for Culvert Extensions or when five items are required.
Standard Drawing Guidance

Some details have been grouped together to allow easy substitution with alternative
details. To edit grouped details, select them and press <Ctrl> U.

1. **Ahead station is shown for streams flowing left to right. Arrow must be flipped for streams that flow right to left.**

2. **Modify Estimated Quantities as required. Don’t leave blank rows but leave space between Estimated Quantities and General Notes for at least one pay item to be added during construction. See Alternate Details for culvert extensions, or if five items are required.**

3. **Add any required transverse joints proportionally spaced along the barrel. Label top and bottom slab reinforcement with actual lengths of units along the barrel.**

4. **Insert STD 703.60 when pipe inlets are required. Add pipe inlets to Plan of Layout Dimensions at appropriate locations and to Elevation A-A if visible from elevation. Add inlet data using notes where space allows, or use tab es.**

For nonstandard culverts with only one design fill height, add supplemental reinforcement table.

No need to revise General Elevation A-A for dual roadways. In Fill Heights table add a lane designation after “Rdwy” and insert another row for the other lane.

---

**VARIABLE DESIGN FILL HEIGHTS**

Select and delete the details grouped with the fill heights table. Select and move the alternate grouped details to drawing.

This portion of table required when design fill height exceeds limits of the standard plans. If only a portion of the units are nonstandard, fill out entire table using the values from the standard table where applicable. Unit if not required.

---

**Supplemental Pipe Inlet Details**

- **Pipes With Same Diameter**
  - XX" Pipe Inlet Data
    - Station
    - Offset
    - D. L. Elev.
    - xxx.xx

- **Pipes With Different Diameters**
  - Pipe Inlet Data
    - Station
    - Offset
    - D. L. Elev.
    - xxx.xx

---

**Supplemental Reinforcement Table**

<table>
<thead>
<tr>
<th>Top Slab Reinforcement</th>
<th>Bottom Slab Reinforcement</th>
<th>Wall Reinforcement</th>
</tr>
</thead>
<tbody>
<tr>
<td>J3 Bars</td>
<td>A1 Bars</td>
<td>C1</td>
</tr>
<tr>
<td>J2 Bars</td>
<td>H2 Bars</td>
<td>K2</td>
</tr>
<tr>
<td>J1 Bars</td>
<td>H1 Bars</td>
<td>C5</td>
</tr>
<tr>
<td>J0 Bars</td>
<td>G1 Bars</td>
<td>Q8</td>
</tr>
<tr>
<td>J- Bars</td>
<td>L1 Bars</td>
<td>C6</td>
</tr>
<tr>
<td>J+ Bars</td>
<td>L2 Bars</td>
<td>Q9</td>
</tr>
</tbody>
</table>

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**XX" Pipe Inlet Data**

<table>
<thead>
<tr>
<th>Station</th>
<th>Offset</th>
<th>D. L. Elev.</th>
<th>Dia.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Station</td>
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</tr>
</tbody>
</table>

---

**Alternate Plan of Transverse Joints**

- **Pipes With Same Diameter**
  - Inlets sized for Elevation A-A pipe diameter/fill height

- **Pipes With Different Diameters**
  - Inlet sized for fill height

---

**Substitute table for tables shown on Standard Plan 703.87**

XX" Pipe Inlet Data

<table>
<thead>
<tr>
<th>Station</th>
<th>Offset</th>
<th>D. L. Elev.</th>
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<td>Dia.</td>
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<tr>
<td>Station</td>
<td>Offset</td>
<td>D. L. Elev.</td>
<td>Dia.</td>
</tr>
</tbody>
</table>

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**Supplemental Pipe Inlet Details**

- **Pipes With Same Diameter**
  - XX" Pipe Inlet Data
    - Station
    - Offset
    - D. L. Elev.
    - xxx.xx

- **Pipes With Different Diameters**
  - Pipe Inlet Data
    - Station
    - Offset
    - D. L. Elev.
    - xxx.xx

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**Supplemental Reinforcement Table**

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<td>Q8</td>
</tr>
<tr>
<td>J- Bars</td>
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<td>C6</td>
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<td>J+ Bars</td>
<td>L2 Bars</td>
<td>Q9</td>
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</tbody>
</table>

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**Alternate Plan of Transverse Joints**

- **Pipes With Same Diameter**
  - Inlets sized for Elevation A-A pipe diameter/fill height

- **Pipes With Different Diameters**
  - Inlet sized for fill height

---

**Substitute table for tables shown on Standard Plan 703.87**

XX" Pipe Inlet Data

<table>
<thead>
<tr>
<th>Station</th>
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**Supplemental Pipe Inlet Details**

- **Pipes With Same Diameter**
  - XX" Pipe Inlet Data
    - Station
    - Offset
    - D. L. Elev.
    - xxx.xx

- **Pipes With Different Diameters**
  - Pipe Inlet Data
    - Station
    - Offset
    - D. L. Elev.
    - xxx.xx

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**Supplemental Reinforcement Table**

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<td>C5</td>
</tr>
<tr>
<td>J0 Bars</td>
<td>G1 Bars</td>
<td>Q8</td>
</tr>
<tr>
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<td>L1 Bars</td>
<td>C6</td>
</tr>
<tr>
<td>J+ Bars</td>
<td>L2 Bars</td>
<td>Q9</td>
</tr>
</tbody>
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<td>Station</td>
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<td>D. L. Elev.</td>
<td>Dia.</td>
</tr>
</tbody>
</table>

---

**Alternate Plan of Transverse Joints**

- **Pipes With Same Diameter**
  - Inlets sized for Elevation A-A pipe diameter/fill height

- **Pipes With Different Diameters**
  - Inlet sized for fill height
Construction joint may not be shown for clarity, see standard plans for details. If any part of the barrel is exposed, the roadway fill shall be warped to provide 12 inches minimum cover. (Roadway Item) If unsuitable material is encountered, excavation of unsuitable material and furnishing and placing of granular backfill shall be in accordance with Part 20.

GENERAL ELEVATION A-A

10' (Typ.)

General Notes:
- Design Specifications: Part 60 Standard Bridge Design Specifications and 2015 Interim Revisions
- Design Loading: LRFD HL-93
- Design Unit Stresses:
  - Equivalent Fluid Pressure = 30 lb/cf (min.), 60 lb/cf (max.)
  - Vehicular = HL-93 minus lane load, Earth = 120 lb/cf
- Design Flood Discharge:
  - Base Flood (100-year) = Design Flood Discharge = ___ cfs
  - Base Flood Elevation = _____
  - Design Flood (D.F.) Elevation = _____
  - Design Flood Discharge = ___ cfs
  - Design Flood Frequency = ___ years
  - Drainage Area = ___ mi

Hydrologic Data
- Design Flood Discharge = ___ cfs
- Design Flood Elevation = _____
- Overtopping Flood Discharge = ___ cfs
- Outlet Velocity = __ ft/s
- Base Flood Discharge = ___ cfs
- Base Flood Elevation = _____
- Design Flood (D.F.) Elevation = _____
- Design Flood Discharge = ___ cfs
- Design Flood Frequency = ___ years
- Drainage Area = ___ mi

Cast-in-Place Concrete Box
- Precast Concrete Box used
- Standard Plans: 703.37, 703.82 703.86, 703.87
- Reinforcing Steel (Grade 60) fy = 60,000 psi
- Reinforcing Steel (Culverts-Bridge) Class B-1 Concrete (Culverts-Bridge)
- Class 4 Excavation
- MoDOT Construction personnel will indicate the type of box culvert constructed
- When alternate precast concrete box sections are used, the minimum distance from inside face of headwall to precast concrete box section shall be at least 18 inches.
- Reinforcement and dimensions for wings and headwall shall be in accordance with MoDOT Standard Plans.
- Channel bottom shall be graded within the right-of-way for transition of channel bed to culvert openings. Channel bottom shall be tapered to match culvert openings (Roadway Item)
- Traffic to be maintained during construction
- Structure to be closed during construction. Traffic to be maintained during construction.
- Structure to be closed during construction. Traffic to be maintained during construction.
- Traffic to be maintained during construction.
Standard Drawing Guidance

Do not show on plans. Turn off the Bridge Construction level to hide.

Some details have been grouped together to allow easy substitution with alternate details. To edit grouped details, select them and press <Ctrl> U.

### pipes with same diameter

**XX" Pipe Inlet Data**

<table>
<thead>
<tr>
<th>Station</th>
<th>Offset</th>
<th>Dia</th>
<th>Elev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>xx xx</td>
<td>xx xx</td>
<td>xx</td>
<td>xx xx</td>
</tr>
<tr>
<td>xx xx</td>
<td>xx xx</td>
<td>xx</td>
<td>xx xx</td>
</tr>
</tbody>
</table>

### pipes with different diameters

**Pipe Inlet Data**

<table>
<thead>
<tr>
<th>Station</th>
<th>Offset</th>
<th>Dia</th>
<th>Elev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>xx xx</td>
<td>xx xx</td>
<td>xx</td>
<td>xx xx</td>
</tr>
<tr>
<td>xx xx</td>
<td>xx xx</td>
<td>xx</td>
<td>xx xx</td>
</tr>
</tbody>
</table>

### variable design fill heights

Select and delete the details grouped with the Fill Heights table. Select and move alternate grouped details in drawing.

### associated tables

#### Top Slab Reinforcement

<table>
<thead>
<tr>
<th>Spa. Sz.</th>
<th>A1 Bars</th>
<th>H1 Bars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sp. Sz.</td>
<td>A2 Bars</td>
<td>H2 Bars</td>
</tr>
</tbody>
</table>

#### Bottom Slab Reinforcement

<table>
<thead>
<tr>
<th>Spa. Sz.</th>
<th>J3 Bars</th>
<th>A1 Bars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spa. Sz.</td>
<td>J4 Bars</td>
<td>C1</td>
</tr>
</tbody>
</table>

#### Wall Reinforcement

<table>
<thead>
<tr>
<th>Spa. Sz.</th>
<th>B1 Bars</th>
<th>B2 Bars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spa. Sz.</td>
<td>H3 Bars</td>
<td>J4 Bars</td>
</tr>
</tbody>
</table>

### culvert extensions

In Fill Heights table add a lane designation after [Rdwy] and insert another row for the other lane.

### alternate plan of transverse joints

**XX" Pipe Inlet Data**

<table>
<thead>
<tr>
<th>Station</th>
<th>Offset</th>
<th>Dia</th>
<th>Elev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>xx xx</td>
<td>xx xx</td>
<td>xx</td>
<td>xx xx</td>
</tr>
<tr>
<td>xx xx</td>
<td>xx xx</td>
<td>xx</td>
<td>xx xx</td>
</tr>
</tbody>
</table>

### supplemental pipe inlet details

Select and delete the details grouped with the Fill Heights table. Select and move alternate grouped details in drawing.

### supplemental reinforcement table (nonstandard culverts with only one design fill height)

Substitute table for tables shown on Standard Plan 703.87.
If any part of the barrel is exposed, the roadway fill shall be warped to provide 12 inches minimum cover. (Roadway Item)

Construction joint key not shown for clarity, see standard plans for details.

If unsuitable material is encountered, excavation of unsuitable material and furnishing and placing of granular backfill shall be in accordance with Sec 206.

Alternate Details for Culvert

Extensions or when Five Items are Required

Alternate Estimated Quantities for Culvert

Dimension are based on end units. Fill heights are measured from the top of top slab to the top of earth fill or roadway.

Alternate Estimated Quantities for Culvert

Estimated Quantities

<table>
<thead>
<tr>
<th>Unit No.</th>
<th>Length</th>
<th>Top Slab Reinforcement</th>
<th>Bottom Slab Reinforcement</th>
<th>Wall Reinforcement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Substitute table for tables shown on Standard Plan 703.87

Corresponds to the border of the standard drawing for ease in moving alternate details (Snap to corner)
Standard Drawing Guidance:

- Ahead station is shown for streams flowing left to right. Arrow must be flipped for streams that flow right to left.
- Some details have been grouped together to allow easy substitution with alternate details. To edit grouped details, select them and press Ctrl+U.
- Add any required transverse joints proportionally spaced along the barrel. Label with actual lengths of units along the barrel.
- **VARIABLE DESIGN FILL HEIGHTS**
  - Select and delete the details grouped with the Fill Heights table. Select and move the alternate grouped details to drawing.
  - Place “See Member Thickness table” in the Equation column and place “Varies” in the Dim. column. If Dimension F varies, place “Varies” in the Dim. column.
  - Add Transverse Joints as required. Add pipe inlets to Plan of Layout Dimensions at appropriate locations and to Elevation A-A if visible from elevation. Add inlet data using notes where space allows, or use tables.
  - For nonstandard culverts with only one design fill height, add supplemental reinforcement table.
  - No need to revise General Elevation A-A for dual roadways. In Fill Heights table add a lane designation after Culvert and insert another row for the other lane.

### Pipes With Same Diameter

<table>
<thead>
<tr>
<th>Station</th>
<th>Offset</th>
<th>F.L. Elev.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Pipes With Different Diameters

<table>
<thead>
<tr>
<th>Station</th>
<th>Offset</th>
<th>F.L. Elev.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### XX" Pipe Inlet Data

<table>
<thead>
<tr>
<th>Station</th>
<th>Offset</th>
<th>F.L. Elev.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Inlets Sized for Elevation A-A (Pipe Diameter/Culvert HT)

### Supplemental Pipe Inlet Details

**Top Slab Reinforcement**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Bottom Slab Reinforcement**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Wall Reinforcement**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Substitute table for tables shown on Standard Plan 703.87
If any part of the barrel is exposed, the roadway fill shall be warped to provide 12 inches minimum cover. Roadway item.

Construction joint key not shown for clarity, see standard plans for details.

If unsuitable material is encountered, excavation of unsuitable material and furnishing and placing of granular backfill shall be in accordance with Sec 206.

Dimensions are based on end units, except AA is based on Unit 1. Fill heights are measured from the top of top slab to the top of earth fill or roadway.

Alternate estimated quantities for culvert extensions or when five items are required.
**General Notes:**

**Design Specifications:**
- AASHTO LRFD Bridge Design Specifications and 2010 Interim Revisions
- Design Loading: 2010 AASHTO LRFD Bridge Design Specifications
- Design Units: 1000 lb (kip), 100 lb/ft (psf), 1000 lb/cu ft (pcf)
- Design Stresses: Reinforcing Steel (Grade 60) f_y = 60,000 psi
- Reinforcement:
  - MoDOT Construction personnel will indicate the type of box culvert construction.
  - Precast Concrete Box used
  - Cast-In-Place Concrete Box used

**Hydrologic Data:**
- Flood Elevation = 6'-0"
- Overtopping Flood Frequency = 100 years
- Overtopping Flood Discharge = 10,000 cfs
- Outlet Velocity = 10 ft/s
- Estimated Backwater = 5 ft
- Base Flood Discharge = 5,000 cfs
- Base Flood Elevation = 5'-0"
- Design Flood (D.F.) Elevation = 6'-0"
- Design Flood Discharge = 10,000 cfs
- Design Flood Frequency = 100 years
- Drainage Area = 10 mi

**Design Loadings:**
- Vehicular = HL-93 minus lane load, Earth = 120 lb/cu ft

**Construction Notes:**
- Granular Backfill Limits:
  - Top of earth fill or roadway.
- Roadway fill shall be warped to match culvert openings. (Roadway Item)
- Transition of channel bed to culvert openings. Channel banks shall be graded within the right of way for runoff and interference with adjacent structures. Channel bottom shall be graded within the right of way for transition of channel bed to culvert openings. Channel banks shall be tapered to match culvert openings. (Roadway Item)

**Miscellaneous:**
- When alternate precast concrete box sections are used, the minimum distance from inside face of headwalls to precast concrete box section shall be in accordance with Missouri Standard Plans.
- Reinforcement and dimensions for wings and headwalls shall be in accordance with Missouri Standard Plans.
- Reinforcing Steel (Concrete-Culvert) = 60,000 psi

**Estimates:**
- Design (All units) = 1,000 cu yd
- Fill Heights = 10 ft
- Fill Elevations = 6'-0"
- Fill Elevations = 6'-0"
- Fill Elevations = 6'-0"
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- Fill Elevations = 6'-0"
- Fill Elevations = 6'-0"
- Fill Elevations = 6'-0"
Standard Drawing Guidance

Examples of Tips:

1. Ahead station is shown for streams flowing left to right. Arrow must be flipped for streams that flow right to left.

2. Variable Design Fill Heights

   - Remove blank rows. End units may have different design fill heights but both units need to have the same member thicknesses.

3. Supplemental Pipe Inlet Details

   - Select and delete the details grouped with the Fill Heights table. Select and move the alternate grouped details to drawing.

4. Supplemental Pipe Inlet Details

   - Pick out D-1 detail to pipe into a 6' tall culvert.

5. Supplemental Reinforcement Table (Nonstandard culverts with only one design fill height)

6. Substitute table for tables shown on Standard Plan 703.87

---

BXC10_tri_sq_fl.pdf Guidance & Alternate Details (1 of 2)
If any part of the barrel is exposed, the roadway fill shall be warped to provide 12 inches minimum cover (Roadway Item).

Construction joint key not shown for clarity; see standard plans for details.

If unsuitable material is encountered, excavation of unsuitable material and furnishing and placing of granular backfill shall be in accordance with Sec 206.

Corresponds to the border of the standard drawing for ease in moving alternate details (Snap to corner).

**Estimated Quantities**

<table>
<thead>
<tr>
<th>Unit No.</th>
<th>Unit Length</th>
<th>Member</th>
<th>Thickness</th>
<th>Top Slab Reinforcement</th>
<th>Bottom Slab Reinforcement</th>
<th>Wall Reinforcement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Alternate Details for Multiple Design Fill Heights**

**Fill Heights**

- E Roadw at E Culvert = ft
- Design Units & I = ft
- Design Units & I = ft
- Design Units & I = ft

**Dimensions are based on end units, except A & B based on Unit. Fill heights are measured from the top of top slab to the top of earth fill or roadway.**

**Estimated Quantities**

- Partial Removal of Culvert-Bridge Concrete (cu yard)
- Reinforcing Steel (Culverts-Bridge) (pound)
- Temporary Shoring (lump sum)

Substitute table for tables shown on Standard Plan 703.87.
If any part of the barrel is exposed, the roadway fill shall be warped to provide an 18-inch minimum cover. (Roadway fill)

If unsuitable material is encountered, excavation of unsuitable material and furnishing and placing of granular backfill shall be in accordance with Sec 206.

Granular Backfill

Note: This drawing is not to scale. Follow dimensions.
Standard Drawing Guidance

1. Ahead station is shown for streams flowing left to right. Arrow must be flipped for streams that flow right to left.

2. Modify Estimated Quantities as required. Don’t leave blank rows. Leave space between Estimated Quantities and General Notes for at least one pay item to be added during construction. See Alternate Details for culvert extensions, if five items are required.

3. Add any required transverse joints proportionally spaced along the barrel. Label units and add actual lengths of units along the barrel.

4. Insert Std. 703.60 when pipe inlets are required. Add pipe inlets to Plan of Layout Dimensions at appropriate locations and to Elevation A-A if visible from elevation. Add inlet data using notes where space allows, or use tables.

5. For nonstandard culverts with only one design fill height, add supplemental reinforcement table.

6. No need to revise General Elevation A-A for dual roadways. In Fill Heights table add a new designation after & after and insert another row for the other lane.

7. For skew 20 degrees or more, remove Detail C, remove TT from equation for D and place NA in the Dim. column of Dimension TT. Will first need to separate Detail C from Plan by selecting and pressing <Ctrl> U.

8. Substituted table for tables shown on Standard Plan 703.87.

9. Supplemental Pipe Inlet Details

10. Supplemental Reinforcement Table (Nonstandard culverts with only one design fill height)

11. Alternate Plan of Transverse Joints

Pipes With Same Diameter

<table>
<thead>
<tr>
<th>Station</th>
<th>Offset</th>
<th>Dia.</th>
<th>Elev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>xx</td>
<td>xx</td>
<td>xx</td>
<td>xx</td>
</tr>
</tbody>
</table>

Pipes With Different Diameters

<table>
<thead>
<tr>
<th>Station</th>
<th>Offset</th>
<th>Dia.</th>
<th>Elev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>xx</td>
<td>xx</td>
<td>xx</td>
<td>xx</td>
</tr>
</tbody>
</table>

Inlets Sized for Elevation A-A

<table>
<thead>
<tr>
<th>Station</th>
<th>Offset</th>
<th>Dia.</th>
<th>Elev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>xx</td>
<td>xx</td>
<td>xx</td>
<td>xx</td>
</tr>
</tbody>
</table>

Supplemental Fill Heights

<table>
<thead>
<tr>
<th>Spa.</th>
<th>Sz.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spa.</td>
<td>Sz.</td>
</tr>
</tbody>
</table>

Inlet Data

<table>
<thead>
<tr>
<th>Station</th>
<th>Offset</th>
<th>F.L. Elev.</th>
<th>Dia.</th>
</tr>
</thead>
<tbody>
<tr>
<td>xx+xx.xx</td>
<td>xxx.xx</td>
<td>xx.xx' XX</td>
<td>xx</td>
</tr>
</tbody>
</table>

Note: Some details have been grouped together to allow easy substitution with alternate details. To edit grouped details, select them and press <Ctrl> U.
Alternate Details for Multiple Design Fill Heights

If any part of the barrel is exposed, the roadway fill shall be warped to provide 12 inches minimum cover. (Roadway items)

Construction joint key not shown for clarity, see standard plans for details.

If unsuitable material is encountered, excavation of unsuitable material and furnishing and placing of granular backfill shall be in accordance with Sec 206.

Alternate Estimated Quantities for Culvert

---

**Estimated Quantities**

<table>
<thead>
<tr>
<th>Final</th>
<th>cu. yard</th>
<th>lump sum</th>
<th>pound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 4 Excavation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temporary Shoring</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partial Removal of Culvert-Bridge Concrete</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class B-1 Concrete (Culverts-Bridge)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reinforcing Steel (Culverts-Bridge)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Fill Heights**

- Design (Units 1 & 2) = ft
- Design (Units 4 & 5) = ft
- Design (Units 6 & 7) = ft

Dimensions are based on end units, except AA-3 is based on Unit 1. Fill heights are measured from the top of top slab to the top of earth fill or roadway.

**PLAN OF TRANSVERSE JOINTS AND STAGE CONSTRUCTION**

Remove if not applicable.

---

**LOCATION SKETCH**

Substitute table for tables shown on Standard Plan 303-B.
**GENERAL ELEVATION A-A**

If any part of the barrel is exposed, the roadway fill shall be warped to clarity, see standard plans for details.

**Elevations**

- **Fill Heights**
  - **Design Elev.**
  - **Design (All units)**
- **Design (All units) =** ft
- **¡ Rdwy at ¡ Culvert =** ft

**Estimated Quantities**

- **Final**
- **Removal of Bridges**
  - **Removal of Bridges =** yd
- **Class M Concrete (Culverts-Bridges)**
  - **Concrete (Culverts-Bridges) =** yd
- **Reinforcing Steel (Culverts-Bridges)**
  - **Reinforcing Steel =** yd

**Hydrologic Data**

- **Drainage Area =** mi²
- **Design Flood Discharge =** ft³/s
- **Base Flood Discharge =** ft³/s
- **Estimated Backwater =** ft
- **Estimated Backwater =** ft

**General Notes:**

- **Design Specifications:**
  - 105 WEST CAPITOL
  - JEFFERSON CITY, MO 65102
  - 1-888-ASK-MODOT (1-888-275-6636)

**LOCATIONS**

- **ROUTE**
- **FROM**
- **TO**
- **SEC/SUR**
- **TWP**
- **RGE**

**LOCATION SKETCH**

- **DATE**
- **DATE PREPARED**
- **PROJECT NO.**
- **BRIDGE NO.**
- **JOB NO.**
- **COUNTY**

**PLAN OF LAYOUT DIMENSIONS**

- **W =** Total length normal to & Roadway or Median

**LAYOUT DIMENSIONS**

- **Var**
- **Equation**
- **Dim**
- **Var**
- **Equation**
- **Dim**

**REVIEWED**

- **DATE**

**CHECKED**

- **DATE**

**DRAFTED**

- **DATE**
Standard Drawing Guidance

(Do not show on plans. Turn off the Bridge Construction level to hide)

Some details have been grouped together to allow easy substitution with alternate details. To edit grouped details, select them and press Ctrl + U.

1. Ahead station is shown for streams flowing left to right. Arrow must be flipped for streams that flow right to left.

2. Modify Estimated Quantities as required. Don’t leave blank rows but leave space between Estimated Quantities and General Notes for at least one pay item to be added during construction.

3. Add any required transverse joints proportionally spaced along the barrel. Label units and add actual lengths at units along the barrel.

4. Insert STD Plan 703.60 when pipe inlets are required. Add pipe inlets to Plan of Layout Dimensions at appropriate locations and to Elevation A-A if visible from elevation. Add inlet data using notes where space allows, or use tables.

5. For nonstandard culverts with only one design fill height, add supplemental reinforcement table.

6. No need to revise General Elevation A-A for dual roadways. In Fill Heights table add a lane designation after Rdwy and insert another row for the other lane.

7. For skews 20 degrees or more, remove Detail C, remove blank rows. End units may have different design fill heights but both units need to have the same member thicknesses.

Alternate Plan of Transverse Joints

<table>
<thead>
<tr>
<th>Unit No.</th>
<th>Trans. Jt.</th>
<th>Culvert</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5</td>
<td>Trans. Jt.</td>
<td>Culvert</td>
</tr>
</tbody>
</table>

Supplemental Pipe Inlet Details

**VARIABLE DESIGN FILL HEIGHTS**

1. Select and delete the details grouped with the Fill Heights table. Select and move the alternate grouped details to drawing.

2. Place See Member Thickness Table in the Equation column and place “Varies” in the Dim. column. If Dimension F varies, place “Varies” in the Dim. column.

3. For nonstandard culverts with only one design fill height, add supplemental reinforcement table.

4. This portion of table required when design fill height exceeds limits of the standard plans or when culvert cell height or span is not standard. If only a portion of the units are nonstandard, fill out entire table using values from standard table where applicable. Omit if not required.

5. Substitute table for tables shown on Standard Plan 703.67.
If any part of the barrel is exposed, the roadway fill shall be warped to provide 12 inches minimum cover. (Roadway Item)

Construction joint key not shown for clarity, see standard plans for details.

If unsuitable material is encountered, excavation of unsuitable material and furnishing and placing of granular backfill shall be in accordance with Sec 206.

**Fill Heights**

<table>
<thead>
<tr>
<th>Item</th>
<th>Final</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Cu. yard</td>
</tr>
<tr>
<td>B</td>
<td>Cu. yard</td>
</tr>
<tr>
<td>C</td>
<td>Cu. yard</td>
</tr>
<tr>
<td>D</td>
<td>Lump Sum</td>
</tr>
<tr>
<td>E</td>
<td>Lump Sum</td>
</tr>
</tbody>
</table>

Dimensions are based on end units, except AA is based on Unit. Fill heights are measured from the top of top slab to the top of earth fill or roadway.

**Estimated Quantities**

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Final</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 4 Excavation</td>
<td>Cu. yard</td>
</tr>
<tr>
<td>Partial Removal of Culvert-Bridge Concrete</td>
<td>Lump Sum</td>
</tr>
<tr>
<td>Re-Excavation Steel (Culverts-Bridge)</td>
<td>Lump Sum</td>
</tr>
</tbody>
</table>

Alternate estimated quantities as for culvert extensions or required.

Alternate details for multiple design fill heights.

Remove if not applicable.
**General Notes:**

Furnishing and installing posts and guardrail on culvert shall be in accordance with Sec 606 except as shown. Rail posts shall be seated on elastomeric pads having the same dimensions as the post base plate and 1/16" thickness. Such pads may be any elastomeric material, plain or fibered, having a hardness (Durometer) of 50 or above, as certified by the manufacturer. Additional pads or half pads may be used in shimming for alignment. Post heights shown will increase by the thickness of the pad.

Posts and base plates shall be fabricated from ASTM A709 Grade 50 steel and galvanized.

Fabrication of structural steel shall be in accordance with Sec 1080.

The contractor shall use one of the qualified resin anchor systems in accordance with Sec 1039.

Cost of furnishing and installing the resin anchor systems, complete in place, will be considered completely covered by the contract unit price for Bridge Guardrail (W-Beam) Bridge Guardrail (Thrie Beam) other items.

The minimum embedment depth in concrete with f'c = 4,000 psi for the resin anchor systems shall be that required to meet the minimum ultimate pullout strength in accordance with Sec 1039 but shall not be less than 5".

Sec 1080 slab shot for rail post spacing.

See Missouri Standard Plans drawing 606.00 for details not shown.

**Standard Drawing Guidance (do not show on plans):**
- Designed for AASHTO LFD.
- Not designed for AASHTO LRFD.
- Not crash tested.
- Comparable to TL-2 (NCHRP 350) deck mounted (top) post and rail system: Texas Type A. (Typ.)
- Unclassified LRO analysis shown:

  - 5' Fill

  - Guardrail (W-Beam): Design Requirements for TL-2
  - 3/4" post spacing max
  - Single Rail
  - Grade 90 post and Plate
  - Thrie-Beam: Design Requirements for TL-2
  - 3/4" post spacing max
  - Single Rail
  - Grade 90 post and Plate
  - 2' Fill

  - Guardrail (W-Beam): Design Requirements for TL-2
  - 3/4" post spacing max
  - Double Nested
  - Grade 90 post and Plate
  - Thrie-Beam: Design Requirements for TL-2
  - 3/4" post spacing max
  - Double Nested
  - Grade 90 post and Plate

Use this detail when required to connect rail post to culvert slab greater than 9" above the culvert wall without interfering with bolting through slab. This detail is shown for connecting guardrail post to culvert slab only. Work with districts on type of guardrail required.

Note: This drawing is not to scale. Follow dimensions.
Furnishing and installing posts and guardrail on culvert shall be in accordance with Sec 605 except as shown.

Rail posts shall be seated on elastomeric pads having the same dimensions as the post base plate and 1/16" thickness. Such pads may be any elastomeric material, plain or fibered. Nailing or bolting of guardrail post to culvert slab shall be by 3/4" x 3/4" or 3/4" x 2" ASTM A307 bolts.

General Notes:

Use this detail when required to connect rail post to culvert slab greater than 9" thick or where culvert walls interfere with bolting through slab.

This sheet shows details for connecting guardrail post to culvert slab only. Work with district on type of guardrail required.
Standard Drawing Guidance (do not show on plans):
Remove all details shown that are not applicable to project.

Note: This drawing is not to scale. Follow dimensions.

PLAN OF PRECAST BOX CULVERT OPTION

Note: If precast concrete box culvert option is selected by the contractor, the centerline of existing cell from centerline of precast cell shall not be more than 15 degrees offset in plan view.

PLAN OF PRECAST BOX CULVERT OPTION

Concrete Removal Line
Connection
Precast Option
Precast Cell

Precast Option
Precast Cell

Precast Option
Precast Cell

Exist. Structure
Proposed Connection
Transverse Jt.

Note: If precast concrete box culvert option is selected by the contractor, the centerline of existing cell from centerline of precast cell shall not be more than 15 degrees offset in plan view.
Standard Drawing Guidance (do not show on plans):
Check wall thickness to see if existing and new matches. If different, see SPM.

SPM to have design checked before using details.

SPM could use wing beam design to possibly eliminate all removals.

General Notes:
For details of Transverse Joint, see Missouri Standard Plans.
When the headwall is removed, the top slab A-bars and F-bars shall lap the existing bars a minimum of 2'-0".

Note: This drawing is not to scale. Follow dimensions.
GENERAL NOTES:

Anchor bolts for Type C bearings shall be 1" Ø ASTM F1554 Grade 55 swedged bolts, with no heads or nuts and shall extend 10" into the concrete. Swedging shall be 1" less than the extension into the concrete. Anchor bolts shall be coated with a minimum of two coats of inorganic zinc primer to provide a total dry thickness of 4 mils minimum, 6 mils maximum, galvanized in accordance with Sec 1081.

Weight of the anchor bolts for bearings are included in the weight of the Fabricated Structural Steel.

(--) Indicates machine finish surface.

Shop drawings are not required for the lead plates and the preformed fabric pads.

Note: This drawing is not to scale. Follow dimensions.
**GENERAL NOTES:**

Anchor bolts for Type D Bearings shall be Ø ASTM F1554 Grade 55 threaded and shall extend into the concrete with ASTM A522 Grade A Heavy Hex nuts. Actual manufacturer's certified mill test reports (chemical and mechanical) shall be provided. Use ASTM A325 hardened washers for the expansion bearings. Wedging shall be 1” less than extension into the concrete.

Anchor bolts, hardened washers and heavy hex nuts shall be coated with a minimum of two coats of paint in primer to provide a finish for thicker of 4 mil minimum, 6 mil maximum, or galvanized in accordance with Sec 1081.

Weight of the anchor bolts, hardened washers and heavy hex nuts for bearings are included in the weight of the fabricated structural steel.

Shop drawings are not required for the lead plates and the preformed fabric pads.

**Note:** This drawing is not to scale. Follow dimensions.

**GENERAL NOTES:**

Anchor bolts for Type D Bearings shall be Ø ASTM F1554 Grade 55 threaded and shall extend into the concrete with ASTM A522 Grade A Heavy Hex nuts. Actual manufacturer’s certified mill test reports (chemical and mechanical) shall be provided. Use ASTM A325 hardened washers for the expansion bearings. Wedging shall be 1” less than extension into the concrete.

Anchor bolts, hardened washers and heavy hex nuts shall be coated with a minimum of two coats of paint in primer to provide a finish for thicker of 4 mil minimum, 6 mil maximum, or galvanized in accordance with Sec 1081.

Weight of the anchor bolts, hardened washers and heavy hex nuts for bearings are included in the weight of the fabricated structural steel.

Shop drawings are not required for the lead plates and the preformed fabric pads.

**Notes:**
- Ø 2”Ø Pin
- Lead plate
- Optional detail for 1 3/8”Ø thru 2 1/2”Ø anchor bolts
- Surface of concrete
- Surface of concrete
- Washing Top Plate
- Flat surface
- WWW: Indicates machine finish surface.

**TYPE D BEARINGS**

(Estimated Weight: pounds)

<table>
<thead>
<tr>
<th>FIXED</th>
<th>Number Required:</th>
</tr>
</thead>
<tbody>
<tr>
<td>END VIEW</td>
<td></td>
</tr>
<tr>
<td>SIDE VIEW</td>
<td></td>
</tr>
<tr>
<td>EXPANSION</td>
<td></td>
</tr>
</tbody>
</table>

**DETAIL FOR 3/8”Ø THRU 2 1/2”Ø ANCHOR BOLTS**

**OPTIONAL DETAIL FOR 1 3/8”Ø THRU 2 1/2”Ø ANCHOR BOLTS**

**SWEDGE ANCHOR BOLTS DETAILS**

1. 1/2” for Ø 1 3/8” anchor bolts
2. 1/2” for Ø 1 3/8” anchor bolts

**Note:** This drawing is not to scale. Follow dimensions.
GENERAL NOTES:

Anchor bolts for Type E bearings shall be Ø ASTM F1554 Grade 55 swedged bolts and shall extend into the concrete with ASTM A325 Grade A heavy hex nuts. Actual manufacturer's certified mill test reports (chemical and mechanical) shall be provided. Use ASTM A563 Grade A flat washers or hardened washers for the expansion bearings. Swedging shall be 1" less than extensions into the concrete.

Anchor bolts, hardened washers and heavy hex nuts shall be coated with a minimum of two coats of inorganic zinc paint. Paint thickness of 4 mil minimum, 6 mil maximum, or galvanized in accordance with Sec 1081.

Weight of the anchor bolts, hardened washers and heavy hex nuts for bearings are included in the weight of the Fabricated Structural Steel.

"a" indicates machine finish surface.

A lubricant coating shall be applied in the shop to both mating surfaces of the bearing assembly. The lubricant method of cleaning, and application shall meet the requirements of MIL-L-23398 and MIL-L-46147. The coated areas shall be protected for shipping and erection.

Shop drawings are not required for the lead plates and the preformed fabric pads.

Anchor bolts, hardened washers and heavy hex nuts shall extend into the concrete with ASTM A563 Grade A heavy hex nuts. Actual manufacturer's certified mill test reports (chemical and mechanical) shall be provided. Use ASTM A563 Grade A flat washers or hardened washers for the expansion bearings. Swedging shall be 1" less than extensions into the concrete.

Weight of the anchor bolts, hardened washers and heavy hex nuts for bearings are included in the weight of the Fabricated Structural Steel.

"a" indicates machine finish surface.

A lubricant coating shall be applied in the shop to both mating surfaces of the bearing assembly. The lubricant method of cleaning, and application shall meet the requirements of MIL-L-23398 and MIL-L-46147. The coated areas shall be protected for shipping and erection.

Shop drawings are not required for the lead plates and the preformed fabric pads.

Anchor bolts, hardened washers and heavy hex nuts shall extend into the concrete with ASTM A563 Grade A heavy hex nuts. Actual manufacturer's certified mill test reports (chemical and mechanical) shall be provided. Use ASTM A563 Grade A flat washers or hardened washers for the expansion bearings. Swedging shall be 1" less than extensions into the concrete.

Weight of the anchor bolts, hardened washers and heavy hex nuts for bearings are included in the weight of the Fabricated Structural Steel.

"a" indicates machine finish surface.

A lubricant coating shall be applied in the shop to both mating surfaces of the bearing assembly. The lubricant method of cleaning, and application shall meet the requirements of MIL-L-23398 and MIL-L-46147. The coated areas shall be protected for shipping and erection.

Shop drawings are not required for the lead plates and the preformed fabric pads.

Anchor bolts, hardened washers and heavy hex nuts shall extend into the concrete with ASTM A563 Grade A heavy hex nuts. Actual manufacturer's certified mill test reports (chemical and mechanical) shall be provided. Use ASTM A563 Grade A flat washers or hardened washers for the expansion bearings. Swedging shall be 1" less than extensions into the concrete.

Weight of the anchor bolts, hardened washers and heavy hex nuts for bearings are included in the weight of the Fabricated Structural Steel.

"a" indicates machine finish surface.

A lubricant coating shall be applied in the shop to both mating surfaces of the bearing assembly. The lubricant method of cleaning, and application shall meet the requirements of MIL-L-23398 and MIL-L-46147. The coated areas shall be protected for shipping and erection.

Shop drawings are not required for the lead plates and the preformed fabric pads.

Anchor bolts, hardened washers and heavy hex nuts shall extend into the concrete with ASTM A563 Grade A heavy hex nuts. Actual manufacturer's certified mill test reports (chemical and mechanical) shall be provided. Use ASTM A563 Grade A flat washers or hardened washers for the expansion bearings. Swedging shall be 1" less than extensions into the concrete.

Weight of the anchor bolts, hardened washers and heavy hex nuts for bearings are included in the weight of the Fabricated Structural Steel.

"a" indicates machine finish surface.

A lubricant coating shall be applied in the shop to both mating surfaces of the bearing assembly. The lubricant method of cleaning, and application shall meet the requirements of MIL-L-23398 and MIL-L-46147. The coated areas shall be protected for shipping and erection.

Shop drawings are not required for the lead plates and the preformed fabric pads.

Anchor bolts, hardened washers and heavy hex nuts shall extend into the concrete with ASTM A563 Grade A heavy hex nuts. Actual manufacturer's certified mill test reports (chemical and mechanical) shall be provided. Use ASTM A563 Grade A flat washers or hardened washers for the expansion bearings. Swedging shall be 1" less than extensions into the concrete.

Weight of the anchor bolts, hardened washers and heavy hex nuts for bearings are included in the weight of the Fabricated Structural Steel.

"a" indicates machine finish surface.

A lubricant coating shall be applied in the shop to both mating surfaces of the bearing assembly. The lubricant method of cleaning, and application shall meet the requirements of MIL-L-23398 and MIL-L-46147. The coated areas shall be protected for shipping and erection.

Shop drawings are not required for the lead plates and the preformed fabric pads.

Anchor bolts, hardened washers and heavy hex nuts shall extend into the concrete with ASTM A563 Grade A heavy hex nuts. Actual manufacturer's certified mill test reports (chemical and mechanical) shall be provided. Use ASTM A563 Grade A flat washers or hardened washers for the expansion bearings. Swedging shall be 1" less than extensions into the concrete.

Weight of the anchor bolts, hardened washers and heavy hex nuts for bearings are included in the weight of the Fabricated Structural Steel.

"a" indicates machine finish surface.

A lubricant coating shall be applied in the shop to both mating surfaces of the bearing assembly. The lubricant method of cleaning, and application shall meet the requirements of MIL-L-23398 and MIL-L-46147. The coated areas shall be protected for shipping and erection.

Shop drawings are not required for the lead plates and the preformed fabric pads.

Anchor bolts, hardened washers and heavy hex nuts shall extend into the concrete with ASTM A563 Grade A heavy hex nuts. Actual manufacturer's certified mill test reports (chemical and mechanical) shall be provided. Use ASTM A563 Grade A flat washers or hardened washers for the expansion bearings. Swedging shall be 1" less than extensions into the concrete.

Weight of the anchor bolts, hardened washers and heavy hex nuts for bearings are included in the weight of the Fabricated Structural Steel.

"a" indicates machine finish surface.

A lubricant coating shall be applied in the shop to both mating surfaces of the bearing assembly. The lubricant method of cleaning, and application shall meet the requirements of MIL-L-23398 and MIL-L-46147. The coated areas shall be protected for shipping and erection.

Shop drawings are not required for the lead plates and the preformed fabric pads.

Anchor bolts, hardened washers and heavy hex nuts shall extend into the concrete with ASTM A563 Grade A heavy hex nuts. Actual manufacturer's certified mill test reports (chemical and mechanical) shall be provided. Use ASTM A563 Grade A flat washers or hardened washers for the expansion bearings. Swedging shall be 1" less than extensions into the concrete.

Weight of the anchor bolts, hardened washers and heavy hex nuts for bearings are included in the weight of the Fabricated Structural Steel.

"a" indicates machine finish surface.

A lubricant coating shall be applied in the shop to both mating surfaces of the bearing assembly. The lubricant method of cleaning, and application shall meet the requirements of MIL-L-23398 and MIL-L-46147. The coated areas shall be protected for shipping and erection.

Shop drawings are not required for the lead plates and the preformed fabric pads.

Anchor bolts, hardened washers and heavy hex nuts shall extend into the concrete with ASTM A563 Grade A heavy hex nuts. Actual manufacturer's certified mill test reports (chemical and mechanical) shall be provided. Use ASTM A563 Grade A flat washers or hardened washers for the expansion bearings. Swedging shall be 1" less than extensions into the concrete.

Weight of the anchor bolts, hardened washers and heavy hex nuts for bearings are included in the weight of the Fabricated Structural Steel.

"a" indicates machine finish surface.

A lubricant coating shall be applied in the shop to both mating surfaces of the bearing assembly. The lubricant method of cleaning, and application shall meet the requirements of MIL-L-23398 and MIL-L-46147. The coated areas shall be protected for shipping and erection.

Shop drawings are not required for the lead plates and the preformed fabric pads.

Anchor bolts, hardened washers and heavy hex nuts shall extend into the concrete with ASTM A563 Grade A heavy hex nuts. Actual manufacturer's certified mill test reports (chemical and mechanical) shall be provided. Use ASTM A563 Grade A flat washers or hardened washers for the expansion bearings. Swedging shall be 1" less than extensions into the concrete.

Weight of the anchor bolts, hardened washers and heavy hex nuts for bearings are included in the weight of the Fabricated Structural Steel.

"a" indicates machine finish surface.

A lubricant coating shall be applied in the shop to both mating surfaces of the bearing assembly. The lubricant method of cleaning, and application shall meet the requirements of MIL-L-23398 and MIL-L-46147. The coated areas shall be protected for shipping and erection.

Shop drawings are not required for the lead plates and the preformed fabric pads.

Anchor bolts, hardened washers and heavy hex nuts shall extend into the concrete with ASTM A563 Grade A heavy hex nuts. Actual manufacturer's certified mill test reports (chemical and mechanical) shall be provided. Use ASTM A563 Grade A flat washers or hardened washers for the expansion bearings. Swedging shall be 1" less than extensions into the concrete.

Weight of the anchor bolts, hardened washers and heavy hex nuts for bearings are included in the weight of the Fabricated Structural Steel.

"a" indicates machine finish surface.

A lubricant coating shall be applied in the shop to both mating surfaces of the bearing assembly. The lubricant method of cleaning, and application shall meet the requirements of MIL-L-23398 and MIL-L-46147. The coated areas shall be protected for shipping and erection.

Shop drawings are not required for the lead plates and the preformed fabric pads.

Anchor bolts, hardened washers and heavy hex nuts shall extend into the concrete with ASTM A563 Grade A heavy hex nuts. Actual manufacturer's certified mill test reports (chemical and mechanical) shall be provided. Use ASTM A563 Grade A flat washers or hardened washers for the expansion bearings. Swedging shall be 1" less than extensions into the concrete.

Weight of the anchor bolts, hardened washers and heavy hex nuts for bearings are included in the weight of the Fabricated Structural Steel.

"a" indicates machine finish surface.

A lubricant coating shall be applied in the shop to both mating surfaces of the bearing assembly. The lubricant method of cleaning, and application shall meet the requirements of MIL-L-23398 and MIL-L-46147. The coated areas shall be protected for shipping and erection.

Shop drawings are not required for the lead plates and the preformed fabric pads.
ELEVATION OF GALVANIZED STEEL STOPPER PLATE

PLAN OF GALVANIZED STEEL STOPPER PLATE

PART PLAN SHOWING STOPPER PLATE

Stopper plates and straps shall be provided to prevent loss of support due to creeping of PTFE bearings. Payment for fabricating and installing the stopper plates and straps shall be considered completely covered by the contract unit price for Type N PTFE Bearing.

The bottom face of the 1/8" stainless steel plate that is welded to the sole plate shall be coated with a lubricant that is approved by the bearing manufacturer.

Steel Stopper Plate

Surface of concrete

Section A-A

Elastomeric Pad

Neoprene Elastomeric Pad

PTFE Sliding Bearings

<table>
<thead>
<tr>
<th>PTFE Sliding Bearings</th>
<th>Number of Shim Plates</th>
<th>Number Required</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Total Bearsings</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Nylon-Zinc Plating (Nylon-Zinc Plating)

General Notes:

1. The required shim plate shall be placed between layers of elastomer and molded together to form an integral unit.

2. Design coefficient of friction equals 0.06.

3. Anchor bolts shall be: 1/2" swedge anchor bolt with heavy hex nut (all galvanized).

4. Anchor bolts shall be Ø 1/2" Swedge anchor bolt (Typ.) 6" to 12" swedge anchor bolts.

5. Type N PTFE Bearings shall be in accordance with Sec 716.
ELEVATION OF GALVANIZED STEEL STOPPER PLATE

PART PLAN SHOWING STOPPER PLATE

Stopper plates and straps shall be provided to prevent loss of support due to creeping of PTFE bearings. Stopper plates and straps will be considered completely covered by the contract unit price for Type N PTFE Bearings.

The bottom face of the 1/8" stainless steel plate that is welded to the sole plate shall be lubricated with a lubricant that is approved by the bearing manufacturer.

SECTION A-A

DETAIL FOR 3/4"Ø THRU 2 1/2"Ø ANCHOR BOLTS

OPTIONAL DETAIL FOR 1 3/8"Ø THRU 2 1/2"Ø ANCHOR BOLTS

PTFE SLIDING BEARINGS

PTFE BEARING DETAILS

GENERAL NOTES:

Design coefficient of friction equals 0.06.

Anchor bolts shall be Ø ASTM F1554 Grade 55 swedged bolts and shall extend 1" into the concrete with ASTM A633 Grade 3 Heavy Hex Nuts. Actual embedment from manufacturer's certified mill test reports (chemical and mechanical) shall be provided. Swedging shall be 1" less than extension into the concrete.

Anchor bolts shall be at the centerline of the slotted hole at GFH Bearing Position (B) for each 10° fall or rise in temperature at the bridge site.

Anchor bolts and heavy hex nuts shall be treated with a minimum of two coats of commercial zinc primer to provide a total dry film thickness of 4 mils minimum, 6 mils maximum, or galvanized in accordance with Sec 1081. Neoprene Elastomeric Pads shall be 70 Durometer.

Structural steel for sole plate shall be ASTM A709 Grade 50 and shall be treated with a minimum of two coats of commercial zinc primer to provide a total dry film thickness of 4 mils minimum, 6 mils maximum. The stainless steel plate shall be protected from any coating.

Type N PTFE Bearings shall be in accordance with Sec 716. Neoprene Elastomeric Pad shall be fabricated as a single piece. Splicing will not be permitted.

Note: This drawing is not to scale. Follow dimensions.
**GENERAL NOTES:**

Anchor bolts shall be **Ø** ASTM F1554 Grade 55 swedge bolts and shall extend **2 1/2"** into the concrete. In ASTM A522 Grade A Heavy Hex Nuts shall be used. Swedge bolts shall be coated with a minimum of two coats of inorganic zinc primer to provide a total dry film thickness of 4 mils minimum, 6 mils maximum, or galvanized in accordance with Sec 1081.

Neoprene Elastomeric Pads shall be **Durometer.**

Structural steel for sole plate shall be ASTM A709 Grade and shall be coated with a minimum of two coats of inorganic zinc primer to provide a total dry film thickness of 6 mils minimum, 8 mils maximum.

Laminated Neoprene Bearing Pad Assembly shall be in accordance with Sec 716.

---

**LAMINATED NEOPRENE BEARING PAD ASSEMBLY**

**FIXED BEARINGS**

<table>
<thead>
<tr>
<th>NO.</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>J</th>
<th>K</th>
<th>L</th>
<th>M</th>
<th>N</th>
<th>P</th>
<th>Q</th>
<th>NUMBER OF SHIM PLATES</th>
<th>NUMBER REQUIRED</th>
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<tbody>
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<td></td>
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</tr>
</tbody>
</table>

* The required shim plate shall be placed between layers of elastomer and molded together to form an integral unit.

---

**NOTE:** This drawing is not to scale. Follow dimensions.

**Sheet No.**

**Detail No.**

**Checked**

**Effective:** Apr. 2022

**Supersedes:** Feb 2021

---

**DEDICATION: TRANSPORTATION AND INFRASTRUCTURE**

**Jefferson City, MO 65102**

10-13-2023

**CONTACT:**

**MISSOURI HIGHWAYS AND TRANSPORTATION**

10-888-ASK-MODOT (1-888-275-6636)
EXPANSION BEARINGS

<table>
<thead>
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<th>NO.</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>J</th>
<th>K</th>
<th>L</th>
<th>M</th>
<th>N</th>
<th>P</th>
<th>Q</th>
<th>R</th>
<th>SHIM PLATES</th>
<th>REQUIRED</th>
</tr>
</thead>
</table>

- The required shim plate shall be placed between layers of elastomeric and molded together to form an integral unit.

TOTAL BEARINGS

GENERAL NOTES:

Anchor bolts shall be Ø ASTM F1554 Grade 55 swedged bolts and shall extend into the concrete with ASTM A572 Grade 50 Heavy Hex nuts. Actual manufacturer's certified mill test reports (chemical and mechanical) shall be provided. Swedging shall be 1" less than extension into concrete.

Anchor bolt shall be at the centerline of slotted hole at 60°F. Bearing position shall be adjusted after each 2°F fall or rise in temperature at installation.

Anchor bolts and heavy hex nuts shall be coated with a minimum of two coats of inorganic zinc primer to provide a total dry film thickness of 4 mils minimum, 6 mils maximum, or galvanized in accordance with Sec 1081.

Neoprene Elastomeric Pads shall be Durometer.

Structural steel for sole plate shall be ASTM A572 Grade 50 and shall be coated with a minimum of two coats of inorganic zinc primer to provide a total dry film thickness of 4 mils minimum, 6 mils maximum.

Laminated Neoprene Bearing Pad Assembly shall be in accordance with Sec 716.

Note: This drawing is not to scale. Follow dimensions.
### NEOPRENE ELASTOMERIC PAD

**Expansion Bearings**

| BENT NO. | A | B | C | D | E | F | G | H | I | J | K | L | M | N | P | Q | R | S | T | U | V | W | X | Y | Z |
|          |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |

**Number of shim plates required:**
- The required shim plate shall be placed between layers of elastomer and molded together to form an integral unit.

**Fixed Bearings**

| BENT NO. | A | B | C | D | E | F | G | H | I | J | K | L | M | N | P | Q | R | S | T | U | V | W | X | Y | Z |
|          |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |

**Number of shim plates required:**
- The required shim plate shall be placed between layers of elastomer and molded together to form an integral unit.

### Laminated Neoprene Bearing Pad Assembly

**Details**

- Neoprene elastomeric pad shall be an integral unit.
- Neoprene elastomeric pad shall be in accordance with Sec 1080.

**EXPANSION BEARINGS**

- Neoprene elastomeric pad shall be in accordance with Sec 1080.

**FIXED BEARINGS**

- Neoprene elastomeric pad shall be in accordance with Sec 1080.

### GENERAL NOTES:

- Anchor bolts shall be ASTM F1554 Grade 55 swedged bolts and shall extend into the concrete with ASTM A563 Grade A Heavy Hex Nuts. Actual manufacturer's certified mill test report shall be provided. Swedging shall be 1" less than extension into concrete.

- Anchor bolts shall be at the centerline of slotted hole at 60°F. Bearing positions shall be adjusted for each 10° fall or rise in temperature at installation.

- Anchor bolts and heavy hex nuts shall be coated with a minimum of two coats of inorganic zinc primer to provide a total dry film thickness of 4 mils minimum, 6 mils maximum. Neoprene elastomeric pads shall be 4 mils minimum, 6 mils maximum.

- Structural steel for sole plate shall be ASTM A992 Grade 50 and shall be coated with a minimum of two coats of inorganic zinc primer to provide a total dry film thickness of 4 mils minimum, 6 mils maximum.

- Neoprene Bearing Pad Assembly shall be in accordance with Sec 1080.
GENERAL NOTES:

The bearing design shall conform to the provisions of the latest edition of AASHTO LRFD Bridge Design Specifications.

The contractor, in coordination with the bearing manufacturer, shall be responsible for sizing the sole plate and masonry plate and determining the size, number, and location of anchor bolts based on the load and movement capacities, indicated in the Bearing Data Table.

The contractor shall submit calculations sealed by a Professional Engineer, licensed in the state of Missouri, indicating conformance with design load and structural criteria in the contract documents.

(1) Maximum vertical dimension of the complete bearing. If the actual bearing dimensions vary, adjustments shall be made to the height of the pot bearing plate. The sole plate and concrete pad as needed by the contractor shall be an additional cost to the owner.

(2) Estimated horizontal dimension of the pot bearing device. If the actual bearing differs, the size of the sole plate and masonry plate as needed by the contractor shall be an additional cost to the owner.

(3) The information in the Bearing Data Table represents the assumed total height of bearing mechanism between the sole plate and masonry plate used by the designer to establish the pedestal elevations.

The bearings shall be manufactured pot bearings, designed for the load and movement capacities indicated in the Bearing Data Table.

All expansion bearings shall have maximum friction coefficient of 4%.

Steel for pot bearings shall be ASTM A307 Grade B and shall be galvanized. Steel for sole plate and masonry plate shall be ASTM A307 Grade C.

Anchor bolts shall conform to ASTM F1554 Grade 5. The anchor bolts shall be the swedge-type and shall have a minimum diameter of 1 1/2 inches and shall be galvanized. The washers shall be a thickness less than the extension into the concrete.

All expansion bearings shall have maximum friction coefficient of 3%.

Steel for pot bearings shall be ASTM A307 Grade B and shall be galvanized. Steel for sole plate and masonry plate shall be ASTM A307 Grade C.

Anchor bolts shall conform to ASTM F1554 Grade 5. The anchor bolts shall be the swedge-type and shall have a minimum diameter of 1 1/2 inches and shall be galvanized. The washers shall be a thickness less than the extension into the concrete.

All expansion bearings shall have maximum friction coefficient of 4%.

Steel for pot bearings shall be ASTM A307 Grade B and shall be galvanized. Steel for sole plate and masonry plate shall be ASTM A307 Grade C.

Anchor bolts shall conform to ASTM F1554 Grade 5. The anchor bolts shall be the swedge-type and shall have a minimum diameter of 1 1/2 inches and shall be galvanized. The washers shall be a thickness less than the extension into the concrete.

All expansion bearings shall have maximum friction coefficient of 4%.

Steel for pot bearings shall be ASTM A307 Grade B and shall be galvanized. Steel for sole plate and masonry plate shall be ASTM A307 Grade C.

Anchor bolts shall conform to ASTM F1554 Grade 5. The anchor bolts shall be the swedge-type and shall have a minimum diameter of 1 1/2 inches and shall be galvanized. The washers shall be a thickness less than the extension into the concrete.
2' - 8" BLOCKOUT

SECTION A-A

PART ELEVATION OF CURB BLOCKOUT

SECTION B-B
3'-0" Curb Blockout
These details are meant to be used as a starting point only. Modify as needed.

1. Taper front face as gradually as possible, while maintaining 6" minimum thickness of blockout at the end of the existing parapet. 2'-7" minimum taper length.
2. Holes may be shifted 12" closer to the end (8" instead of 20") to avoid attaching a rail post to the top of backwall. All other dimensions and reinforcement remain the same.
3. Longitudinal R bars shall extend 2'-7" minimum into new end post.

Notes:
Work this sheet with Sheet No. __.
For details of resin anchors, see Sheet No. __.
Resin anchors shall be shifted or bent in field to clear one-inch diameter holes by at least 1/2 inch.

Curb Blockout at End Bents

ELEVATION SHOWING REINFORCEMENT
(Right End Post at End Bent No. 1 similar)

PLAN SHOWING REINFORCEMENT
LEFT END POST AT END BENT No. 1

SECTION A-A

PLAN SHOWING REINFORCEMENT
LEFT END POST AT END BENT NO.

SECTION B-B

Notes:

- Diagrams are not to scale. Follow dimensions
- Work this sheet with Sheet No._
- For details of resin anchors, see Sheet No._
- Resin anchors shall be shifted or bent in field to clear one-inch diameter holes by at least 1/2 inch.

Curb Blockout at End Bents

Note: This drawing is not to scale. Follow dimensions.
2'-8" Curb Blockout

These details are meant to be used as a starting point only. Modify as needed.

1. Taper front face as gradually as possible, while maintaining 6" minimum thickness of blockout at the end of the existing parapet. 2'-8" maximum taper length.

2. Holes may be shifted 12" closer to the end (8" instead of 20") to avoid attaching a rail post to the top of backwall. All other dimensions and reinforcement remain the same.

3. Longitudinal R bars shall extend 2'-7" minimum into new end post. Detach unused border reference file before PDF request.

4. For details of resin anchors, see Sheet No. 1.

Cost of removing existing end posts will be considered completely covered by the contract unit price for Curb Blockout.
Cost of any concrete curb repair will be considered completely covered by the contract unit price for Curb Blockout. The 1/4-inch joints may be either formed joints with joint filler or saw-cut joints.

Joint sealant and backer rods shall be in accordance with Sec 717 for Silicone Joint Sealant for Saw Cut and Formed Joints. For details of optional saw-cut joint, see Sheet No. __. For additional details of end of blockout, see Sheet No. __.

Language:

PLAN OF LEFT CURB BLOCKOUT

(Right curb blockout similar)

Notes:

Longitudinal dimensions are along grade and are taken at top surface of edge of curb.
Top of curb blockout shall be built parallel to grade with curb blockout joints except at end bents normal to grade.
Concrete in the curb blockout shall be Class B-1.
All exposed edges of curb blockout shall have either a 1/2-inch radius or a 3/8-inch bevel, unless otherwise noted.
Payment for concrete, reinforcement, resin anchor systems and any other work incidental to the curb blockout, complete in place, will be considered completely covered by the contract unit price for Curb Blockout per linear foot.
Measurement of curb blockout is to the nearest linear foot for each structure measured along the inside edge of curb from end of slab to end of slab.
Concrete traffic barrier delineators shall be placed on top of the curb blockout similarly as shown on Missouri Standard Plans 617.10 and in accordance with Sec 617. Delineator on bridges with two lane, two-way traffic shall have retroreflective sheeting on both sides. Concrete traffic barrier delineators will be considered completely covered by the contract unit price for Curb Blockout.

COST:

Note: This drawing is not to scale. Follow dimensions.
These details are meant to be used as a starting point only. Modify as needed.

If slip-form option is not allowed, include saw-cut joint details, or allow joint filler only [with SPM approval].

Longitudinal R bars in front face shall lap 3'-3" minimum with horizontal R bars in end post.

Change to 3-#5 R bars in Plan (top bar not bent in field) and remove line that indicates the sloped top. Use resin anchor System A for all. 8 R bars in end post at front face (top bar not bent in field).

ALTERNATE DETAILS FOR 2'-8" BLOCKOUT
**Notes:**
- Longitudinal dimensions are along grade and are taken at top outside edge of curb.
- Top of curb blockout shall be built parallel to grade with curb blockout joints normal to grade.
- Concrete in the curb blockout shall be Class B-1.
- All exposed edges of curb blockout shall have a 1/2-inch radius or a 3/8-inch bevel, unless otherwise noted.
- Payment for concrete, reinforcement, resin anchor systems and any other work included in the curb blockout, complete in place, will be considered completely covered by the contract unit price for Curb Blockout per linear foot.
- Cost of any concrete curb repair will be considered completely covered by the contract unit price for Curb Blockout.
- Payment for concrete, reinforcement, resin anchor systems and any other work included in the curb blockout, complete in place, will be considered completely covered by the contract unit price for Curb Blockout per linear foot.
- Measurement of curb blockout is to the nearest linear foot for each structure, measured along the inside edge of curb from end of slab to end of slab.
- Concrete traffic barrier delineators shall be placed on top of the curb blockout similarly as shown on Missouri Standard Plans 617.10 and in accordance with Sec 717 for Silicone Joint Sealant for Saw Cut and Formed Joints.
- For additional details of end of blockout, see Sheet No. _.
- Work this sheet with Sheets No.   &  .

**PLAN OF LEFT CURB BLOCKOUT**
(Right curb blockout similar)

Cost of any concrete curb repair will be considered completely covered by the contract unit price for Curb Blockout.

The 1/4-inch joints may be either formed joints with joint filler or saw-cut joints.

Joint sealant and backer rods shall be in accordance with Sec 717 for Silicone Joint Sealant for Saw Cut and Formed Joints.

For details of optional saw-cut joint, see Sheet No. _.

For additional details of end of blockout, see Sheet No. _.

Work this sheet with Sheets No.   &  .
These details are meant to be used as a starting point only. Modify as needed.

If slip-form option is not allowed, include saw-cut joint details, or allow joint filler only (with SPM approval).

Longitudinal R bars in front face shall lap 3'-1" minimum with horizontal R bars in end post.

ALTERNATE DETAILS FOR 2'-8" BLOCKOUT

- 3-#5 R bars (Each face) (Equally spaced)
CURB BLOCKOUT

Notes:

Work this sheet with Sheets No. 2 & 3.

All curb blockout reinforcement shall be epoxy coated.

The contractor shall use one of the qualified resin anchor systems in accordance with Sec. 1039.

The minimum embedment depth in concrete with f'c = 4,000 psi for the resin anchor system shall be 5 inches in accordance with Sec. 1039 but shall not be less than 1/2 inch.

An epoxy coated #6 Grade 60 reinforcing bar shall be substituted for the 3/4-inch diameter threaded rod.

Resin anchors shall be shifted or bent in the field to clear one-inch diameter holes by at least 1/2 inch.

Notes:

Cost of channel removal will be considered completely covered by the contract unit price for Curb Blockout.

**Modified Terminal Connection**

Use only if there is an expansion gap (any size) between the end post and the first rail post off the bridge.

Part Section Thru Railing

Showing Channel Removal

Part Elevation Showing End of Blockout

FREE FROM END POST {3'-0' +}

Details of Resin Anchors

Cost of channel removal will be considered completely covered by the contract unit price for Curb Blockout.

Use Only if There Is an Expansion Gap (Any Size) Between the End Post and the First Rail Post Off the Bridge.

Modifying Terminal Connection

At Abutments (Roadway Item)

Use Only if There Is an Expansion Gap (Any Size) Between the End Post and the First Rail Post Off the Bridge.

Free Standing

Free From Existing End Post (3'-0')

(Encore for 2'-6' Blockout)

(Encore for Free-Standing End Post)

System B

24 required

System A

1 required

System C

7 required

Details of Resin Anchors

Manufacturer's recommended embedment length (15' min.)

Note: This drawing is not to scale. Follow dimensions.
Standard Drawing Guidance (Do not show on plans):

1. May use 2'-8" if curb blockout is on a non-NHS route and sight distance or weight is an issue.
2. Holes may be shifted 12" closer to the end (8" instead of 20") to avoid attaching a rail post to the top of backwall. All other dimensions and reinforcement remain the same.

Use this sheet with CBO_03 or 04 & CBO_05.

Longitudinal R bars in front face shall lap 3'-1" minimum with horizontal R bars in end post.

These details may not cover all situations, and are intended as a starting point only. Modify as necessary.

PART SECTION THRU END OF BLOCKOUT

ATTACH TO EXISTING END POST (3'-0'')

PART ELEVATION SHOWING END OF BLOCKOUT

FREE FROM EXISTING END POST (2'-8'')

PART ELEVATION OF END OF BLOCKOUT SHOWING REINFORCEMENT

ELEVATION B-B

PART ELEVATION SHOWING END OF BLOCKOUT

3'-9" X 2'-0"
PART ELEVATION SHOWING END OF BLOCKOUT SHOWING REINFORCEMENT

ATTACH TO EXISTING END POST (2'-8")
**TYPICAL ELEVATION OF CURB BLOCKOUT AT SUPPORT LOCATIONS**

- Horizontal #4 bars are not shown for clarity. C bars and #4 Textured fiberglass bars shall be used in addition to reinforcement shown for conventional forming.

- Joint sealant and backer rods shall be in accordance with Sec 717 for silicone joint sealant for saw cut and formed joints.

- For slip-formed option, both sides of the curb blockout shall have a vertically broomed finish and the top shall have a transversely broomed finish.

- Cost of silicone joint sealant and backer rod, complete in place, will be considered completely covered by the contract unit price for Curb Blockout.

**OPTIONAL SLIP-FORMED CURB BLOCKOUT**

- When optional construction joint is used, #5-C2 bars may be shifted or omitted.

- Work this sheet with Sheets No. _ & _.

- Joint sealant and backer rods shall be in accordance with Sec 717 for silicone joint sealant for saw cut and formed joints.

- For slip-formed option, both sides of the curb blockout shall have a vertically broomed finish and the top shall have a transversely broomed finish.

- Cost of silicone joint sealant and backer rod, complete in place, will be considered completely covered by the contract unit price for Curb Blockout.

- General notes shown for conventionally formed curb blockouts also apply to slip-formed curb blockouts.

- Channel, posts and concrete end posts shall be removed if necessary for slip forming. Removal cost will be considered completely covered by the contract unit price for Curb Blockout.
Guidance: Remove top slopes from ends in Elevation for 2'-8" blockout.

Alternate details for 2'-8" blockout
Standard Drawing Guidance (do not show on plans):
Check that the 1 1/2"Ø holes for the diaphragms shown on the design plans will provide a minimum clearance of at least 1 1/2" to any prestressing strands. Diaphragm spacing may need to be adjusted.

For MoDOT Type 2 girder only, use shorter angle and plate 15 1/2" instead of 16" to account for depth tolerance of web. Revise bolt end clearances to 1 3/4".

Delete panels for CIP slab.

Detailed
Thinned Note: This drawing is not to scale. Follow dimensions. Sheet No. of

STEEL INTERMEDIATE DIAPHRAGMS

SECTION C-C

STEEL DIAPHRAGM NOTES:

- In lieu of 2 1/2" outside diameter washers, contractor may substitute a 3/16" (Min. thickness) plate with four 15/16" holes and one hardened washer per bolt.
- Bolts shall be tightened to provide a tension of one-half that specified in Sec 712 for high strength bolt installation. ASTM F3125 Grade A325 Type 1 bolts may be substituted for and installed in accordance with the requirements for the specified ASTM A307 bolts.
- All diaphragm materials including bolts, nuts, and washers shall be galvanized.
- Fabricated structural steel shall be ASTM A709 Grade 36 except as noted.

Payment for furnishing and installing steel intermediate diaphragms will be considered completely covered by the contract unit price for Steel Intermediate Diaphragm for P/S Concrete Girders.

Shop drawings will not be required for steel intermediate diaphragms and angle connections.

For location of intermediate diaphragms, see Sheet No.
Standard Drawing Guidance (do not show on plans):

Check that the 1 1/2"Ø holes for the diaphragms shown on the design plans will provide a minimum clearance of at least 1 1/2" to any prestressing strands. Diaphragm spacing may need to be adjusted.

For MoDOT Type 2 girder only, use shorter angle and plate 15 1/2" instead of 18" to account for depth tolerance of web. Revise bolt end clearances to 1 3/4".

Delete panels for CIP slab.

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Steel Intermediate Diaphragms:

- **Steel Diaphragm Notes:**
  - In lieu of 2 1/2" outside diameter washers, contractor may substitute a 3/16" (Min. thickness) plate with four 1 1/16" Ø holes and one hardened washer per bolt.
  - Bolts shall be tightened to provide a tension of one-half that specified in Sec 712 for high strength bolt installation. ASTM F3125 Grade A325 Type 1 bolts may be substituted for and installed in accordance with the requirements for the specified ASTM A307 bolts.
  - All diaphragm materials including bolts, nuts, and washers shall be galvanized.
  - Fabricated structural steel shall be ASTM A709 Grade 36 except as noted.
  - Payment for furnishing and installing steel intermediate diaphragms will be considered completely covered by the contract unit price for Steel Intermediate Diaphragm for P/S Concrete Girders.
  - Shop drawings will not be required for steel intermediate diaphragms and angle connections.
  - For location of intermediate diaphragms, see Sheet No. 105.

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**Diagram Description:**

- **SECTION THRU INT. GIRDER AT DIAPHRAGM**
  - C15x33.9
  - 1 1/16" Ø holes cast in beam with 7/8"Ø (ASTM A325) bolt, hex nut and 2 hardened washers. Tighten and burr threads.

- **SECTION THRU EXT. GIRDER AT DIAPHRAGM**
  - C15x33.9
  - 1 1/2"Ø holes, bolts (ASTM A325); hex nuts and washers.

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**Steel Intermediate Diaphragms**

- **STEEL DIAPHRAGM NOTES:**
  - In lieu of 2 1/2" outside diameter washers, contractor may substitute a 3/16" (Min. thickness) plate with four 1 1/16" Ø holes and one hardened washer per bolt.
  - Bolts shall be tightened to provide a tension of one-half that specified in Sec 712 for high strength bolt installation. ASTM F3125 Grade A325 Type 1 bolts may be substituted for and installed in accordance with the requirements for the specified ASTM A307 bolts.
  - All diaphragm materials including bolts, nuts, and washers shall be galvanized.
  - Fabricated structural steel shall be ASTM A709 Grade 36 except as noted.
  - Payment for furnishing and installing steel intermediate diaphragms will be considered completely covered by the contract unit price for Steel Intermediate Diaphragm for P/S Concrete Girders.
  - Shop drawings will not be required for steel intermediate diaphragms and angle connections.
  - For location of intermediate diaphragms, see Sheet No. 105.
**Standard Drawing Guidance (Do not show on plans):**

Check that the 1/2" holes for the diaphragms shown on the design plans will provide a minimum clearance of at least 1/2" to any prestressing strands. Diaphragm spacing may need to be adjusted.

Delete panels for CIP slab.

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**STEEL DIAPHRAGM NOTES:**

- In lieu of 2 1/2" outside diameter washers, contractor may substitute a 3/16" (Min. thickness) plate with four 15/16" holes and one hardened washer per bolt.

- Bolts shall be tightened to provide a tension of one-half that specified in Sec 712 for high strength bolt installation. ASTM F3125 Grade A325 Type 1 bolts may be substituted for and installed in accordance with the requirements for the specified ASTM A307 bolts.

- All diaphragm materials including bolts, nuts, and washers shall be galvanized.

- Fabricated structural steel shall be ASTM A709 Grade 36 except as noted.

- Payment for furnishing and installing steel intermediate diaphragms will be considered completely covered by the contract unit price for Steel Intermediate Diaphragm for P/S Concrete Girders.

**Shop drawings will not be required for steel intermediate diaphragms and angle connections.**

For location of intermediate diaphragms, see Sheet No.
Standard Drawing Guidance (do not show on plans):

Check that the 1 1/2"Ø holes for the diaphragms shown on the design plans will provide a minimum clearance of at least 1 1/2" to any prestressing strands. Diaphragm spacing may need to be adjusted.

Delete panels for CIP slab.

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STEEL DIAPHRAGM NOTES:

- In lieu of 2 1/2" outside diameter washers, contractor may substitute a 3/16" (Min. thickness) plate with four 15/16"Ø holes and one hardened washer per bolt.

- Bolts shall be tightened to provide a tension at the half that specified in Sec 712 for high strength bolt installation. ASTM F3125 Grade A325 Type 1 bolts may be substituted for and installed in accordance with the requirements for the specified ASTM A307 bolts.

- All diaphragm materials including bolts, nuts, and washers shall be galvanized.

- Fabricated structural steel shall be ASTM A709 Grade 36 except as noted.

- Payment for furnishing and installing steel intermediate diaphragms will be considered completely covered by the contract unit price for Steel Intermediate Diaphragm for P/S Concrete Girders.

Shop drawings will not be required for steel intermediate diaphragms and angle connections.

For location of intermediate diaphragms, see Sheet No.
Standard Drawing Guidance (do not show on plans):

Check that the 1 1/2"Ø holes for the diaphragms shown on the design plans will provide a minimum clearance of at least 1 1/2" to any prestressing strands. Diaphragm spacing may need to be adjusted.

Delete panels for CIP slab.

Steel Diaphragm Notes:

- In lieu of 2 1/2" outside diameter washers, contractor may substitute a 3/16" Min. thickness plate with four 1 1/16" Ø holes and one hardened washer per bolt.
- Plates to be furnished and installed in accordance with the requirements for the specified ASTM A307 bolts.
- All diaphragm materials including bolts, nuts, and washers shall be galvanized.
- Fabricated structural steel shall be ASTM A709 Grade 36 except as noted.
- Payment for furnishing and installing steel intermediate diaphragms will be considered completely covered by the contract unit price for Steel Intermediate Diaphragm for P/S Concrete Girders.
- Shop drawings will not be required for steel intermediate diaphragms and angle connections.

For location of intermediate diaphragms, see Sheet No. 8.

1 1/16"Ø Hole in 4" leg of 6 x 4 x 1/2 x 16" angle and in 4" x 3/8" x 16" plate

1 1/2"Ø Holes cast in beam with 7/8"Ø (ASTM A307) bolt, hex nut and 2 hardened washers.

Tighten and burr threads.

Steel Intermediate Diaphragms

Note: This drawing is not to scale. Follow dimensions.
**Steel Intermediate Diaphragms**

- **Steel Diaphragm Notes:**
  - In lieu of standard diameter washers, contractor may substitute a 3/32" (Min. thickness) plate with four 3/32" Ø holes and one hardened washer per bolt.
  - Nuts shall be tightened to provide a tension of one-half that specified in Sec 712 for high strength bolt installation. ASTM F3125 Grade A325 Type 1 bolts may be substituted for and installed in accordance with the requirements for the specified ASTM A307 bolts.
  - All diaphragm materials including bolts, nuts, and washers shall be galvanized.
  - Fabricated structural steel shall be ASTM A509 Grade 36 except as noted.
  - Payroll for furnishing and installing steel intermediate diaphragms will be considered complete when approved by the contractor for Steel Intermediate Diaphragm for P/S Concrete Girders.
  - Shop drawings will not be required for steel intermediate diaphragms and angle connections.

- **Standard Drawing Guidance (Do not show on plans):**
  - Check that the 1 1/2"Ø holes for the diaphragms shown on the design plans will provide a minimum clearance of at least 1/2" to any prestressing strands. Diaphragm spacing may need to be adjusted.

- **Delete panels for CIP slab.**

- **Notes:** This drawing is not to scale. Follow dimensions.
Standard Drawing Guidance (Do not show on plans):

Check that the 1 1/2" holes for the diaphragms shown on the design plans will provide a minimum clearance of at least 1 1/2" to any prestressing strands. Diaphragm spacing may need to be adjusted.

Delete panels for CIP slab.

Steel Diaphragm Notes:
- In lieu of 2 1/2" outside diameter washers, contractor may substitute a 3/16" (Min. thickness) plate with four 15/16" holes and one hardened washer per bolt.
- Bolts shall be tightened to provide a tension of one-half that specified in Sec 712 for high strength bolt installation. ASTM F3125 Grade A325 Type 1 bolts may be substituted for and installed in accordance with the requirements for the specified ASTM A307 bolts.
- All diaphragm materials including bolts, nuts, and washers shall be galvanized.
- Fabricated structural steel shall be ASTM A709 Grade 36 except as noted.
- Payment for furnishing and installing steel intermediate diaphragms will be considered completely covered by the contract unit price for Steel Intermediate Diaphragm for P/S Concrete Girders.
- Shop drawings will not be required for steel intermediate diaphragms and angle connections.

For location of intermediate diaphragms, see Sheet No.

Note: This drawing is not to scale. Follow dimensions.
Standard Drawing Guidance (Do not show on plans):
Check that the 1 1/2" holes for the diaphragms shown on the design plans will provide a minimum clearance of at least 1 1/2" to any prestressing strands. Diaphragm spacing may need to be adjusted.

Use 2'-4" for NU 78 girders
Delete panels for CIP slab.

Note: This drawing is not to scale. Follow dimensions.
STEEL INTERMEDIATE DIAPHRAGMS

Part Section Showing Intermediate Diaphragms

Standard Drawing Guidance (Do not show on plans):
Check that the 1 1/2"Ø holes for the diaphragms shown on the design plans will provide a minimum clearance of at least 1 1/2" to any prestressing strands. Diaphragm spacing may need to be adjusted.

Use 2'-4" for NU 78 girders
Delete panels for CIP slab.

Note: This drawing is not to scale. Follow dimensions.

Payment for furnishing and installing steel intermediate diaphragms will be considered completely covered by the contract unit price for Steel Intermediate Diaphragm for P/S Concrete Girders.

Shop drawings will not be required for steel intermediate diaphragms and angle connections.
For location of intermediate diaphragms, see Sheet No. 10.

Fabricated structural steel shall be ASTM A709 Grade 36 except as noted.

All diaphragm materials including bolts, nuts, and washers shall be galvanized.

Bolts shall be tightened to provide a tension of one-half that specified in Sec 712 for high strength bolt installation. ASTM F3125 Grade A325 Type 1 bolts may be substituted for and installed in accordance with the requirements for the specified ASTM A307 bolts.

Steel diaphragm notes:

- In lieu of 2 1/2" outside diameter washers, contractor may substitute a 3/8" (Min. thickness) plate with Four 5/16" Ø holes and one hardened washer per bolt.

- Holes, bolts (ASTM A307), hex nuts, and washers

- Four 1 1/8" x 2 1/4" horizontal slotted holes in 6" leg of each 6 x 4 x 1 1/2 x 16" angle; eight 7/8"Ø holes in bent plate; eight 1 1/2"Ø bolts (ASTM A325) with hex nuts, eight 2 1/2" O.D. washers and 16 hardened washers.

- 1 1/16"Ø Hole in 4" leg of 6 x 4 x 1 1/2 x 16" angle and 16 plate 4 x 3 1/8" x 16".

- 1 1/16"Ø Hole cast in web, 1 1/8" Ø bolt (ASTM A325), four nuts, and hardened washers.

- 1 1/2"Ø Holes cast in web, 7/8"Ø bolt (ASTM A307), hex nut, and 2 hardened washers.

Tighten and burr threads.

Steel Intermediate Diaphragms

Note: This drawing is not to scale. Follow dimensions.
TYPICAL PART SECTION SHOWING END DIAPHRAGMS

(W2 thru W40) Omit this detail if End Diaphragms (slab haunched to bear) are not used.

TYPICAL PART SECTION SHOWING END DIAPHRAGMS

(W2 thru W40) Omit these details if End Diaphragms (slab haunched to bear) are not used.

TYPICAL PART SECTION SHOWING CROSS FRAMES AND INTERMEDIATE DIAPHRAGMS

Modify if necessary in accordance with EPG 751.14.5.3.

STANDARD DRAWING GUIDANCE (DO NOT SHOW ON PLANS):

Angle size should be shown without inch (") marks on the plans.

Do not show fillet weld size unless by design and size of weld exceeds Sec 1080.

Show specialty welds information as given unless by design.

Delete panels for CIP slab.

Note: This drawing is not to scale. Follow dimensions.
Use these alternate details if Flange Connection Angle is required by design.

2 Use Type 3 for weathering steel bolted connections and Type 1 for painted or galvanized steel connections.

3 Verify clearance for cross slope.
TYPICAL PART SECTION SHOWING END DIAPHRAGMS

(4" thru 40" webs) Omit this detail and Details A & B if End Diaphragms (slab haunched to bear) are not used.

TYPICAL PART SECTION SHOWING END DIAPHRAGMS

(36" thru 40" webs) Omit this detail and Detail A if End Diaphragms (slab haunched to bear) are not used.

TYPICAL PART SECTION SHOWING CROSS FRAMES AND INTERMEDIATE DIAPHRAGMS

Replace this detail with alternate details if flange connection angle is required by design.

STEEL DIAPHRAGMS

Standard Drawing Guidance (do not show on plans):

- Angle size should be shown without inch (") marks on the plans.
- Do not show fillet weld size unless by design and size of weld exceeds Sec 1080.
- Show specialty welds information as given unless by design.
- Delete panels for CIP slab.

Modify if necessary in accordance with EPG 751.14.5.4.

Note: This drawing is not to scale. Follow dimensions.
Use these alternate details if Flange Connection Angle is required by design.

1. Use Type 3 for weathering steel bolted connections and Type 1 for painted or galvanized steel connections.

2. Verify clearance for cross-slope.

Note: Bolts shall be 3/4-inch diameter ASTM F3125 Grade A325 Type 1 and Type 3 that connect the 6 x 6 x 3/8 angle to the top flange and placed so the nut is on the inside of flange (toward the web).
Steel Diaphragms

TYPICAL PART SECTION SHOWING END DIAPHRAGMS

TYPICAL PART SECTION SHOWING CROSS FRAMES AND INTERMEDIATE DIAPHRAGMS

Standard Drawing Guidance (do not show on plans):
- Angle size should be shown without inch ("") marks on the plans.
- Do not show fillet weld size unless by design and size of weld exceeds Sec 1080.
- Show specialty welds information as given unless by design.
- Delete panels for CIP slab.
- Modify if necessary in accordance with EPG 751.14.5.4.

Note: This drawing is not to scale. Follow dimensions.
Use these alternate details if Flange Connection Angle is required by design:

2 Use Type 3 for weathering steel bolted connections and Type 1 for painted or galvanized steel connections.

Note: Bolts shall be 3/4-inch diameter ASTM 3125 Grade A325 Type 1 that connect the top flange and placed so the nut is on the inside of the flange (toward the web).
CONSTRUCTION SEQUENCE:

Construct end bent with anchor tees in place.

Construct deadman with anchor tees in place.

Machine compact fill up to elevation of __" rod and turnbuckle.

Install __" rod, clevis and turnbuckle assembly.

Tighten turnbuckle until snug.

Hand compact fill for __" (Min.) over __" rod and turnbuckle.

Machine compact remaining fill.

BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>NUMBER</th>
<th>SIZE &amp; MARK</th>
<th>LENGTH</th>
</tr>
</thead>
</table>

Reinforcing steel lengths are based on nominal lengths, out to out.

All anchor tees, rods, clevises, turnbuckles, etc. shall be fabricated from ASTM A36 Grade 36, ASTM A368 Class F or equivalent steel and galvanized in accordance with Sec 1081. Shop drawings will not be required. All concrete shall be Class B. All reinforcing steel shall be Grade 60.

All metal members of the anchorage system not embedded in concrete shall be cleaned and receive a heavy coating of an approved bituminous paint.

Fine aggregate shall be in accordance with Sec 1005 and shall be placed below and above the rod and turnbuckles.

Payment for all materials, excavation, backfill and any other incidental work necessary to complete the Deadman Anchorage Assembly, shall be considered completely covered by the contract unit price per each.

Note: This drawing is not to scale. Follow dimensions.
Drip bars should be located between 5 feet from center of expansion device and 1 foot short of the end of the partial coating limit. Details shown are for plate girder. For wide flange beam, change "Girder" to "Beam" (5 places).

Standard Drawing Guidance (do not show on plans):
- Use this detail near expansion device to deflect water away from girder.
- Use this detail near bent, on outside of exterior girder only, to deflect water away from bent.

Steel for drip bars shall be same grade as bottom flange.

Note:
- This drawing is not to scale. Follow dimensions.

Details shown are for plate girder. For wide flange beam, change "Girder" to "Beam" (5 places).
Drip angles shall be caulked with dark brown caulk against flange, web and fillet welds.
Drip angles shall be same grade as bottom flange.
Bolted drip angles should only be used when welded drip bars cannot be used.
Drip angles should be located between 5 feet from center of expansion device and 2 feet less from the end of the partial coating limit.

Note:

- Drip angles shall be caulked with dark brown caulk against flange, web and fillet welds.
- Use this detail near expansion device.
- Use this detail as shown to deflect water from girder.
- Use this detail near bent.
- Use this detail as shown to deflect water away from bent for exterior girder only.
- Bolted drip angles should only be used when welded drip bars cannot be used.
- Drip angles should be located between 5 feet from center of expansion device and 2 feet less from the end of the partial coating limit.

Standard Drawing Guidance (do not show on plans):
- Use this detail near expansion device.
- Use this detail as shown to deflect water from girder.
- Use this detail near bent.
- Use this detail as shown to deflect water away from bent for exterior girder only.
- Bolted drip angles should only be used when welded drip bars cannot be used.
- Drip angles should be located between 5 feet from center of expansion device and 2 feet less from the end of the partial coating limit.
PART PLAN SHOWING DRILLED SHAFT NUMBERING FOR RECORDING AS-BUILT DRILLED SHAFT DATA

- Note: This sheet to be completed by MoDOT construction personnel.
- Standard Drawing Guidance (do not show on plans):
  - Draw layout and provide numbering of shafts.
  - Combine with As-Built Pile Data if both piles and drilled shafts are shown on the same sheet.

### AS-BUILT DRILLED SHAFT DATA

<table>
<thead>
<tr>
<th>Shaft No.</th>
<th>Tip of Casing (Elev.)</th>
<th>Bottom of Rock Socket (Elev.)</th>
<th>Shaft No.</th>
<th>Tip of Casing (Elev.)</th>
<th>Bottom of Rock Socket (Elev.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

Note: This drawing is not to scale. Follow dimensions.

Standard Drawing Guidance (Do not show on plans):

1) 6" embedment typical, may be adjusted to accommodate a thinner slab thickness, but not less than 4" embedment.

2) May conflict with any proposed expansion device in sidewalk, consult the structural project manager.

GENERAL NOTES:

Pedestrian guard fence (Chain link type) shall be in accordance with Sec. 1043 except all fabric shall have the top and bottom edges knuckled.

All posts shall be vertical. Grout of 1/2" minimum thickness shall be placed under floor plates to provide for vertical alignment of posts.

Payment for furnishing, galvanizing and erecting the fence and frame complete with anchor bolts and washers will be considered completely covered by the contract unit price for (112 in.) Curved Top Pedestrian Fence (Structures) per linear foot.

Dimensions of pedestrian guard fence are measured horizontally.

The maximum spacing allowed between pull posts and end posts is 100 ft. Post brace and 1/2"Ø truss rod are required for panels adjacent to pull posts and end posts to which the stretcher bar is attached.

(112 in.) Curved Top Pedestrian Fence (Structures) will be measured to the nearest linear foot for each structure measured along the bottom outside edge of the sidewalk barrier from _____ to _____.

Core wire size for wire fabric shall be 6 gauge minimum.
PLAN SHOWING PEDESTRIAN CURB

Left side shown, right side similar
Longitudinal dimensions are horizontal.

PART ELEVATION OF PEDESTRIAN CURB AT END BENT

SECTION A-A

SECTION B-B

PART ELEVATION AT CURB JOINT

PEDESTRIAN CURB

Notes:
- Top of curb shall be built parallel to grade and curb joints (except at and bends), return to grade.
- All exposed edges of curb shall have either a 1/2-inch radius or a 3/8-inch vee, unless otherwise noted.
- Measurement of pedestrian curb is to the nearest linear foot for each structure, measured along the outside top of curb from end to end at curb.
- Center of posts shall clear curb joints or ends by at least 6 inches.
- Minimum lap for longitudinal R-bars is 2'-7".
- Slab reinforcement not shown for clarity.

For details of decorative pedestrian fence, see Sheet No. 

Concrete in curb shall be Class B-1.

Payment for all concrete and reinforcement, complete in place, will be considered completely covered by the contract unit price for Pedestrian Curb per linear foot.

A deal is a jolt on this sheet. It has been electronically sealed and dated.
Notes:

These details are a general representation of a Decorative Pedestrian Fence. The actual fence components and component positions may be different than what is shown.

Fence shall have a gloss black finish (Federal Standard #17038). See special provisions.

Base plate shall be ASTM A302, Grade B.

All base plates, U-bolts, hex nuts and washers shall be galvanized in accordance with ASTM A123 and Sec 1083.

Measurement of pedestrian fence will be made horizontally and in the nearest linear foot along centerline fence.

Payment for furnishing and erecting the fence complete in place will be considered completely covered by the contract unit price for 1 in. Decorative Pedestrian Fence (Structural).

All fence posts shall be vertical.

Material shall be placed under the post base plates in accordance with Sec 1090.

Decorative pedestrian fencing shall be in accordance with 2020-AASHTO LRFD Bridge Design Specifications, Ninth Ed.

Shop drawings and structural calculations will not be required for the decorative pedestrian fences on the Bridge Pre-qualified Products List.

All materials used in fabrication and construction of the decorative pedestrian fencing shall be in accordance with the manufacturer's specifications, except as modified in the contract documents.

Decorative pedestrian fencing system shall be supplied by only one manufacturer. Decorative pedestrian fencing system shall include all components except the anchor bolts and hardware. Steel bars welded to the anchor bolts. The materials used in the construction of the fence posts shall be the same as the style mentioned for the manufacturer.

See Bridge Pre-qualified Products List (BPPL) for a list of approved manufacturers.

Substitution for the U-bolt cages will not be permitted.

For details of pedestrian curb, see Sheet No.

---

**Standard Drawing Guidance:**

(Do not show on plans.)

Note on plans that longitudinal dimensions of fence are horizontal.

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**Notes:**

This drawing is not to scale. Follow dimensions.

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**Decorative Pedestrian Fence**

Dec 2023

[Drawing Details]

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[Material Specifications]

---

[Assembly Instructions]

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[Section Details]
FEN04 Alternate Details

On Type H Barrier

On Type H Barrier

Use where the top of barrier is less than 9 inches wide, or when the barrier is to be slip-formed.

Use this detail when an expansion joint is used (on curb).

Include this detail when an expansion joint is used (on curb).

PART PLAN SHOWING CONNECTION PLATE

PART ELEVATION AT EXPANSION JOINT SHOWING EXPANSION PANEL

- Optional rail. Need is based on design computations performed by the manufacturer and approved by MoDOT, or may be added for aesthetics.
- Connection shall allow 4" movement.

Use where the top of barrier is less than 9 inches wide, or when the barrier is to be slip-formed.

TYPICAL DETAIL OF FENCE AT LIGHT STANDARDS

TYPICAL PART ELEVATION

- Optional rail. Need is based on design computations performed by the manufacturer and approved by MoDOT, or may be added for aesthetics.
- Connection shall allow 4" movement.

Show this detail when an expansion joint is used (on curb).
Finger plate shall be cut with a machine guided gas torch from one plate. The plate from which fingers are cut may be sawed before fingers are cut. The surface of the cut shall be smooth and may be field welded for a maximum of 3/16" in width. The center line of cut shall not deviate more than ±1/8" from the position of centerline of cut shown. No splicing of finger plate or finger plate assembly shall be allowed after fingers are cut. The expansion device shall be fabricated and installed to the crown and grade of roadway face.

Plan dimensions are based on installation at 60°F. The expansion gap and other dimensions shall be increased or decreased for each 10° fall or rise in temperature at time of fabrication of the expansion device shall be in accordance with Sec 1037.

Material for the expansion device shall be ASTM A709 Grade 36 structural steel. Anchors for the expansion device shall be coated with a minimum of two coats of inorganic zinc primer to provide a local dry film thickness of 4 mils minimum, 8 mils minimum, or galvanized in accordance with ASTM A123. Anchors need not be protected from overspray.

Payment for furnishing, coating or galvanizing and installing the structural steel for the expansion device will be considered completely covered by the contract unit price for Expansion Device (Finger Plate) per linear foot.

Longitudinal reinforcing steel shall be placed so that ends shall not be more than 2" from the 3/4" vertical mounting plate at the expansion device.

Material for the expansion device and barrier shall be Grade 36 structural steel. Anchors for the expansion device shall be in accordance with Sec 1037.

Structural steel for the expansion device and barrier plate shall be coated with a minimum of two coats of inorganic zinc primer to provide a local dry film thickness of 4 mils minimum, 8 mils minimum, or galvanized in accordance with ASTM A123. Anchors need not be protected from overspray.

Payment for furnishing, coating or galvanizing and installing the structural steel for the expansion device will be considered completely covered by the contract unit price for Expansion Device (Finger Plate) per linear foot.
STANDARD DRAWING GUIDANCE (do not show on plans):
1. Not a guidance note. Do not replace.
2. Gap between fingers, barrier recess gap and, for intermediate bents, gap in barrier.
3. Gap adjustment for temperature: along bridge longitudinal axis
4. Transverse gap between fingers
5. Maximum gap between fingers normal to joint @ 60°F.
6. Finger length. 
7. Transverse gap between fingers: not the same as 5 for skewed joints.
8. Plate length = (18" + \[\frac{d}{\cos(\theta)}\]) / \cos(\theta)
9. Gap between girder or between girder and end bent.
10. Include details of slab projection beyond W-beam under barrier on plan of slab detail sheet. Consider similarly projection beyond front face of angle under barrier at end bent.
11. Delete panel for CIP slab.

PART PLAN OF DEVICE
LA TYPE B BARRIER (SBC)

PART PLAN OF FINGER PLATE
LA

PART PLAN OF DEVICE
SQ TYPE B BARRIER (SBC)

LA TYPE D BARRIER
PART PLAN OF DEVICE

RA TYPE D BARRIER

PART PLAN OF FINGER PLATE

RA

PART ELEVATION

AT END OF BENT BARRIER PLATE

SECTION B-B

SECTION C-C

SECTION A-A

ELEVATION OF BARRIER

PART PLAN OF DEVICE

RA TYPE B BARRIER (SBC)

TYPE B BARRIER (SBC) (ALL SKEWS)
Finger plate shall be cut with a machine guided gas torch from one plate. The plate from which fingers are cut may be spliced before fingers are cut. The surface of cut shall not exceed 1/8" in width. The concentricity of cut shall not deviate more than 1/2" from the position of centerline of cut shown. No splicing of finger plate or finger plate assembly will be allowed after fingers are cut. The expansion device shall be fabricated and installed to the crown and grade of the roadway.

Plan dimensions are based on installation at 60°F. The expansion joint and other dimensions shall be increased or decreased for each 10°F fall or rise in temperature at installation.

Material for the expansion device shall be ASTM A706 Grade 36 structural steel. Anchors for the expansion device shall be in accordance with Sec 1037.

Concrete shall be forced under and around finger plate supporting hardware, anchors and bars. Proper consolidation shall be achieved by localized internal vibration.

Concrete shall be coated with a minimum of two coats of inorganic zinc primer to provide a total dry film thickness of 4 mil minimum, 8 mil maximum, or galvanized in accordance with ASTM A653. Anchors need not be protected from overspray.

Structural steel for the expansion device and barrier plate shall be coated with a minimum of two coats of primer and two coats of polyurethane. The total dry film thickness of 8 mil minimum, 12 mil maximum, or galvanized in accordance with ASTM A653. Anchors need not be protected from overspray.

For furnishing, coating or galvanizing and installing the structural steel for the expansion device shall be considered completely covered by the contract unit price for Expansion Device (Finger Plate) per linear foot.

The expansion device shall be placed so that end shall not be more than 1/4" from the 3/4" vertical slotted holes (Typ.) in continuous L8x6x3/4 (Typ.) at 60°F.

Concrete joint penetration grout utilized in the fabrication of the expansion device shall be nondestructively tested by an approved method.

Notes:
Concrete shall be forced under and around finger plate supporting hardware, anchors and bars. Proper consolidation shall be achieved by localized internal vibration.

GENERAL NOTES:

SECTION A-A

FINGER PLATE EXPANSION DEVICE AT INT. BENT NO. _

ELEVATION OF BARRIER

Note: This drawing is not to scale. Follow dimensions. Sheet No. sf
STANDARD DRAWING GUIDANCE (do not show on plans):
1) Not a guidance note. Do not replace.
2) Gap between fingers, barrier recess gap and, for intermediate bents, gap in barrier.
3) Gap adjustment for temperature: along bridge longitudinal axis
4) Transverse gap between fingers
5) Maximum gap between fingers normal to joint @ 60°F.
6) Finger length
7) Transverse gap between fingers: not the same as 5) for skewed joints.
8) Plate length = (18" + 6\) / cos (skew)
9) Gap between girder or between girder and end bent.
10) Include details of slab projection beyond W-beam under barrier on plan of slab detail sheet. Consider similarly projection beyond front face of angle under barrier at end bent.
11) Delete panel for CIP slab.

PART PLAN OF DEVICE
LA TYPE B BARRIER (SBC)

PART PLAN OF DEVICE
LA TYPE D BARRIER

PART PLAN OF FINGER PLATE
LA
PART PLAN OF DEVICE

RA TYPE D BARRIER

PART PLAN OF DEVICE

RA TYPE B BARRIER (SBC)

3/4" Mounting Plate with 13/16" x 2" vertical slotted holes (Typ.)
L8x6x3/4 (Continuous) (Typ.)
3/4"Ø x 8" Long Welded Shear Connector Studs
(Spaced alternately at about 9" cts.) (Typ.)
3/4"Ø x 7" Anchor Bolt with Nut and Washer (Typ.)

3/4"Ø x 6" Long Welded Shear Connector Studs
(Spaced alternately at about 9" cts.) (Typ.)
3/4"Ø Vent Hole at abt. 12" cts. (Typ.)
1 1/4" Finger Plate

PART PLAN OF FINGER PLATE

RA

PART ELEVATION AT END OF BENT BARRIER PLATE

3/4"Ø x 6" Long Welded Shear Connector Stud (Typ.)

Three 3/4"Ø x 6" Long Welded Shear Connector Studs (Typ.)
Bent Barrier Plate
1 1/2" Bent Plate
1 1/2" Barrier Plate
1 1/2" Plate

2-Layers 30# (Min.) Roofing Felt between plate and recess

PART ELEVATION

Bevel barrier plate on roadway face

Round upper edges

PART PLAN OF FINGER PLATE

RA
Finger plate shall be cut with a machine guided gas torch from one plate. The plate from which fingers are cut may be spliced before fingers are cut. The surface of cut shall be perpendicular to the plate. The distance between fingers shall not exceed 1/8" in width. The centerline of cut shall not deviate more than 1/8" from the position of centerline of cut shown. No splicing of finger plate or finger plate assembly shall be allowed after fingers are cut. The expansion device shall be fabricated and installed to the crown and grade of the roadway.

Plan dimensions are based on installation at 60°F. The expansion gap and other tolerances shall be increased as decreased for each 10°F fall or rise in temperature at installation.

Material for the expansion device shall be ASTM A709 Grade 36 Structural steel. Anchors for the expansion device shall be in accordance with Sec 1037.

Structural steel for the expansion device and barrier plate shall be coated with a minimum of two coats of primer to provide a total dry film thickness of 4 mil minimum, 6 mil max, or galvanized in accordance with ASTM A123. Anchors need not be protected from overspray.

Payment for furnishing, coating or galvanizing and installing the structural steel for the expansion device will be considered completely covered by the contract unit price for Expansion Device (Finger Plate) per linear foot.

All holes shown for connections shall be subpunched 11/16 inch diameter (shop or field drill) and reamed to 15/32-inch diameter in field, except holes in members that will be spliced before fingers are cut. Shop reaming may be done at multi-piece connections, only the holes in the template member may be drilled to 15/32-inch diameter in the shop.

Longitudinal reinforcing steel shall be placed so that ends shall not be more than 10" from the web of W14 x 43 at the expansion device.

Complete joint penetration welds utilized in the fabrication of the expansion device shall be nondestructively tested by an approved method.

GENERAL NOTES:

Finger plate may extend 1" outside of gutter line.

Plan dimensions are based on installation at 60°F. The expansion gap and other tolerances shall be increased as decreased for each 10°F fall or rise in temperature at installation.

Material for the expansion device shall be ASTM A709 Grade 36 Structural steel. Anchors for the expansion device shall be in accordance with Sec 1037.

Structural steel for the expansion device and barrier plate shall be coated with a minimum of two coats of primer to provide a total dry film thickness of 4 mil minimum, 6 mil max, or galvanized in accordance with ASTM A123. Anchors need not be protected from overspray.

Payment for furnishing, coating or galvanizing and installing the structural steel for the expansion device will be considered completely covered by the contract unit price for Expansion Device (Finger Plate) per linear foot.

All holes shown for connections shall be subpunched 11/16 inch diameter (shop or field drill) and reamed to 15/32-inch diameter in field, except holes in members that will be spliced before fingers are cut. Shop reaming may be done at multi-piece connections, only the holes in the template member may be drilled to 15/32-inch diameter in the shop.

Longitudinal reinforcing steel shall be placed so that ends shall not be more than 10" from the web of W14 x 43 at the expansion device.

Complete joint penetration welds utilized in the fabrication of the expansion device shall be nondestructively tested by an approved method.
FING03_stl_end Guidance & Alternate Details (1 of 2)

STANDARD DRAWING GUIDANCE (do not show on plans):

1. Not a guidance note. Do not replace.
2. Gap between fingers, barrier recess gap, and for intermediate bents, gap in barrier.
3. For end bents: 2 + 1/2”/cos(θ)
4. Gap adjustment for temperature: along bridge longitudinal axis
5. Transverse gap between fingers
6. Maximum gap between fingers normal to joint @ 60°F.
7. Finger length
8. Transverse gap between fingers: not the same as 5 for skewed joints.
9. Plate length = (18” + θ)/cos(θ/2)
10. Gap between girder or between girder and end bent.
11. Include details of slab projection beyond W-beam under barrier on plan of slab detail sheet. Consider similarly projection beyond front face of angle under barrier at end bents.
12. Delete panel for CIP slab.

PART PLAN OF DEVICE

LA TYPE B BARRIER (SBC)

PART PLAN OF FINGER PLATE

LA

PART PLAN OF DEVICE

SQ TYPE B BARRIER (SBC)
PART PLAN OF FINGER PLATE
RA

PART PLAN OF DEVICE
RA TYPE D BARRIER

PART PLAN OF DEVICE
RA TYPE B BARRIER (SBC)

SECTION C-C

Shop or field weld
1 1/4" Finger Plate

Tight Fit

SECTION A-A

Finger plate may extend 1" outside of gutter line

SECTION B-B

Bent 1/2" Barrier Plate

5/8" x 3" Long Welded Shear Connector Studs

3/4"Ø x 6" Long Welded Shear Connector Studs

PART ELEVATION
AT END OF BENT BARRIER PLATE

Bevel barrier plate on roadway face

PART ELEVATION
RA

Bevel barrier plate on roadway face

3/4"Ø x 6" Long Welded Shear Connector Stud (Typ.)

Const. Joint

Raftypeb (Sbc) (All)
FINGER PLATE EXPANSION DEVICE AT INT. BENT NO.  

GENERAL NOTES:  
Finger plate shall be cut with a machine guided gas torch from one plate. The plate from which fingers are cut may be spliced before fingers are cut. The surface of cut shall be free from any scale, and the edges of the cut shall not exceed 1/8" in width. The plates shall not be more than 2 1/8" from the position at centerline of cut shown. No splicing of finger plate or finger plate assembly will be allowed. The fingers are cut in place. The expansion device shall be fabricated and installed to the crown and grade of the roadway. 

Plan dimensions are based on installation at 60°F. The expansion gap shall be increased or decreased for each 10° fall or rise in temperature. 

Material for the expansion device shall be ASTM A709 Grade 50 structural steel. Anchors for the expansion device shall be in accordance with Sec 1037.

Section A-A 

Note: This drawing is not to scale. Follow dimensions. Steel No. AL

1. Finger Plate 
2. 1/4" Plate
3. 1/2" Plate
4. Bevel barrier plate on roadway face
5. Finger plate assembly will be allowed after fingers are installed to the crown and grade of the roadway. 
6. Finger plate shall be cut with a machine guided gas torch from one plate. 
7. The surface of cut shall be free from any scale, and the edges of the cut shall not exceed 1/8" in width. 
8. The plates shall not be more than 2 1/8" from the position at centerline of cut shown. 
9. No splicing of finger plate or finger plate assembly will be allowed. 

Payment for furnishing, coating or galvanizing and installing the structural steel for the expansion device will be considered lump sum covered by the contract unit price for Separation Device (Finger Plate) per linear foot. 

All holes shown for connections shall be subpunched 1/32" in diameter (shop or field drill) and reamed to 0.036" diameter in field, except holes in members that will be used as locations for drilling or tapping. For multiple connections, only the holes in the template member may be drilled to 0.036" in diameter in the shop. Longitudinal reinforcing steel shall be placed so that ends shall not be more than 1/2" from the web of W14 x 43 at the expansion device. 

Complete joint penetration welds shall be used in the fabrication of the expansion device shall be nondestructively tested by approved method. 

ALL WORK TO BE FINISHED, PAINTED, OR GALVANIZED IN ACCORDANCE WITH CURRENT MISSOURI HIGHWAY AND TRANSPORTATION COMMISSION STANDARD SPECIFICATIONS. 

PAGE 1 OF 2 

Date 04/19/2021 

CONTRACT ID.  105 WEST CAPITOL  
JEFFERSON CITY, MO 65102  
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Page 1 of 2  

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STANDARD DRAWING GUIDANCE (do not show on plans):

1. Not a guidance note. Do not replace.
2. Gap between fingers, barrier recess gap and, for intermediate bents, gap in barrier.
3. For end bents, $\delta = \frac{1}{2} \cos(\theta_{skew})$.
4. Gap adjustment for temperature; along bridge longitudinal axis.
5. Transverse gap between fingers.
6. Maximum gap between fingers normal to joint @ 60°F.
7. Finger length.
8. Transverse gap between fingers not the same as for skewed joints.
9. Plate length = $(18" + \delta) / \cos(\theta_{skew})$
10. Gap between girder or between girder and end bent.
11. Include details of slab projection beyond W-beam under barrier on plan of slab detail sheet. Consider similarly projection beyond front face of angle under barrier at end bents.
12. Delete panel for CIP slab.

LA TYPE B BARRIER (SBC)

LA TYPE D BARRIER

Guide & Alternate Details (1 of 2)
PART PLAN OF DEVICE
RA TYPE D BARRIER

RA TYPE B BARRIER (SBC)

PART PLAN OF FINGER PLATE
RA

PART ELEVATION
AT END OF BENT BARRIER PLATE

SECTION B-B

SECTION C-C

SECTION A-A

ELEVATION OF BARRIER

PART ELEVATION
AT END OF BENT BARRIER PLATE

FINGER PLATE

RA TYPE D BARRIER

TYPE B BARRIER (SBC) (ALL SKEWS)
FINGER PLATE EXPANSION DEVICE AT INT. BENT No._

1. Finger plate shall be cut with a machine-guided gas torch from one plate. The plate from which fingers are cut may be spliced before fingers are cut. The surface of cut shall be finished so that the cut shall not exceed 1/8" in width. The cut shall not be more than 1/8" from the position of centerline of cut shown. No splicing of finger plate or finger plate assembly shall be allowed after fingers are cut. The expansion device shall be fabricated and installed in the crown and grade of the roadway.

2. Plan dimensions are based on installation at 60°F. The expansion joint and other dimensions shall be increased or decreased for each 10°F fall or rise in temperature at installation.

3. Material for the expansion device shall be ASTM A709 Grade 36 structural steel. The expansion device shall be in accordance with Sec. 1037.

4. Structural steel for the expansion device and barrier plate shall be coated with a minimum of two coats of primer. Concrete shall be protected from overspray.

5. Bevel barrier (part of barrier) shall be bevel cut at 90°. The surface of cut shall be perpendicular to the surface of the plate. The edge of the expansion gap and other dimensions shall be increased or decreased for each 10°F fall or rise in temperature at installation.

6. Complete joint penetration welds utilized in the installation of expansion device shall be nondestructively tested by an approved method.

GENERAL NOTES:
- Finger plate may extend 1" from edge of gutter line.
- Finger plate shall be cut with a machine guided gas torch from one plate. The plate from which fingers are cut may be spliced before fingers are cut. The surface of cut shall be finished so that the cut shall not exceed 1/8" in width. The cut shall not be more than 1/8" from the position of centerline of cut shown. No splicing of finger plate or finger plate assembly shall be allowed after fingers are cut. The expansion device shall be fabricated and installed in the crown and grade of the roadway.
- Plan dimensions are based on installation at 60°F. The expansion joint and other dimensions shall be increased or decreased for each 10°F fall or rise in temperature at installation.
- Material for the expansion device shall be ASTM A709 Grade 36 structural steel. The expansion device shall be in accordance with Sec. 1037.
- Structural steel for the expansion device and barrier plate shall be coated with a minimum of two coats of primer. Concrete shall be protected from overspray.
- Bevel barrier (part of barrier) shall be bevel cut at 90°. The surface of cut shall be perpendicular to the surface of the plate. The edge of the expansion gap and other dimensions shall be increased or decreased for each 10°F fall or rise in temperature at installation.
- Complete joint penetration welds utilized in the installation of expansion device shall be nondestructively tested by an approved method.
STANDARD DRAWING GUIDANCE (do not show on plans):
(For all finger plate drawings. Some notes may not apply to this sheet!)

Not a guidance note. Do not replace.

1. Gap between fingers, barrier recess gap and, for intermediate bents, gap in barrier.
2. For end bents: \( 2 + \frac{1}{2}'' \cdot \cos(\text{skew}) \)
3. Gap adjustment for temperature: along bridge longitudinal axis
4. Transverse gap between fingers
5. Maximum gap between fingers normal to joint @ 60°F.
6. Plate length = \( 18'' + \frac{6}{\cos(\text{skew})} \)
7. Finger length.
8. Transverse gap between fingers: not the same as 5 for skewed joints.
9. Include details of slab projection beyond W-beam under barrier on plan of slab detail sheet. Consider similarly projection beyond front face of angle under barrier at end bents.
10. Delete panel for CIP slab.

LA TYPE D BARRIER

LA TYPE B BARRIER (SBC)

SQ TYPE B BARRIER (SBC)
RA TYPE B BARRIER (SBC)

PART PLAN OF DEVICE

1. 1 1/4" x 2" x 4 1/2" Slotted Well (Cast in top of P/S girder) and 3/4"Ø x 7" Anchor Bolt with Nut and Washer
2. 3/4"Ø x 8" Long Welded Shear Connector Studs (Spaced alternately at about 9" cts.)
3. 3/4"Ø x 8" Long Welded Shear Connector Studs (Spaced alternately at abt. 9" cts.)
4. 3/4"Ø Vent Hole at abt. 12" cts. (Typ.)

PART PLAN OF FINGER PLATE

RA

PART ELEVATION

AT END OF BEND BARRIER PLATE

RA TYPE D BARRIER

PART PLAN OF DEVICE

Recess barrier to permit free movement of plate

1. 1 1/4" x 2" x 4 1/2" Slotted Well (Cast in top of P/S girder) and 3/4"Ø x 7" Anchor Bolt with Nut and Washer
2. 3/4"Ø x 8" Long Welded Shear Connector Studs (Spaced alternately at about 9" cts.)
3. 3/4"Ø x 8" Long Welded Shear Connector Studs (Spaced alternately at abt. 9" cts.)
4. 3/4"Ø Vent Hole at abt. 12" cts. (Typ.)

PART PLAN OF DEVICE

Recess barrier to permit free movement of plate

1. 1 1/4" x 2" x 4 1/2" Slotted Well (Cast in top of P/S girder) and 3/4"Ø x 7" Anchor Bolt with Nut and Washer
2. 3/4"Ø x 8" Long Welded Shear Connector Studs (Spaced alternately at about 9" cts.)
3. 3/4"Ø x 8" Long Welded Shear Connector Studs (Spaced alternately at abt. 9" cts.)
4. 3/4"Ø Vent Hole at abt. 12" cts. (Typ.)
ALTERNATE DETAILS FOR TYPE B BARRIER (SBC)

STANDARD DRAWING GUIDANCE (do not show on plans):
1. Gap in barrier and barrier recess gap
   - For gap in barrier at end bents: add 1/2"/cos(skew)
2. Barrier plate length
3. Include details of slab projection beyond W-beam under barrier on plan or slab detail sheet. Consider similar projection beyond front face of angle under barrier at end bents.

ELEVATION OF BARRIER

SECTION A-A

PART ELEVATION AT END OF BENT BARRIER PLATE

SECTION B-B

SECTION C-C

FINGER PLATE EXPANSION DEVICE AT MEDIAN

Note: This drawing is not to scale. Follow dimensions.
FLAT PLATE EXPANSION DEVICE AT END BENT NO.

GENERAL NOTES:

Expansion device shall be fabricated in one section, except for stage construction when the length is over 50 ft. A complete joint penetration groove weld shall be provided in the weld edges of the device. The weld is provided a smooth surface. The expansion device shall be fabricated and installed in the crown and grade of the roadway.

Plan dimensions are based on installation at 60°F. All necessary accommodations for expansion and the vertical leg of the angle at the expansion device shall be achieved by hand finishing within one foot of the expansion device. Horizontal concrete vent holes shall be offset from each other. Do not weld anchors at the 22°F.

Longitudinal reinforcing steel shall be placed so that end shall not exceed more than 4" from vertical plate and the vertical leg of the angle at the expansion joint.

Complete joint penetration welds utilized in the fabrication of the expansion device shall be nondestructively tested by an approved method.

Concrete shall be forced under and around flat plate, anchor plates and angles. The consolidation of the concrete shall be achieved by hand finishing within one foot of the expansion device. Vertical and horizontal concrete vent holes shall be offset from each other. Do not weld anchor bolts at the 22°F.

Expansion device shall be nondestructively tested by an approved method.

Concrete barrier plates shall be coated with a minimum of two coats of asphalt emulsion primer to provide a total dry film thickness of not less than 1.5 mils. The barrier plates shall be galvanized in accordance with ASTM A125. Anchors need not be protected from overspray.

Material for the expansion device shall be ASTM A709 Grade 36 structural steel. Material for the expansion device shall be ASTM A125.Machine bolts and nuts.

Payment for furnishing, coating or galvanizing and installing the concrete vent holes shall be offset from the expansion device by a total dry film thickness of not less than 1.5 mils. The barrier plates shall be galvanized in accordance with ASTM A125.

Structural steel for the expansion device and barrier plates shall be coated with a minimum of two coats of asphalt emulsion primer to provide a total dry film thickness of not less than 1.5 mils. The barrier plates shall be galvanized in accordance with ASTM A125.

Structural steel for the expansion device and barrier plates shall be coated with a minimum of two coats of asphalt emulsion primer to provide a total dry film thickness of not less than 1.5 mils. The barrier plates shall be galvanized in accordance with ASTM A125.

Structural steel for the expansion device and barrier plates shall be coated with a minimum of two coats of asphalt emulsion primer to provide a total dry film thickness of not less than 1.5 mils. The barrier plates shall be galvanized in accordance with ASTM A125.

Structural steel for the expansion device and barrier plates shall be coated with a minimum of two coats of asphalt emulsion primer to provide a total dry film thickness of not less than 1.5 mils. The barrier plates shall be galvanized in accordance with ASTM A125.

Structural steel for the expansion device and barrier plates shall be coated with a minimum of two coats of asphalt emulsion primer to provide a total dry film thickness of not less than 1.5 mils. The barrier plates shall be galvanized in accordance with ASTM A125.

Structural steel for the expansion device and barrier plates shall be coated with a minimum of two coats of asphalt emulsion primer to provide a total dry film thickness of not less than 1.5 mils. The barrier plates shall be galvanized in accordance with ASTM A125.

Structural steel for the expansion device and barrier plates shall be coated with a minimum of two coats of asphalt emulsion primer to provide a total dry film thickness of not less than 1.5 mils. The barrier plates shall be galvanized in accordance with ASTM A125.

Structural steel for the expansion device and barrier plates shall be coated with a minimum of two coats of asphalt emulsion primer to provide a total dry film thickness of not less than 1.5 mils. The barrier plates shall be galvanized in accordance with ASTM A125.
Recess barrier to permit free movement of plate

1/2" Barrier Plate

3/4" Plate with two 3/4" x 1 1/2" vertical slotted holes for 3/4"Ø machine bolts and nuts

1/2" Beveled Stiffener Plate

3/4"Ø x 6" Long Welded Shear Connector Studs (Spaced alternately at about 9" cts.)(Typ.)

RA TYPE B BARRIER (SBC)

Recess barrier to permit free movement of plate

1/2" Bent Barrier Plate

3/4" Plate with two 3/4" x 1 1/2" vertical slotted holes for 3/4"Ø machine bolts and nuts

1/2" Beveled Stiffener Plate

3/4"Ø x 6" Long Welded Shear Connector Studs (Spaced alternately at about 9" cts.)(Typ.)

Bevel barrier plate on roadway face

RA TYPE D BARRIER

Recess barrier to permit free movement of plate

1/2" Barrier Plate

3/4" Plate with two 3/4" x 1 1/2" vertical slotted holes for 3/4"Ø machine bolts and nuts

1/2" Beveled Stiffener Plate

3/4"Ø x 6" Long Welded Shear Connector Studs (Spaced alternately at about 9" cts.)(Typ.)

RA
FLAT PLATE EXPANSION DEVICE AT INT. BENT NO.

**GENERAL NOTES:**

Expansion device shall be fabricated in one section, except for stage construction and when the length is over 60 feet. A complete joint penetration groove weld shall be made on each plate along the horizontal line on the plate. A 3/4" plate thickness shall have a minimum of 6 mils in thickness. This is a smooth surface. The expansion device shall be fabricated and installed to the crown and grade of the roadway.

Plan dimensions are based on installation at 60°F temperature. Distortion due to temperature change shall not exceed 0.2% of total length. Allow for all or rise in temperature at installation.

Material for the expansion device shall be ASTM A709 Grade 36 structural steel. No material for the expansion device shall be coated or galvanized in accordance with ASTM A122. Anchors need not be protected from overspray.

Payment for furnishing, coating or galvanizing and installing the expansion device for the expansion device will be considered completed when the contract unit price for Expansion device (Flat Plate) per linear foot.

Concrete shall be forced under and around flat plate, vertical plate, and recess barrier plate on both sides of the expansion device. The vertical and horizontal concrete vent holes shall be offset from each other. Do not alternate holes at the 12" interval. The expansion gap and other dimensions shall be fabricated and installed to the crown and grade of the roadway.

Complete joint penetration welds utilized in the fabrication of the expansion device shall be nondestructively tested by an approved method.

**PERMISSIBLE FIELD SPlice AT INT. BENT**

Note: This drawing is not to scale. Follow dimensions.
STANDARD DRAWING GUIDANCE (do not show on plans):

1. Bar height.
2. Plate length = 12"/cos(sweep) [12" for 0° skew]
3. Barrier gap = 3"/cos(sweep) [3" for 0° skew]
4. Barrier recess gap = 2"/cos(sweep) [2" for 0° skew]. Assume recess ends at front edge of bar.
5. Installation gap adjustment for temperature: normal to joint.
6. Check and revise locations of slotted wells to clear girder end section reinforcement.
7. Delete panel for CIP slab.

FLAT02_psi_int  Guidance & Alternate Details (1 of 2)

PART PLAN

LA TYPE D BARRIER

3/4" x 2 1/4" Wide Plate with two 13/16" x 3" slotted holes for 3/4"Ø machine bolts and nuts. (Typ.)

LA TYPE B BARRIER (SBC)

3/4" x 2 1/4" Wide Plate with two 13/16" x 3" slotted holes for 3/4"Ø machine bolts and nuts. (Typ.)
**RA TYPE D BARRIER**

- **3/4" x 2 1/4" Wide Plate with two 13/16" x 3" slotted holes** placed along centerline of girder parallel to roadway (Typ.).
- **3 1/2" Beveled Stiffener Plate** (Typ.).
- **3/4" x 2 1/4" Wide Plate with two 13/16" x 3" slotted holes** placed along centerline of girder parallel to roadway (Typ.).
- **Plate 6" x 5/8"**

**PART PLAN**

Note: Concrete vent holes not shown for clarity.

**RA TYPE B BARRIER (SBC)**

- **3/4" x 2 1/4" Wide Plate with two 13/16" x 3" slotted holes for 3/4"Ø machine bolts and nuts.** (Typ.)
- **3/4"Ø x 8" Long Welded Shear Connector Studs (3/4"Ø x 6" Long).**

**PART PLAN**

Note: Concrete vent holes not shown for clarity.
**Flattend FLAT03 stl_end**

Effective: July 2020  
Supersedes: Apr. 2020

### General Notes

Expansion device shall be fabricated in one section, except for stage construction, and when the length is over 65 ft. A complete joint penetration groove weld shall be required. Threaded rod and bolt shall be placed to provide smooth surface. The expansion shall be fabricated and installed in the crown and grade of the roadway.

Plan dimensions are based on installation at 60°F. 
Increased or decreased " for each 10°F fall or rise in temperature at installation.

Material for the expansion device shall be ASTM A709 Grade 36 structural steel. Welding for the expansion device shall be performed by an approved method.

Structural steel for the expansion device and barrier plate shall be coated with a minimum of two coats of epoxy primer to provide a total dry film thickness of at least 12 mils. Structural steel shall be galvanized in accordance with ASTM A123. Anchors need not be protected from overspray.

Payment for furnishing, coating or galvanizing and installing the expansion device shall be nondestructively tested by an approved method.

Concretes shall be forced under and around flat plate, anchors and angles. Consolidation shall be achieved by hand finishing within one foot of the expansion device. Vertical and horizontal concrete vent holes shall be offset from each other. Do not alternate holes at the 12" spacing.

Longitudinal reinforcing steel shall be placed so that ends shall not be more than 4" from vertical plate and the vertical leg of the angle at the expansion joint shall be required. Welds shall be ground flush after concrete has set, except for stage construction and when the length is over 65 ft. A complete joint penetration groove weld shall be required. Threaded rod and bolt shall be placed to provide smooth surface. The expansion shall be fabricated and installed in the crown and grade of the roadway.

### General Specifications

- Expansion device shall be fabricated in one section, except for stage construction, and when the length is over 65 ft.
- Plan dimensions are based on installation at 60°F. Increased or decreased " for each 10°F fall or rise in temperature at installation.
- Material for the expansion device shall be ASTM A709 Grade 36 structural steel. Welding for the expansion device shall be performed by an approved method.
- Structural steel for the expansion device and barrier plate shall be coated with a minimum of two coats of epoxy primer to provide a total dry film thickness of at least 12 mils. Structural steel shall be galvanized in accordance with ASTM A123. Anchors need not be protected from overspray.
- Payment for furnishing, coating or galvanizing and installing the expansion device shall be nondestructively tested by an approved method.
- Concretes shall be forced under and around flat plate, anchors and angles. Consolidation shall be achieved by hand finishing within one foot of the expansion device. Vertical and horizontal concrete vent holes shall be offset from each other. Do not alternate holes at the 12" spacing.
- Longitudinal reinforcing steel shall be placed so that ends shall not be more than 4" from vertical plate and the vertical leg of the angle at the expansion joint shall be required. Welds shall be ground flush after concrete has set, except for stage construction and when the length is over 65 ft. A complete joint penetration groove weld shall be required. Threaded rod and bolt shall be placed to provide smooth surface. The expansion shall be fabricated and installed in the crown and grade of the roadway.
STANDARD DRAWING GUIDANCE (do not show on plans):

1. Bar height.
2. Plate length = 12"/(cos(skew) [12" for 0° skew])
3. Barrier gap = 3/(cos(skew) [3" for 0° skew])
4. Barrier recess gap = 2/(cos(skew) [2" for 0° skew]). Assume recess ends at front edge of bar.
5. Installation gap adjustment for temperature: normal to joint.
6. Check and revise locations of slotted wells to clear girder end section reinforcement.
7. Delete panel for CIP slab.

PART PLAN

Note: Concrete vent holes not shown for clarity.
RA TYPE D BARRIER

PART PLAN
Note: Concrete vent holes not shown for clarity.

RA TYPE B BARRIER (SBC)

PART PLAN
Note: Concrete vent holes not shown for clarity.

RA

PART ELEVATION AT END OF BENT BARRIER PLATE

SECTION A-A

SECTION B-B

SECTION C-C

ELEVATION OF BARRIER

PERMISSIBLE FIELD SPLICE AT END BENT

RA

Note: Concrete vent holes not shown for clarity.
**GENERAL NOTES:**

Expansion device shall be fabricated in one section, except for stage construction and when the length is over 50 feet. A complete joint penetration groove weld shall be provided to the root of the weld bead with weld finisher to provide a smooth surface. The expansion device shall be labelled and installed to the crown and grade of the roadway.

Plan dimensions are based on installation at 60°F. The expansion gap shall be increased or decreased “ for each 10° fall or rise in temperature at installation.

Material for the expansion device shall be ASTM A709 Grade 36 structural steel. Material for the expansion device and barrier shall be galvanized in accordance with ASTM A123. Anchors need not be protected from overspray.

Payment for furnishing, coating or galvanizing and installing the expansion device will be considered complete when the contract unit price for Expansion Device (Flat Plate) per linear foot.

Concrete shall be poured under and around flat plate, and the vertical leg of the angle at the expansion device shall be achieved by hand finishing within one foot of the expansion device. The vertical and horizontal concrete vent holes shall be off-set from each other. Do not alternate holes at the 12" deep configuration.

Longitudinal reinforcing steel shall be placed so that ends shall not be more than 3" from vertical plate and the vertical leg of the angle at the expansion device shall be fabricated and installed to the crown and grade of the roadway.

Complete joint penetration welds utilized in the fabrication of the expansion device shall be nondestructively tested by an approved method.

**SECTION C-C**

**ELEVATION OF BARRIER**

**PART ELEVATION AT END OF BARRIER PLATE**

**SECTION B-B**

**PART PLAN SHOWING ROADWAY PLATE AND VERTICAL PLATE**

**PART PLAN OF ANGLE AND BAR**

**SECTION A-A**

**PERMISSIBLE FIELD SPlice AT int. BENT**

**SECTION AT INTERMEDIATE BENT**

**PART PLAN**

Note: Concrete vent holes not shown for clarity.

**SECTION THRU DEVICE**

**PART PLAN OF ROADWAY PLATE AND VERTICAL PLATE**

**FLAT PLATE EXPANSION DEVICE AT int. BENT NO.**

**Note:** This drawing is not in scale. Follow dimensions.

**SUPERSIDES:**

FLAT04 stl_int     Effective: July 2020     Supersedes: Apr. 2020

**REFERENCES:**

FLAT04_stl_int 10/16/2023  105 WEST CAPITOL  JEFFERSON CITY, MO 65102  1-888-ASK-MODOT (1-888-275-6636)
GUIDANCE & ALTERNATE DETAILS (1 of 2)

STANDARD DRAWING GUIDANCE (do not show on plans):

1. Bar height.
2. Plate length = 12"/cos(skew) [12" for 0° skew]
3. Barrier gap = 3"/cos(skew) [3" for 0° skew]
4. Barrier recess gap = 2"/cos(skew) [2" for 0° skew]. Assume recess ends at front edge of bar.
5. Installation gap adjustment for temperature: normal to joint.
6. Check and revise locations of slotted wells to clear girder end section reinforcement.
7. Delete panel for CIP slab.

PART PLAN

LA TYPE D BARRIER

Note: Concrete vent holes not shown for clarity.

SQUARE TYPE B BARRIER (SBC)

Note: Concrete vent holes not shown for clarity.

LA TYPE D BARRIER (SBC)
RA TYPE D BARRIER

PART PLAN
Note: Concrete vent holes not shown for clarity.

RA TYPE D BARRIER

PART PLAN
Note: Concrete vent holes not shown for clarity.

RA TYPE D BARRIER

PART PLAN
Note: Concrete vent holes not shown for clarity.

RA TYPE B BARRIER (SBC)

PART PLAN
Note: Concrete vent holes not shown for clarity.

RA TYPE B BARRIER (SBC)

PART PLAN
Note: Concrete vent holes not shown for clarity.

RA TYPE B BARRIER (SBC)

PART PLAN
Note: Concrete vent holes not shown for clarity.

RA TYPE B BARRIER (SBC)

PART PLAN
Note: Concrete vent holes not shown for clarity.

RA TYPE B BARRIER (SBC)

PART PLAN
Note: Concrete vent holes not shown for clarity.

RA TYPE B BARRIER (SBC)

PART PLAN
Note: Concrete vent holes not shown for clarity.

RA TYPE B BARRIER (SBC)

PART PLAN
Note: Concrete vent holes not shown for clarity.

RA TYPE B BARRIER (SBC)

PART PLAN
Note: Concrete vent holes not shown for clarity.

RA TYPE B BARRIER (SBC)

PART PLAN
Note: Concrete vent holes not shown for clarity.

RA TYPE B BARRIER (SBC)

PART PLAN
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RA TYPE B BARRIER (SBC)

PART PLAN
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RA TYPE B BARRIER (SBC)

PART PLAN
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RA TYPE B BARRIER (SBC)

PART PLAN
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RA TYPE B BARRIER (SBC)

PART PLAN
Note: Concrete vent holes not shown for clarity.

RA TYPE B BARRIER (SBC)

PART PLAN
Note: Concrete vent holes not shown for clarity.

RA TYPE B BARRIER (SBC)

PART PLAN
Note: Concrete vent holes not shown for clarity.
**General Notes:**

Open cell foam joint seal size (width and depth) shall be determined by the manufacturer. Manufacturer recommended seal size shall meet the movement and installation gap requirements and skew effect.

The open cell foam joint seal shall be installed according to the manufacturer's recommendations.

The installation temperature shall be taken as the actual air temperature averaged over the 24-hour period immediately preceding installation.

(1) Allow installation gap (±) normal to joint at roadway surface (see table)

---

**Open Cell Foam Joint Seal**

MO DOT construction personnel will record the manufacturer and seal name that was used.

<table>
<thead>
<tr>
<th>Movement</th>
<th>Movement Name to Joint</th>
<th>Min. Joint Width</th>
<th>Max. Joint Width</th>
<th>± Allowable Installation Gap at Joint at Air/Surface Temperature</th>
<th>Manufacturer</th>
<th>Seal Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
<td>@ 40°F              @ 50°F              @ 60°F              @ 70°F</td>
<td>XXX</td>
<td>XXX</td>
</tr>
</tbody>
</table>

Note: This drawing is not to scale. Follow dimensions.
SECTION THRU JOINT AT END OF BRIDGE APPROACH SLAB

- Manufacturer's recommended size
- Extend seal full width of approach slab.

Between bridge approach slab and concrete approach pavement (Use only with approval of SPM or SLE)

SECTION THRU JOINT AT _____ NO.  

- Manufacturer's recommended size
- Extend seal 3'' past edges of slab.

With existing steel armor

SECTION THRU JOINT AT ABUTMENT NO.  

- Manufacturer's recommended size
- Extend seal 3'' past edges of slab.

Between slab and approach slab

Use for locations other than approach slab

SECTION THRU JOINT AT BENT NO.  

- Manufacturer's recommended size
- Extend seal 3'' past edges of slab.
**Standard Drawing Guidance** (do not show on plans):
- Remove non-applicable rows in table.
- Revise notes and details per project as necessary.
- Use standard detailing notes H5.31, H5.32 thru H5.36 (EPG 751.50) when new armor is to be used.
- Modify note H5.33 for preformed silicone or EPDM joint seal.
- When new steel armor is to be installed, use armor information from P COM standard drawing and modify as needed.
- Omit "( )" when not applicable.

**General Notes:**
- The seal shall be installed in joints in an uninterrupted line without interruptions or factory splices; gaps are permitted for joints in excess of 33 feet.
- The installation temperature shall be taken as the actual air temperature averaged over the 24-hour period immediately preceding installation.
- 1) Allowed installation gap (±) normal to joint at roadway surface (see table)
- 2) Installation depth (±) per manufacturer's recommendation

**Allowed Transverse Preformed Silicone or EPDM Joint Seals**

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Seal Name</th>
<th>Movement Parallel to Roadway Surface</th>
<th>Allowed Installation Gap Normal to Joint at Roadway Surface</th>
<th>Type of Seal</th>
</tr>
</thead>
<tbody>
<tr>
<td>R J Watson</td>
<td>Silicoflex SP150</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
</tr>
<tr>
<td>R J Watson</td>
<td>Silicoflex SP375</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
</tr>
<tr>
<td>R J Watson</td>
<td>Silicoflex SP450</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
</tr>
<tr>
<td>Watson Bowman Acme Wabo</td>
<td>Wabo 250</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
</tr>
<tr>
<td>Watson Bowman Acme Wabo</td>
<td>Wabo 350</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
</tr>
<tr>
<td>Watson Bowman Acme Wabo</td>
<td>Wabo 500</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
</tr>
<tr>
<td>D S Brown</td>
<td>EPDM Joint Seal V-500</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
</tr>
<tr>
<td>D S Brown</td>
<td>EPDM Joint Seal V-500</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
</tr>
</tbody>
</table>

MoDOT Construction personnel will indicate the type of seal used.

**PREFORMED SILICONE OR EPDM JOINT SEAL**

Note: This drawing is not to scale. Follow dimensions.
Polymer concrete shall be in accordance with Sec 623.

Joint gap (opening) wider than 3" during installation may require use of backer rod to keep seal in place while adhesive is curing.
Mechanically Stabilized Earth (MSE) Retaining Wall System

**General Notes:**
- Design Specifications: 2002 AASHTO (ID) 13th Ed. Standard Specifications (Section 5 AS4 Design) - Soil Classification and Performance Category
- Acceleration Coefficient
- Design loading: 
  - dp = 1.5 and unit weight, γ = 1.15 for retained backfill material to be retained by the mechanically stabilized earth wall system.
  - dp = 1.1 for unsupported foundation ground where wall is to be built.

**For Unreinforced Foundation Ground:**
- Allowable bearing pressure and limits of improved foundation ground shall not be adjusted from that as shown on the plans.
- Design # = 30' for the select granular backfill (reinforced backfill) or wedge area backfill for structural systems or shop drawings. Contractor shall identify source of select granular backfill material. Submit proract in accordance with AASHTO table 5.3.3.2a for the select granular backfill, and for the shop drawings. Contractor shall design the maximum dry density relative to the shop drawings. The Commission does not represent greater significance or weight on the performance on the boring data as it may encounter in basing its bid construct for this project. A standard soil boring report will be included in the Electronic Bridge Deliverables. They will be included in the Electronic Subsurface Data and Investigations shown on Sheet(s) No. __ and may also be available from the Project Office upon written request. No other factual records of the design of the project, are to be encountered in basing its bid construct for this project. A standard soil boring report will be included in the Electronic Subsurface Data and Investigations shown on Sheet(s) No. __ and may also be available from the Project Office upon written request. No other factual records of the design of the project, are to be encountered in basing its bid construct for this project.

**Notice and Disclaimer Regarding Materials:**
- Notice and Disclaimer Regarding Boring Log Data
- Notice and Disclaimer Regarding Design Criteria
- Notice and Disclaimer Regarding Specifications
- Notice and Disclaimer Regarding Construction
- Notice and Disclaimer Regarding Quality Control
- Notice and Disclaimer Regarding Final Inspection
- Notice and Disclaimer Regarding Payment and Final Report

**PLANS**

- Top of Wall
- Proposed Grade
- Theoretical Top of Concrete Leveling Pad Elevations

**DETAILS OF GROUND IMPROVEMENTS**

- Concrete Leveling Pad not shown for clarity. (1) Wall contractor shall show the following items on the design drawings and/or on the fabricated shop drawings:
  - Leveling pad horizontal.
  - Leveling pad length and step elevations shall be labeled on the shop drawings.
  - Leveling pad elevations shall not be higher than the theoretical top of leveling pad elevations shown on these plans.

**LOCATIONS**

- Sheet No. 1 of MO DOT
- 105 West Capitol
- Jefferson City, MO 65102
- 1-888-ASK-MODOT (1-888-275-6636)

**IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.**
NOTES TO ROADWAY AND BRIDGE DESIGNERS:

Excavation classes, quantities and pay items are the responsibility of District Design Division for including on the roadway 2B quantity sheets which is noted on the MSEW plans and required in accordance with Sec 720. All other quantities are the responsibility of the division responsible for the MSE wall plans.

If rock is not known to exist from a geotechnical report or study, place the following note on the plans:

"If rock is encountered in the proposed reinforced backfill area or wedge area of the MSE wall before or during excavation, the contractor shall immediately cease excavating and notify the engineer."

Otherwise, if rock is known to exist and it is to be excavated, then do not place above note on plans and determine the excavation class and estimate a rock quantity. For all Bridge Division MSE walls, Bridge Division and District Design Division shall coordinate in estimating excavation quantities when rock is known to exist from the geotechnical report and is noted on the MSEW plans and required in accordance with Sec 720. All other quantities are the responsibility of District Design Division for including on the roadway 2B quantity sheets which is noted on the MSEW plans and required in accordance with Sec 720. All other quantities are the responsibility of the division responsible for the MSE wall plans.

1. Show the minimum embedment = maximum (2 feet; embedment based on Geotechnical Report and global stability requirements; and FHWA-NHI-10-024, Table 2-2).
2. Show theoretical top of leveling pad elevation on the plan based on minimum embedment requirements. Minimum embedment shall be provided in accordance with FHWA-NHI-10-024, Table 2-2, and Geotechnical Report.
3. The allowable bearing pressure and an angle of internal friction, \( \Phi \), for unimproved and improved ground where wall is to be built shall be determined by the Geotechnical Section and reported on the Foundation Investigation Geotechnical Report (FIGR) which shall be reviewed and approved by the Geotechnical Section. Provide cross-sections of ground improvement along the wall where required, for example, using stationing or using changes in wall height. Provide cross-section of ground improvement based on FIGR. Provide any other geotechnical requirements in FIGR on plans.

Use the underlined portion from note FIGR-750.50. If 25a, when limits of improved foundation ground is required by Geotechnical Section:

1. Show all boring locations on Plan.
2. Use for all large block MSE walls.
3. Use for all large block walls. Use for small block walls if applicable.
4. Use for all large block walls. Use for small block walls if applicable.
General Notes Cont.:

- Minimum 18" wide geotextile strips shall be centered at vertical and horizontal joints of panel. Underfill material shall be placed to back support SRJC (Sec 1000) and design panels. Drainage lines shall be positioned at the outer edges of each fabric strip to provide positive seal. A minimum 18" overlap shall be provided between spliced fabrics.
- Aluminized soil reinforcement shall have edges coated with coating material per manufacturer.
- Soil reinforcement shall be placed to avoid roadway drop inlet behind wall.
- Upper two layers of wall reinforcement shall be extended 3 feet in width at the lower layer of wall height greater than 3 feet.
- All steel soil reinforcements shall be separated from other metallic elements by at least 3 inches.
- The splay angle should be greater than 15° and the tensile capacity of the reinforcement shall be reduced by the cosine of the splay angle. Soil reinforcement shall clear the obstruction by at least 3 feet.
- No reinforcement shall be left unconnected to the wall face or arbitrarily cut in the field to avoid the obstruction.
- Where interference between the vertical obstruction and the soil reinforcement is unavoidable, the design of the wall near the obstruction may be modified using one of the alternative solutions in FHWA-01-0022, Section 3.4.2.1. Lay out the drawing for wall designs with horizontal obstructions in reinforced soil mass, see FHWA-NHI-10-024, Section 3.4.3.

Material Properties Used in Design:

- Geotextile: Type A or B
- Active force computations: Structural Systems Sec 1010
- Reinforced Backfill: Sec 1011
- Drainage System (3): Sec 720 and Sec 1013

Note: This drawing is not to scale. Follow dimensions. Sheet No. 1 of 1.
MSEW_02_LFD2     Guidance

Standard Drawing Guidance (do not show on plans):
Revise notes and details per project as necessary.
For Modified Type A and Type B Gutter and Fence Post Connection
details, see Missouri Standard Plans No. 607.01.
For Type A & Type B Gutter information, see Missouri Standard
Plans No. 605.00.
See EPG 751 24.2.1 for drainage guidance.
1. Use for MSE walls when there may be contact between
dissimilar metals.
2. Use for MSE Walls when there may be vertical and/or
horizontal obstructions in reinforced soil mass.
3. Use for all large block MSE walls.
4. Do not show values in the plan details. MSE wall designer shall include this
table on shop drawings and provide values used in the design computations.
**LARGE BLOCK WALL AT CULVERT**

**TYPICAL SECTION THRU LARGE BLOCK WALL AT CULVERT**

Notes:
- Vertical joint in MSE wall shall be located at each exterior culvert wall.
- Reinforced Coping shall be attached to wall by panel dowels. (1)
- 1" Jt. Filler located at each exterior culvert wall.
- Reinforced Coping shall be attached to wall by panel dowels. (1)
- 1" Jt. Filler located at each exterior culvert wall.

Note: This drawing is not to scale. Follow dimensions.

**DELTA FOR GENERIC MSE WALL**

Details for generic MSE wall:
- Sheet No. 01
- Project No. 609.00
- Bridge No. ______
- Job No. ______
- County ______
- Route ______
- District Design Division to verify 6" diameter pipe or increase diameter. Minimum pipe diameter shall be 6".
- For bridge length less than or equal to 200 feet, use 4'-6" minimum setback which is based on the use of 18" inside diameter pipe pile spacers. For larger than 18" diameter pipe pile spacers, increase clear space between pile spacers and FHWA-NHI-10-024, Figure 5-17C. For larger than 18" diameter pipe pile spacers, increase clear space between pile spacers and FHWA-NHI-10-024, Figure 5-17C. For larger than 18" diameter pipe pile spacers, increase clear space between pile spacers.
- For bridge lengths greater than 200 feet, use 5'-6" minimum setback which is based on the use of 24" inside diameter pipe pile spacers.

**SEC 1011**
- Geotextile Separation
- Slope Excavation Line
- Abutment, embed pipe pile spacers at least 22" into rock and bear pile on the rock.
- For bridge length less than or equal to 200 feet, use 4'-6" minimum setback which is based on the use of 18" inside diameter pipe pile spacers. For larger than 18" diameter pipe pile spacers, increase clear space between pile spacers and FHWA-NHI-10-024, Figure 5-17C. For larger than 18" diameter pipe pile spacers, increase clear space between pile spacers and FHWA-NHI-10-024, Figure 5-17C. For larger than 18" diameter pipe pile spacers, increase clear space between pile spacers.
- District Design Division to verify 6" diameter pipe or increase diameter. Minimum pipe diameter shall be 6".
- For walls parallel to abutment, provide actual slope H:V. Otherwise, replace leadered note with "Varies (4)".

**EQUIPMENT GUIDANCE**
- For Type A and Type B Gutter information, see Missouri Standard Plans No. 607.11.
- For Modified Type A and Modified Type B Gutter and Fence Post Connection Details, see Missouri Standard Plans No. 607.11.
- See Bridge Plans No. 609.00.
- For Type A and Type B Gutter information, see Missouri Standard Plans No. 607.11.
- See Missouri Standard Plans No. 607.11.

**PARAMETERS**
- See EPG 751.24.2.1 for drainage guidance.
- See MO 403.4.3.1 for drainage guidance.
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- See MO 403.4.3.1 for drainage guidance.
**STATE**

**DESCRIPTION**


---

**Detailed Design Division to verify 6" diameter pipe or based on Geotechnical Report and global stability. See EPG 751.24.2.1 for drainage guidance.**

**Note (1) does not apply to Small Block Walls.**

Revise notes and details per project as necessary.

**Standard Drawing Guidance (do not show on plans):**

- THRU LARGE BLOCK WALL SHOWING FILTER CLOTH.
- Note: For additional information, see "TYPICAL SECTION THRU LARGE BLOCK WALL".

---

**TYPICAL SECTION THRU LARGE BLOCK WALL**

- Cap Blocks
- Front Face of Wall
- Unit Fill

**TYPICAL SECTION THRU SMALL BLOCK WALL**

- Cap Blocks
- Front Face of Wall
- Unit Fill

---

**Details for Generic MSE Wall**

**Note:**

- This drawing is not to scale. Follow dimensions.
- The cost of form liners for MSE wall systems, complete in place, will be considered completely covered by the contract unit price for Mechanically Stabilized Earth Wall System.
- Form liner shall be constructed in accordance with Special Provisions.

The following is a list of form liner manufacturers and types which may be used. Depth of relief for all form liner patterns shall vary up to 1 3/16". The height of any single 'stone' shall be 35" maximum.

- Scott System, Inc.: Form liner pattern #167 "Ashlar Stone"
- Fitzgerald Formliners: Form liner pattern #1696 "Ashlar Stone"
- Greenstreak Form liner pattern #330 "Ashlar Stone"
- Spec Formliners: Form liner pattern #3305 "Ashlar Stone"
- Customrock: Form liner pattern #12202 "Tollway Ashlar"
- An approved equal
Table of Transverse Preformed Compression Seal Expansion Joint System Dimensions

<table>
<thead>
<tr>
<th>Seal Width</th>
<th>Perpendicular to Joint</th>
<th>Height</th>
<th>Movement Capacity (Normal to Joint)</th>
<th>Min. Joint Width (Normal to Joint)</th>
<th>Max. Joint Width (Normal to Joint)</th>
<th>Actual Installation Gap (Normal to Joint at Remote Surface)</th>
<th>Manufacturer</th>
<th>Seal Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.25</td>
<td></td>
<td>0.85</td>
<td>1.05&quot;</td>
<td>1.25&quot;</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
</tr>
<tr>
<td>2.50</td>
<td>Manufactured's Recommended Height</td>
<td>1.00&quot;</td>
<td>1.25&quot;</td>
<td>1.45&quot;</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
</tr>
<tr>
<td>3.00</td>
<td>Manufactured's Recommended Height</td>
<td>1.30&quot;</td>
<td>1.50&quot;</td>
<td>1.75&quot;</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
</tr>
<tr>
<td>3.50</td>
<td>Manufactured's Recommended Height</td>
<td>1.60&quot;</td>
<td>1.75&quot;</td>
<td>2.00&quot;</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
</tr>
<tr>
<td>4.00</td>
<td>Manufactured's Recommended Height</td>
<td>1.85&quot;</td>
<td>2.00&quot;</td>
<td>2.25&quot;</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
</tr>
<tr>
<td>4.50</td>
<td>Manufactured's Recommended Height</td>
<td>2.20&quot;</td>
<td>2.40&quot;</td>
<td>2.65&quot;</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
</tr>
</tbody>
</table>

Note: Depth of seal shall not be less than width of seal.

Size of arm angle:
- Vertical leg of angle shall be a minimum of Manufacturer's Recommended Height
- Horizontal leg of angle shall be a minimum of 3".
- Maximum thickness of angle shall be achieved by localized internal vibration.
- Conformal layer of bond shall be applied every 6" over 24 hours.

The installation temperature shall be taken as actual air temperature averaged over the 24-hour period immediately preceding installation.

MoDOT construction personnel will record the manufacturer and seal name that was used.

Note: This drawing is not to scale. Follow dimensions. Sheet No. 1/8.
STANDARD DRAWING GUIDANCE (do not show on plans):

For slab thickness < 8 1/2”, check shear connector stud length for clearance to flange or diaphragm and adjust length as necessary. See Structural Project Manager.

Use standard detailing note HS.55 when polymer concrete wearing surface is used with a preformed compression seal.

Remove non-applicable rows in table.

1. Piece angle length to center of first slotted hole
2. Use squared, left advanced or right advanced Part Plan as needed.

A = 3/4” (Min.) @ 60°. Verify only.
B = (Typ.)

C = 3/4” (Min.) @ 60°. Verify only.
C = 3/8” (Min.) @ 60°. Verify only.

Delete panels for CIP slab.

1/4” x 1/2” Bar

1/2”Ø Machine bolt at about 18” cts. with hardwood spacer block. Cut machine bolt flush with angles after concrete in last pour has taken initial set. (Typ.)

1/2”Ø Machine bolt at about 18” cts. with hardwood spacer block. Cut machine bolt flush with angles after concrete in last pour has taken initial set. (Typ.)

P_COM01_psi_end     Guidance & Alternate Details
Part Section A-A

- Stud (Typ.)
  - 3/4"Ø x 8" Long Welded Shear Connector Stud (Typ.)

Part Section B-B

- Const. Joint
  - 3/16"Ø Machine bolt and nut with 1/2"Ø concrete vent holes at about 9/16" from the vertical leg of the angle at the expansion joint system.

- Angle (Typ.)
  - 3 1/2 x 5/16" Plate
  - 5 x 5/16" Angle 3 1/2 x 5/16" Plate and 3 1/2 x 5/16" Angle

- Seal Width
  - For staged construction and when the length is over 50 feet. A minimum of two sets of initial bolts shall be installed immediately preceding installation.

- Movement Capacity
  - 0.85" - 1.06" - 1.93"

- Min. Joint Width
  - To Joint
  - 0.13" - 0.13" - 0.13"

- Max. Joint Width
  - To Joint
  - 1.06" - 1.93" - 1.93"

- Movement Capacity
  - 1.64" - 1.64" - 1.64"

- Min. Joint Width
  - To Joint
  - 0.13" - 0.13" - 0.13"

- Max. Joint Width
  - To Joint
  - 1.93" - 1.93" - 1.93"

- Seal Height
  - For 2" from the vertical leg of the angle at the expansion joint system.

- Allowed Installation Gap
  - @ 50°F
  - @ 60°F
  - @ 70°F
  - @ 75°F

- Anchors for the expansion joint system shall be in accordance with Sec 717. Preformed compression seal expansion joint system shall be in accordance with Sec 717.

- Structural steel for the expansion joint system shall be ASTM A572 Grade 50. Anchors for the expansion joint system shall be be in accordance with Sec 717. Preformed compression seal expansion joint system shall be in accordance with Sec 717.

- Structural steel for the expansion joint system shall be fabricated and installed in accordance with ASTM A572. Anchors need not be protected from overspray.

- Concrete shall be forced under armor angle and around anchors. Proper consolidation of the concrete shall be achieved by localized internal vibration.

- Longitudinal reinforcing steel shall be placed so that ends shall be 2" from the vertical leg of the angle at the expansion joint system.
STANDARD DRAWING GUIDANCE (do not show on plans):

For slab thickness < 8 1/2", check shear connector stud length for clearance to flange or diaphragm and adjust length as necessary. See Structural Project Manager.

Use standard detailing note H5.55 when polymer concrete wearing surface is used with a preformed compression seal.

Remove non-applicable rows in table.

A Use squared, left advanced or right advanced Part Plan as needed.

B = 3/4" (Min.) @ 60°. Verify only.

C = 1 @ 60° + 3/4" (Min.). Verify only.

Delete panels for CIP slab.

A Use squared, left advanced or right advanced Part Plan as needed.

B = 3/4" (Min.) @ 60°. Verify only.

C = 1 @ 60° + 3/4" (Min.). Verify only.

Delete panels for CIP slab.
GENERAL NOTES:

Expansion joint system shall be fabricated in one section, except for stamped and fabricated expansion joint systems. The expansion joint system shall be fabricated and installed in the crown and grade of the roadway.

Structural steel for the expansion joint system shall be ASTM A572 Grade 50. Anchors for the expansion joint system shall be in accordance with Sec 1037. Preformed compression seal expansion joint system shall be in accordance with Sec 717.

Structural steel for the expansion joint system shall be coated with a minimum of two coats of rustproof paint, provided a seal dry. Presence of rust shall be observed in accordance with ASTM A533. Anchors need not be protected from overspray.

Concrete shall be forced under armor angle and around anchors. Proper consolidation of the concrete shall be achieved by localized (internal vibration. Concrete shall be forced under armor angle and around anchors. Proper consolidation of the concrete shall be achieved by localized (internal vibration.

Structural steel for the expansion joint system shall be fabricated in accordance with Sec 1037. Preformed compression seal expansion joint system shall be in accordance with Sec 717.

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Concrete shall be forced under armor angle and around anchors. Proper consolidation of the concrete shall be achieved by localized (internal vibration.

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Structural steel for the expansion joint system shall be fabricated in accordance with Sec 1037. Preformed compression seal expansion joint system shall be in accordance with Sec 717. 

Concrete shall be forced under armor angle and around anchors. Proper consolidation of the concrete shall be achieved by localized (internal vibration.
STANDARD DRAWING GUIDANCE (do not show on plans):

For slab thickness < 8 1/2”, check shear connector stud length for clearance to flange or diaphragm and adjust length as necessary. See Structural Project Manager.

Use standard detailing note H5.55 when polymer concrete wearing surface is used with a preformed compression seal.

Remove non-applicable rows in table.

A Use squared, left advanced or right advanced Part Plan as needed.

B = 3/4” (Min.) @ 60° Verify only.

C = 1 @ 60° + 3/4” (Min.) Verify only.

Delete panels for CIP slab.
Standard Drawing Guidance (do not show on plans):

1. Use Type 3 for weathering steel bolted connections and Type 1 for painted or galvanized steel bolted connections.

### TABLE OF DIMENSIONS - FIELD SPLICE

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>I</th>
<th>K</th>
<th>M</th>
<th>N</th>
<th>P</th>
<th>Q</th>
<th>R</th>
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</thead>
<tbody>
<tr>
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</tr>
</tbody>
</table>

Note: This drawing is not to scale. Follow dimensions.
Standard Drawing Guidance (do not show on plans):

Choose the appropriate Plan of Flange.

Detail of Bolted Field Splice shown is for flange splices with a uniform hole pattern only. Detail will need to be modified to accommodate flange splices with a staggered hole pattern (14" & 15" flanges).

1. Use Type 3 for weathering steel bolted connections and Type 1 for painted or galvanized steel bolted connections.

Bolts shall be 7/8-inch diameter ASTM F3125 Grade A325 Type 3 in 15/16-inch diameter holes. Contact surfaces shall be in accordance with Sec 1081 for surface preparation.

Detailed
Checked

Note: This drawing is not to scale. Follow dimensions.
GALVANIZED CLOSED ENDED CAST-IN-PLACE (CECIP) CONCRETE PILE

**CRUCIFORM PILE POINT**

- **Note**: Cost of closure plate is included with cast-in-place concrete pile.

**ELEVATION B-B**

- **Manufactured Conical Point**

  - **Note**: If the conical point is not pre-beveled, place a 3/8" bevel at 45 degrees on the pipe.

**SECTION C-C**

- **Cruciform Pile Point Reinforcement**

  - **Note**: This drawing is not in scale. Follow dimensions.

**CRUCIFORM PILE POINT REINFORCEMENT**

- **GALVANIZED CLOSED ENDED CAST-IN-PLACE (CECIP) CONCRETE PILE**

  - **Note**: This drawing is not in scale. Follow dimensions.

**CRUCIFORM PILE POINT REINFORCEMENT**

- **GALVANIZED CLOSED ENDED CAST-IN-PLACE (CECIP) CONCRETE PILE**

  - **Note**: This drawing is not in scale. Follow dimensions.

**CRUCIFORM PILE POINT REINFORCEMENT**

- **GALVANIZED CLOSED ENDED CAST-IN-PLACE (CECIP) CONCRETE PILE**

  - **Note**: This drawing is not in scale. Follow dimensions.
Standard Drawing Guidance (do not show on plans):

Do not use 20" and 24" diameter closed ended cast-in-place (CECIP) concrete pile without approval of Structural Project Manager or Liaison.

<table>
<thead>
<tr>
<th>Typical Data for CECIP Piles</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>D1, CECIP Pile (O.D.) (by design)</strong></td>
</tr>
<tr>
<td><strong>Min. Nominal Wall Thickness (by design)</strong></td>
</tr>
<tr>
<td><strong>Closure Plate Thickness</strong></td>
</tr>
<tr>
<td><strong>Pile Point Reinforcement</strong></td>
</tr>
<tr>
<td><strong>Upper Stirrup Bars</strong></td>
</tr>
<tr>
<td><strong>Min. Vertical Bars</strong></td>
</tr>
<tr>
<td><strong>Min. Lower Stirrup Bars</strong></td>
</tr>
</tbody>
</table>

For LFD seismic performance category (SPC) A and LRFD seismic design category (SDC) A, minimum number of vertical bars, size and length and seismic stirrup bar information is provided in Galvanized Closed Ended Cast-In-Place (CECIP) Concrete Pile Data. Modify reinforcement size, length of vertical bars (L1), number of vertical bars, number of stirrup bars, and bar mark information as needed for specific project.

- Min. L1 = 5'-3" for 14"Ø and 16"Ø CECIP & 7'-3" for 20"Ø and 24"Ø CECIP
- Min. Lower Stirrup Bars = 5-#4 for 14"Ø and 16"Ø CECIP & 7-#4 for 20"Ø and 24"Ø CECIP
- Min. Vertical Bars = 6-#5 for 14"Ø CECIP, 6-#6 for 16"Ø CECIP, 8-#6 for 20"Ø CECIP & 12-#6 for 24"Ø CECIP

For SPC B, C and D, modify reinforcement as needed to meet AASHTO 17th edition (LFD) and for SDC B, C and D, modify reinforcement as needed to meet AASHTO Guide Specification for LRFD Seismic Bridge Design (SGS).

For hard driving conditions consider ASTM A148 Grade 90-60. If conical pile points are not used, this note may be removed.
GALVANIZED OPEN ENDED CAST-IN-PLACE (OECIP) CONCRETE PILE
WITHOUT PILE POINT REINFORCEMENT

Notes:
- Welded or seamless steel shell (pipe) shall be ASTM A252 Grade 3 (f_y = 45,000 psi).
- Open ended pile shall be augered out to the minimum pile cleanout penetration elevation and filled with Class B-1 concrete.
- Concrete for cast-in-place pile shall be Class B-1.
- Steel casting for open ended cutting shoe pile point reinforcement shall be ASTM A27 Grade 65-35 ASTM A148 Grade 90-60.
- The minimum wall thickness of any spot or local area of any type shell shall not be more than 12.5% under the specified nominal wall thickness.
- The contractor shall determine the pile wall thickness required to avoid damage from all driving activities, but wall thickness shall not be less than the minimum specified. An additional seam weld shall be required for furnishing a thicker wall.
- Splices of pipe for cast-in-place pipe piles shall be made watertight and to the full strength of the pipe above and below the splice to permit hard driving without damage. Pipe sections used for splicing shall be at least 5 feet in length.
- At the contractor's option, the hooks of vertical bars embedded in the beam cap may be oriented inward or outward. The hooks of vertical bars embedded in the pile cap footing should be oriented inward for seismic categories 4, 5, and 6.
- All reinforcement for cast-in-place pile is included in the Bill of Reinforcing Steel.
- For Foundation Data table, see Sheet No. 1.

GALVANIZED OPEN ENDED CAST-IN-PLACE (OECIP) CONCRETE PILE

Note: This drawing is not to scale. Follow dimensions.

Sheet No. 1

Detailed
Checked
**Standard Drawing Guidance (do not show on plans):**

Do not use 20" and 24" diameter open ended cast-in-place (OECIP) concrete pile without approval of Structural Project Manager or Liaison.

1. Typical Data for OECIP Piles

<table>
<thead>
<tr>
<th>D1, OECIP Pile (O.D.) (by design)</th>
<th>14&quot;</th>
<th>16&quot;</th>
<th>20&quot;</th>
<th>24&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. Nominal Wall Thickness (by design)</td>
<td>1/2&quot; (See EPG 751.36.3.3.3 for commonly available nominal wall thicknesses.)</td>
<td>1/2&quot;</td>
<td>1/2&quot;</td>
<td>3/8&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pile Point Reinforcement</th>
<th>**** (add note below) or &quot;None&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. Pile Cleanout Penetration (Elev.)</td>
<td>300</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vertical Bars</th>
<th>6.00-Vxxx</th>
<th>6.00-Vxxx</th>
<th>8.00-Vxxx</th>
<th>12.00-Vxxx</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1, Length of Vertical Bars</td>
<td>5'-3&quot;</td>
<td>7'-3&quot;</td>
<td>7'-3&quot;</td>
<td>7'-3&quot;</td>
</tr>
<tr>
<td>Upper Stirrup Bars</td>
<td>5-#6-Pxxx</td>
<td>5-#6-Pxxx</td>
<td>7-#6-Pxxx</td>
<td></td>
</tr>
<tr>
<td>Lower Stirrup Bars</td>
<td></td>
<td></td>
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</tbody>
</table>

**Open ended cutting shoe**

2. For LFD seismic performance category (SPC) A and LRFD seismic design category (SDC) A, minimum number of vertical bars, size and length and seismic stirrup bar information is provided in Galvanized Open Ended Cast-In-Place (OECIP) Concrete Pile Data. Modify reinforcement size, length of vertical bars (L1), number of vertical bars, number of stirrup bars, and bar mark information as needed for specific project.

Min. L1 = 5'-3" for 14"Ø and 16"Ø OECIP &
7'-3" for 20"Ø and 24"Ø OECIP

Min. Lower Stirrup Bars = 5-#4 for 14"Ø and 16"Ø OECIP &
7-#4 for 20"Ø and 24"Ø OECIP

Min. Vertical Bars = 6-#5 for 14"Ø OECIP,
6-#6 for 16"Ø OECIP,
8-#6 for 20"Ø OECIP &
12-#6 for 24"Ø OECIP

For SPC B, C and D, modify reinforcement as needed to meet AASHTO 17th edition (LFD) and for SDC B, C and D, modify reinforcement as needed to meet AASHTO Guide Specification for LRFD Seismic Bridge Design (SGS).

3. For hard driving conditions consider ASTM A148 Grade 90-60. If cutting shoe is not used, this note may be removed.

4. Use appropriate note based on seismic category (See EPG 751.50, Notes G5b7a & G5b7b)

5. These details of bar array 6, 8 and 12 count, can be used as needed in sheet details "Section A-A" & "DETAIL OF SEISMIC STIRRUP BAR" by using centroid as the handle.
Standard Drawing Guidance (Do not show on plans):
Sheet for piles WITHOUT dynamic pile testing.

Draw layout with bents labeled and provide numbering of piles. List in the tables the piles grouped by bents with the name of the bent included in the remarks column as a header for the piles located at that bent. Provide two blank rows after the last pile of each bent grouping to allow for additions in the field.

Combine with As-Built Drilled Shaft Data if both piles and drilled shafts are shown on same sheet.

PART PLAN SHOWING PILE NUMBERING FOR RECORDING AS-BUILT PILE DATA

<table>
<thead>
<tr>
<th>Pile No</th>
<th>Length in Place (ft)</th>
<th>Computed Nominal Axial Compressive Resistance (kips)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
</tbody>
</table>

Note: Indicate in remarks column:
A. Pile type and grade
B. Batter
C. Driven to practical refusal

This sheet to be completed by MoDOT construction personnel.
Standard Drawing Guidance (Do not show on plans):

Sheet for piles WITH dynamic pile testing.

Draw layout with bents labeled and provide numbering of piles. List in the tables the piles grouped by bents with the name of the bent included in the remarks column as a header for the piles located at that bent. Provide two blank rows after the last pile of each bent grouping to allow for additions in the field.

Combine with As-Built Drilled Shaft Data if both piles and drilled shafts are shown on same sheet.

As-Built Pile Data

<table>
<thead>
<tr>
<th>Pile No.</th>
<th>Length in Place (ft)</th>
<th>PDA Nom. Axial Compressive Resistance (kips)</th>
<th>Actual End of Drive Blow Count (blows/in.)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
</tbody>
</table>

Note: Indicate in remarks column:
A. Pile type and grade
B. Batter
C. Driven to practical refusal
D. PDA test pile
E. Minimum tip elevation controlled

This sheet to be completed by MoDOT construction personnel.
STANDARD DRAWING GUIDANCE (do not show on plans): (Turn off level Bridge-Guidance to hide guidance)

1. Actual strand arrangement, bent up strands, and debonding (if any) is by design (top two strands are required). Add or remove symbols and instructions as required. Strands may be placed continuously across beam (eliminating 4" space), but dimension to drain hole in Part Plan shall be revised to 10".

2. Revise if #3 is required. Use 6'-7" for #3-33 actual length and 6'-1" for #3-53 actual length.

3. Splices shown only when necessary (girder length > 60'-2"). Use 2'-1" lap for #4 & 2'-7" lap for #5.

   - When lap is unnecessary: Delete grouped elements.
   - In Part Plan: 10 to 3 A1 bars & 8 to 4 A2 bars.

4. Interior diaphragm & vent pipe shall be shown only when necessary (when structure may be submerged).

   - When not necessary: Delete the two grouped elements.
   - In Part Plan: revise remaining dimension to full length of void.

5. Revise minimum dimension if required by design.

6. By design. Typically 30.98 kips per 0.5" strand & 43.94 kips per 0.6" strand, rounded to nearest whole kip.

7. Strand location not available when vent pipe is required.
STANDARD DRAWING GUIDANCE (do not show on plans):

1. Actual strand arrangement, bent up strands, and debonding (if any) is by design (top two strands are required). Add or remove symbols and instructions as required. Strands may be placed continuously across beam (eliminating 4" space), but dimension to drain hole in Part Plan shall be revised to 10".

2. Revise if #3 is required. Use 6'-7" for #3-33 actual length and 6'-1" for #3-52 actual length.

3. Splices shown only when necessary (girder length > 60'-2"). Use 2'-1" lap for #4 & 2'-7" lap for #5.

   - When lap is unnecessary:
     - Delete grouped elements.
     - Extend A bars to E Beam.
     - Revise 10 to 3 A1 bars & 8 to 4 A2 bars.

4. Interior diaphragm & vent pipe shall be shown only when necessary (when structure may be submerged):

   - When not necessary:
     - Delete the two grouped elements.
     - Delete the two grouped hidden lines to E Beam.
     - In Part Plan revise remaining dimension to full length of void.

5. Revise minimum dimension if required by design.

6. By design, typically 30 kips per 0.5" strand & 43 kips per 0.6" strand, rounded to nearest whole kip.

7. Strand location not available when vent pipe is required.
1. Actual strand arrangement, bent up strands, and debonding (if any) is by design (top two strands are required). Add or remove symbols and instructions as required. Strands may be placed continuously across beam (eliminating 4" space), but dimension to drain hole in Part Plan shall be revised to 10".

2. Revise if #3 is required. Use 7'-3" for #3-33 actual length and 6'-9" for #3-52 actual length.

3. Splices shown only when necessary (girder length > 60'-2'). Use 2'-1" lap for #4 & 2'-7" lap for #5.

4. When lap is necessary:
   - Delete grouped elements.
   - Extend A bars to Ø Beam.
   - Revise 10 to 3 A1 bars & 8 to 4 A2 bars.

5. Splice location not available when vent pipe is required.

6. By design. Typically 36.94 kips per 0.5" strand & 43.94 kips per 0.6" strand, rounded to nearest whole kip.

7. Strand location not available when vent pipe is required.
STANDARD DRAWING GUIDANCE (do not show on plans)

1. Actual strand arrangement, bent up strands, and debonding (if any) is by design. Top two strands are required. Add or remove symbols and instructions as required. Strands may be placed continuously across beam (eliminating 4” space), but dimension to drain hole in Part Plan shall be revised to 10”.

2. Revise if #3 is required. Use 7'-3" for #3-S1 actual length and 6'-9" for #3-S2 actual length.

3. Splices shown only when necessary (girder length > 60'-2”). Use 2'-1” lap for #4 & 2'-7” lap for #5.

4. Interior diaphragm & vent pipe shall be shown only when necessary (when structure may be submerged).

5. Strand location not available when vent pipe is required.
1. Actual strand arrangement, bent up strands, and debonding (if any) is by design (top two strands are required). Add or remove symbols and instructions as required. Strands may be placed continuously across beam (eliminating 4" space), but dimension to drain hole in Part Plan shall be revised to 10".

2. Revise if #3 is required. Use 7'-4" for #3-33 actual length and 7'-5" for #3-32 actual length.

3. Splices shown only when necessary (girder length > 60'-2"). Use 2'-1" lap for #4 & 2'-7" lap for #5.
   - When lap is unnecessary: Delete grouped elements.

4. Interior diaphragm & vent pipe shall be shown only when necessary (when structure may be submerged).
   - When not necessary: Delete the two grouped elements.

5. Strand location not available when vent pipe is required.

6. By design. Typically 20.90 kips per 0.5" strand & 43.94 kips per 0.6" strand, rounded to nearest whole kip.
STANDARD DRAWING GUIDANCE (do not show on plans):

1. Actual strand arrangement, bent up strands, and debonding (if any) is by design (top two strands are required). Add or remove symbols and instructions as required. Strands may be placed continuously across beam (eliminating 4” space), but dimension to drain hole in Part Plan shall be revised to 10”.

2. Revise if #3 is required. Use 7'-4” for #3-33 actual length and 7'-5” for #3-52 actual length.

3. Splices shown only when necessary (girder length > 60'-2”). Use 2'-1” lap for #4 & 2'-7” lap for #5.

4. Interior diaphragm & vent pipe shall be shown only when necessary (when structure may be submerged).

5. Strand location not available when vent pipe is required.
1. Actual strand arrangement, bent up strands, and debonding (if any) is by design (top two strands are required). Add or remove symbols and instructions as required. Strands may be placed continuously across beam (eliminating 4” space), but dimension to drain hole in Part Plan shall be revised to 10”.

2. Revise if #5 is required. Use 8’-4” for #5-S1 actual length and 7’-9” for #5-S2 actual length.

3. Splices shown only when necessary (girder length > 60’-2”). Use 2’-1” lap for #4 & 2’-7” lap for #5.
   - When lap is unnecessary: - Delete grouped elements.
   - In Half Elev. extend hidden lines to & Beam.
   - Revise 10’ to 3 A1 bars & 8 to 4 A2 bars.

4. Interior diaphragm & vent pipe shall be shown only when necessary (when structure may be submerged).
   - When not necessary: - Delete the two grouped elements.
   - In Part Plan revise remaining dimension to full length of void.

5. Revise minimum dimension if required by design.

6. By design. Typically 30.98 kips per 0.5” strand & 43.94 kips per 0.6” strand, rounded to nearest whole kip.
1. Actual strand arrangement, bent-up strands, and debonding (if any) is by design (top two strands are required). Add or remove symbols and instructions as required. Strands may be placed continuously across beam (eliminating 4" space), but dimension to drain hole in Part Plan shall be revised to 10".

2. Revise if #5 is required. Use 8'-4" for #5-33 actual length and 7'-5" for #5-53 actual length.

3. Splices shown only when necessary (girder length > 60'-2""). Use 2'-1" lap for #4 & 2'-7" lap for #5.

   - When necessary: Delete grouped elements.
   - When not necessary: Extend A bars to Beam.
   - Revise 10' to 3 A1 bars & 8 to 4 A2 bars.

4. Interior diaphragm & vent pipe shall be shown only when necessary (when structure may be submerged).

   - When not necessary: Delete the two grouped elements.
   - Extend hidden lines to Beam.
   - In Part Plan revise remaining dimension to full length of void.

5. Revise minimum dimension if required by design.

6. By design. Typically 30.98 kips per 0.5" strand & 43.94 kips per 0.6" strand, rounded to nearest whole kip.

7. Part Plan and Beam Plan may be released at same time.
STANDARD DRAWING GUIDANCE (do not show on plans): (Turn off level Bridge-Guidance to hide guidance)

1. Actual strand arrangement, bent up strands, and debonding (if any) is by design (top two strands are required). Add or remove symbols and instructions as required. Strands may be placed continuously across beam (eliminating 4” space), but dimension to drain hole in Part Plan shall be revised to 10”.

2. Revise if #3 is required. Use 9’-4” for #3-5 actual length and 7’-9” for #5-32 actual length.

3. Splices shown only when necessary (girder length > 60’-2”). Use 2’-1” lap for #4 & 2’-7” lap for #5.

   When lap is
   - Delete grouped elements;
   - Extend A bars to Beam;
   - Revise 10 to 3 A1 bars & 8 to 4 A2 bars.

4. Interior diaphragm & vent pipe shall be shown only when necessary (when structure may be submerged).

   When not necessary
   - Delete the two grouped elements.
   - Extend A bars & hidden lines to Beam;
   - In Part Plan revise remaining dimension to full length of void.

5. Revise minimum dimension if required by design.

6. By design. Typically 30.98 kips per 0.5” strand & 43.94 kips per 0.6” strand,
   rounded to nearest whole kip.
Actual strand arrangement, bent up strands, and debonding (if any) is by design (top two strands are required). Add or remove symbols and instructions as required. Strands may be placed continuously across beam (eliminating 4" space), but dimension to drain hole in Part Plan shall be revised to 10".

Revise if #3 is required. Use 9'-4" for #3-36 actual length and 7'-9" for #3-32 actual length.

Splices shown only when necessary (girder length > 60'-2''). Use 2'-3" lap for #4 & 2'-7" lap for #5.

When lap is unnecessary:
- Delete grouped elements.
- Extend A bars to G Beam.
- Revise 10 to 3 A1 bars & 8 to 4 A2 bars.

Interior diaphragm & vent pipe shall be shown only when necessary (when structure may be submerged):
- When not necessary:
  - Delete the two grouped elements.
  - Delete the two bold lines to G Beam.
  - In Part Plan revise remaining dimension to full length of void.

Revise minimum dimension if required by design.

By design, typically 30.96 kips per 0.5" strand & 43.94 kips per 0.6" strand, rounded to nearest whole kip.
All strands are fully bonded unless otherwise noted.
- Indicates prestressing strand.
- Indicates top and shop bend with 2'-6" projection.
- Indicates debonded for X'-X" from beam end.

Ref: Dimensions are not to scale. Follow dimensions.

**General Notes:**
Concrete for prestressed beams shall be Class A-1 with f'c = 3000 psi and f'c = 3000 psi.

Use strands: "0 Grade 70.
Prec tensioned members shall be in accordance with Sec 1029.
Fabricator shall be responsible for fabrication and design of lifting devices.

Exterior and interior beams are the same except coil ties for intermediate bents.

For Beam Camber Diagram, see Sheet No. __.
For location of end inserts, see Sheet No. __.
For location of coil ties at concrete bent diaphragms, see Sheets Nos. __ and __.
STANDARD DRAWING GUIDANCE (do not show on plans):
(Turn off level Bridge-Guidance to hide guidance)

1 Actual strand arrangement, bent up strands, and debonding (if any) is by design (top two strands are required). Add or remove symbols and instructions as required. Strands may be placed continuously across beam eliminating 4" space, but dimension to drain hole in Part Plan shall be revised to 10".

2 Revise if #3 is required. Use 9'-10" for #3-53 actual length end 7'-3" for #5-52 actual length.

3 Splices shown only when necessary (girder length > 60'-2`). Use 2'-1" lap for #4 & 2'-7" lap for #5.
   When lap is unnecessary:
   - Delete grouped elements.
   - Extend A bars to Beam.
   - Revise 10 to 5 A1 bars & 8 to 4 A2 bars.

4 Interior diaphragm & vent pipe shall be shown only when necessary (when structure may be submerged).
   When not necessary:
   - Delete the two grouped elements.
   - Extend hidden lines to Beam.
   - In Part Plan revise remaining dimension to full length of void.

5 Revise minimum dimension if required by design.

6 By design. Typically 30.9 kips per 0.5" strand & 43.94 kips per 0.6" strand, rounded to nearest whole kip.
Actual strand arrangement, bent up strands, and debonding (if any) is by design (top two strands are required). Add or remove symbols and instructions as required. Strands may be placed continuously across beam (eliminating 4" space), but dimension to drain hole in Part Plan shall be revised to 10".

Revise if #5 is required. Use 9'-10" for #5-1 actual length and 7'-3" for #5-2 actual length.

Splices shown only when necessary (girder length > 60'-2"). Use 2'-1" lap for #4 & 2'-7" lap for #5.

- Delete grouped elements.
- Extend A bars to G beam.
- Revise 10 to 3 A1 bars & 8 to 4 A2 bars.

Interior diagonal & vent pipe shall be shown only when necessary (when structure may be submerged).

- Delete the two grouped elements.
- Extend hidden lines to beam.
- In Part Plan revise remaining dimension to full length of void.

Revise minimum dimension if required by design.

By design. Typically 30.98 kips per 0.5" strand & 43.94 kips per 0.6" strand, rounded to nearest whole kip.
Standard Drawing Guidance (do not show on plans):

To display the strand details open the reference files dialog box and activate
the display option of the file with the description that best matches what is
required by the design.

See EPG for actual length of B1 bars which vary by size.

The details of the coil ties are for closed diaphragms. Include additional
detail below for open diaphragms.

① This detail only needs to be used if the structure is over water. For all
other crossings remove this detail.

② Remove if #5-B1 bars are used.

③ Use with end spans when both interior & exterior girders are detailed on the
same sheet, and the 2'-6" long tie rod will not fit in the exterior diaphragm
portion. Remove when not necessary.

④ By design. Typically 30.98 kips per 1/2" strand & 43.94 kips per 0.6" strand,
rounded to nearest whole kip.
**General Notes:**

- All bends shall be 90°, and bends shall be in accordance with Sec 1029.
- Pretensioned members shall be in accordance with Sec 1029.
- Prestressed members shall be in accordance with Sec 1029.
- Exterior and interior girders are the same except: coil inserts and overtightening of intermediate diaphragms.
- For Girder Camber Diagram, see Sheet No.

**Fabricator shall be responsible for installation and design of lifting devices.**

- Exterior and interior girders are the same except: coil inserts and overtightening of intermediate diaphragms.
- For Girder Camber Diagram, see Sheet No.

**Material:**

- Use strands, 1/2"Ø Grade 270, with an initial prestress force of 1 kips.
- Prestressed members shall be in accordance with Sec 1029.
- Fabricator shall be responsible for installation and design of lifting devices.

**General Notes:**

- All dimensions are out to out.
- Hooks and bends shall be in accordance with the CRSI Manual of Standard Practice for Detailing Reinforced Concrete Structures. Stirrup and Tie Dimensions.
- Actual lengths are measured along centerline of bar to the nearest inch.
- Minimum clearance to reinforcing shall be 1/2".
- All reinforcement shall be Grade 60.
- The two D1 bars may be furnished as one bar at the fabricator's option.
- All bar shall be epoxy coated.

**Bill of Reinforcing Steel - Each Girder**

<table>
<thead>
<tr>
<th>Bar Type</th>
<th>Length</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>#4-D1</td>
<td>6</td>
<td>1.2</td>
</tr>
<tr>
<td>#4-C1</td>
<td>6</td>
<td>1.2</td>
</tr>
<tr>
<td>#6-B2</td>
<td>6</td>
<td>1.2</td>
</tr>
<tr>
<td>#X-B1</td>
<td>6</td>
<td>1.2</td>
</tr>
<tr>
<td>#X-A1</td>
<td>6</td>
<td>1.2</td>
</tr>
</tbody>
</table>

**Strands not shown for clarity.**

For location of holes and details of intermediate diaphragms, see Sheet No.

For Girder Camber Diagram, see Sheet No.

For location of coil inserts at slab drains, see Sheet No.

For location of coil inserts at slab drains, see Sheet No.
Standard Drawing Guidance (do not show on plans):

To display the strand details open the reference files dialog box and activate the display option of the file with the description that best matches what is required by the design.

See EPG for actual length of B1 bars which vary by size.

The details of the coil ties are for closed diaphragms. Include additional detail below for open diaphragms.

1. This detail only needs to be used if the structure is over water. For all other crossings remove this detail.
2. Remove if #5 B1 bars are used.
3. Use with end spans when both interior & exterior girders are detailed on the same sheet, and the 2'-6" long tie rod will not fit in the exterior diaphragm portion. Remove when not necessary.
4. By design. Typically 30.98 kips per 1/2" strand & 43.94 kips per 0.6" strand, rounded to nearest whole kip.

See EPG for actual length of B1 bars which vary by size.

The details of the coil ties are for closed diaphragms. Include additional detail below for open diaphragms.
Standard Drawing Guidance (do not show on plans):
To display the strand details open the reference files dialog box and activate
the display option of the file with the description that best matches what is
required by the design.

See EPG for actual length of B1 bars which vary by size.

The details of the coil ties are for closed diaphragms. Include additional
detail below for open diaphragms.
① This detail only needs to be used if the structure is over water. For all
other crossings remove this detail.
② Remove if #5-B1 bars are used.
③ Use with end spans when both interior & exterior girders are detailed on the
same sheet, and the 2'-6" long tie rod will not fit in the exterior diaphragm
portion. Remove when not necessary.
④ By design. Typically 30.98 kips per 1/2" strand & 43.94 kips per 0.6" strand,
rounded to nearest whole kip.
Standard Drawing Guidance (do not show on plans):

To display the strand details open the reference files dialog box and activate the display option of the file with the description that best matches what is required by the design.

See EPG for actual length of B1 bars which vary by size.

The details of the coil ties are for closed diaphragms. Include additional detail below for open diaphragms.

1. This detail only needs to be used if the structure is over water. For all other crossings remove this detail.

2. Remove if #5-B1 bars are used.

3. Use with end spans when both interior & exterior girders are detailed on the same sheet, and the 2'-6" long tie rod will not fit in the exterior diaphragm portion. Remove when not necessary.

4. By design. Typically 30.98 kips per 1/2" strand & 43.94 kips per 0.6" strand, rounded to nearest whole kip.
Standard Drawing Guidance (do not show on plans):

To display the strand details open the reference files dialog box and activate the display option of the file with the description that best matches what is required by the design.

See EPG for actual length of B1 bars which vary by size.

The details of the coil ties are for closed diaphragms. Include additional detail below for open diaphragms.

1. This detail only needs to be used if the structure is over water. For all other crossings remove this detail.
2. Remove if #5-B1 bars are used.
3. Use with end spans when both interior & exterior girders are detailed on the same sheet, and the 2'-6" long tie rod will not fit in the exterior diaphragm portion. Remove when not necessary.

4. By design. Typically 30.90 kips per 1/2" strand & 43.94 kips per 0.6" strand, rounded to nearest whole kip.

See EPG for actual length of B1 bars which vary by size.

The details of the coil ties are for closed diaphragms. Include additional detail below for open diaphragms.
1. Fabricator shall apply a bond breaker to this region preceding wash out line will be raked up.

2. Outer strands tensioned to 2,000 kips/strand and inner strands to 2,500 kips/strand. Placed symmetrical about x-Girder. May be moved laterally in pairs.

3. Cut top 2 rows of strands with a 12" projection and bend in shop (all remaining top strands within 1' of end of girders) (Typ.)

4. Cut & Stop bend with 8" projection (Cut strands within 1' of girder ends) (Typ.)

5. 8" Chamfer

6. Strands not shown for clarity.

7. Note: This drawing is not to scale. Follow dimensions.
Choose one of the 4 details for the top flange blockout detail and follow the provided detail guidance. For 0-7° skew, remove G6 bars from bill of reinforcing.

The left advanced details shown may be used for right advanced bridges. May remove mirror note if left advanced.

Blockout shall be dimensioned along the girder to 1 1/2 inches inside the face of the diaphragm and adjusted for girder tilt if present.

Revise bent references as required. Specify the bent number if blockout varies by bent.

Aug 22

0° TO 7° LA SKEW

TOP FLANGE BLOCKOUT

INTERIOR GIRDER AT ALL BENTS

NO SKEW

Inter change detail for non integral end bents (exterior girder at end bent will be same detail as at intermediate bent).

FLANGE BLOCKOUT DATA

<table>
<thead>
<tr>
<th>Skew</th>
<th>X Eq</th>
<th>X Spa</th>
<th>#4-G6 Bar Lengths</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;14° to 21°</td>
<td>5</td>
<td>2</td>
<td>G3 bar = -46.25 cos (skew)</td>
</tr>
<tr>
<td>&gt;21° to 27°</td>
<td>4</td>
<td>3</td>
<td>G5 bar = 32.125 cos (skew)</td>
</tr>
<tr>
<td>&gt;27° to 32°</td>
<td>5</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>&gt;32° to 37°</td>
<td>6</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>&gt;37° to 42°</td>
<td>7</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>&gt;42° to 46°</td>
<td>8</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>&gt;46° to 49°</td>
<td>9</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>&gt;49° to 52°</td>
<td>10</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>&gt;52° to 55°</td>
<td>11</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>&gt;55° to 57°</td>
<td>12</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>&gt;57° to 60°</td>
<td>12</td>
<td>12</td>
<td></td>
</tr>
</tbody>
</table>

- The maximum strand arrangement is shown in details including top straight strands and necessary strands from the four details where shown.
- For skews > 7° to 14°:
  - G6 bar = G3 bar + 46.25 cos (skew)
- For skews > 14° to 60°:
  - G5 bar = 32.125 cos (skew)

Strands are not typically debonded for NU girders, but if required by design, add symbols to end of Girder strand arrangement detail and add the appropriate notes (Note H2c1.44 as shown below).

- Indicates debonded for x'-0" from end of girder.
- Indicates debonded for x'-0" from end of girder.

- 7° Maximum and 1° Minimum.
- By design. Typically 30-38 kips per 1/2" strand & 43.94 kips per 0.6" strand, rounded to nearest whole kip.
- Revise minimum dimension if required by design.
- Adjust for modified flange thickness.
- Use with end spans where both interior & exterior girders are detailed on same sheet and the 2'-6" long tie rod will not fit in the exterior diaphragm portion. Remove when not necessary.
- Substitute these values into drawing.

<table>
<thead>
<tr>
<th>NU</th>
<th>a</th>
<th>b</th>
<th>c</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>20%</td>
<td>2'-11&quot;</td>
<td>23%</td>
</tr>
<tr>
<td>63</td>
<td>2'-4&quot;</td>
<td>3'-2½&quot;</td>
<td>2'-9½&quot;</td>
</tr>
<tr>
<td>53</td>
<td>3'-2½&quot;</td>
<td>4'-0&quot;</td>
<td>3'-9½&quot;</td>
</tr>
<tr>
<td>63</td>
<td>4'-0&quot;</td>
<td>5'-3&quot;</td>
<td>4'-9½&quot;</td>
</tr>
<tr>
<td>70</td>
<td>4'-0&quot;</td>
<td>5'-10&quot;</td>
<td>4'-13&quot;</td>
</tr>
<tr>
<td>78</td>
<td>5'-4&quot;</td>
<td>6'-0&quot;</td>
<td>5'-7&quot;</td>
</tr>
</tbody>
</table>

- Remove note for NU 53, 63, 70 and 78.
- Remove notes for NU 35 and 43.
- The overall height of the WWR5 shall not be increased for girder steps. Reduce this dimension by the accumulated girder step height.
PSI_07_NU_Bars  Guidance & Alternate Details

Standard Drawing Guidance (do not show on plans)

Choose one of the 4 details for the top flange blockout detail and follow the provided detail guidance. For 0-3° skew remove G6 bars from bill of reinforcing. The left advanced details shown may be used for right advanced bridges. May remove mirror note if left advanced details are used. Blockout shall be dimensioned along the girder to 1 1/2 inches inside the face of the diaphragm and adjusted for girder tilt if present. Revise bent references as required. Specify the bent number at end bent will be same detail as at intermediate bent.

**FLANGE BLOCKOUT DATA**

<table>
<thead>
<tr>
<th>Skew</th>
<th>X Eq Sp.</th>
<th>#4-G6</th>
<th>Bar Lengths</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;2° to 7°</td>
<td>5</td>
<td>2</td>
<td>G3 bar = 46.25</td>
</tr>
<tr>
<td>&gt;7° to 27°</td>
<td>5</td>
<td>2</td>
<td>G5 bar = 52.125</td>
</tr>
<tr>
<td>&gt;27° to 62°</td>
<td>7</td>
<td>6</td>
<td>G6 bar = 60</td>
</tr>
<tr>
<td>&gt;62° to 14°</td>
<td>8</td>
<td>7</td>
<td>G6 bar = 60</td>
</tr>
<tr>
<td>&gt;14° to 60°</td>
<td>10</td>
<td>9</td>
<td>G6 bar = 60</td>
</tr>
<tr>
<td>&gt;60° to 78°</td>
<td>11</td>
<td>11</td>
<td>G6 bar = 60</td>
</tr>
</tbody>
</table>

The maximum strand arrangement is shown in details including top straight strands. Remove unnecessarily small strands from the four details where shown. Details only needs to be used if structure is over water. For all other crossings remove detail.

Indicate 10 strands as shown at NU 55. G3 & G4 indicate 2 more strands for NU 62, 70 and 78.

Stands are not typically delected for NU girders. If required by design, add symbols to End of Girder strand arrangement detail and add the appropriate notes (Note H2c1.44 and as shown below).

- Indicate delected for x° from end of girder
- Indicates delected for x° from end of girder

Actual length of 81 bars:

<table>
<thead>
<tr>
<th>NU 25</th>
<th>NU 43</th>
<th>NU 53</th>
<th>NU 63</th>
<th>NU 70</th>
<th>NU 78</th>
</tr>
</thead>
<tbody>
<tr>
<td>#4</td>
<td>4'-4&quot;</td>
<td>5'-0&quot;</td>
<td>5'-10&quot;</td>
<td>6'-4&quot;</td>
<td>7'-2&quot;</td>
</tr>
<tr>
<td>#6</td>
<td>4'-10&quot;</td>
<td>5'-0&quot;</td>
<td>5'-10&quot;</td>
<td>6'-8&quot;</td>
<td>7'-4&quot;</td>
</tr>
</tbody>
</table>

By design. Typically 30 kips per 1/2 strand & 45 kips per 43/4 strand, rounded to nearest 5 kips. Adjust if necessary. By design. Typically 30 kips per 1/2 strand & 45 kips per 43/4 strand, rounded to nearest 5 kips. Adjust if necessary.

Substitute these values into drawing:

<table>
<thead>
<tr>
<th>Skew</th>
<th>X Eq Sp.</th>
<th>#4-G6</th>
<th>Bar Lengths</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;2°</td>
<td>5</td>
<td>2</td>
<td>G3 bar = 46.25</td>
</tr>
<tr>
<td>&gt;7°</td>
<td>5</td>
<td>2</td>
<td>G5 bar = 52.125</td>
</tr>
<tr>
<td>&gt;27°</td>
<td>7</td>
<td>6</td>
<td>G6 bar = 60</td>
</tr>
<tr>
<td>&gt;62°</td>
<td>8</td>
<td>7</td>
<td>G6 bar = 60</td>
</tr>
<tr>
<td>&gt;14°</td>
<td>10</td>
<td>9</td>
<td>G6 bar = 60</td>
</tr>
<tr>
<td>&gt;60°</td>
<td>11</td>
<td>11</td>
<td>G6 bar = 60</td>
</tr>
</tbody>
</table>

Remove note for NU 53, 43, 70 and 78.

Remove notes for NU 35 and 43.

The overall height of the WWR shall not be increased for girder steps. Adjust this dimension by the accumulated girder step height.

Remove if #5-B1 bars are used.
General Notes:

Prestressed Panels

1. Concrete for prestressed panels shall be Class A-1 with

2. The top surface of all panels shall receive a scored finish with a depth of scoring of 1/8" to 1/4" perpendicular to the prestrain strands in the panels.

3. Prestressing tendons shall be high-tensile strength, uncoated, galvanized, and in accordance with the American Association of State Highway and Transportation Officials (AASHTO) standards. Each tendon strand shall be composed of 7 strands of wire (7 x 7 1/2 strand = 34 strand). No interstrand welding shall be used. Each tendon strand shall be composed of 7 strands of wire (7 x 7 1/2 strand = 34 strand). Precast concrete panels shall be prestrained with a minimum tendon strand of 17.2 kips/strand. The ultimate strength shall be 22.95 kips (270 ksi). Larger strands may be used with the same spacing and initial tension.

4. Initial prestressing force = 17.2 kips/strand.

5. The contractor shall ensure proper consideration under and between panels.

6. Use Slab Haunching Diagram on Sheet No. 2 for determining the thickness of joint filler within the limit of the slab.

7. Prestressed panels shall be brought to saturated surface dry (SSD) condition just prior to the deck pour. There shall be no free standing water on the panels or in the area to be cast.

8. When squared end panels are used squared end panels, the sustained portion shall be cast full depth. No separate payment will be made for additional concrete and reinforcing required. Support from diaphragm forms is required under the optional 1/2" x 45° Chamfer one or both sides at bottom.

9. Reference Notes:

(a) Blocks and headers shall be in accordance with the CRSI Manual of Standard Practice for Detailing Reinforced Concrete Structures: Stirrup and Tie Dimensions.

(b) Minimum clearance to reinforcing shall be 1 1/2", unless otherwise shown.

(c) U1 bars interface with placement of slab steel. U1 loops may be bent over, as necessary, to clear slab steel.

(d) All dimensions are out to out.

(e) #3-P2 bars at 16 inches.

(f) For truncated end panels, use a min. of #5-S bars near edge of panel at top (under strands).

(g) #3-P2 bars at 16 inches.

(h) #3-P2 bars at 16 inches.

(i) Minimum reinforcement steel length shall be 2'-6".

(j) For panels with other than prestressing strands shall be epoxy coated.

(k) Precast panels may be in contact with stirrup reinforcing in diaphragms.

(l) Glue used shall be the type recommended by the joint filler manufacturer.

(m) Polystyrene bedding material may be cut with a transition to match haunch height above top of flange.

(n) The top surface of the 1/2" x 45° Chamfer shall be scored and used with squared end panels only.

(o) The same thickness of preformed fiber expansion joint material shall be used under any one edge of any panel except at locations shown.

(p) The thickness of preformed fiber expansion joint material shall be used with the same spacing and initial tension.

(q) The top surface of all panels shall receive a scored finish with a depth of scoring of 1/8" to 1/4" perpendicular to the prestrain strands in the panels.

(r) The contractor shall ensure proper consideration under and between panels.

(s) Use Slab Haunching Diagram on Sheet No. 3 for determining the thickness of joint filler within the limit of the slab.

(t) Joint filler shall be preformed fiber expansion joint material in accordance with Sec 1073 or expanded or extruded polystyrene in accordance with Sec 1073.

(u) Use Slab Haunching Diagram on Sheet No. 3 for determining the thickness of joint filler within the limit of the slab.

(v) All reinforcing other than prestressing strands shall be epoxy coated.

(w) Precast panels may be in contact with stirrup reinforcing in diaphragms.

(x) #3-P2 bars are not listed in the bill of reinforcing.

(y) Cost of S-bars will be considered completely covered by the contract unit price for the slab.

(z) Joint filler shall be preformed fiber expansion joint material in accordance with Sec 1073 or expanded or extruded polystyrene in accordance with Sec 1073.

AA00: PS-Type 3 4 Effective: Feb. 2023 Superseded: Nov. 2019

PLAN SHOWING PANEL PLACEMENT

**SECTION A-A**

**Reference Notes:**

1. **Plan of Panel Placement:**
   - (1) S-bars shown are bottom steel in slab between panels and used with squared and truncated end panels.
   - (2) #3-U1 bars are to be used with #3-P2 bars.
   - (3) S-bars shall be 38" in length to facilitate alignment of panel ends.
   - (4) End panels shall be dimensioned 3/8" min. to 3 1/2" max.
   - (5) For truncated end panels, use a min. of #5-S bars at 6" spacings at openings, min. 6" away.

**Details**

- (a) Use #3-P2 bars if panel is skew 45° or more.
- (b) Any strand 2'-0" or shorter shall have a #3-U1 bar at each end do to 3'-0" center.
- (c) Optimal 1/2" x 45° Chamfer and #3-P2 bars at 16 inches.

**Joint Filler Dimensions:**

- (a) Joint Filler Dimensions:
  - (1) Use recommended fillers per shop drawings.
  - (2) Initial prestressing force = 17.2 kips/strand.
  - (3) The contractor may vary joint filler dimensions based on shop drawings.
  - (4) The maximum thickness of joint filler should be 2'-0".
  - (5) Joint filler shall be preformed fiber expansion joint material in accordance with Sec 1073.

**Width:**

- (a) Use #3-P2 bars @ 16 inches.

**Length:**

- (a) Use #3-P2 bars @ 16 inches.

**Panel Width:**

- (a) Use #3-P2 bars @ 16 inches.

**Height:**

- (a) Use #3-P2 bars @ 16 inches.

**PLAN OF OPTIONAL TRUNCATED END PANEL**

**PLAN OF SQUARED PANEL**

**PRESTRESSED PANELS**

**PLAN OF SQUARED PANEL**

**PLAN OF OPTIMAL TRUNCATED END PANEL**

**PLAN OF OPTIMAL SKEWED END PANEL**

**PLAN OF SQUARED PANEL**
Standard Drawing Guidance (do not show on plans):

1. Modify details if expansion gap is used and add Section B-B at expansion device and additional reference notes as shown on standard drawing for steel structures (PSP06).
Standard Drawing Guidance (do not show on plans):

1. Modify details if expansion gap is used and add Section B-B at expansion device and additional reference notes as shown on standard drawing for steel structures (PSP06).
Standard Drawing Guidance (do not show on plans):

1. Modify details if expansion gap is used and add Section B-B at expansion device and additional reference notes as shown on standard drawing for steel structures (PSP06).
**SECTION B-B**

**Panel Width**

<table>
<thead>
<tr>
<th>#3-P1</th>
<th>#3-P2</th>
</tr>
</thead>
<tbody>
<tr>
<td>3&quot; (Min.)</td>
<td>3&quot; (Max.)</td>
</tr>
</tbody>
</table>

**Panel Length**

<table>
<thead>
<tr>
<th>#3-P1</th>
<th>#3-P2</th>
</tr>
</thead>
<tbody>
<tr>
<td>6&quot; (Max.)</td>
<td>6&quot; (Max.)</td>
</tr>
</tbody>
</table>

**Filler Dimensions**

- **Front Face**
  - 2" (Typ.)
  - 1 1/2 inches thick

- **Joint Filler**
  - 3" (Typ.)
  - Minimum slab thickness
  - Maximum change in thickness of joint filler:
    - 1/2" over prestressed panels
    - 1 1/2" over skewed end panels

**General Notes**

- **Concrete**
  - Prestressed panels will be Class A-3 with:
    - F'c = 4,000 psi
    - F'c = 6,000 psi

- **Reinforcement**
  - Prestressing tendons shall be high tensile strength, uncoated, seven-wire, low-relaxation strands for prestressed concrete in accordance with AASHTO M 203 Grade 270, with nominal diameter of 0.375 inch. Larger strands may be used by agreement between the contractor and engineer.

- **Prestressing Force**
  - Initial prestressing force = (f')c * A

- **Skewed End Panels**
  - Skewed end panels shall be brought to saturated surface dry (SSD) condition just prior to the deck pour. There shall be no free standing water or ice on the panels. Gutter edges shall be flat and untapered. The method and sequence of releasing the strands shall be shown on the shop drawings.

- **Joint Filler**
  - Joint filler shall be glued to the girder. When thickness exceeds 1 1/2 inches, the joint filler shall be glued top and bottom. The maximum change in thickness of joint filler within the limits noted in the table of joint filler dimensions.

- **Slab Haunching**
  - Use Slab Haunching Diagram on Sheet No. XX for determining thickness of joint filler within the slab.

- **Concrete**
  - Concrete shall be mixed in accordance with Sec 1073.

- **Prestressing Tendons**
  - Prestressing tendons shall be high tensile strength, uncoated, seven-wire, low-relaxation strands for prestressed concrete in accordance with AASHTO M 203 Grade 270, with nominal diameter of 0.375 inch. Larger strands may be used by agreement between the contractor and engineer.

- **Reinforcement**
  - Reinforcement other than prestressing strands shall be epoxy coated. Precast panels may be in contact with slab reinforcement in accordance with Sec 1073.

- **Prestressed Panels**
  - Prestressed panels shall be kept at a minimum of 48 hours after the deck pour. The concrete shall be dry and cured before the strands are released.

- **Initial Prestressing Force**
  - Initial prestressing force = (f')c * A

- **Concrete Mixtures**
  - Concrete mixtures shall be placed in accordance with Sec 1073.

- **Joint Filler**
  - Joint filler shall be glued to the girder. When thickness exceeds 1 1/2 inches, the joint filler shall be glued top and bottom. The maximum change in thickness of joint filler within the limits noted in the table of joint filler dimensions.

- **Concrete**
  - Concrete shall be mixed in accordance with Sec 1073.

- **Prestressing Tendons**
  - Prestressing tendons shall be high tensile strength, uncoated, seven-wire, low-relaxation strands for prestressed concrete in accordance with AASHTO M 203 Grade 270, with nominal diameter of 0.375 inch. Larger strands may be used by agreement between the contractor and engineer.

- **Reinforcement**
  - Reinforcement other than prestressing strands shall be epoxy coated. Precast panels may be in contact with slab reinforcement in accordance with Sec 1073.

- **Prestressed Panels**
  - Prestressed panels shall be kept at a minimum of 48 hours after the deck pour. The concrete shall be dry and cured before the strands are released.

- **Initial Prestressing Force**
  - Initial prestressing force = (f')c * A

- **Concrete Mixtures**
  - Concrete mixtures shall be placed in accordance with Sec 1073.
Standard Drawing Guidance (do not show on plans):

1. Modify details if expansion gap is used and add Section B-B at expansion device and additional reference notes as shown on standard drawing for steel structures (PSP06).
Standard Drawing Guidance (do not show on plans):

1. Modify details if expansion gap is used and add Section B-B at expansion device and additional reference notes as shown on standard drawing for steel structures (PSP06).
**General Notes: Precast Panels:**

Concrete for precast panels shall be Class A with C = 6,000 psi, V = 4,000 psi.

- The top surface of all panels shall receive a scored finish with a depth of scoring of 1/16" parallel to the precasting direction of the panels. (see details on Sheet No. "2")

- Prestressing tendons shall be high-tensile strength uncoated seven-wire low-relaxation prestressing bars. (see details on Sheet No. "2")

- Prestressing force shall be 12 kips/strand. (see details on Sheet No. "2")

Prestressed tension shall be equal to 22.95 kips (270 ksi). Larger strands may be used when required by the structural engineer.

Prestressed panels shall be brought to saturated surface dry (SSD) prestressed condition prior to casting. (see details on Sheet No. "2")

- Prestressed panels shall be 3/8" thick. (see details on Sheet No. "2")

Note: This drawing is not to scale. Follow dimensions.
Standard Drawing Guidance (do not show on plans):

1. Update with correct sheet no.
2. For wide flange beams, turn off Level 20 & turn on Level 21.
3. XX = G - 1\(\frac{1}{4}\)" (1\(\frac{1}{2}\)" max.) If XX equals \(\frac{3}{4}\)", remove asterisk and note. 
   G is from the edge of the splice plate to the centerline of the nearest splice bolt.
4. Trade Section B-B as needed or omit if integral end bents.
5. Replace all expansion gap with integral end bents in "Plan Showing Panels Placement".
General Notes:

- Reinforcing Steel (Grade 60) $f_y = 60,000$ psi
- Class B-1 Concrete (Barrier) $f'_c = 4,000$ psi
- Class B-2 Concrete $f'_c = 4,000$ psi

Fatigue Stress - Case II

Earth - 120 lb/cf, Equivalent Fluid Pressure 45 lb/cf

35 lb/sf Future Wearing Surface

HS20-44 (New Construction)

Seismic Performance Category A

2002 AASHTO LFD (17th Ed.) Standard Specifications

Design Loading
- LRFD, Life-Cycle Loadings
- AASHTO LRFD 2002 - Table 10.2.2.1-A
- AASHTO LRFD 2002 - Table 10.2.2.2-A
- AASHTO LRFD 2002 - Table 10.2.2.3-A

Design Unit Stresses
- Reinforcing Steel (Grade 60) $f_y = 60,000$ psi
- Concrete $f'_c = 4,000$ psi

Joint Filler:
- All joint filler shall be in accordance with Sec 1057 for
  - Flexible rubber expansion and partition joint filler,
  - Preformed sponge rubber expansion and partition joint filler,
  - Other joint filler shall be in accordance with Sec 1057 for

Reinforcing Steel:
- Minimum clearance to reinforcing steel shall be 1 1/2", unless otherwise shown.

Miscellaneous:
- Protective coating for concrete bents and piers (Urethane or Epoxy) shall be applied as shown on the bridge plans and in accordance with Sec 711.
- Protective coating for forming the slab to be left in place as a permanent part of the structure shall be coated in accordance with ASTM A123 or ASTM B633 with a thickness of at least 20 mils.
- Method of forming the slab shall be in accordance with Sec 703.
- All hardware for forming the slab shall be provided by the contractor.
- Slab shall be cast in place with conventional forming or stay-in-place concrete forms. Precast prestressed panels will not be permited.

### Estimated Quantities

#### Estimated Quantities for Slab on Steel

<table>
<thead>
<tr>
<th>Item</th>
<th>Co.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class B-2 Concrete</td>
<td>$C_b$</td>
<td>$C_s$</td>
</tr>
<tr>
<td>Class B-1 Concrete</td>
<td>$C_b$</td>
<td>$C_s$</td>
</tr>
<tr>
<td>Reinforcing Steel (Epoxy Coated)</td>
<td>$P_r$</td>
<td>$P_s$</td>
</tr>
</tbody>
</table>

Cost of any required excavation for Bridge will be considered completely covered by the contract unit price for other items.

The table of Estimated Quantities for Slab on Steel represents the quantities used by the State to prepare the cost estimates for concrete slabs. The area of the concrete slab will be measured to the nearest square yard longitudinally from end of slab to end of slab and transversely from one out to out of Bridge slab (not with the horizontal dimensions as shown on the plan of slab). Payment for stay-in-place concrete forms, conventional forms, all concrete and protective coating reinforcing steel will be considered completely covered by the contract unit price for the slab. Variations may be encountered in the estimated quantities for the slab. Variations cannot be used for an adjustment in the contract unit price.

Method of forming the slab shall be in accordance with Sec 703. All hardware for forming the slab shall be provided by the contractor. Precast prestressed panels will not be permitted.
Standard Drawing Guidance: (do not show on plans):

1. Remove if not required, may be incorporated into half section slab details.
2. Use the note only when specified in Bridge Memo or Design Layout.
3. For skewed bridges, add these items to section details to call out varied transverse bars at end bents.
4. Note is required only when shop drawings will be required (for example, expansion device replacement, diaphragm replacement, etc.)

Structural Steel Protective Coating: System G in accordance with Sec 1081. All exposed surfaces of the existing structural steel piles shall be coated with one 6-mil thickness of aluminum gray epoxy-mastic primer applied over an SSPC-SP3 surface preparation in accordance with Sec 1081. The bituminous coating shall be applied one foot above and one foot below the existing ground line and in accordance with Sec 702. The cost of the intermediate field coat shall be in accordance with Sec 1081. The cost of the finish field coat shall be considered completely covered by the contract unit price for Recoating Existing Bearings.

Use when Rock Blanket is specified on BR Memo.

*** SKEWED BRIDGES ***
REDECK01_front_sheet  Alternate Details (2 of 7)

### TYPICAL SECTION THRU SLAB

#### 22' RDWY-4 BEAMS @ 6' - 8"

- **Detail A**: 12-#5-S1 (Spaced as shown)
- **Detail B**: 20-#6-S2 @ 5" cts. (Spa. between S1)

#### 22' RDWY-4 BEAMS @ 6' - 0"

- **Detail A**: 11-#5-S1 (Spaced as shown)
- **Detail B**: 19-#6-S2 @ 5" cts. (Spa. between S1)

#### 24' RDWY-4 BEAMS @ 6' - 10"

- **Detail A**: 16-#5-S1 (Spaced as shown)
- **Detail B**: 20-#6-S2 @ 5" cts. (Spa. between S1)

### Typical Section Thru Slab

- **Symm. abt. ¡ Structure**
- **Crown of Slab**
- **Const. Jt.**

### Notations

- **Spa.** = Spacing
- **@** = At
- **Symm. abt. ¡ Structure** = Symmetric about ¡ Structure
- **Crown of Slab** = Crown of Slab
- **Const. Jt.** = Connection Joint
HALF SECTION NEAR MIDSPAN
HALF SECTION NEAR INT. BENT

TYPICAL SECTION THRU SLAB

26’ RDWY-4 BEAMS @ 7’-8"

26’ RDWY-4 BEAMS @ 7’-4”
### Typical Section Thru Slab

**32' RDWY-4 Beams @ 9'-4''**

- Symm. abt. Existing Structure
- Crown of Slab
- Const. Jt.
- Exist. Beam

**34' RDWY-5 Beams @ 7'-6''**

- Symm. abt. Existing Structure
- Crown of Slab
- Const. Jt.
- Exist. Beam
19'-0" 19'-0" 19'-0"

HALF SECTION NEAR MIDSPAN

HALF SECTION NEAR INT. BENT

TYPICAL SECTION THRU SLAB

38' RDWY-5 BEAMS @ 8'-6"

REDECK01_front_sheet  Alternate Details (7 of 7)
Details of Concrete Removal at End Bents

The cost of concrete removal as shown will be considered completely covered by the contract unit price for Removal of Existing Bridge Deck. Optional backwall gap and original reinforcement of the concrete removal surface and the resulting holes shall be filled with a specified special mortar.

A smooth, level surface shall be provided at Bent No. removal lines.

General Notes:

Stay-In-Place Forms:

Corrugated steel forms, supports, closure elements and form ties shall be made in accordance with shop drawings and coating designation GIS of ASTM A683. Complete shop drawings of the permanent steel deck forms shall be required in accordance with Sec 1060.

Corrugations of stay-in-place forms shall be filled with an expanding pasty material. The protective material in contact with the concrete in accordance with the manufacturer’s recommendations.

Form sheets shall not rest directly on the top of beam supports. Form supports shall be securely tied to form supports. End supports shall be placed in direct contact with the flange. Welding or using notes in the beam flanges will not be permitted. All steel fabrication and construction shall be in accordance with Sec 1080 and 712. Certified field welds will not be required for welding of the form supports.

The design of stay-in-place corrugated steel forms is per manufacturer which shall be in accordance with Sec 753 for use in this project. Materials shall be specified in accordance with the manufacturer's recommendations.

The contractor shall provide a method of preventing the direct contact of the stay-in-place forms and connection components with uncured weathering steel members that is approved by the engineer.

Pouring and Finishing Slab:

The contractor shall provide bracing necessary for lateral and torsional stability during construction of the slab. The contractor shall also provide details regarding the installation, removal of bracing and installation procedure. The cost of supplying and installing shear connectors shall be considered completely covered by the contract unit price for Slab on Steel.

Slab shall be poured so that the slab meets the tolerances specified in Sec 1080.

Alternate pour sequences may be submitted to the engineer. Security information on existing joints shall be provided between pours.

Haunching:

(1) Slab is to be considered a uniform thickness as shown on the plans. Haunching will vary. See front sheet of slab thickness.

Details of Shear Connectors:

Cost of supplying and installing shear connectors will be considered completely covered by the contract unit price for Slab on Steel.

Shear connectors shall be in accordance with Sec 712, 1037 & 1080.

The contractor shall provide a method of preventing the direct contact of the stay-in-place forms and connection components with uncured weathering steel members that is approved by the engineer.

Protective Coating:

Protective Coating - Concrete Bents and Piers (Urethane or Epoxy) (See Sec 711).

Clean and seal with Protective Coating - Concrete Bents and Piers (Urethane or Epoxy) (See Sec 711).

Clean and seal with Protective Coating - Concrete Bents and Piers (Urethane or Epoxy) (See Sec 711).
Standard Drawing Guidance (do not show on plans):

Some notes on the standard redecking template drawings are not shown in EPG 751.50 Standard Detailing Notes.

Remove details that do not apply.
Check slab pouring sequencing and revise notes as required.
Including alternate pour sequences is per approval of Structural Project Manager or Liaison.
PART ELEVATION OF EXTERIOR BEAM SHOWING COVER PLATE INSTALLATION
SPAN (X-X) AND SPAN (X-X)

PART ELEVATION OF EXTERIOR BEAM SHOWING COVER PLATE INSTALLATION
SPAN (X-X)

TYPICAL DETAIL OF THE ENDS OF COVER PLATES (BOTTOM VIEW)

STRENGTHENING EXISTING BEAMS

Notes:
- Beam with end-bolted cover plates shall be installed in the following sequence after existing bridge deck is removed:
  1. Drill holes in cover plate and flange.
  2. Clean faying surfaces. (See Special Provisions)
  3. Install and tighten bolts.
  4. Weld cover plate to flange.

Fabricated Structural Steel shall be ASTM A709 Grade 36, except as noted.

Payment for ____ pounds of new cover plates complete in place will be considered completely covered by the contract lump sum price for Strengthening Existing Beams.

Notch toughness is required for all cover plates.

Contractor shall verify all dimensions in field before finalizing the shop drawings.
**U.I.P. AND REHABILITATE EXISTING (X'-X'-X') SPANS (SKEW: x)**

### Estimated Quantities

<table>
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<td>Deck Surface Repair Uniform</td>
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<td>Full Depth Repair</td>
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<td>Half-Sole Repair</td>
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<tr>
<td>Cleaning and Epoxy Coating</td>
<td>740.013</td>
</tr>
</tbody>
</table>

B3.0 Supplementary wearing surface material for monolithic deck repair will be paid for at the fixed unit price in accordance with Sec. 109. Note B3.0 if required.

#### General Notes:

- **A.1** Design Specifications:
  - 2002 AASHO LFD (17th Ed.) Standard Specifications
  - AASHTO LRFD (2010 Ed.) Standard Specifications

- **A.2** Design loading:
  - MISTRY-2010:
    - I1.0.1 Established Concrete Deck Repair
    - I1.0.1 Established Concrete Deck Repair
  - AASHTO-2010:
    - I1.0.1 Established Concrete Deck Repair
    - I1.0.1 Established Concrete Deck Repair

- **A.3** Design Unit Stresses:
  - Class B-2 Concrete (Half-Sole and Full Depth Repair) f’c = 4,000 psi

#### Miscellaneous:

- **I1.0.3** (If required): Roadway surfacing adjacent to bridge ends shall match new bridge wearing surface (roadway item).

- **I1.0.4** (If required): All concrete repairs shall be in accordance with Sec. 790, unless otherwise noted (roadway item).

- **I1.0.5** (If required): Outline of existing work is indicated by light dashed lines. Heavy lines indicate new work.

- **I1.0.6** (If required): Contractor shall verify all dimensions in field before finalizing the shop drawings.

- **I1.0.7** (If required): In order to maintain grade and a minimum thickness of wearing surface as shown on plans, there may be necessity to use additional quantities of wearing surface at various locations throughout the structure. The cost of furnishing and installing the wearing surface will be completely covered in the contract unit price, including all additional labor, materials, and equipment for variations in thickness of wearing surface.

#### Traffic Handling:

- **A.3** Structure to be closed during construction. Traffic to be maintained on alternate (SKEW: x) lane (if required). Construction details.

### Repairs to Bridge: Route *

- **Over**: ROUTE FROM TO
- **About**: MILES OFF
- **Beginning Station**: ± (Match Existing)
STANDARD DRAWING GUIDANCE
(donot show on plans)

This is an index of Standard Drawing details. Draw typical section as required and scale to fit within attached border. Use appropriate deck repair details and modify as required (match orientation of actual reinforcement).

For bridges with epoxy-coated steel, see Sec 710 for repairing bars and add notes as necessary. See SPM.

Wearing surface thickness can vary according to grade elevation requirements and minimum barrier, joint height requirements. Maximum thickness should be limited to 3" (Ref: Organizational Results Research Report ORER-104, May 2006). Limits exclude reinforced concrete slab wearing surfaces.

Will need to adjust wearing surface thickness when detailing a thin wearing surface > 1", but it is a preferred detailing practice to show a discernible thickness on the plans. No thickness is shown for crack filler application.

- Show difference as ± 1/4" (see Bridge Memo or SPM).
- Match existing grade plus ± 1/4".
- Identify new wearing surface (see Bridge Memo or SPM) and specify minimum thickness in deck details.
- Identify existing wearing surface (see Bridge Memo or existing plans).
- See Bridge Memo or SPM, typically ± 1/2". Use ± if more than 10% of existing deck needs repair. Verify there will be a minimum of 1/2" of concrete above the top bars after scarification.
- See Bridge Memo or SPM, typically ± 1/2".
- See existing plans.
- Use appropriate reference (e.g., Structure, Median, etc.)

Cleaning and epoxy coating is preferred because of the relative short life of slab edge repair and unformed repair especially when over traffic. However in urban regions repairing the overhang may be preferred. Consult with SPM or SLE.

Scarification prior to adding first wearing surface or removing a portion of the deck when removing an existing wearing surface is not required for seal coat, asphalt, HMAC, epoxy polymer or MMA polymer slurry wearing surfaces.

Note is required only when shop drawings will be required (for example, expansion device replacement, diaphragm replacement, etc.)

FOR EPOXY POLYMER OR MMA POLYMER SLURRY WEARING SURFACE

FOR ALL OTHER WEARING SURFACES

- Width of joint seal to be not less than the depth and not more than twice the depth of the joint seal.
- See Bridge Memo or SPM, typically ± 1/2".
- See existing plans.
- Use appropriate reference (e.g., Structure, Median, etc.)

Cleaning and epoxy coating is preferred because of the relative short life of slab edge repair and unformed repair especially when over traffic. However in urban regions repairing the overhang may be preferred. Consult with SPM or SLE.

Scarification prior to adding first wearing surface or removing a portion of the deck when removing an existing wearing surface is not required for seal coat, asphalt, HMAC, epoxy polymer or MMA polymer slurry wearing surfaces.

Note is required only when shop drawings will be required (for example, expansion device replacement, diaphragm replacement, etc.)
Hydro Demolition Case 1: Hydro Demolition Case 1:

Monolithic Deck Repair

After Hydro Demolition

### Monolithic Deck Repair

**Mortar Line**

- **3" to 4" Steel Fiber Reinforced**
- **1 3/4" to 3" CSA Cement Very Early Strength**
- **1 3/4" to 3" Latex Modified Very Early Strength**
- **2 1/4" to 3" Silica Fume**
- **1 3/4" to 3" Latex Modified**

May be used with the following concrete wearing surfaces:

- **Hydro Demolition Case 1:**
  - Coating (Overhang)
  - Cleaning and Epoxy
- **Coating (Overhang)**
- **Cleaning and Epoxy**

### Detail A

**Removal of Existing Deck**

- **Monolithic Deck Repair**
- **Removal of Existing Deck**

**Top of Existing Wearing Surface**

- **Monolithic Deck Repair**
- **Monolithic Deck Repair**

**Milling and Hydro Demolition Limits**

- **Monolithic Deck Repair**
- **Monolithic Deck Repair**

**Top of New Wearing Surface**

### REQUIRING INCIDENTAL FORMING

- **Monolithic Deck Repair**
- **Monolithic Deck Repair**

**Existing Aggregate**

- **Monolithic Deck Repair**
- **Monolithic Deck Repair**

**REPAIR BEFORE HYDRO DEMOLITION**

- **Monolithic Deck Repair**
- **Monolithic Deck Repair**

**Match existing grade ±**

- **Monolithic Deck Repair**
- **Monolithic Deck Repair**
Hydro Demolition Case 2: Conventional Deck Repair After Hydro Demolition

Monolithic and Half-Sole Repair

Full Depth Repair with Half-Sole Repair

Adding First Wearing Surface

Replacing Existing Wearing Surface

Monolithic and Half-Sole Repair

Full Depth Repair

Detail A

Detail B

STANDARD DRAWING GUIDANCE (do not show on plans):

- 3/4" to 3" Polyester Polymer
- 2 1/4" to 3" Low Slump

May be used with the following concrete wearing surfaces:

- Roadway item
- Traffic Barrier
- Temporary Concrete

- e.g. "LOW SLUMP CONCRETE DETAILS"

(Adding First Wearing Surface)

(Replacing Existing Wearing Surface)
Conventional Deck Repair Only

STANDARD DRAWING GUIDANCE (do not show on plans):

May be used with all wearing surfaces.

- 1/2" to 3/4" Alternate Ultrathin Bonded Asphalt
- 1" to 3" Alternate Asphaltic Concrete
- 3/8" Chip Seal Grade A1
- 4" to 5" Reinforced Concrete Slab
- 3/8" MMA Polymer Slurry
- 3/4" to 3" Polyester Polymer Concrete
- 1/4" Epoxy Polymer
- 3" to 4" Steel Fiber Reinforced Concrete
- 1 3/4" to 3" CSA Cement Very Early Strength Concrete
- 1 3/4" to 3" Latex Modified Very Early Strength Concrete
- 2 1/4" to 3" Silica Fume Concrete
- 1 3/4" to 3" Latex Modified Concrete
- 2 1/4" to 3" Low Slump Concrete

Scarification not required with the following wearing surfaces:
- Seal Coat
- UBAWS
- Asphalt

For application of concrete crack filler:
- Adjust wearing surface thickness for thin wearing surfaces
- Delete top existing line
- Delete Dimension/Note (1) and renumber others
- Adjust existing line inside wearing surface

For application of seal coat, asphalt, UBAWS, epoxy polymer:
- Replace "Wearing Surface" with "Concrete Crack Filler" 
- Adjust top of the original depth dimension
- Delete existing line inside wearing surface
- Delete Dimension/Note (1) and renumber others

For application of MMA polymer slurry:
- Adjust depth for thin wearing surfaces
- Adjust top of the original depth dimension
- Delete existing line inside wearing surface
- Delete Dimension/Note (1) and renumber others

For application of latex modified concrete:
- Adjust depth for thin wearing surfaces
- Adjust top of the original depth dimension
- Delete existing line inside wearing surface
- Delete Dimension/Note (1) and renumber others

For application of latex modified very early strength concrete:
- Adjust depth for thin wearing surfaces
- Adjust top of the original depth dimension
- Delete existing line inside wearing surface
- Delete Dimension/Note (1) and renumber others

For application of silica fume concrete:
- Adjust depth for thin wearing surfaces
- Adjust top of the original depth dimension
- Delete existing line inside wearing surface
- Delete Dimension/Note (1) and renumber others

For application of low slump concrete:
- Adjust depth for thin wearing surfaces
- Adjust top of the original depth dimension
- Delete existing line inside wearing surface
- Delete Dimension/Note (1) and renumber others

For application of latex modified very early strength concrete:
- Adjust depth for thin wearing surfaces
- Adjust top of the original depth dimension
- Delete existing line inside wearing surface
- Delete Dimension/Note (1) and renumber others

For application of latex modified concrete:
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- Adjust depth for thin wearing surfaces
- Adjust top of the original depth dimension
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For application of silica fume concrete:
- Adjust depth for thin wearing surfaces
- Adjust top of the original depth dimension
- Delete existing line inside wearing surface
- Delete Dimension/Note (1) and renumber others
U.I.P. AND REHABILITATE EXISTING (X'-X'•X') ___ SPANS (SKEW: x)  

**Estimated Quantities**

<table>
<thead>
<tr>
<th>Item</th>
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<tr>
<td>Total Surface Dressing</td>
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<td>New Concrete Dressing (Formed)</td>
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<td></td>
</tr>
<tr>
<td>Latex Modified Concrete Wearing Surface</td>
<td></td>
</tr>
<tr>
<td>Mongolithic Deck Repair</td>
<td></td>
</tr>
</tbody>
</table>

**General Notes:**

- Supplementary wearing surface material for monolithic deck repair will be paid for at the fixed unit price in accordance with Sec 109.

**Note B3.3**

- Supplementary wearing surface material for monolithic deck repair will be paid for at the fixed unit price in accordance with Sec 109.

**Note B3.3 (If required)**

- All concrete repairs shall be in accordance with Sec 704, unless otherwise noted.

**Outline of existing work is indicated by light dashed lines. Heavy lines indicate new work.**

- Contractor shall verify all dimensions in field before ordering new material.

- In order to maintain grade and a minimum thickness of wearing surface as shown on plans, it may be necessary to use additional quantities of wearing surface at various points throughout the structure. The cost of furnishing and installing the wearing surface shall be considered completely covered in the contract unit price. In order to maintain grade, materials or equipment for variations in thickness of wearing surface shall be furnished at the contractor's expense.

- Traffic handling:

- Structure is closed during construction. Traffic to be maintained on existing roadway adjacent to bridge ends shall match new bridge wearing surface (roadway item).

- Traffic handling:

- Structure is closed during construction. Traffic to be maintained on existing roadway adjacent to bridge ends shall match new bridge wearing surface (roadway item).

**Remains to Bridge: Route * OVER * ABOUT * Width * Classification:**
STANDARD DRAWING GUIDANCE (do not show on plans)

This is an index of Standard Drawing details. Draw typical sections as required and scale to fit within attached border. Use appropriate deck repair details and modify as required (omit or detail altered). For bridges with epoxy coated steel, see Sec 710 for bars and notes as necessary. See SPH.

Wearing surface thickness can vary according to grade elevation requirements and minimum barrier curb height requirements. Maximum thickness should be limited to 3 (Ref. Organizational Results Research Report ORO 004, May 2006). Limit excludes reinforced concrete slab wearing surfaces.

**NOTE:** Existing Steel exposed to deck including Old or New Decking.

Will need to adjust wearing surface thickness when detailing a thin wearing surface (fighter) or less); it is preferred not to detail the deck to show a discernable thickness on the plans. No thickness is shown for crack filler application.

**NOTE:** Consideration shall be made for repairing deterioration of the precast prestressed panels. See SPH.

The Prestressed Panel Joint Repair detail is shown transverse because typically deterioration follows the strand elongation and requires a hold point on the plans for engineer review when panel deterioration is anticipated outside the limits shown. This can be a staggered position on the panel edge, referred to as a "joint.

**NOTE:** Show difference as 3/4" or 1/2" see Bridge Memo or SPH.

- **Identify new wearing surface** (See Bridge Memo or SPH). Specify minimum thickness in detail.
- **Identify existing wearing surface** and thickness, see Bridge Memo or existing plans.
- **See Bridge Memo or SPH, typically 1/2."** Use 1/2" if more than 30% of existing deck need repair. Verify there will be a minimum of 1/2" of concrete above the top bars after scarification.
- **See Bridge Memo or SPH, typically 1/2."**
- **See existing plans.**
- **Use appropriate reference (Structure, Roadway, Median, etc.)**
- **Applying and removing crack filler** is preferred because of the relative short life of slab edge repair and unformed repair especially when over traffic. However, in urban regions requiring the overhang may be preferred. Consult with SPH or SDC.

**NOTE:** Scarification prior to adding first wearing surface or removing a portion of the deck when removing an existing wearing surface. A hot poured or MMA polymer slurry wearing surfaces.

The following note will be required if concrete removal exposing prestressing strands is anticipated.

**NOTE:** Adequate precaution shall be taken to prevent any nicks or cuts of the prestressing strands.

If full depth repair thru panels is anticipated additional deck repair details will be required. Details shown are for conventional deck repair post-hydro demolition when adding first wearing surface. Details for other cases are similar.

**NOTE:** If severe panel deterioration is anticipated at the strand ends (within the development lengths of the strands) either in a transverse joint or in the interval between transverse joints, a repair method will need to be properly shown to the limits of strand engagement and require a hold point on the plans for engineer review when panel deterioration is discovered within these limits.

**NOTE:** Note is required only when stop drawing will be required for example, expansion device replacement, diaphragm replacement, etc.

**NOTE:** Add note: (5) One inch vertical side shall be established outside the deteriorated area. See Sec 704.

**NOTE:** Highlight Concrete removal exposing prestressing strands within a special repair zone shall require engineer approved repair.

**NOTE:** Add note: (5) This will allow time for the bridge office to assess situation and develop repair method.
Hydro Demolition Case 1: Monolithic Deck Repair After Hydro Demolition

Monolithic Deck Repair

Cleaning and Epoxy Coating (Overhang)

3” to 4” Steel Fiber Reinforced
1 3/4” to 3” CSA Cement Very Early Strength
1 3/4” to 3” Latex Modified Very Early Strength
2 1/4” to 3” Silica Fume
1 3/4” to 3” Latex Modified

May be used with the following concrete wearing surfaces:

5 Remove all deteriorated concrete at 3”± _______________ concrete wearing
surface of sound concrete, measured to mortar line
4 Original depth of deck minus previous
3 ___” minimum _______________ concrete wearing
2 ___” minimum total surface hydro demolition
1 ___” scarification of existing deck

---

DETAIL A
(Replacing Existing Wearing Surface)
(Typical Section Thru Existing Deck (Panel joint))

---

DETAIL A
(Adding First Wearing Surface)
(Typical Section Thru Existing Deck (Panel joint))

---

Match existing grade _________± ____________________

---

Traffic Barrier
Temporary Concrete

---

Existing Aggregate
coustic with epoxy.
transverse joint between prestressed panels and
scarification.

---

Using polyester polymer is an option:
If optional concrete wearing surface is specified and either low slump or
delayed job mix is required, LRFD Bridge Design is an option.
See appropriate details below on first sheet and add a sheet title using the
allowed options for the below details.
"latex modified concrete details"
Conventional Deck Repair Only

STANDARD DRAWING GUIDANCE (do not show on plans):

- May be used with all wearing surfaces.
- 2 1/4" to 3" Low Slump Concrete
- 3/4" to 3" Latex Modified Concrete
- 2 1/4" to 3" Silica Fume Concrete
- 2 1/4" to 3" Latex Modified Very Early Strength Concrete
- 3/4" to 3" CSA Cement Very Early Strength Concrete
- 1 3/4" to 3" CSA Cement Very Early Strength Concrete
- 1 3/4" to 3" Latex Modified Very Early Strength Concrete
- 2 1/4" to 3" Low Slump Concrete
- 1" to 3" Alternate Asphaltic Concrete
- 3/8" Chip Seal Grade A1
- 4" to 5" Reinforced Concrete Slab
- 3/8" MMA Polymer Slurry
- 3/4" to 3" Polyester Polymer Concrete
- 1/4" Epoxy Polymer
- 3" to 4" Steel Fiber Reinforced Concrete
- 1 3/4" to 3" Latex Modified Concrete
- 2 1/4" to 3" Latex Modified Very Early Strength Concrete
- 2 1/4" to 3" Low Slump Concrete

SDG: For seal coat, asphalt, UBAWS, epoxy polymer or MMA polymer slurry:
- Adjust top of the original depth dimension to bottom of new wearing surface to remove top existing line.
- Delete Dimension/Note (1) and renumber others.
- Adjust depth for thin wearing surfaces (3/8" MMA聚合物乳液).
STANDARD DRAWING GUIDANCE (SDG) (do not show on plans)

Select the appropriate 1st and 2nd sheet. Draw typical section as required and scale to fit within attached border replacing the provided example. Modify other details and notes as required (match orientation of actual reinforcement).

Transverse repair zoning over intermediate bents is required for these structures. Longitudinal repair zoning in spans is required only when Hydro demolition is required and is based on anticipated quantity of deck repair if not overlapped. Conference of anticipated quantity of deck repair if overlaid, deck rating is 0 or better may not need zoning. See EPG 751.40 (If only transverse zoning is required, zones shall be called “Special Repair Zones”).

Wearing surface thickness can vary according to grade elevation requirements and minimum barrier curb height requirements. Maximum thickness should be limited to 3” (Ref. Organizational Results Research Report ORGE 094, May 2009). Limit excludes reinforced concrete slab wearing surfaces.

Wearing surface thickness can vary according to grade elevation requirements and minimum barrier curb height requirements. Maximum thickness should be limited to 3” (Ref. Organizational Results Research Report ORGE 094, May 2009). Limit excludes reinforced concrete slab wearing surfaces.

Wearing surface thickness can vary according to grade elevation requirements and minimum barrier curb height requirements. Maximum thickness should be limited to 3” (Ref. Organizational Results Research Report ORGE 094, May 2009). Limit excludes reinforced concrete slab wearing surfaces.

Will need to adjust wearing surface thickness when detailing a thin wearing surface (1” or less), but it is a preferred detailing practice to show a discernable thickness on the plans. No thickness is shown for crack filler application.

Show difference as “±1/4” or see Bridge Memo or SPM, e.g. Match existing grade plus 1/4”.

Identify new wearing surface (see Bridge Memo or SPM). Specify minimum thickness in deck details. Typically 1/4” thicker outside special repair zones for Hydro Case 2.

Identify existing wearing surface and thickness, see Bridge Memo or existing plans.

See Bridge Memo or SPM, typically 1/2” if more than 50% of existing deck needs repair. Verify there will be a minimum of 1/2” of concrete above the top bars after scarring or sterilization.

See Bridge Memo or SPM, typically 3/4” inside special repair zones to avoid deeper penetration into newly repaired areas and 1/2” outside special repair zones.

See existing plans.

Use appropriate reference (¡ Structure, ¡ Roadway, ¡ Median, etc.)

The two types of overhang rehabilitation are shown. Cleaving and epoxy coating is preferred because of the relative short life of slab edge repair and unfilled repair especially when over traffic. However in urban regions repairing the overhang may be preferred. Consult with SPM or SIE.

Scarring or sterilization prior to adding first wearing surface or removing a portion of the deck when removing an existing wearing surface is not required for seal, etc. asphalt, USACO epoxy polymer or MMA polymer slurry wearing surfaces.

Monolithic deck repair should only be allowed where longitudinal zoning is not required.

May be used for aesthetics when there will be an extensive patchwork of repairs visible to the public.

If a deterioration is within 6 inches of edge then slab edge repair may be used instead of unfilled superstructure repair.

Note is required only when shop drawings will be required (for example, expansion device replacement, diaphragm replacement, etc.)

PART PLAN OF SLAB SHOWING SPECIAL REPAIR ZONES

End of Slab at End Bent 1

Roadway Face of Curb

A

B

C

C

B

A

A

B

C

C

B

A

PART PLAN OF SLAB SHOWING SPECIAL REPAIR ZONES

End of Slab at End Bent 1

Roadway Face of Curb

A

B

C

C

B

A

A

B

C

C

B

A

PART PLAN OF SLAB SHOWING SPECIAL REPAIR ZONES

End of Slab at End Bent 1

Roadway Face of Curb

A

B

C

C

B

A

A

B

C

C

B

A
Hydro Demolition Case 1A:
Zoned Conventional Deck Repair Before Hydro Demolition and Non-Zoned Monolithic Deck Repair After Hydro Demolition
(Adding First Wearing Surface)

STANDARD DRAWING GUIDANCE (do not show on plans):
1. Add a title block for the following concrete wearing surfaces:
   - 3" to 4" Steel Fiber Reinforced
   - 1 3/4" to 3" CSA Cement Very Early Strength
   - 2 1/4" to 3" Silica Fume
   - 1 3/4" to 3" Latex Modified
2. Add "Low Slump Concrete" to the RHB03f sheet title and revise the sheet number from two to three. Sheet RHB03e will not be used.
3. Add to this sheet the typical section from Sheet RHB03e with "Low Slump Concrete" added to the title.

If optional concrete wearing surface is specified and low slump or polyester polymer is an option:

- Use for the following concrete wearing surfaces:
  - 3" to 4" Steel Fiber Reinforced
  - 1 3/4" to 3" CSA Cement Very Early Strength
  - 2 1/4" to 3" Silica Fume
  - 1 3/4" to 3" Latex Modified

REPAIRS TO BRIDGE: ROUTE * OVER *

ROUTE + FROM * TO *

ABOUT + HILLS + OR +

BEGINNING STATION _________± (Match Existing)

OUTSIDE SPECIAL REPAIR ZONES (POST-HYDRO DEMOLITION REPAIRS)

INSIDE SPECIAL REPAIR ZONES (PRE-HYDRO DEMOLITION REPAIRS)

TYPICAL SECTION THRU EXISTING DECK

Estimated Quantities

<table>
<thead>
<tr>
<th>Item</th>
<th>Total</th>
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<tbody>
<tr>
<td>Surface Hydro Demolition</td>
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</tr>
<tr>
<td>Non-Hydro Demolition Repair</td>
<td>216-10.01</td>
</tr>
<tr>
<td>Supplementary Wearing Surface Material</td>
<td>216-10.02</td>
</tr>
<tr>
<td>Substructure Repair (Formed)</td>
<td>216-10.03</td>
</tr>
<tr>
<td>Substructure Repair (Unformed)</td>
<td>216-10.04</td>
</tr>
<tr>
<td>Full Depth Repair</td>
<td>216-10.05</td>
</tr>
<tr>
<td>Deck Repair (Bridges)</td>
<td>216-10.06</td>
</tr>
<tr>
<td>Deck and Total Surfacing</td>
<td>216-10.07</td>
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<tr>
<td>Scarification of Bridge Deck</td>
<td>216-10.08</td>
</tr>
<tr>
<td>Scarification of Total Surfacing</td>
<td>216-10.09</td>
</tr>
<tr>
<td>Scarification of Existing Surfacing</td>
<td>216-10.10</td>
</tr>
<tr>
<td>Concrete and Epoxy Coating</td>
<td>216-10.11</td>
</tr>
</tbody>
</table>

General Notes:
- Design Specifications:
  - 2003 AASHTO (Ditch 2 Ed.) Standard Specifications
  - Bridge Deck Rating

- Design Loading:
  - HS20-44 Modified (    ) and Military 25,000 lb Tandem Axle (    )
  - Design Unit Stresses:
    - Class B-1 Concrete (Half-Sole and Full Depth Repair) f'c = 4,000 psi
  - General Notes:
    - All concrete repairs shall be in accordance with Sec 704, unless otherwise noted.

- Limits of Cleaning and Epoxy Coating
- Limits of Replacement of Existing Concrete
- Limits of Cleaning
- Limits of Epoxy Coating
- Limits of Replacement of Existing Concrete

- All concrete repairs shall be in accordance with Sec 704, unless otherwise noted.
- Casualty of existing work is indicated by light dashed lines. Heavy lines indicate new work.
- Contractor shall verify all dimensions in field before finalizing the shop drawings.
- Traffic handling:
  - Traffic is to be maintained on one lane during construction.

- Note: This drawing is not to scale. Follow dimensions.
Deck Repair Notes:

Order of Repair:
1. Scarify existing deck
2. Power wash deck to identify sound and unsound repairs
3. Inside special repair zones, complete the following repairs in order:
   a. Removal of existing deck repair
   b. Half-sole repair
4. Outside special repair zones, remove existing deck repair
5. Complete total surface hydro demolition, removing a minimum of sound concrete, inside special repair zones and removing a minimum of sound concrete outside special repair zones
   a. Sound deck and if needed complete incidental concrete removal
   b. Outside special repair zones, complete full depth repair
7. Place new wearing surface, including additional material for areas of monolithic deck repair

Special Repair Zones:

- Any deck repair in areas not designated as special repair zones shall be completed after hydro demolition
- Removal and dust repair shall be completed in the area that will be covered by the slab. Work shall be started in the next special repair zone
- Total width of full depth repair shall not exceed 1/3 of the deck width at one time. For any area of deck repair that extends across the deck, the width shall be established at one half the diameter of the longitudinal reinforcing bar. Full depth repair shall be started in the next special repair zone as an adjacent zone
- Any single repair in the special repair zone does not exceed 9 square feet in the total repair area within the special repair zones. If any single repair in the special repair zone exceeds 9 square feet, repairs may be completed in one pass over the centerline of web and repair completed in this area. Prior to continuing work in this area, the concrete shall have attained a compressive strength of 3200 psi. No traffic shall be permitted over the web that is undergoing repair

DECK REPAIR DETAILS

Details of: This drawing is not to scale. Follow dimensions.

1. Scarify existing deck
2. Power wash deck to identify sound and unsound repairs
3. Inside special repair zones, complete the following repairs in order:
   a. Removal of existing deck repair
   b. Half-sole repair
4. Outside special repair zones, remove existing deck repair
5. Complete total surface hydro demolition, removing a minimum of sound concrete, inside special repair zones and removing a minimum of sound concrete outside special repair zones
   a. Sound deck and if needed complete incidental concrete removal
   b. Outside special repair zones, complete full depth repair
7. Place new wearing surface, including additional material for areas of monolithic deck repair

DECK REPAIR DETAILS:

Details of: This drawing is not to scale. Follow dimensions.

Order of Repair:
1. Scarify existing deck
2. Power wash deck to identify sound and unsound repairs
3. Inside special repair zones, complete the following repairs in order:
   a. Removal of existing deck repair
   b. Half-sole repair
4. Outside special repair zones, remove existing deck repair
5. Complete total surface hydro demolition, removing a minimum of sound concrete, inside special repair zones and removing a minimum of sound concrete outside special repair zones
   a. Sound deck and if needed complete incidental concrete removal
   b. Outside special repair zones, complete full depth repair
7. Place new wearing surface, including additional material for areas of monolithic deck repair

DECK REPAIR DETAILS:

Details of: This drawing is not to scale. Follow dimensions.

Order of Repair:
1. Scarify existing deck
2. Power wash deck to identify sound and unsound repairs
3. Inside special repair zones, complete the following repairs in order:
   a. Removal of existing deck repair
   b. Half-sole repair
4. Outside special repair zones, remove existing deck repair
5. Complete total surface hydro demolition, removing a minimum of sound concrete, inside special repair zones and removing a minimum of sound concrete outside special repair zones
   a. Sound deck and if needed complete incidental concrete removal
   b. Outside special repair zones, complete full depth repair
7. Place new wearing surface, including additional material for areas of monolithic deck repair

DECK REPAIR DETAILS:

Details of: This drawing is not to scale. Follow dimensions.

Order of Repair:
1. Scarify existing deck
2. Power wash deck to identify sound and unsound repairs
3. Inside special repair zones, complete the following repairs in order:
   a. Removal of existing deck repair
   b. Half-sole repair
4. Outside special repair zones, remove existing deck repair
5. Complete total surface hydro demolition, removing a minimum of sound concrete, inside special repair zones and removing a minimum of sound concrete outside special repair zones
   a. Sound deck and if needed complete incidental concrete removal
   b. Outside special repair zones, complete full depth repair
7. Place new wearing surface, including additional material for areas of monolithic deck repair

DECK REPAIR DETAILS:

Details of: This drawing is not to scale. Follow dimensions.

Order of Repair:
1. Scarify existing deck
2. Power wash deck to identify sound and unsound repairs
3. Inside special repair zones, complete the following repairs in order:
   a. Removal of existing deck repair
   b. Half-sole repair
4. Outside special repair zones, remove existing deck repair
5. Complete total surface hydro demolition, removing a minimum of sound concrete, inside special repair zones and removing a minimum of sound concrete outside special repair zones
   a. Sound deck and if needed complete incidental concrete removal
   b. Outside special repair zones, complete full depth repair
7. Place new wearing surface, including additional material for areas of monolithic deck repair

DECK REPAIR DETAILS:

Details of: This drawing is not to scale. Follow dimensions.

Order of Repair:
1. Scarify existing deck
2. Power wash deck to identify sound and unsound repairs
3. Inside special repair zones, complete the following repairs in order:
   a. Removal of existing deck repair
   b. Half-sole repair
4. Outside special repair zones, remove existing deck repair
5. Complete total surface hydro demolition, removing a minimum of sound concrete, inside special repair zones and removing a minimum of sound concrete outside special repair zones
   a. Sound deck and if needed complete incidental concrete removal
   b. Outside special repair zones, complete full depth repair
7. Place new wearing surface, including additional material for areas of monolithic deck repair

DECK REPAIR DETAILS:

Details of: This drawing is not to scale. Follow dimensions.
Hydro Demolition Case 1B: Zoned Conventional Deck Repair Before Hydro Demolition and Non-Zoned Monolithic Deck Repair After Hydro Demolition (Replacing Existing Wearing Surface)

STANDARD DRAWING GUIDANCE (do not show on plans):
- Use the following concrete wearing surfaces:
  - 2" to 2½" SFR concrete
  - 2½" to 3" CSA early strength
  - 2½" to 3" latex modified early strength
  - 2½" to 3" latex modified

1. Add "(Low Slump Concrete)" to the RHB03h sheet title and revise the sheet number from two to three. Sheet RHB03g will not be used.
2. Add to this sheet the typical section from Sheet RHB03g with "(Low Slump Concrete)" added to the title.
3. Add the allowed options in parentheses to the typical section title below and also to the RHB03h sheet title.

If optional concrete wearing surface is specified and low slump or polyester polymer is an option:
- Use for the following concrete wearing surfaces:
  - Class B-1 Concrete (Half-Sole and Full Depth Repair) f'c = 4,000 psi
  - HS20-44 Modified (    ) and Military 24,000 lb Tandem Axle (    )

Design Specifications:
- 2002 AASHTO LFD (17th Ed.) Standard Specifications
- Bridge Deck Rating = 2002 AASHTO LFD (17th Ed.) Standard Specifications
- Design Loading:
  - Bridge Deck Rating = 2002 AASHTO LFD (17th Ed.) Standard Specifications
- Design Unit Stresses:
  - Class Concrete (half sole and full depth repair) f'c = 4,000 psi

General Notes:
- Replacement of concrete wearing surface will be paid for at the fixed unit price in accordance with Sec 109.
- Supplementary wearing surface material for monolithic deck repair will be paid for during construction. See roadway plans for traffic control and Sheet No. for structure to be closed during construction. Traffic to be maintained on __
- In order to maintain grade and a minimum thickness of wearing surface as shown, it may be necessary to use additional quantities of wearing surface at various locations throughout the structure. The cost of furnishing and placing the wearing surface will be considered completely covered in the contract unit price.
- All concrete repairs shall be in accordance with Sec 704, unless otherwise noted.

Contractor shall verify all dimensions in field before finalizing the shop drawings.

Note: This drawing is not to scale. Follow dimensions.
Deck Repair Notes:

Order of Repair:
1. Remove existing wearing surface plus ___" of existing deck.

2. Power wash deck to identify sound and unsound deck area.

3. Inside special repair zones, complete the following repairs:
   a. Removal of existing deck repair.
   b. Full depth repair.
   c. Half-sole repair.

4. Outside special repair zones, remove existing deck repair.

5. Complete total surface hydro demolition, removing minimum of sound concrete inside special repair zones and removing ___" minimum of deteriorated concrete outside special repair zones.

6. Sound deck and if needed complete incidental concrete removal.

7. Outside special repair zones, complete full depth repair.

8. Place new wearing surface including additional material for areas of monolithic deck repair.

Special Repair Zones:

Deck repairs required in the areas designated as special repair zones shall be completed before hydro demolition.

Any deck repair in a repair zone shall be completed before hydro demolition.

Removal and deck repair shall be completed in one special repair zone at a time. The zone shall have attained a compressive strength of 3200 psi before work can be started in the next special repair zone.

Total width of full depth repair shall not exceed 1/3 of the deck width at one time. For any area of deck repair that extends over a web and is more than 18 inches in length along the web, the concrete removal including removal with hydro demolition shall stop at the centerline of web and repair completed in this area. Prior to continuing work in this area, the full depth repair shall extend no more than 1/3 of the deck width at one time. For any area of deck repair that extends over a diaphragm or web, all deteriorated concrete shall be removed and replaced as full depth repair. Concrete in the area shall be cured for at least 7 days prior to the application of new concrete. Full depth repair shall extend over a diaphragm or web, the repair shall be complete at the same time. Hydro demolition shall not enter the special repair zone without prior review and approval from the engineer.

When the full depth repair extends over a diaphragm or web, all deteriorated concrete shall be removed and replaced as full depth repair. Concrete in the area shall be cured for at least 7 days prior to the application of new concrete.

If any single special repair area does not exceed 9 square feet in size and the total repair area within a special repair zone does not exceed 25 square feet, the special repair zone may be repaired at the same time as an adjacent zone.

When the full depth repair extends over a diaphragm or web, all deteriorated concrete shall be removed and replaced as full depth repair. Concrete in the area shall be cured for at least 7 days prior to the application of new concrete.

Special Repair Zones:

Deck repairs required in the areas designated as special repair zones shall be completed before hydro demolition.

Any deck repair in a repair zone shall be completed before hydro demolition.

Removal and deck repair shall be completed in one special repair zone at a time. The zone shall have attained a compressive strength of 3200 psi before work can be started in the next special repair zone.

Total width of full depth repair shall not exceed 1/3 of the deck width at one time. For any area of deck repair that extends over a web and is more than 18 inches in length along the web, the concrete removal including removal with hydro demolition shall stop at the centerline of web and repair completed in this area. Prior to continuing work in this area, the full depth repair shall extend no more than 1/3 of the deck width at one time. For any area of deck repair that extends over a diaphragm or web, all deteriorated concrete shall be removed and replaced as full depth repair. Concrete in the area shall be cured for at least 7 days prior to the application of new concrete. Full depth repair shall extend over a diaphragm or web, the repair shall be complete at the same time. Hydro demolition shall not enter the special repair zone without prior review and approval from the engineer.

When the full depth repair extends over a diaphragm or web, all deteriorated concrete shall be removed and replaced as full depth repair. Concrete in the area shall be cured for at least 7 days prior to the application of new concrete.

If any single special repair area does not exceed 9 square feet in size and the total repair area within a special repair zone does not exceed 25 square feet, the special repair zone may be repaired at the same time as an adjacent zone.
Hydro Demolition Case 2A:
Zoned Conventional Deck Repair Before Hydro Demolition and
Non-Zoned Conventional Deck Repair After Hydro Demolition
(Adding First Wearing Surface)

STANDARD DRAWING GUIDANCE (do not show on plans):
Use for the following concrete wearing surfaces:

- Low slump concrete
- Polyester polymer

If optional concrete wearing surface is specified and low slump or polyester polymer is used, follow guidance on Sheet RHB03a.

All concrete repairs shall be in accordance with Sec 704, unless otherwise noted.

General Notes:
- Contractor shall verify all dimensions in field before finalizing the shop drawings.
- Traffic handling shall be in accordance with Sec 109.
- Time of existing work is indicated by light dashed lines. Heavy lines indicate new work.
- Storm drain systems and other utilities typically indicated on roadway plans for traffic control.

SUPPLEMENTARY WEARING SURFACE MATERIALS

- Supplementary wearing surface material for monolithic deck repair will be paid for at the fixed unit price in accordance with Sec 109.
- Additional labor, materials, or equipment for variations in thickness of wearing surface will be considered completely covered in the contract unit price, including all additional labor, material, or equipment for variations in thickness of wearing surface locations throughout the structure.

- In order to maintain grade, and a minimum thickness of wearing surface as shown on plans, the contractor may be necessary to use additional quantities of wearing surface at various locations throughout the structure. The cost of furnish and installing the wearing surface will be considered completely covered in the contract unit price, including all additional labor, materials, or equipment for variations in thickness of wearing surface.

Traffic Handling:
- Traffic to be maintained on structure to be closed during construction. Traffic to be maintained on structure to be closed during construction.

- Haunch Slab
- Slab Edge Repair
- Full Depth Repair
- Half-Sole Repair
- Pressure Cleaning and Epoxy Coating

Estimated Quantities

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Estimated Quantity</th>
<th>Unit</th>
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<tbody>
<tr>
<td>Total Surface Hydro Demolition</td>
<td>1000 sq. ft.</td>
<td>sq. ft.</td>
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<tr>
<td>Scarification of Bridge Deck</td>
<td>500 sq. ft.</td>
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<td>Superstructure Repair (Unformed)</td>
<td>3000 sq. ft.</td>
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<td>Substructure Repair (Unformed)</td>
<td>2000 sq. ft.</td>
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<tr>
<td>Integral Replacement</td>
<td>1000 sq. ft.</td>
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<tr>
<td>Traffic Barrier</td>
<td>1000 linear ft.</td>
<td>linear ft.</td>
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<tr>
<td>Temporary Concrete</td>
<td>500 sq. yard</td>
<td>sq. yard</td>
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</tbody>
</table>

Note: This drawing is not to scale. Follow dimensions.
Hydro Demolition Case 2B:
Zoned Conventional Deck Repair Before Hydro Demolition and Non-Zoned Conventional Deck Repair After Hydro Demolition
(Replacing Existing Wearing Surface)

STANDARD DRAWING GUIDELINES (do not show on plans):

Use for the following concrete wearing surfaces:
- 3/4" to 3" Polyester Polymer
- Low slump or polyester

If optional concrete wearing surface is specified and low slump or polyester polymer is not used, follow guidance on Sheet RHB03c.

Use for the following concrete wearing surfaces:
- STANDARD DRAWING GUIDANCE (do not show on plans):
  - 704-01.01 - Sheet No. 1 of 216-10.01 (If required)
  - 704-01.02 - Sheet No. 2 of 216-10.01 (If required)
  - I1.0.1 - Sheet No. 3 of 216-10.01 (If required)
  - I1.0.2 - Sheet No. 4 of 216-10.01 (If required)
  - I1.0.3 - Sheet No. 5 of 216-10.01 (If required)
  - 704-01.03 - Sheet No. 6 of 216-10.01 (If required)
  - 704-01.04 - Sheet No. 7 of 216-10.01 (If required)
  - 704-01.05 - Sheet No. 8 of 216-10.01 (If required)
  - 704-01.06 - Sheet No. 9 of 216-10.01 (If required)
  - 704-01.07 - Sheet No. 10 of 216-10.01 (If required)
  - 704-01.1 - Sheet No. 11 of 216-10.01 (If required)
  - 704-01.11 - Sheet No. 12 of 216-10.01 (If required)
  - 704-01.12 - Sheet No. 13 of 216-10.01 (If required)
  - 704-01.13 - Sheet No. 14 of 216-10.01 (If required)

General Notes:

- Bridge Deck Rating = 2002 AASHTO LFD (17th Ed.) Standard Specifications
- Design Loading = HS20-44 Modified (Roadway item) and Military 24,000 lb Tandem Axle (Roadway item)
- Design Unit Stresses:
  - Class B-1 Concrete (Half-Sole and Full Depth Repair) $f'c = 4,000$ psi
  - HS20-44 Modified (704-01.13) and Military 24,000 lb Tandem Axle (704-01.13)
- Traffic Handling:
  -bridge repairs to existing concrete.

Note: This drawing is not to scale. Follow dimensions.
Deck Repair Notes:

1. Remove existing wearing surface plus ___" of existing deck repair.
2. Power wash deck to identify sound and unsound areas.
3. Inside special repair zones, complete the following repairs:
   a. Half-sole repair
   b. Full depth repair
4. Outside special repair zones, remove existing deck repair.
5. Complete total surface hydro demolition, removing minimum of sound concrete and deteriorated concrete outside special repair zones.
6. Sound deck and ___" thickness of remaining concrete to margin of special repair zones.
7. Power wash deck to identify sound and unsound areas.
8. Place new wearing surface including additional material for areas where deck repair was completed.

Order of Repair:

1. Remove existing wearing surface plus ___" of existing deck repair.
2. Power wash deck to identify sound and unsound areas.
3. Inside special repair zones, complete the following repairs:
   a. Half-sole repair
   b. Full depth repair
4. Outside special repair zones, remove existing deck repair.
5. Complete total surface hydro demolition, removing minimum of sound concrete and deteriorated concrete outside special repair zones.
6. Sound deck and ___" thickness of remaining concrete to margin of special repair zones.
7. Power wash deck to identify sound and unsound areas.
8. Place new wearing surface including additional material for areas where deck repair was completed.

Special Repair Zones:

- Zone A
- Zone B
- Zone C
- Zone D
- Zone E

Deck Repair Details:

1. Remove existing wearing surface plus ___" of existing deck repair.
2. Power wash deck to identify sound and unsound areas.
3. Inside special repair zones, complete the following repairs:
   a. Half-sole repair
   b. Full depth repair
4. Outside special repair zones, remove existing deck repair.
5. Complete total surface hydro demolition, removing minimum of sound concrete and deteriorated concrete outside special repair zones.
6. Sound deck and ___" thickness of remaining concrete to margin of special repair zones.
7. Power wash deck to identify sound and unsound areas.
8. Place new wearing surface including additional material for areas where deck repair was completed.

Deck Repair Notes:

1. Remove existing wearing surface plus ___" of existing deck repair.
2. Power wash deck to identify sound and unsound areas.
3. Inside special repair zones, complete the following repairs:
   a. Half-sole repair
   b. Full depth repair
4. Outside special repair zones, remove existing deck repair.
5. Complete total surface hydro demolition, removing minimum of sound concrete and deteriorated concrete outside special repair zones.
6. Sound deck and ___" thickness of remaining concrete to margin of special repair zones.
7. Power wash deck to identify sound and unsound areas.
8. Place new wearing surface including additional material for areas where deck repair was completed.

Order of Repair:

1. Remove existing wearing surface plus ___" of existing deck repair.
2. Power wash deck to identify sound and unsound areas.
3. Inside special repair zones, complete the following repairs:
   a. Half-sole repair
   b. Full depth repair
4. Outside special repair zones, remove existing deck repair.
5. Complete total surface hydro demolition, removing minimum of sound concrete and deteriorated concrete outside special repair zones.
6. Sound deck and ___" thickness of remaining concrete to margin of special repair zones.
7. Power wash deck to identify sound and unsound areas.
8. Place new wearing surface including additional material for areas where deck repair was completed.
Conventional Deck Repair Only (Case A)

(Adding First Wearing Surface or Applying Concrete Crack Filler)

## Estimated Quantities

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Unit</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

### General Notes:

A1.1 Design Specifications:
- 2002 AASHTO (17th Ed.) Standard Specifications

A1.2 Design Loading:
- HS20-44 Modified
- Military 24,000 lb Tandem Axle

A1.3 Design Live Load:
- Class 11.1 Concrete (Half-Sole and Full Depth Repair) 4 kips

A2.1 Roadway surfacing adjacent to bridge ends shall match new bridge wearing surface (roadway item).

A2.2 All concrete repairs shall be in accordance with Sec 704, unless otherwise noted.

A2.3 Outlines of existing work is indicated by light dashed lines. Heavy lines indicate new work.

A2.4 Contractor shall verify all dimensions in field before ordering finalizing the shop drawings.

A2.5 In order to maintain grade and a minimum thickness of wearing surface at street on planes it may be necessary to use additional quantities of wearing surface at various locations throughout the structure. The cost of surfacing and replacing the wearing surface will be considered completely covered in the contract unit price, including all additional labor, materials or equipment for variations in thickness of wearing surface.

A2.6 Traffic Handling:
- Structure to be closed during construction. Traffic is to be maintained on temporary concrete traffic barrier (roadway item).

### Detailed Notes:

- 1/4" to 3" Low Slump Concrete
- 1 3/4" to 3" Latex Modified Concrete
- 2 1/4" to 3" Silica Fume Concrete
- 3/4" to 3" CSA Cement Very Early Strength Concrete
- 3" to 6" Steel Fiber Reinforced Concrete
- 1/8" Epoxy Polymer
- 3/4" to 5" Polymer-Stabilized Slab
- 3/8" MMA Polymer Slurry
- 3/4" to 3" Optional Asphaltic Concrete
- 1/4" to 1/8" Optional UltraThin Bonded Asphalt

Note: This drawing is not to scale. Follow dimensions.
Deck Repair Notes:

1. Scarify existing deck.
2. Sound deck to identify areas in need of repair.
3. Outside special repair zones, complete the following repairs:
   a. Half-sole repair
   b. Full depth repair
   c. Full depth repair
4. Inside special repair zones, complete the following repairs:
   a. Half-sole repair
   b. Full depth repair
   c. Full depth repair
5. Place new wearing surface.

Special Repair Zones:

Any deck repair area not designated as a special repair zone shall be completed prior to work in Zone A. Deck repair required in the areas designated as special repair zones shall be completed in alphabetical sequence beginning with Zone A. Zones with the same letter designation may be repaired at the same time.

Removal and deck repair shall be completed in one special repair zone and concrete that have attained a compressive strength of 3200 psi. No traffic shall be permitted over the web that is undergoing repair.

Feasibility of structures with single column bents, shall be removed and replaced as full depth repair. Concrete in webs shall not be removed during the slab repair if the web is undergoing repair. No traffic shall be permitted over the web that is undergoing repair.

A. Full depth repair extends over a diaphragm or web and the deteriorated concrete extends into the diaphragm or web. All deteriorated concrete shall be removed and replaced as full depth repair. Concrete in webs shall not be removed during the slab repair if the web is undergoing repair. No traffic shall be permitted over the web that is undergoing repair.

B. When the full depth repair extends over a diaphragm or web and the deteriorated concrete extends into the diaphragm or web. All deteriorated concrete shall be removed and replaced as full depth repair. Concrete in webs shall not be removed during the slab repair if the web is undergoing repair. No traffic shall be permitted over the web that is undergoing repair.

C. For seal coat, asphalt, UBAWS, epoxy polymer, or MMA polymer slurry wearing surfaces:
   - Replace "Wearing Surface" with "Concrete Crack Filler".
   - Adjust wearing surface thickness for thin wearing surfaces.
   - Adjust top of the original depth dimension to the new wearing surface.
   - Delete top existing line & the wearing surface.
   - Delete top line & the remaining top line.
   - Replace "Wearing Surface" with "Concrete Crack Filler" and adjust leader note to point to the remaining line.

For application of concrete crack filler:
   - Delete Dimension Note (1) and (3) and remember others.
   - Delete top existing line & the remainder of the detail.
   - Adjust leader note to point to the remaining line.

Note: This drawing is not to scale. Follow dimensions.
Conventional Deck Repair Only  
(Case B)  
(Replacing Existing Wearing Surface)

STANDARD DRAWING GUIDANCE (do not show on plans):  
May be used for all wearing surfaces:  
Scarification not required with the following wearing surfaces:  
Seal Coat  
Asphalt  
UBAWS  
Epoxy Polymer  
MMA Polymer Slurry

Detailed Checked  
Note: This drawing is not to scale. Follow dimensions.

General Notes:
A1. Design Specifications:  
2003 AASHTO LRFD (17th Ed.) Standard Specifications  
Bridge Deck Rating =
A2. Design Loading:  
HS20-44 (17th Ed.) Standard Specifications  
Military 24,000 lb Tandem Axle  
Year
A3. Design Unit Stresses:  
Class 3 Concrete (half sole and Full Depth Repair)  
v = 4,000 psi  
Member average
I1.0.1 (If required)  
Outline of existing work is indicated by light dashed lines. Heavy lines indicate new work.
I1.0.2 All concrete repairs shall be in accordance with Sec 704, unless otherwise noted.
I1.1 2 1/4" to 3" Low Slump Concrete  
1 3/4" to 3" Latex Modified Concrete  
2 1/4" to 3" Silica Fume Concrete
I1.2 1 3/4" to 3" CSA Cement Very Early Strength Concrete  
5" to 4" Steel Fiber Reinforced Concrete  
1/4" Epoxy Polymer  
3/4" to 5" Polyester Polymer Concrete  
3/8" MMA Polymer Slurry  
6" to 5" Reinforced Concrete Slab  
3/8" Chip Seal Grade A1
I1.3 1" to 3" Optional: Asphaltic Concrete  
1/2" to 3/4" Optional: Ultrathin Banded Asphalt

REPAIRS TO BRIDGE: ROUTE *  
OVER *  
ROUTE FROM * TO *  
ABOUT * MILES * OF *  
BEGINNING STATION ±  
(Match Existing)
Partial Plan of Slab Showing Special Repair Zones

ORDER OF REPAIR:
1. Remove existing wearing surface,
2. Sound deck to identify areas in need of repair,
3. Inside special repair zones, complete the following repairs:
   a. Half-sole repair,
   b. Full depth repair,
4. Full depth repair shall extend over a web and is more than 18 inches in length along the web; it shall stop at the centerline of web and repair shall not extend over a web.
5. Removal and deck repair shall be completed in one special repair zone and shall not extend to a depth that will not expose half the diameter of the longitudinal reinforcing bar. Full depth repair shall stop at the centerline of web and repair that extends over a web and is more than 18 inches in length along the web, shall stop at the centerline of web and repair shall not extend over a web.
6. If any single repair area does not exceed 9 square feet, removal and deck repair shall be completed in one special repair zone and concrete shall have attained a compressive strength of 3200 psi before work can be started in the next special repair zone. Removal and deck repair shall be completed in one special repair zone and shall not extend to a depth that will not expose half the diameter of the longitudinal reinforcing bar. Full depth repair shall stop at the centerline of web and repair that extends over a web and is more than 18 inches in length along the web, shall stop at the centerline of web and repair shall not extend over a web.
7. When the full depth repair extends over a diaphragm or web, the deteriorated concrete extending into the diaphragm or web shall be removed to a depth that will not expose half the diameter of the longitudinal reinforcing bar. For repairs:
   a. Half-sole repair
   b. Full depth repair
8. If any single repair area does not exceed 9 square feet, removal and deck repair shall be completed in one special repair zone and concrete shall have attained a compressive strength of 3200 psi before work can be started in the next special repair zone. Removal and deck repair shall be completed in one special repair zone and shall not extend to a depth that will not expose half the diameter of the longitudinal reinforcing bar. Full depth repair shall stop at the centerline of web and repair that extends over a web and is more than 18 inches in length along the web, shall stop at the centerline of web and repair shall not extend over a web.
9. Interior falsework installed by the contractor resting on the bottom slab shall be removed when entry access is available.
10. Interior falsework shall be removed when entry access is available.
11. If any single repair area does not exceed 9 square feet in size and the total repair area within a special repair zone does not exceed 27 square feet, the special repair zone may repaired at the same time as an adjacent zone.
12. Half-sole repair in the special repair zone on either side of the intermediate bents, shall be to a depth that will not expose half the diameter of the longitudinal reinforcing bar. For repairs:
   a. Half-sole repair
   b. Full depth repair
13. Special Repair Zones:
   a. Special repair zones shall be completed in alphabetical sequence beginning with Zone A. Zones with the same letter designation may be repaired at the same time.
   b. Any repair zone not designated as a special repair zone shall be completed prior to work in Zone A.
14. Partial Plan of Slab Showing Special Repair Zones

DECK REPAIR DETAILS

Note: Dimensioning, tolerances, and details for transverse and longitudinal reinforcing bar and anchorages shall be in accordance with the current edition of the Standard Specifications for Highway Bridges. For seal coat, asphalt, UBAWS, epoxy polymer or MMA polymer slurry wearing surfaces:
- Use existing thin inside wearing surface
- Adjust the slab to the neighbouring slabs
- Adjust the slab to the neighbouring slabs (SDG)
- Adjust depth for thin wearing surfaces
RHB04_CIP_VS_or_SS_Slab  Guidance & Alternate Details

STANDARD DRAWING GUIDANCE (SDG) (do not show on plans)

Select the appropriate 1st and 2nd sheet. Draw typical section as required and scale to fit within attached border replacing the provided example. Modify other details and notes as required (match orientation of actual reinforcement)

For solid slabs, all details shall be modified by removing voids and all notes pertaining to void repair.

District/SPM typically estimates the percentage of void tube replacement.

Transverse repair zoning over intermediate bents is required for these structures: Longitudinal repair zoning in spans is required only when hydro demolition is required and is based on anticipated quantity of deck repaired areas and 1/2" outside special repair zones for hydro Case 1 & 2.

Wearing surface thickness can vary according to grade elevation requirements and minimum barrier curb height requirements. Maximum thickness should be limited to 3" (Ref. Organizational Results Research Report ORO6.004, May 2006). Limit excludes reinforced concrete slab wearing surfaces.

Wearing surface thickness can vary according to grade elevation requirements and minimum barrier curb height requirements. Maximum thickness should be limited to 3" (Ref. Organizational Results Research Report ORO6.004, May 2006). Limit excludes reinforced concrete slab wearing surfaces.

Will need to adjust wearing surface thickness when detailing a thin wearing surface (1" or less), but it is a preferred detailing practice to show a discernable thickness on the plans. No thickness is shown for crack filler application.

Show difference as plus/minus X"±, see Bridge Memo or SPM. e.g. Match existing grade plus 2 1/4" thicker outside special repair zones for hydro Case 1 & 2.

Identify existing wearing surface and thickness, see Bridge Memo or SPM. Specify minimum thickness in deck details, typically 1/4" inside special repair zones for hydro Case 1 & 2.

Identify existing wearing surface, see Bridge Memo or SPM. Specify minimum thickness in deck details, typically 1/4" inside special repair zones for hydro Case 1 & 2.

Identify existing wearing surface, see Bridge Memo or SPM. Specify minimum thickness in deck details, typically 1/4" inside special repair zones for hydro Case 1 & 2.

Identify existing wearing surface, see Bridge Memo or SPM. Specify minimum thickness in deck details, typically 1/4" inside special repair zones for hydro Case 1 & 2.

Identify existing wearing surface, see Bridge Memo or SPM. Specify minimum thickness in deck details, typically 1/4" inside special repair zones for hydro Case 1 & 2.

See Bridge Memo or SPM, typically 1/2" Use 1" if more than 30% of existing deck needs repair. Verify there will be a minimum of 1/4" inside special repair zones to allow for this much scarification.

See Bridge Memo or SPM, typically 1/4" inside special repair zones to avoid deeper penetration into newly repaired areas and 1/2" outside special repair zones.

See existing plans.

See appropriate reference (Structure, Roadway, Median, etc.)

Two types of overhang rehabilitation are shown. Cleaning and epoxy coating is preferred because of the "relative short life of side edge repair" and untaped repair especially when over traffic. However in urban regions repairing the overhang may be preferred. Consult with SPM or SLE.

Scarification prior to adding first wearing surface or removing a portion of the deck when removing an existing wearing surface is not required for seal coat, asphalt, USBAS, epoxy polymer or MMA polymer slurry wearing surfaces.

Monolithic deck repair should only be allowed where longitudinal zoning is not required.

Monolithic deck repair should only be allowed where longitudinal zoning is not required.

Monolithic deck repair should only be allowed where longitudinal zoning is not required.

Note is required only when shop drawings will be required (for example, expansion device replacement, diaphragm replacement, etc.).

Two spans and five bents are shown. These details can be used on Sheets RHB04J and RHB04L for conventional deck repair only projects.
Hydro Demolition Case 1A:
Zoned Conventional Deck Repair Before Hydro Demolition and Non-Zoned Monolithic Deck Repair After Hydro Demolition
(Adding First Wearing Surface)
Deck Repair Notes:

Order of Repair:

1. Scarify existing deck ___". 
2. Power wash deck to identify sound and unsound areas — complete the area ___" minimum of sound concrete before work can be started in the next special repair zone.
3. Outside special repair zones, remove existing deck repair ___" minimum outside special repair zones and ___" minimum inside special repair zones.
4. Inside special repair zones, complete the following repairs in alphabetical sequence beginning with Zone A. Zones may be repaired at the same time as an adjacent zone.
   a. Removal of existing deck repair ___" minimum outside special repair zones and ___" minimum inside special repair zones.
   b. Full depth repair ___" minimum outside special repair zones and ___" minimum inside special repair zones.
   c. Deck repair with void tube replacement ___.
   d. Full depth repair ___" minimum outside special repair zones and ___" minimum inside special repair zones.
   e. Half-sole repair ___" minimum outside special repair zones and ___" minimum inside special repair zones.
5. Sound deck ___" minimum outside special repair zones and ___" minimum inside special repair zones.

Deck Repair Details:

Note: This drawing is not to scale. Follow dimensions.

1. Scarify existing deck ___". 
2. Power wash deck to identify sound and unsound areas — complete the area ___" minimum of sound concrete before work can be started in the next special repair zone.
3. Outside special repair zones, remove existing deck repair ___" minimum outside special repair zones and ___" minimum inside special repair zones.
4. Inside special repair zones, complete the following repairs in alphabetical sequence beginning with Zone A. Zones may be repaired at the same time as an adjacent zone.
   a. Removal of existing deck repair ___" minimum outside special repair zones and ___" minimum inside special repair zones.
   b. Full depth repair ___" minimum outside special repair zones and ___" minimum inside special repair zones.
   c. Deck repair with void tube replacement ___.
   d. Full depth repair ___" minimum outside special repair zones and ___" minimum inside special repair zones.
   e. Half-sole repair ___" minimum outside special repair zones and ___" minimum inside special repair zones.
5. Sound deck ___" minimum outside special repair zones and ___" minimum inside special repair zones.

Special Repair Zones:

- Zone A: 
- Zone B: 
- Zone C: 
- Zone D: 
- Zone E: 
- Zone F: 
- Zone G: 
- Zone H: 
- Zone I: 
- Zone J: 

Detailed Notes:

- Restore existing weep hole, if encountered.
- Minimum surface hydro demolition ___" minimum inside special repair zones.

Milling and Hydro Demolition Limits:

- Remove if repair is not required.
- Minimum outside special repair zones ___" minimum inside special repair zones.

Fiber Void Tube Replacement:

- Use the fiber void tube in place of existing void tubes for producing voids, if any, and required by the engineer.
- The void tube shall be maintained completely free of concrete, and the void tube shall be replaced if damaged during the repair process.

Note: This drawing is not to scale. Follow dimensions.

Remove if repair is not required.

1. Scarify existing deck ___". 
2. Power wash deck to identify sound and unsound areas — complete the area ___" minimum of sound concrete before work can be started in the next special repair zone.
3. Outside special repair zones, remove existing deck repair ___" minimum outside special repair zones and ___" minimum inside special repair zones.
4. Inside special repair zones, complete the following repairs in alphabetical sequence beginning with Zone A. Zones may be repaired at the same time as an adjacent zone.
   a. Removal of existing deck repair ___" minimum outside special repair zones and ___" minimum inside special repair zones.
   b. Full depth repair ___" minimum outside special repair zones and ___" minimum inside special repair zones.
   c. Deck repair with void tube replacement ___.
   d. Full depth repair ___" minimum outside special repair zones and ___" minimum inside special repair zones.
   e. Half-sole repair ___" minimum outside special repair zones and ___" minimum inside special repair zones.
5. Sound deck ___" minimum outside special repair zones and ___" minimum inside special repair zones.

Detailed Notes:

- Restore existing weep hole, if encountered.
- Minimum surface hydro demolition ___" minimum inside special repair zones.

Milling and Hydro Demolition Limits:

- Remove if repair is not required.
- Minimum outside special repair zones ___" minimum inside special repair zones.

Fiber Void Tube Replacement:

- Use the fiber void tube in place of existing void tubes for producing voids, if any, and required by the engineer.
- The void tube shall be maintained completely free of concrete, and the void tube shall be replaced if damaged during the repair process.

Note: This drawing is not to scale. Follow dimensions.
Hydro Demolition Case 1B:
Zoned Conventional Deck Repair Before Hydro Demolition and Non-Zoned Monolithic Deck Repair After Hydro Demolition (Replacing Existing Wearing Surface)

Standard Drawing Guidance (do not show on plans):
- Use for the following concrete wearing surfaces:
  - CSA Cement Very Early Strength
  - Latex Modified
  - 1 3/4" to 3" Silica Fume
  - 1 3/4" to 3" Steel Fiber Reinforced

If optional concrete wearing surface is specified and low slump or polyester polymer is an option:
- Add "(Low Slump Concrete)" to the RHB04h sheet title and revise the sheet number from two to three. Sheet RHB04g will not be used.
- Add to this sheet the typical section from Sheet RHB04g with "(Low Slump Concrete)" added to the title.

Note B3.9 if required.

Miscellaneous:
- Class B-1 Concrete (Half-Sole and Full Depth Repair) f'c = 4,000 psi
- HS20-44 Modified (   ) and Military 24,000 lb Tandem Axle (   )
- Design Unit Stresses:
  - Bridge Deck Rating = 2002 AASHTO LFD (17th Ed.) Standard Specifications

General Notes:
- Design Specifications:
  - 2003 AASHTO LRFD (20th Ed.) Standard Specifications

Contractor shall verify all dimensions in field before finalizing the shop drawings.

Note: This drawing is not to scale. Follow dimensions.
Hydro Demolition Case 2A:
Zoned Conventional Deck Repair Before Hydro Demolition and Non-Zoned Conventional Deck Repair After Hydro Demolition
(Adding First Wearing Surface)

STANDARD DRAWING GUIDANCE (do not show on plans):
- May be used with the following concrete wearing surfaces:
  - 3/4" to 3" polyester polymer

If optional concrete wearing surface is specified and low pump or polyester polymer is an option follow guidance on Sheet RHB04a.

RHB04e Effective: Feb. 2024 
Supersedes: Mar. 2021

Repair Slab Edge

Limits of Cleaning and Epoxy Coating

Cleaning and Epoxy Coating

Deck Repair with Void Tube Replacement

Deck Repair

Existing Removal of

Monolithic

Full Depth

Half-Sole

Superstructure Repair (Unformed)

Substructure Repair (Formed)

Removal of Venezia Deck Repairs

Cleaning of Bridge Deck

Temporary Concrete Shirting

Match existing grade

Temporary Concrete Shirting

Match existing grade (Bridge deck)

Temporary Concrete Shirting

Match existing grade (Total Surface Hydro Demolition)

Scarification of Bridge Deck and Total Surface Hydro Demolition

Scarification of Bridge Deck and Total Deck Repair

Scarification of Bridge Deck (After Deck Repairs)

X'-X' Roadway

�
cleaning and epoxy coating

TYPICAL SECTION THRU EXISTING DECK

Estimated Quantities

<table>
<thead>
<tr>
<th>Description</th>
<th>Item</th>
<th>Type</th>
<th>Unit</th>
<th>Quantity</th>
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<tr>
<td>Cleaning of Bridge Deck</td>
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<tr>
<td>Cleaning of Superstructure</td>
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<td>Cleaning of Substructure</td>
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General Notes:
- Supplementary wearing surface material for monolithic deck repair will be paid for at the fixed unit price in accordance with Sec 109.
- Design Specifications:
  - 2002 AASHTO Std 12th Ed. Standard Specifications
  - Design Drawing No. 704-01.01
  - Design Loading:
    - HS20-44 Modified
    - Military 24,000 lb Tandem Axle
  - Design Unit Stresses:
    - B3.8 Concrete (Half-Sole and Full Depth Repair and Deck Repair) 
    - Concrete (Half-Sole and Full Depth Repair and Deck Repair) 
    - Concrete (Half-Sole and Full Depth Repair and Deck Repair)
  - Miscellaneous:
    - II.2.3 If required
    - B3.0 If required
    - All concrete repairs shall be in accordance with Sec 704, unless otherwise noted.
    - Details of existing work is indicated by light dashed lines. Heavy lines indicate new work.
    - Contractor shall verify all dimensions in field before finalizing shop drawings.
    - In order to maintain grade and a minimum thickness of wearing surface as shown on plans it may be necessary to use additional quantities of wearing surfacing as various locations throughout the structure. The cost of surfacing and replacing the wearing surface will be considered completely covered in the contract unit price. The cost of all labor, materials or equipment for variations in surfacing will be considered in the contract unit price.

REPAIRS TO BRIDGE: ROUTE * OVER *

ROUTE * FROM * TO *

ABOUT * MILES * OF *

OVER *

BEGINNING STATION (Match Existing)
PART PLAN OF SLAB SHOWING SPECIAL REPAIR ZONES

DECK REPAIR OUTSIDE SPECIAL REPAIR ZONES (AFTER HYDRO DEMOLITION)

DECK REPAIR WITH VOID TUBE REPLACEMENT
A = Half-Sole Repair
B = Deck Repair with Void Tube Replacement

DECK REPAIR INSIDE SPECIAL REPAIR ZONES (BEFORE HYDRO DEMOLITION)

DECK REPAIR DETAILS

Deck Repair Notes:

Order of Repair:
1. Scavenge existing deck
2. Remove deck as required, either sound and unsound
3. Inside special repair zones, complete the following repairs at the same time: scarifying the top bar, running new bonding steel, placing new deck repair
4. Place new wearing surface.
5. If any single repair area does not exceed 4 square feet, the special repair zone may be repaired at the same time as an adjacent zone.
6. Sound deck and if needed complete incidental concrete repairs.
7. Complete total surface hydro demolition, removing minimum of sound concrete inside special repair zones and removing A = minimum of sound concrete and B = minimum of voidcrete outside special repair zones.
8. Replace with Note 13.3 for structures with an outside special repair zone.
9. Sound deck and if needed complete incidental concrete repairs.
10. Complete total surface hydro demolition, removing minimum of sound concrete inside special repair zones and removing A = minimum of sound concrete and B = minimum of voidcrete outside special repair zones.

Special Repair Zones:

Remove if repair is not required.

Note: This drawing is not to scale. Follow dimensions.
Hydro Demolition Case 2B:

Zoned Conventional Deck Repair Before Hydro Demolition and Non-Zoned Conventional Deck Repair After Hydro Demolition

(Replacing Existing Wearing Surface)

STANDARD DRAWING GUIDANCE (do not show on plans):

May be used with the following concrete wearing surfaces:

- 3/4" to 3" Polyester Polymer
- 2 1/4" to 3" Low Slump

If optional concrete wearing surface is specified and low slump or polyester polymer is an option follow guidance on Sheet RHB04c.

Maximum depth of concrete repair will be paid at the fixed unit price in accordance with Sec 109.

General Notes:

- Deck repair shall be in accordance with Sec 704, unless otherwise noted.
- Outline of existing work is indicated by light dashed lines. Heavy lines indicate new work.
- Contractor shall verify all dimensions in field before finalizing the shop drawings.

K5.9 Substituting concrete wearing surface material for monolithic deck repair will be paid for at the fixed unit price in accordance with Sec 109.

Removal of Existing Wearing Surface - Prior to Hydro Demolition

- Hydro Demolition
- Removal of Existing Wearing Surface
- Deck Repair with Void Tube Replacement

Removal of Concrete Wearing Surface - After Hydro Demolition

- Half-Sole Repair
- Full Depth Repair
- Match existing barrier (if required)

Concrete Wearing Surface

- 3/4" to 3" Polyester Polymer
- 2 1/4" to 3" Low Slump

For at the fixed unit price in accordance with Sec 109.

Note: This drawing is not to scale. Follow dimensions.

Missouri Highways and Transportation
105 West Capitol
Jefferson City, MO 65102
1-888-ASK-MODOT (1-888-275-6636)
Deck Repair Notes:

Order of Repair:
1. Remove existing wearing surface plus ___" of existing deck.
2. Repair deck to identify sound and intact concrete to be removed.
3. Inside special repair zones, complete the following repairs:
   a) Remove and repair wearing surface
   b) Repair half-sole or patch
   c) Half-sole repair with void tube replacement
   d) Full depth repair
4. Outside special repair zones, remove existing deck.
5. Complete total surface hydro demolition.
7. Sound deck and if needed complete incidental concrete removal.
8. Outside special repair zones, complete the following repairs:
   a) Full depth repair
   b) Repair deck with void tube replacement
   c) Full depth repair

Special Repair Zones:

Any deck repair in areas designated as special repair zones shall be completed after hydro demolition. Any special repair zone that has not been completed by the time hydro demolition is started in the next special repair zone.

For any deck repair area within a special repair zone, the total repair area within the zone shall be completed at the same time. Hydro demolition shall not move forward until the repairs to all special repair zones are completed and properly cured.

Void Repair:

Any damage sustained to the void tube as a result of the contractor’s operations shall be repaired as required by the engineer. The contractor shall be responsible for all costs associated with the repair, including the cost of labor, materials, and equipment.

Fiber Tube Virtual Replacement:

When a deteriorated portion of the void tube is beyond the point of patching, the engineer shall determine if the fiber tubes for producing voids shall be removed. The fiber tubes for producing voids shall be removed and replaced as required by the engineer.

Fiber void tube replacement:

Fiber tubes for producing voids shall be removed and replaced after the concrete has been cured. The fiber tubes shall be replaced with new and properly curing concrete.

Note: This drawing is not to scale. Follow dimensions.
Special Repair Zones

Part Plan of Slab Showing Special Repair Zones

Deck Repair Notes:

1. Scuff existing deck
2. Smooth to identify areas in need of repair.
3. Outside special repair zones, complete the following repairs:
   a. Half-sole repair
   b. Full depth repair
4. Inside special repair zones, complete the following repairs:
   a. Half-sole repair
   b. Full depth repair

Deck Repair Details

Detail A

Surface

HALF SOLE REPAIR

DECK REPAIR WITH VOID TUBE REPLACEMENT

FULL DEPTH REPAIR

FIBER VOID TUBE REPLACEMENT

Wear Surface

Note: This drawing is not to scale. Follow dimensions.
### Conventional Deck Repair Only (Case B)

(Replacing Existing Wearing Surface)

#### General Notes:

- **A1.2** Design Loading: Missouri HS20-44 Modified (    ) and Military 24,000 lb Tandem Axle (    )
- **A1.3** Design Unit Stresses:
  - Class B Concrete (Half-Sole and Full Depth Repair and Deck Repair with Void Tube Replacement)
  - 1 ksi = 4,000 psi

- **B1.0.2** All concrete repairs shall be in accordance with Sec 704, unless otherwise noted.
- **B1.2** Outline of existing work is indicated by light dashed lines. Heavy lines indicate new work.
- **B2.0.2** Contractor shall verify all dimensions in field before finalizing the shop drawings.
- **B13.0.2** In order to maintain grade and a minimum thickness of wearing surface as shown on plans, it may be necessary to use additional quantities of wearing surface at various locations throughout the structure. The cost of surfacing and installing the wearing surface will be considered completely covered in the contract unit price for surfacing all additional labor, materials or equipment for variations in thickness of wearing surface.

#### Traffic Handling:

- **A9.0** Structure to be closed during construction. Traffic to be maintained on roadway plans for traffic control.

#### Estimated Quantities

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Unit</th>
<th>Total Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Removal of Concrete Wearing Surface</td>
<td>ft²</td>
<td></td>
</tr>
<tr>
<td>Superstructure Repair (Half-Sole)</td>
<td>ft²</td>
<td></td>
</tr>
<tr>
<td>Superstructure Repair (Unformed)</td>
<td>ft²</td>
<td></td>
</tr>
<tr>
<td>Full Depth Repair</td>
<td>ft²</td>
<td></td>
</tr>
<tr>
<td>Half-Sole Repair</td>
<td>ft²</td>
<td></td>
</tr>
<tr>
<td>Void Tube Replacement</td>
<td>ft²</td>
<td></td>
</tr>
<tr>
<td>Deck Repair with Void Tube Replacement</td>
<td>ft²</td>
<td></td>
</tr>
<tr>
<td>Cleaning and Epoxy Coating</td>
<td>ft²</td>
<td></td>
</tr>
<tr>
<td>Latex Modified Concrete Wearing Surface</td>
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<td></td>
</tr>
<tr>
<td>Superstructure Repair (Unformed)</td>
<td>ft²</td>
<td></td>
</tr>
<tr>
<td>Substructure Repair (Formed)</td>
<td>ft²</td>
<td></td>
</tr>
<tr>
<td>Slab Edge Repair (Bridges)</td>
<td>ft²</td>
<td></td>
</tr>
<tr>
<td>Slab Edge Repair (Unformed)</td>
<td>ft²</td>
<td></td>
</tr>
<tr>
<td>Repair - Match Existing Concrete Color</td>
<td>lin. ft</td>
<td></td>
</tr>
<tr>
<td>Repair - Match Existing Concrete Color</td>
<td>lin. ft</td>
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<tr>
<td>Repair - Match Existing Concrete Color</td>
<td>lin. ft</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** This drawing is not to scale. Follow dimensions.
FIBER VOID TUBE REPLACEMENT

Fiber tubes for producing voids shall have an approximate cylinder diameter of 4"± x"± 4 inches. Fiber tubes shall be manufactured of a strong polymeric material having a compressive strength of 3200 psi before work can be started in the next special repair zone.

The portion of the deteriorated void tube shall be cut from the point of patching as determined by the engineer, when a deteriorated portion of the void tube is beyond the point of patching as determined by the engineer, the portion of the deteriorated void tube shall be cut from the point of patching as determined by the engineer. The fiber tubes for producing the void shall have an outside diameter of 4 inches which fits the acceptance of the original spacing. Cost of patching an exposed void will be considered contractor's expense.

An exposed void in the deck shall be patched as approved by the engineer, for sealing the exposed void, the deck shall be considered completely covered by the contract unit price for Half-Sole Repair. Void Repair:

1. Place new wearing surface.
2. Inside special repair zones, complete the following repairs:
   a. Full depth repair
   b. Deck repair with void tube replacement
   c. Half-sole repair
3. Inside special repair zones, complete the following repairs:
   a. Half-sole repair
   b. Deck repair with void tube replacement
   c. Full depth repair
4. Place new wearing surface.

Any deck repair in areas not designated as a special repair zone shall be completed prior to work in Zone A.

If any single repair area does not exceed 4 square feet in size and the total repair area within a special repair zone does not exceed 10 square feet, the special repair zone may be repaired at the same line as an adjacent lane.

Fiber tubes for producing voids shall have an approximate cylinder diameter of 4"± x"± 4 inches. Fiber tubes shall be manufactured of a strong polymeric material having a compressive strength of 3200 psi before work can be started in the next special repair zone.

The portion of the deteriorated void tube shall be cut from the point of patching as determined by the engineer, when a deteriorated portion of the void tube is beyond the point of patching as determined by the engineer, the portion of the deteriorated void tube shall be cut from the point of patching as determined by the engineer. The fiber tubes for producing the void shall have an outside diameter of 4 inches which fits the acceptance of the original spacing. Cost of patching an exposed void will be considered contractor's expense.

An exposed void in the deck shall be patched as approved by the engineer, for sealing the exposed void, the deck shall be considered completely covered by the contract unit price for Half-Sole Repair. Void Repair:

1. Place new wearing surface.
2. Inside special repair zones, complete the following repairs:
   a. Full depth repair
   b. Deck repair with void tube replacement
   c. Half-sole repair
3. Inside special repair zones, complete the following repairs:
   a. Half-sole repair
   b. Deck repair with void tube replacement
   c. Full depth repair
4. Place new wearing surface.

Any deck repair in areas not designated as a special repair zone shall be completed prior to work in Zone A.

If any single repair area does not exceed 4 square feet in size and the total repair area within a special repair zone does not exceed 10 square feet, the special repair zone may be repaired at the same line as an adjacent lane.

Fiber tubes for producing voids shall have an approximate cylinder diameter of 4"± x"± 4 inches. Fiber tubes shall be manufactured of a strong polymeric material having a compressive strength of 3200 psi before work can be started in the next special repair zone.

The portion of the deteriorated void tube shall be cut from the point of patching as determined by the engineer, when a deteriorated portion of the void tube is beyond the point of patching as determined by the engineer, the portion of the deteriorated void tube shall be cut from the point of patching as determined by the engineer. The fiber tubes for producing the void shall have an outside diameter of 4 inches which fits the acceptance of the original spacing. Cost of patching an exposed void will be considered contractor's expense.

An exposed void in the deck shall be patched as approved by the engineer, for sealing the exposed void, the deck shall be considered completely covered by the contract unit price for Half-Sole Repair. Void Repair:

1. Place new wearing surface.
2. Inside special repair zones, complete the following repairs:
   a. Full depth repair
   b. Deck repair with void tube replacement
   c. Half-sole repair
3. Inside special repair zones, complete the following repairs:
   a. Half-sole repair
   b. Deck repair with void tube replacement
   c. Full depth repair
4. Place new wearing surface.

Any deck repair in areas not designated as a special repair zone shall be completed prior to work in Zone A.

If any single repair area does not exceed 4 square feet in size and the total repair area within a special repair zone does not exceed 10 square feet, the special repair zone may be repaired at the same line as an adjacent lane.

Fiber tubes for producing voids shall have an approximate cylinder diameter of 4"± x"± 4 inches. Fiber tubes shall be manufactured of a strong polymeric material having a compressive strength of 3200 psi before work can be started in the next special repair zone.

The portion of the deteriorated void tube shall be cut from the point of patching as determined by the engineer, when a deteriorated portion of the void tube is beyond the point of patching as determined by the engineer, the portion of the deteriorated void tube shall be cut from the point of patching as determined by the engineer. The fiber tubes for producing the void shall have an outside diameter of 4 inches which fits the acceptance of the original spacing. Cost of patching an exposed void will be considered contractor's expense.

An exposed void in the deck shall be patched as approved by the engineer, for sealing the exposed void, the deck shall be considered completely covered by the contract unit price for Half-Sole Repair. Void Repair:

1. Place new wearing surface.
2. Inside special repair zones, complete the following repairs:
   a. Full depth repair
   b. Deck repair with void tube replacement
   c. Half-sole repair
3. Inside special repair zones, complete the following repairs:
   a. Half-sole repair
   b. Deck repair with void tube replacement
   c. Full depth repair
4. Place new wearing surface.

Any deck repair in areas not designated as a special repair zone shall be completed prior to work in Zone A.

If any single repair area does not exceed 4 square feet in size and the total repair area within a special repair zone does not exceed 10 square feet, the special repair zone may be repaired at the same line as an adjacent lane.

Fiber tubes for producing voids shall have an approximate cylinder diameter of 4"± x"± 4 inches. Fiber tubes shall be manufactured of a strong polymeric material having a compressive strength of 3200 psi before work can be started in the next special repair zone.

The portion of the deteriorated void tube shall be cut from the point of patching as determined by the engineer, when a deteriorated portion of the void tube is beyond the point of patching as determined by the engineer, the portion of the deteriorated void tube shall be cut from the point of patching as determined by the engineer. The fiber tubes for producing the void shall have an outside diameter of 4 inches which fits the acceptance of the original spacing. Cost of patching an exposed void will be considered contractor's expense.

An exposed void in the deck shall be patched as approved by the engineer, for sealing the exposed void, the deck shall be considered completely covered by the contract unit price for Half-Sole Repair. Void Repair:

1. Place new wearing surface.
2. Inside special repair zones, complete the following repairs:
   a. Full depth repair
   b. Deck repair with void tube replacement
   c. Half-sole repair
3. Inside special repair zones, complete the following repairs:
   a. Half-sole repair
   b. Deck repair with void tube replacement
   c. Full depth repair
4. Place new wearing surface.

Any deck repair in areas not designated as a special repair zone shall be completed prior to work in Zone A.

If any single repair area does not exceed 4 square feet in size and the total repair area within a special repair zone does not exceed 10 square feet, the special repair zone may be repaired at the same line as an adjacent lane.

Fiber tubes for producing voids shall have an approximate cylinder diameter of 4"± x"± 4 inches. Fiber tubes shall be manufactured of a strong polymeric material having a compressive strength of 3200 psi before work can be started in the next special repair zone.

The portion of the deteriorated void tube shall be cut from the point of patching as determined by the engineer, when a deteriorated portion of the void tube is beyond the point of patching as determined by the engineer, the portion of the deteriorated void tube shall be cut from the point of patching as determined by the engineer. The fiber tubes for producing the void shall have an outside diameter of 4 inches which fits the acceptance of the original spacing. Cost of patching an exposed void will be considered contractor's expense.

An exposed void in the deck shall be patched as approved by the engineer, for sealing the exposed void, the deck shall be considered completely covered by the contract unit price for Half-Sole Repair. Void Repair:

1. Place new wearing surface.
2. Inside special repair zones, complete the following repairs:
   a. Full depth repair
   b. Deck repair with void tube replacement
   c. Half-sole repair
3. Inside special repair zones, complete the following repairs:
   a. Half-sole repair
   b. Deck repair with void tube replacement
   c. Full depth repair
4. Place new wearing surface.

Any deck repair in areas not designated as a special repair zone shall be completed prior to work in Zone A.

If any single repair area does not exceed 4 square feet in size and the total repair area within a special repair zone does not exceed 10 square feet, the special repair zone may be repaired at the same line as an adjacent lane.

Fiber tubes for producing voids shall have an approximate cylinder diameter of 4"± x"± 4 inches. Fiber tubes shall be manufactured of a strong polymeric material having a compressive strength of 3200 psi before work can be started in the next special repair zone.

The portion of the deteriorated void tube shall be cut from the point of patching as determined by the engineer, when a deteriorated portion of the void tube is beyond the point of patching as determined by the engineer, the portion of the deteriorated void tube shall be cut from the point of patching as determined by the engineer. The fiber tubes for producing the void shall have an outside diameter of 4 inches which fits the acceptance of the original spacing. Cost of patching an exposed void will be considered contractor's expense.

An exposed void in the deck shall be patched as approved by the engineer, for sealing the exposed void, the deck shall be considered completely covered by the contract unit price for Half-Sole Repair. Void Repair:

1. Place new wearing surface.
2. Inside special repair zones, complete the following repairs:
   a. Full depth repair
   b. Deck repair with void tube replacement
   c. Half-sole repair
3. Inside special repair zones, complete the following repairs:
   a. Half-sole repair
   b. Deck repair with void tube replacement
   c. Full depth repair
4. Place new wearing surface.
U.I.P., STRENGTHEN AND REHABILITATE EXISTING \(X', X', X')\) WIDE FLANGE BEAM SPANS (SKEW: X)

**TYPICAL ELEVATION OF BEAM**

Span \(+:\) and \(-:\)

**SECTION THRU BEAM**

**DETAIL OF FLANGE PLATE**

**Table of Variables**

<table>
<thead>
<tr>
<th>Beam Location</th>
<th>Dimensions</th>
<th>Load</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
</tr>
</tbody>
</table>

Note: This drawing is not to scale. Follow dimensions.

**Estimated Quantities**

**General Notes:**

Design Specifications:

- 2002 AASHTO LRFD (17th Ed.) Standard Specifications
- 1993 Missouri Posting Loads (H20 & 3S2)
- No Future Wearing Surface

Design Unit Stresses:

- Structural Carbon Steel \(F_y = 36,000\) psi (New Steel)
- Existing Steel \(F_y = \) psi
- Working Stress Design = 68% of \(F_y\) (Existing)

- Calcium Sulfonate (2 coats)

Beam Support:

- All existing beams in the span being strengthened shall be raised simultaneously with jacking point and supported during welding of new steel plates.

- The temporary supports must be capable of safely supporting a service load of approximately 2 tons per beam (factor of safety not included). See special provisions.

- One lane of traffic shall be maintained on structure during construction. See roadway plans for traffic control.

Traffic Handling:

- Outline of existing work is indicated by light dashed lines. Heavy lines indicate new work.

- Longitudinal dimensions are based on the original design plans.

- Contractor shall verify all dimensions in field before finalizing the shop drawings.
The drawing provides details on the optional slab cantilever replacement for a bridge. The notes include:

- Minimum distance required for mechanical bar splice. All existing transverse slab reinforcement in this area shall be cleanly stripped.

With the optional slab cantilever replacement, the contractor shall use a mechanical bar splice for the existing exposed transverse slab reinforcement. The length of the new #6 reinforcing bars used with the mechanical bar splice shall be determined by the contractor based on the style of mechanical bar splice used and other considerations. Mechanical bars splices shall be in accordance with Sec. 706 except that there will be no separate pay item for mechanical bar splices. The mechanical bar splices and accompanying new #6 reinforcing bars will be considered completely covered by contract unit price for other items included in the contract.

For spacing of longitudinal reinforcing steel, see Sheet No. 1 & 2. For details of barrier, see Sheet No. 4.

Notes:
- This drawing is not to scale. Follow dimensions.
### Roadway Width

<table>
<thead>
<tr>
<th>Bridge Number</th>
<th>County</th>
<th>Route Carried</th>
<th>Bridge Over</th>
<th>Bridge Deck Rating</th>
<th>Length of Bridge Deck (feet)</th>
<th>Bridge Area of Bridge Approach (sq. yard)</th>
<th>Estimated Quantity of Concrete Crack Filler (sq. yard)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Bid Quantities:**

- (1) End of slab to end of slab (includes semi-deep abutment slabs)
- (2) Concrete Crack Filler shall not be applied on bridge approach slabs
- (3) Estimated area of bridge approach slabs to be coated with Concrete Crack Filler is included in this quantity. See special provisions.

**Standard Drawing Guidance (Do not follow all plans):**

- Add note (4) if applicable for individual structures.
- Add (4) after the total quantity for applicable bridge (if not shown). Add (4) if applicable for individual structures.
- Do not apply Concrete Crack Filler to portions of bridge approach slab with an existing asphalt overlay.

### Notes:

- Outline of existing work is indicated by light dashed lines. Heavy lines indicate new work.
- Traffic to be maintained on structure during construction. See roadway plans for traffic control.

---

**Bid Quantities:**

- (1) End of slab to end of slab (includes semi-deep abutment slabs)
- (2) Concrete Crack Filler shall not be applied on bridge approach slabs
- (3) Estimated area of bridge approach slabs to be coated with Concrete Crack Filler is included in this quantity. See special provisions.

**Standard Drawing Guidance (Do not follow all plans):**

- Add note (4) if applicable for individual structures.
- Add (4) after the total quantity for applicable bridge (if not shown). Add (4) if applicable for individual structures.
- Do not apply Concrete Crack Filler to portions of bridge approach slab with an existing asphalt overlay.

---

**Bid Quantities:**

- (1) End of slab to end of slab (includes semi-deep abutment slabs)
- (2) Concrete Crack Filler shall not be applied on bridge approach slabs
- (3) Estimated area of bridge approach slabs to be coated with Concrete Crack Filler is included in this quantity. See special provisions.

**Standard Drawing Guidance (Do not follow all plans):**

- Add note (4) if applicable for individual structures.
- Add (4) after the total quantity for applicable bridge (if not shown). Add (4) if applicable for individual structures.
- Do not apply Concrete Crack Filler to portions of bridge approach slab with an existing asphalt overlay.
Notes:

- Design Force is the factored shear force at any cross section in each design region that shall be resisted entirely by the FRP reinforcement.
- See special provisions.

BENT CAP SHEAR STRENGTHENING USING FRP WRAP

Note: This drawing is not to scale. Follow dimensions.
Instructions for Pile Plating:

- **Fabricated structural steel** shall be ASTM A992 Grade 50 or 50W. All field connections shall be made with 3/4" inch diameter ASTM 4135 Grade 60 bolts and 3/4" inch diameter holes.
- Only one pile shall be repaired at a time.

**General Notes:**

- Contact surfaces shall be in accordance with Sec 1081 for surface preparation.
- All new or existing structural steel shall be coated with a minimum of two coats of inorganic zinc primer (5 mils minimum).
- The cost of furnishing and installing structural steel, all steel coatings and any other incidental materials or labor to complete pile repairs shall be considered complete and paid. Variations may be encountered in the estimated quantities but the variations can not be used for an adjustment in the contract unit price.
- Cost of all excavation will be considered completely covered by the contract lump sum price for Steel Pile Repair.
- Variations may be encountered in the estimated quantities but the variations can not be used for an adjustment in the contract unit price.
- Variations may be encountered in the estimated quantities but the variations can not be used for an adjustment in the contract unit price.
- Variations may be encountered in the estimated quantities but the variations can not be used for an adjustment in the contract unit price.

**General Notes:**

- New steel pile section shall be coated in accordance with Sec 702.
- New steel pile section shall be the same grade as, or greater than, the existing pile (ASTM A709 Grade 36 or 50).
- New steel pile section shall be coated with inorganic zinc primer and epoxy-mastic primer applied over SSPC-SP3 coating shall be applied one foot above and below the existing ground line and in accordance with Sec 102. These protective coatings will not be required below the normal low water line. The cost of surface preparation shall be considered completely covered by the contract lump sum price for Surface Preparation.
- The cost of the aluminum gray epoxy-mastic primer and protective coating will be considered completely covered by the contract lump sum price for Aluminum Gray Epoxy-Mastic Primer.
- The cost of the inorganic zinc primer and protective coating will be considered completely covered by the contract lump sum price for Inorganic Zinc Epoxy Primer.
- New steel piles shall be the minimum of two coats of inorganic zinc primer (5 mils minimum).
- Contact surfaces shall be in accordance with Sec 1081 for surface preparation.
- New steel piles shall be the same grade as, or greater than, the existing pile (ASTM A709 Grade 36 or 50).
- New steel piles shall be coated with inorganic zinc primer and epoxy-mastic primer applied over SSPC-SP3 coating shall be applied one foot above and below the existing ground line and in accordance with Sec 102. These protective coatings will not be required below the normal low water line. The cost of surface preparation shall be considered completely covered by the contract lump sum price for Surface Preparation.
- The cost of the aluminum gray epoxy-mastic primer and protective coating will be considered completely covered by the contract lump sum price for Aluminum Gray Epoxy-Mastic Primer.
- The cost of the inorganic zinc primer and protective coating will be considered completely covered by the contract lump sum price for Inorganic Zinc Epoxy Primer.
Standard Drawing Guidance
(Do not show on plans):

1. Show only pile repair method required. Delete all other details. If used in combination, specify associated piles by method.

   a. Based on similar percentage of section loss, pile plating may be more attractive than partial pile replacement.

   b. Details can be modified if only the web or flanges need to be plated. If only the web is plated, plates on each side of the web are required. If only a flange is to be plated, both flanges and plates on each side of the flanges are required. Overall symmetry of the section shall be maintained.

2. Based on additional factors other than just percent of section lost, partial pile replacement may be considered. Minimizing or eliminating traffic loading, adding falsework, or just having support conditions such as integral piers can help to determine the repair method. Pile replacement shall not be used if multiple piles need repair and falsework is not provided.

3. Use this note for coating any remaining piles or pile sections, and strap bracing not being repaired. Use this note on Front Sheet or Notes Sheet when no repair or no encasement is required. Include standard pay items.

   a. Surface Preparation for Applying Epoxy-Mastic Primer
   b. Gray Epoxy-Mastic Primer
   c. Aluminum Epoxy-Mastic Primer

   “Aluminum” is preferred because it acts as both a barrier and corrosion protection where “Gray” only acts as a barrier. If any coated pile is embedded in fresh concrete or “Gray” is being used elsewhere, “Aluminum” shall not be used.

   - If galvanizing is preferred, add splice detail and replace note with:

     a. New steel pile section shall be galvanized. See special provisions.

   - See EPG 751.40.1.2.1 for guidance on when coating, encasement or jacketing, and plating or partial replacement should be considered.

   - Show Quantity Table on sheet. (Possible items given)

   - See RHB09_10x42PileRepair for guidance on when pile plating is used.

   - See EPG 751.40.1.2.1 for guidance on when coating, encasement or jacketing, and plating or partial replacement should be considered.

   - Steel Pile Splice

   - Galvanizing material shall be omitted or removed 1 inch clear of weld locations. See Special Provisions.

   - These quantities are included in the Estimated Quantities table on Sheet No.
Minimum clearance to reinforcing steel shall be 1 1/2", unless otherwise shown.

All concrete for pile encasement shall be Class B (f'c = 3000 psi).

The reinforcing steel shall be epoxy coated Grade 60 with fy = 60,000 psi.

The exposed and accessible surfaces of the existing structural steel that will be encased in concrete shall be cleaned with a minimum of SSPC-SP-3 surface preparation and coated with a minimum of one coat of gray epoxy-mastic primer (non-aluminum) in accordance with Sec 1081 to produce a dry film thickness of not less than 3 mils before concrete is poured. The surface preparation and coating for piles shall extend a minimum of one foot outside the face of the pile encasement.

Cost of all concrete, reinforcement, shear connectors, surface preparation, coatings and any other incidental material or labor to complete pile encasement, complete in place, will be considered completely covered by the contract unit price for Pile Encasement.

General Notes:

For details of pile plating, see Sheet No.  .

A FRP pile jacketing system may be used in lieu of pile encasement at the contractor's option. No additional payment will be made for this substitution. See special provisions.

For details of pile plating, see Sheet No.  .
Standard Drawing Guidance
(donotshowonplans):

1. This sheet is supplemental to Details of Pile Repair Sheet. Use details that match the selected pile repair method. Delete all other details. Use general notes and bill of reinforcing steel for either method.

2. See EPG 751.40.1.2.1 for guidance on when coating, encasement or jacketing, and plating or partial replacement should be considered.

3. Shear connectors are only used for partial pile replacement.

4. Delete note if there is not any existing sway bracing.

Existing sway bracing may need to be removed and replaced or reattached if it is located in the area of pile to be replaced or plated.
Minimum clearance to reinforcing steel shall be 1 1/2", unless otherwise shown.
All concrete for pile encasement shall be Class B (f'c = 3000 psi).
The reinforcing steel shall be epoxy coated Grade 60 with fy = 60,000 psi.
The exposed and accessible surfaces of the existing structural steel piles and sway bracing shall be recoated with one 6-mil thickness of American Gray epoxy-mastic primer applied over an SSPC-SP-3 surface preparation and coated with a minimum of one coat of gray epoxy-mastic primer in accordance with Sec 1081. The bituminous coating shall be applied one foot above and below the existing ground line and in accordance with Sec 702. These protective coatings shall not be required below the normal low water line. The cost of the surface preparation and in accordance with Sec 1081. The surface preparation and coatings for Applying Epoxy Mastic Primer. The cost of the American Gray epoxy-mastic primer and bituminous coating will be considered completely covered by the contract lump sum price for American Gray Epoxy-Mastic Primer.

General Notes:
All exposed surfaces of the existing structural steel piles and sway bracing shall be recoated with one 6-mil thickness of American Gray epoxy-mastic primer applied over an SSPC-SP-3 surface preparation and coated with a minimum of one coat of gray epoxy-mastic primer in accordance with Sec 1081. The bituminous coating shall be applied one foot above and below the existing ground line and in accordance with Sec 702. These protective coatings shall not be required below the normal low water line. The cost of the surface preparation and in accordance with Sec 1081. The surface preparation and coatings for Applying Epoxy Mastic Primer. The cost of the American Gray epoxy-mastic primer and bituminous coating will be considered completely covered by the contract lump sum price for American Gray Epoxy-Mastic Primer.

Shear connectors shall be in accordance with Sec 712, 1037 and 1080.
A FRP pile jacketing system may be used in lieu of pile encasement at the contractor's option. No additional payment will be made for this substitution. See special provisions.

Note: Existing sway bracing not shown for clarity. Shift reinforcing steel in the field to clear existing sway bracing.

Note: This drawing is not to scale. Follow dimensions.
Standard Drawing Guidance
(do not show on plans):

1. Use this note for coating any remaining piles or pile sections, and sway bracing not being repaired. Use this note on Front Sheet or Notes Sheet when no repair or no encasement is required. Include standard pay items “Surface Preparation for Applying Epoxy-Mastic Primer” and either “Aluminum Epoxy-Mastic Primer” or “Gray Epoxy-Mastic Primer”.

   “Aluminum” is preferred because it acts as both a barrier and corrosion protection where “Gray” only acts as a barrier. If for any reason coated pile is embedded in fresh concrete or “Gray” is being used elsewhere, “Aluminum” shall not be used.

2. See EPG 751.40.1.2.1 for guidance on when coating, encasement or jacketing, and plating or partial replacement should be considered.

3. Delete note if there is not any existing sway bracing.

---
Instructions for Pile Plating:

1. Number of 3" spaces shall be determined in the field to extend past the extents of the deteriorated area.
2. Plate length shall be determined in the field.
3. Extents of deteriorated area will be determined by the engineer.

For details of pile encasement, see Sheet No. ___.

All exposed surfaces of the existing structural steel piles will be coated in accordance with Sec. 11001 to a thickness of 20 mils minimum of primer and 80 mils minimum of epoxy-mastic primer applied over an SSPC-SP3 surface preparation. The cost of the primer and surfacing coating shall be applied on one foot above and below the existing ground line and in accordance with Sec. 11001. Coatings will not be required below the normal low water line. The cost of the surfacing coating shall be considered completely covered by the contract lump sum price for Applying Epoxy-Mastic Primer. The cost of the primer will be considered completely covered by the contract lump sum price for Aluminum Gray Epoxy-Mastic Primer (Add to either method).

Fabricated structural steel shall be ASTM A992 Grade 50 or higher. Field connections shall be made with 3/8" and 5/8" diameter holes. Existing piles shall be made with a minimum size of A325 Grade A325 Type 1 bolts and 13/16-inch diameter holes. All new or existing structural steel shall be coated with a minimum of two coats of inorganic zinc primer (5 mils minimum) applied over an SSPC-SP3 surface preparation. The cost of primer and surfacing coating shall be considered completely covered by the contract lump sum price for Steel Pile Repair. Variations may be encountered in the estimated quantities but the variations will not be used for an adjustment in the contract unit price.

Contact surfaces shall be in accordance with Sec. 1081 for surface preparation. All new or existing structural steel piles shall be coated with a minimum of two coats of primer and surfacing coating in accordance with Sec. 11001. The existing piles shall be coated with a minimum of two coats of primer and surfacing coating in accordance with Sec. 11001.

For Applying Epoxy-Mastic Primer. The cost of the aluminum gray epoxy-mastic primer applied over an SSPC-SP3 surface preparation shall be considered completely covered by the contract lump sum price for Applying Epoxy-Mastic Primer. The cost of the primer will be considered completely covered by the contract lump sum price for Aluminum Gray Epoxy-Mastic Primer (Add to either method).

General Notes:

New steel pile section shall be the same grade as, or greater than, the existing pile (ASTM A992 Grade 50 or 70).

New steel pile section shall be coated in accordance with Sec. 11001.

Only one pile shall be repaired at a time. Repair shall be a continuous operation from removal through backfilling.

Length and location of pile replacement will be determined by the engineer.

Cost of furnishing and installing structural steel piles, all field coating and any other incidental material or labor to complete pile repair, complete in place, will be considered completely covered by the contract unit price for Steel Pile Repair. Variations may be encountered in the estimated quantities but the variations will not be used for an adjustment in the contract unit price.

Cost of dewatering will be considered completely covered by the contract lump sum price for Class 2 Excavation.

Cost of dewatering will be considered completely covered by the contract lump sum price for Demolition. See supplemental details of HP12x53 Pile Encasement with Pile Repair Sheet.
Standard Drawing Guidance
(Do not show on plans):

1. Show only pile repair method required. Delete all other details. If used in combination, specify associated piles by method.

Based on similar percentage of section loss, pile plating may be more attractive than partial pile replacement. Details can be modified if only the web or flanges need to be plated. If only the web is plated, plates on each side of the web are required. If only a flange is to be plated, both flanges and plates on each side of the flanges are required. Overall symmetry of the section shall be maintained.

2. Based on additional factors other than just percent of section loss, partial pile replacement may be considered. Minimizing or eliminating traffic loading, adding falsework, or just having support conditions such as integral bents can help to determine the repair method. Pile replacement shall not be used if multiple piles need repair and falsework is not provided.

3. Use this note for coating any remaining piles or pile sections, and away bracing not being repaired. Use this note on Front Sheet or Notes Sheet when no repair or no encasement is required. Include standard pay items “Surface Preparation for Applying Epoxy-Mastic Primer” and either “Aluminum Epoxy-Mastic Primer” or “Gray Epoxy-Mastic Primer”.

*Aluminum* is preferred because it acts as both a barrier and corrosion protection where “Gray” only acts as a barrier. If for any reason coated pile is embedded in fresh concrete or “Gray” is being used elsewhere, “Aluminum” shall not be used.

4. If galvanizing is preferred, add splice detail and replace note with:

New steel pile section shall be galvanized. See special provisions.

See EPG 751.40.1.2.1 for guidance on when coating, encasement or jacketing, and plating or partial replacement should be considered.

Show Quantity Table on sheet. (Possible items given)

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 2 Excavation</td>
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<tr>
<td>Dewatering</td>
<td>lump sum</td>
<td>x</td>
</tr>
<tr>
<td>Surface Preparation for Applying Epoxy-Mastic Primer</td>
<td>lump sum</td>
<td>x</td>
</tr>
<tr>
<td>Aluminum Epoxy-Mastic Primer</td>
<td>lump sum</td>
<td>x</td>
</tr>
<tr>
<td>Gray Epoxy-Mastic Primer</td>
<td>lump sum</td>
<td>x</td>
</tr>
<tr>
<td>Steel Pipe Repair</td>
<td>linear foot</td>
<td>x</td>
</tr>
<tr>
<td>Pile Encasement</td>
<td>linear foot</td>
<td>x</td>
</tr>
</tbody>
</table>

These quantities are included in the Estimated Quantities table on Sheet No.
**BILL OF REINFORCING STEEL - EACH PILE**

<table>
<thead>
<tr>
<th>NO.</th>
<th>SIZE &amp; MARK</th>
<th>LENGTH</th>
<th>BENDING DIAGRAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>P1</td>
<td>10'-0&quot;</td>
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</tr>
<tr>
<td>5</td>
<td>V1</td>
<td>6'-0&quot;</td>
<td>SHAPE 20</td>
</tr>
</tbody>
</table>

**Notes:**
- All dimensions are out to out.
- All bars shall be epoxy coated.
- Minimum clearances to reinforcing steel shall be 1 1/2", unless otherwise shown.
- For details of pile plating, see Sheet No.  .

**General Notes:**
- All concrete for pile encasement shall be Class D (f'c = 3000 psi).
- Reinforcing steel shall be epoxy coated Grade 60 with fy = 60,000 psi.
- Actual lengths are measured along centerline of bar to the nearest inch.
- The exposed and accessible surfaces of the existing structural steel that will be encased in concrete shall be cleaned with a minimum of SSPC-SP-3 surface preparation and coated with a minimum of one coat of gray epoxy-mastic primer (non-aluminum) in accordance with Sec 1081 to produce a dry film thickness of not less than 3 mils before concrete is poured. The surface preparation and coating for piles shall extend a minimum of one foot outside the face of the pile encasement.
- Shear connectors shall be in accordance with Sec 712, 1037 and 1080.
- A CFRP pile jacketing system may be used in lieu of pile encasement at the contractor's option. No additional payment will be made for this substitution. See special provisions.

**PART ELEVATION SHOWING PILE ENCASEMENT**

- Existing and/or encasing pile clear of reinforcing steel in the field to clear existing sway bracing.

**SECTION SHOWING PILE ENCASEMENT WITH PILE PLATING**

- Shear connectors shall be in accordance with Sec 712, 1037 and 1080.
- For details of pile plating, see Sheet No.  .

**PILE ENCASEMENT WITH PILE REPAIR**

- Shear connectors shall be in accordance with Sec 712, 1037 and 1080.

- Existing and/or encasing pile clear of reinforcing steel in the field to clear existing sway bracing.

**SECTION SHOWING PILE ENCASEMENT WITH PARTIAL PILE REPLACEMENT**

- Shear connectors shall be in accordance with Sec 712, 1037 and 1080.

- Existing and/or encasing pile clear of reinforcing steel in the field to clear existing sway bracing.
Standard Drawing Guidance
(do not show on plans):

1. This sheet is supplemental to Details of Pile Repair Sheet. Use details that match the selected pile repair method. Delete all other details. Use general notes and bill of reinforcing steel for either method.

   See EPG 751.40 3.2.1 for guidance on when coating, encasement or jacketing, and plating or partial replacement should be considered.

2. Delete note if there is not any existing sway bracing.

   Existing sway bracing may need to be removed and replaced or reattached if it is located in the area of pile to be replaced or plated.

3. Shear connectors are only used for partial pile replacement.
**Bill of Reinforcing Steel - Each Pile**

<table>
<thead>
<tr>
<th>No.</th>
<th>Size &amp; Mark</th>
<th>Length</th>
<th>Shape</th>
<th>Bending Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vari</td>
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<td>10'-0&quot;</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8/5/V1</td>
<td></td>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**

- All dimensions are out to out.
- Hooks and bends shall be in accordance with the CRSI Manual of Standard Practice for Detailing Reinforced Concrete Structures: Stirrup and Tie Dimensions.
- All exposed lengths are measured along centerline of bar to the nearest inch.
- All bars shall be epoxy coated.

All exposed surfaces of the existing structural steel piles and sway bracing shall be recoated with one 6-mil thickness of Aluminum Gray Epoxy-Mastic Primer applied over an SSPC-SP 3 surface preparation in accordance with Sec 1081. A FRP pile jacketing system may be used in lieu of pile encasement at the contractor's option. No additional payment will be made for this substitution. See special provisions.

**General Notes:**

- All concrete for pile encasement shall be Class B (f′c = 3000 psi).
- The reinforcing steel shall be epoxy coated Grade 60 with fy = 60,000 psi.
- Minimum clearance to reinforcing steel shall be 3 1/2", unless otherwise shown.
- The exposed and accessible surfaces of the existing structural steel that will be encased shall be cleaned with a minimum of SSPC-SP-3 surface preparation and coated with a minimum of one coat of gray epoxy-mastic primer (non-aluminum) in accordance with Sec 1081. To produce a dry film thickness of not less than 3 mils, it is required that the surface preparation and coating for piles shall extend a minimum of one foot outside the face of the pile encasement.

**Pile Encasement**

Note: Existing sway bracing not shown for clarity. Shift reinforcing steel in the field to clear existing sway bracing.

**Part Elevation Showing Pile Encasement**

Clean and seal top pile with Protective Coatings and Piers (Urethane) see Sec 711.

**Section Showing Pile Encasement**

4" x 3/4"Ø Shear Connector (Typ.)

#4-P1 (Typ.)

#5-V1 (Typ.)
Standard Drawing Guidance
(do not show on plans):

1. Use this note for coating any remaining piles or pile sections, and sway bracing not being repaired. Use this note on Front Sheet or Notes Sheet when no repair or no encasement is required. Include standard pay items “Surface Preparation for Applying Epoxy-Mastic Primer” and either “Aluminum Epoxy-Mastic Primer” or “Gray Epoxy-Mastic Primer”.

   “Aluminum” is preferred because it acts as both a barrier and corrosion protection where “Gray” only acts as a barrier. If for any reason coated pile is embedded in fresh concrete or “Gray” is being used elsewhere, “Aluminum” shall not be used.

See EPG 751.40.1.2.1 for guidance on when coating, encasement or jacketing, and plating or partial replacement should be considered.

2. Delete note if there is not any existing sway bracing.
Standard Drawing Guidance

1. Show only pile repair method required. Delete all other details. If used in combination, specify associated pile(s) by method.

2. Based on similar percentage of section loss, pile plating may be more attractive than partial pile replacement. Details can be modified if only the web or flanges need to be plated. If only the web is plated, plates on each side of the web are required. If only a flange is to be plated, both flanges and plates on each side of the flanges are required. Overall symmetry of the section shall be maintained.

3. Based on additional factors other than just percent of section loss, partial pile replacement may be considered. Minimizing or eliminating traffic loading, adding falsework, or just having support conditions such as integral bents can help to determine the repair method. Pile replacement shall not be used if multiple piles need repair and falsework is not provided.

4. Use this note for coating any remaining piles or pile sections, and swaying being repaired. Use this note on Front Sheet or Notes Sheet when no repair or no encasement is required. Include standard pay items “Surface Preparation for Applying Epoxy-Mastic Primer” and either “Aluminum Epoxy-Mastic Primer” or “Gray Epoxy-Mastic Primer”.

   “Aluminum” is preferred because it acts as both a barrier and corrosion protection where “Gray” only acts as a barrier. If for any reason coated pile is embedded in fresh concrete or “Gray” is being used elsewhere, “Aluminum” shall not be used.

5. If galvanizing is preferred, add splice detail and replace note with:

   New steel pile section shall be galvanized. See special provisions.

See EPG 751.40.1.2.1 for guidance on when coating, encasement or jacketing, and plating or partial replacement should be considered.

Show Quantity Table on sheet. (Possible items given)

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 1 Excavation</td>
<td>lump sum</td>
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<tr>
<td>Dewatering</td>
<td>lump sum</td>
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<tr>
<td>Surface Preparation for Applying Epoxy-Mastic Primer</td>
<td>lump sum</td>
</tr>
<tr>
<td>Alumnum Epoxy-Mastic Primer</td>
<td>lump sum</td>
</tr>
<tr>
<td>Gray Epoxy-Mastic Primer</td>
<td>lump sum</td>
</tr>
<tr>
<td>Steel Pile Repair</td>
<td>linear ft</td>
</tr>
<tr>
<td>Pile Encasement</td>
<td>linear ft</td>
</tr>
</tbody>
</table>

These quantities are included in the Estimated Quantities table on Sheet No. .
Note: This drawing is not to scale. Follow dimensions.

Minimum clearance to reinforcing steel shall be 1 1/2", unless otherwise shown.

All concrete for pile encasement shall be Class B (f'c = 3000 psi). The reinforcing steel shall be epoxy coated Grade 60 with fy = 60,000 psi.

The exposed and accessible surfaces of the existing structural steel that will be encased in concrete shall be cleaned with a minimum of SSPC-SP-3 surface preparation and coated with a minimum of one coat of gray epoxy-mastic primer (non-aluminum) in accordance with Sec 1081 to produce a dry film thickness of not less than 3 mils before concrete is poured. The surface preparation and coating for piles shall extend a minimum of one foot outside the face of the pile encasement.

Note: Existing sway bracing not shown for clarity. Shift reinforcing steel in the field to clear existing sway bracing.

A FRP pile jacketing system may be used in lieu of pile encasement at the contractor's option. No additional payment will be made for this substitution. See special provisions.

FOR details of pile plating, see Sheet No. __.
Standard Drawing Guidance
(do not show on plans):

1. This sheet is supplemental to Details of Pile Repair Sheet. Use details that match the selected pile repair method. Delete all other details. Use general notes and bill of reinforcing steel for either method.

2. See EPG 751.40.1.2.1 for guidance on when coating, encasement or jacketing, and plating or partial replacement should be considered.

3. Delete note if there is not any existing sway bracing.

   Existing sway bracing may need to be removed and replaced or reattached if it is located in the area of pile to be replaced or plated.

4. Shear connectors are only used for partial pile replacement.
**Bill of Reinforcing Steel - Each Pile**

<table>
<thead>
<tr>
<th>NO.</th>
<th>Size &amp; Mark</th>
<th>Actual Length</th>
<th>Bending Diagram</th>
</tr>
</thead>
<tbody>
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<td>4 P1</td>
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</tr>
<tr>
<td>5 VI</td>
<td>Varied</td>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- All dimensions are out to out.
- Hooks and bends shall be in accordance with the CRSI Manual of Standard Practice for Detailing Reinforced Concrete Structures, Stirrup and Tie Dimensions.
- Actual lengths are measured along centerline of bar to the nearest inch.
- All bars shall be epoxy coated.

All exposed surfaces of the existing structural steel piles and sway bracing shall be recoated with one 6-mil thickness of aluminum epoxy-mastic primer applied over an SSPC-SP3 surface preparation in accordance with Sec 1081. The bituminous coating shall be applied one foot above and below the existing ground line and in accordance with Sec 702. These protective coatings shall be applied in accordance with Sec 1081. The cost of surface preparation will be considered completely covered by the contract lump sum price for Surface Preparation for Applying Epoxy-Mastic Primer. The cost of the thin film bonding epoxy-mastic primer and bituminous coating will be considered completely covered by the contract lump sum price for Aluminum Gray Epoxy-Mastic Primer.

**General Notes:**
- All concrete for pile encasement shall be Class B (f'c = 3000 psi).
- The reinforcing steel shall be epoxy coated Grade 60 with f_y = 60,000 psi.
- Minimum clearance to reinforcing steel shall be 1 1/2", unless otherwise shown.
- The exposed and accessible surfaces of the existing structural steel that will be encased in concrete shall be cleaned with a minimum of one coat of gray epoxy-mastic primer (Aluminum Gray Mastic) applied over an SSPC-SP3 surface preparation in accordance with Sec 1081. The bituminous coating shall be applied one foot above and below the existing ground line and in accordance with Sec 702. These protective coatings shall be applied in accordance with Sec 1081. The cost of surface preparation will be considered completely covered by the contract lump sum price for Surface Preparation for Applying Epoxy-Mastic Primer. The cost of the thin film bonding epoxy-mastic primer and bituminous coating will be considered completely covered by the contract lump sum price for Aluminum Gray Epoxy-Mastic Primer.

Cost of dewatering will be considered completely covered by the contract lump sum price for Dewatering. See special provisions.

A FRP pile jacketing system may be used in lieu of pile encasement at the contractor's option. No additional payment will be made for this substitution. See special provisions.

# Existing Pile & # Pile Encasement

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**Notes:**
- This drawing is not to scale. Follow dimensions.

**Pile Encasement**

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**Notes:**
- This drawing is not to scale. Follow dimensions.
**Standard Drawing Guidance**

*(do not show on plans)*:

1. Use this note for coating any remaining piles or pile sections, and sway bracing not being repaired. Use this note on Front Sheet or Notes Sheet when no repair or no encasement is required. Include standard pay items “Surface Preparation for Applying Epoxy-Mastic Primer” and either “Aluminum Epoxy-Mastic Primer” or “Gray Epoxy-Mastic Primer”. “Aluminum” is preferred because it acts as both a barrier and corrosion protection where “Gray” only acts as a barrier. If for any reason coated pile is embedded in fresh concrete or “Gray” is being used elsewhere, “Aluminum” shall not be used.

See EPG 751.40.1.2.1 for guidance on coating, encasement or jacketing, and plating or partial replacement should be considered.

2. Delete note if there is not any existing sway bracing.
PART PLAN SHOWING CORED SLAB DRAIN LOCATIONS

EXHIBIT PLAN

RHB18_Cored_Slab_Drains Alternate Details Sh. 1 of 2

Prestressed Girder, Existing Curb Blockout

Attach angle to existing prestressed girder with using an approved epoxy adhesive.

Fill with epoxy mortar. See Sec 623.20 (1)

PART SECTION NEAR DRAIN

SOLID SLAB

(1) Use backer rod around drain @ bottom of slab and epoxy inject from the top.

PART SECTION SHOWING BRACKET ASSEMBLY

Attachment angle to existing prestressed girder web using an approved epoxy adhesive.
ANCHOR TO EXISTING SLAB, STEEL GIRDER

(Based on A2015 & A49301)

(1) Use backer rod around drain @ bottom of slab and epoxy inject from the top.

Plan of Drain

Plan of Optional FRP Drain

Part Plan of Slab at Drain

Part Section Showing Bracket Assembly

Elevation of Drain

Part Section Near Drain

(1) Use backer rod around drain @ bottom of slab and epoxy inject from the top.
General Notes:
- Contractor shall have the option to construct either steel or FRP slab drains. All drains shall be of same type.
- Slab drain assembly shall be ASTM A709 Grade 36 steel.
- Locate drains in slab by dimensions shown in Part Section Near Drain.
- Reinforcing steel shall be shifted to clear drain.
- The coil inserts and bracket assembly shall be galvanized in accordance with ASTM A123.
- All bolts, hardened washers, lock washers and nuts shall be galvanized in accordance with ASTM A153 (Class B
- All 1/2" bolts shall be ASTM A507.

Shop drawings will not be required for the slab drain and the bracket assembly.
- The coil inserts required for the bracket assembly attachment shall be located in the prestressed girder shop drawings.
- Coil inserts shall have a concrete pull-out strength (ultimate load) of at least 2,500 pounds in 5,000 psi concrete.
- The bolt required to attach the slab drain bracket assembly to the prestressed girder shall be supplied by the prestressed girder fabricator.

Notes for Steel Drain:
- Slab drains may be fabricated of either steel or from 1/4" structural steel tubing ASTM A500 or A501.
- Outside dimensions of drains are 8" x 4".
- The slab drain shall be galvanized in accordance with ASTM A123.

Notes for FRP Drain:
- Drains shall be made from FRP or FRP-steel to meet the requirements of ASTM D2996 in the following exceptions:
  - Shape of drains shall be rectangular with outside nominal dimensions of 8" x 4".
  - Minimum reinforced wall thickness shall be 1/4 inch.
- The resin used shall be ultraviolet (UV) resistant and shall have all additives mixed throughout. Drains may have an exterior coating for additional UV resistance.
- The color of the slab drain shall be gray in accordance with Standard 523. The color shall be uniform throughout the resin and any coating applied.
- The combination of materials used in the manufacture of the drain shall be subjected to additional test for its resistance in accordance with ASTM D4329 Cycle B. The representative material shall withstand at least 500 hours of testing with only minor discoloration and without any physical deterioration. The color shall be uniform throughout. The test results shall be determined within 45 days prior to acceptance of the slab drains.
- The slab drain shall be supplied by the manufacturer to ensure a smooth, chip free cut.
- All drained shall be predrilled for the specified cement grouts. The method of grouting the slab drain shall be specified by the contractor and shall be in accordance with the prestressed girder shop drawings.
Standard Drawing Guidance (do not show on plans):

1. Replace example Plan of Slab Showing Slab Drain Locations with actual plan.

2. Details shown inside the sheet border are for drains transverse to roadway requiring a cantilever 4 feet or more. Use the below details for drains parallel to roadway requiring a cantilever 3'-8" or more.

3. Delete panels for CIP slab.

4. Total drain length is equal to 9' + maximum girder and haunch + slab thickness, rounded up to the next whole inch.

Alternate details for Type B barrier (SBC):
**Notes for Steel Drain:**

Slab drains may be fabricated of either: 1/4" buildings or sheet of ASTM A36 steel, or 1/4" structural steel tubing ASTM A500 or A501. Slab drains may be fabricated of either 1/4" structural steel tubing ASTM A500 or A501. The slab drain bracket assembly to the prestressed girder shall be the required ultraviolet testing prior to acceptance of the slab drains. The combination of materials used in the manufacture of the slab is not limited to ASTM D2996 with the following exceptions:

- **Elevation of Drain:** The color shall be uniform throughout the resin and any coating used.
- **Shape of Drain:** The resin shall be rejected if the slab drain shall be as recommended by the manufacturer to ensure a smooth, chip-free appearance. Drains may have an exterior face of 9/16"Ø hole in angle for the prestressed girder shop drawings. All bolts, hardened washers, lock washers, and coil inserts shall be galvanized in accordance with ASTM A123. The combination of materials used in the construction of the slab drains is not limited to the following exceptions:

**Notes for FRP Drain:**

The combination of materials used in the manufacture of the slab shall be tested for UV resistance in accordance with ASTM D2996 with the following exceptions:

- **Shape of Drain:** The color shall be uniform throughout the resin and any coating used.
- **Elevation of Drain:** The color shall be uniform throughout the resin and any coating used.
- **Shape of Drain:** The resin shall be tested for UV resistance in accordance with ASTM D2996 with the following exceptions:

**General Notes:**

- Contractor shall have the option to construct either steel or FRP slab drains. All slab drain bracket assembly shall be in accordance with ASTM A500 or A501. Slab drain bracket assembly shall be located on the prestressed girder shop drawings. The coil inserts required for the bracket assembly shall be located on the prestressed girder shop drawings. The bolt required to attach the slab drain bracket assembly to the prestressed girder shall be galvanized in accordance with ASTM A123.

- All drain pieces shall be Robinhood in accordance with ASTM D2996 with the following exceptions:

- **General Notes:**

- **Elevation of Drain:** The color shall be uniform throughout the resin and any coating used.
- **Shape of Drain:** The resin shall be rejected if the slab drain shall be as recommended by the manufacturer to ensure a smooth, chip-free appearance. Drains may have an exterior face of 9/16"Ø hole in angle for the prestressed girder shop drawings. All bolts, hardened washers, lock washers, and coil inserts shall be galvanized in accordance with ASTM A123. The combination of materials used in the manufacture of the slab drains shall be tested for UV resistance in accordance with ASTM D2996 with the following exceptions:

- **Shape of Drain:** The color shall be uniform throughout the resin and any coating used.
- **Elevation of Drain:** The color shall be uniform throughout the resin and any coating used.
- **Shape of Drain:** The resin shall be tested for UV resistance in accordance with ASTM D2996 with the following exceptions:
Standard Drawing Guidance (do not show on plans):

1. Replace example Plan of Slab Showing Slab Drain Locations with actual plan.
2. Details shown inside the sheet border are for drains transverse to roadway requiring a cantilever 4 feet or more. Use the below details for drains parallel to roadway requiring a cantilever 3'-8" or more.
3. Delete panels for CIP slab.
4. Total drain length is equal to 9" + maximum girder and haunch + slab thickness, rounded up to the next whole inch.

Alternate details for Type B barrier (SBC):

PART PLAN OF SLAB AT DRAIN

PART SECTION SHOWING BRACKET ASSEMBLY

ELEVATION OF DRAIN

PART PLAN OF SLAB AT DRAIN

PLAN OF STEEL DRAIN OPTION

PLAN OF FRP DRAIN OPTION
**General Notes:**

Contractor shall have the option to construct either steel or FRP slab drains. All slab drains shall be of the same type.

Slab drain bracket assembly shall be ASTM A500 Grade 36 steel.

Locate drains in slab by dimensions shown in Part Section Near Drain.

Reinforcing steel shall be shifted to clear drain locations.

The bracket assembly shall be galvanized in accordance with ASTM A123.

All bolts, washers, and nuts shall be galvanized in accordance with ASTM A522 (ASTM A250, Class C).

**Notes for Steel Drain:**

Slab drains may be fabricated of either 1/4-inch welded sheets of ASTM A36 Grade 36 steel or from 1/4-inch structural steel (no ASTM A500 or A501).

Outside dimensions of drains are 8" x 4".

The slabs shall be galvanized in accordance with ASTM A500.

**Notes for FRP Drain:**

Drains shall be machine filament wound thermosetting resin tubing meeting the requirements of ASTM D2996 with the thermosetting resin tubing meeting the requirements of ASTM D2996 with the requirements of ASTM D2996 with the requirements of ASTM D2996 with the requirements of ASTM D2996 with the.
Standard Drawing Guidance (do not show on plans):

1. Replace example Plan of Slab Showing Slab Drain Locations with actual plan.

2. Details shown inside the sheet border are for drains transverse to roadway. Use the below details for drains parallel to roadway.

3. Use 1/6 of web depth.

4. Use with weathering steel. Delete for painted or galvanized steel.

5. Type 3 for weathering steel; Type 1 for painted or galvanized steel.

6. Delete panel for CIP slab.

7. Total drain length is equal to 9" + maximum girder and haunch + slab thickness, rounded up to the next whole inch.

**Alternate details for Type B barrier (SBC):**

- **Angle (1/4" min., 1/2" max. thickness) (3" min. legs) x 2" long**
- **Slot in L2x2x16**
- **Bent Strip 10 Gauge [Min.] x 2 L2x2x4**
- **9/16"Ø hole in angle for 1/2"Ø bolt with 2 hardened washers, lock washer, and nut**
- **Bent Strip 1/8"Ø hole in angle for 1/2"Ø bolt with lock washer and nut**
- **1/2"Ø bolt with 9/16"Ø hole in angle for Type 3 bolt with 9/16"Ø hole in angle for Type 3 bolt with 1/2"Ø bolt with lock washer and nut (Typ.)**
- **1/2"Ø bolt with 9/16"Ø hole in angle for Type 3 bolt with 1/2"Ø bolt with lock washer and nut (Typ.)**
- **1/2"Ø bolt with lock washer and nut (Typ.)**

**Plan of Steel Drain Option**

- **1/2"Ø x 3" Rod (ASTM A307 Grade A325) or 1/2"Ø x 3" Shear Connector (Typ.)**
- **1/2"Ø x 3" Rod (ASTM A307 Grade A325) or 1/2"Ø x 3" Shear Connector (Typ.)**

**Plan of FRP Drain Option**

- **1/2"Ø x 3" Rod (ASTM A307 Grade A325) or 1/2"Ø x 3" Shear Connector (Typ.)**
- **1/2"Ø x 3" Rod (ASTM A307 Grade A325) or 1/2"Ø x 3" Shear Connector (Typ.)**
General Notes:
Contractor shall have the option to construct either steel or FRP slab drains. All drains shall be of same type.

Slab drains may be fabricated of either (1) 4" welded sheets of ASTM A709 Grade 36 steel or from (2) Structural steel tubing ASTM A500 or A501.

Outside dimensions of drains are 8" x 4". The drains shall be galvanized in accordance with ASTM A123.

Notes for Steel Drain:
Drains shall be machine filament-wound thermosetting resin tubing meeting the requirements of ASTM D2996 with the following exceptions:

- The resin used shall be ultraviolet (UV) resistant and/or have UV inhibitors mixed throughout. Drains may have an exterior coating for additional UV resistance.
- The color of the slab drain shall be gray (Federal Standard 26373). The color shall be uniform throughout the resin and any coating used.
- The combination of materials used in the manufacture of the drain shall be tested for UV resistance in accordance with ASTM D4329 Cycle A. The representative material shall withstand at least 500 hours of testing with only minor discoloration and without any physical deterioration. The contractor shall furnish the results of the required UV testing prior to acceptance of the slab drains.

At the contractor’s option, drains may be field cut. The method of cutting FRP slab drain shall be as recommended by the manufacturer to ensure a smooth, chip free cut.

Notes for FRP Drain:
Drains shall be machine filament-wound thermosetting resin tubing meeting the requirements of ASTM D2996 with the following exceptions:

- Shape of drains shall be rectangular with outside nominal dimensions of 8" x 4".
- Minimum reinforced wall thickness shall be 1/16 inch.
- The resin used shall be ultraviolet (UV) resistant and/or have UV inhibitors mixed throughout. Drains may have an exterior coating for additional UV resistance.
- The color of the slab drain shall be gray (Federal Standard 26373). The color shall be uniform throughout the resin and any coating used.
- Reinforcing steel shall be shifted to clear drains. Shop drawings will not be required for the slab drains.

SLAB DRAINS

Plan of Slab Showing Slab Drain Locations

Plan of Steel Drain Option

Plan of FRP Drain Option

Note: This drawing is not to scale. Follow dimensions.
Standard Drawing Guidance (do not show on plans):

1. Replace example Plan of Slab Showing Slab Drain Locations with actual plan.
2. Details shown inside the sheet border are for drains transverse to roadway. Use the below details for drains parallel to roadway.

Alternate details for Type B barrier (SBC):

- Drain
- Inside face of Barrier
- Drain
- Inside face of Barrier
- Drain
- Inside face of Barrier

Connector (Typ.): 1/2"Ø x 3"± Shear (ASTM A709 Grade 36)

Lock Washer (Typ.) with Hex Nut and Carriage Bolt

1/2"Ø x 3" Galv. Carriage Bolt with Hex Nut and Lock Washer (Typ.)

Plan of Steel Drain Option

Plan of FRP Drain Option

Part Plan of Slab at Drain

Part Plan of Slab at Drain

Elevation of Drain
General Notes:

Contractor shall have the option to construct either steel or FRP slab drains. All slabs shall be of same type.

Slab drain bracket assembly shall be ASTM A109 Grade 36 steel.

Locate drains in slab by dimensions shown in Part Section Near Drain.

Reinforcing steel shall be shifted to clear drains.

The coil inserts and bracket assembly shall be galvanized in accordance with ASTM A123.

All bolts, hardened washers, lock washers and nuts shall be galvanized in accordance with ASTM A153. Class C.

All 1/2"Ø bolts shall be ASTM A307.

Shop drawings will not be required for the slab drains and the bracket assembly.

Coil inserts shall have a combined bend out strength (ultimatum load) of at least 2,500 pounds in 3,000 psi concrete.

The bolt required to attach the slab drain bracket assembly to the prestressed girder shop drawings.

The coil required for the bracket assembly attachment shall be located on the prestressed girder shop drawings.

The coil required to attach the slab drain bracket assembly to the prestressed girder shop drawings.

The bolt required to attach the slab drain bracket assembly to the prestressed girder shop drawings.

The bolt required to attach the slab drain bracket assembly to the prestressed girder shop drawings.

Notes for Steel Drain:

Slab drains may be fabricated of either 1/2"Ø x 3" galvanized or 1/4" structural steel tubing or 1/4" x 3/8" structural steel angles.

Outside dimensions of drainage are 8" x 4".

The drains shall be galvanized in accordance with ASTM A153.

Notes for FRP Drain:

Drains shall be machined from filament-wound thermosetting resin tubing meeting the requirements of USACE D5955 with the resin family of R101 with the HC-140 family.

Shape of drain shall be rectangular with a minimum reinforced wall thickness of 1/4 inch.

Minimum reinforced wall thickness shall be 1/4 inch.

The resin used shall be ultraviolet (UV) resistant and shall have UV inhibitors mixed in the coating used.

The color of the slab drain shall be gray (Federal Standard 26373). The color shall be uniform throughout the resin and any coating used.

The combination of materials used in the manufacture of the drains shall be tested in accordance with ASTM D4329 Cycle A. The representative material shall be tested in accordance with only minor disassociation and without any physical deterioration. The contractor shall furnish results of the testing conducted in accordance with the ASTM standards.

As the contractor's option, drains may be field cut. The method of cutting FRP slab drain shall be as recommended by the manufacturer to ensure a smooth, chip free finish.

Notes for FRP Drain:

Drains shall be galvanized in accordance with ASTM A123.

Notes for Steel Drain:

Drains shall be galvanized in accordance with ASTM A123.

Notes for FRP Drain:

Drains shall be galvanized in accordance with ASTM A123.

Notes for Steel Drain:

Drains shall be galvanized in accordance with ASTM A123.
Standard Drawing Guidance (do not show on plans):

1. Replace example Plan of Slab Showing Slab Drain Locations with actual plan.

2. Details shown inside the sheet border are for drains transverse to roadway requiring a cantilever of at least 2'-9 1/2" for Type 2, 3 & 4 and at least 3'-3" for Type 6. Use the below details for drains parallel to roadway requiring a cantilever of at least 2'-5 1/2" for Type 2, 3 & 4 and at least 2'-11" for Type 6.

3. Details shown inside the sheet border are for Type 2, 3 & 4 girders. Use the below left details for Type 6 girders.

4. Delete panel for CIP slab.

5. Total drain length is equal to 9" + maximum girder and haunch + slab thickness, rounded UP to the next whole inch.
General Notes:

All drains shall be of the same type. Slab drain assembly shall be ASTM A790 Grade 36 steel. Located drains in slab by dimensions shown in Part Section Near Drain. Reinforcing steel shall be shifted to clear drains. The coil inserts and bracket assembly shall be galvanized in accordance with ASTM A525. All bolts, hardened washers, lock washers and nuts shall be galvanized in accordance with ASTM A325. All 1/2" bolts shall be ASTM A307.

Shop drawings will not be required for the slab drain and the bracket assembly.

The coil insert required for the bracket assembly attachment shall be located on the prestressed girder shop drawings. The coil insert shall have a concrete pull-out strength of at least 2,500 pounds in 3,000 psi concrete. The bolt required to attach the slab drain bracket assembly to the prestressed girder shall be supplied by the prestressed girder fabricator.

Notes for Steel Drain:

Slab drain may be fabricated of other 11⁄4" thick sheets of ASTM A790 Grade 36 steel or from 11⁄4" structural steel tubing ASTM A500 or A501. Outside dimensions of drain are 8" x 4". The drain shall be galvanized in accordance with ASTM A123.

Notes for FRP Drain:

Drains shall be machine filament-wound thermosetting resin tubing meeting the requirements of ASTM D2996 with the following exceptions:

- Shape of drain shall be rectangular with outside nominal dimensions of 8" x 4".
- Minimum reinforced wall thickness shall be 1/8 inch.
- The resin used shall be ultraviolet (UV) resistant and/or have ultraviolet additives throughout. Drains may have an exterior coating for additional UV resistance.
- The color of the slab drain shall be gray (Federal Standard 28355). The color shall be uniform throughout the resin and any coating used.
- The combination of materials used in the manufacture of the drains shall be tested for UV resistance in accordance with ASTM D4329 Cycle A. The representative material shall withstand at least 500 hours of testing with only minor discoloration and the required ultraviolet testing prior to acceptance of the slab drains. The combination of materials used in the manufacture of the drains shall be tested for UV resistance in accordance with ASTM D4329 Cycle A. The representative material shall withstand at least 500 hours of testing with only minor discoloration and the required ultraviolet testing prior to acceptance of the slab drains. The combination of materials used in the manufacture of the drains shall be tested for UV resistance in accordance with ASTM D4329 Cycle A. The representative material shall withstand at least 500 hours of testing with only minor discoloration and the required ultraviolet testing prior to acceptance of the slab drains. The combination of materials used in the manufacture of the drains shall be tested for UV resistance in accordance with ASTM D4329 Cycle A. The representative material shall withstand at least 500 hours of testing with only minor discoloration and the required ultraviolet testing prior to acceptance of the slab drains.
- All drains shall be of the same type. Slab drain assembly shall be ASTM A790 Grade 36 steel. Located drains in slab by dimensions shown in Part Section Near Drain. Reinforcing steel shall be shifted to clear drains. The coil inserts and bracket assembly shall be galvanized in accordance with ASTM A525. All bolts, hardened washers, lock washers and nuts shall be galvanized in accordance with ASTM A325. All 1/2" bolts shall be ASTM A307.

Shop drawings will not be required for the slab drain and the bracket assembly. The coil insert required for the bracket assembly attachment shall be located on the prestressed girder shop drawings. The coil insert shall have a concrete pull-out strength of at least 2,500 pounds in 3,000 psi concrete. The bolt required to attach the slab drain bracket assembly to the prestressed girder shall be supplied by the prestressed girder fabricator.

Notes for FRP Drain:

- Slab drains may be fabricated of other 11⁄4" thick sheets of ASTM A790 Grade 36 steel or from 11⁄4" structural steel tubing ASTM A500 or A501.
- Outside dimensions of drain are 8" x 4". The drain shall be galvanized in accordance with ASTM A123.
- Notes for Steel Drain:

- Slab drain may be fabricated of other 11⁄4" thick sheets of ASTM A790 Grade 36 steel or from 11⁄4" structural steel tubing ASTM A500 or A501. Outside dimensions of drain are 8" x 4". The drain shall be galvanized in accordance with ASTM A123.
- Notes for FRP Drain:

- Slab drains may be fabricated of other 11⁄4" thick sheets of ASTM A790 Grade 36 steel or from 11⁄4" structural steel tubing ASTM A500 or A501. Outside dimensions of drain are 8" x 4". The drain shall be galvanized in accordance with ASTM A123.
Standard Drawing Guidance (do not show on plans):

1. Replace example Plan of Slab Showing Slab Drain Locations with actual plan.

2. Details shown inside the sheet border are for drains transverse to roadway requiring a cantilever 4 feet or more. Use the below details for drains parallel to roadway requiring a cantilever 3'-8" or more.

3. Delete panels for CIP slab.

4. Total drain length is equal to 9" + maximum girder and haunch + slab thickness, rounded up to the next whole inch.
**General Notes:**

Contractor shall have the option to construct slab drain option FRP drain. All drains shall be of same type.

- Slab drain bracket assembly shall be ASTM A500 Grade 36 steel.
- Locate drains in slab by dimensions shown in Part Section Near Drain.
- Reinforcing steel shall be shifted to clear drains.
- The coil inserts and bracket assembly shall be galvanized in accordance with ASTM A153.
Standard Drawing Guidance (do not show on plans):

1. Replace example Plan of Slab Showing Slab Drain Locations with actual plan.

2. Details shown inside the sheet border are for drains transverse to roadway requiring a cantilever 3'-9 1/2" or more. Use the below details for drains parallel to roadway requiring a cantilever 3'-3 3/4" or more.

3. Delete panel for CIP slab.

4. Total drain length is equal to 9" + maximum girder and haunch + slab thickness, rounded up to the next whole inch.

Alternate details for Type B barrier (SBC):

- Part Plan of Slab at Drain
- Part Plan of Slab at Drain
- Part Section Showing Bracket Assembly
- Elevation of Drain
- Plan of Steel Drain Option
- Plan of FRP Drain Option
**General Notes:**
- Contractor shall have the option to construct either steel or FRP slab drains. All drains shall be of same type.
- Slab drain bracket assembly shall be ASTM A709 Grade 36 steel.
- Locate drains in slab by dimensions shown in Part Section Near Drain.
- Reinforcing steel shall be shifted to clear drains.
- The coil inserts and bracket assembly shall be galvanized in accordance with ASTM A123.
- All bolts, hardened washers, lock washers and nuts shall be galvanized in accordance with ASTM A153.
- All 1/2" bolts shall be ASTM A307.
- Shop drawings will not be required for the slab drains and the bracket assembly.
- The coil inserts required for the bracket assembly attachment shall be located on the prestressed beam shop drawings.
- Coil inserts shall have a concrete pull-out strength ultimate load of at least 2,500 pounds in 3,000 psi concrete.
- The bolts required to attach the slab drain bracket assembly to the prestressed beam shall be supplied by the prestressed beam fabricator.

**Notes for Steel Drain:**
- Slab drains may be fabricated of structural steel tubing ASTM A500 or A501.
- Outside dimensions of drains are 8" x 4".
- The drain shall be galvanized in accordance with ASTM A123.

**Notes for FRP Drain:**
- Drains shall be machine filament wound thermosetting resin tubing meeting the requirements of ASTM D2996 with the following exceptions:
  - Shape of drains shall be rectangular with outside nominal dimensions of 8" x 4".
  - Minimum reinforced wall thickness shall be 1/16 inch.
  - The resin used shall be ultraviolet (UV) resistant and/or have the resistance meeting the requirements of ASTM D4329 Cycle A. The color of the slab drain shall be grey (Federal Standard 26373). The color shall be uniform throughout the resin and any coating used.
  - The combination of materials used in the manufacture of the slab shall be tested for UV resistance in accordance with ASTM D4329. The representative material shall withstand at least 500 hours of testing with only minor discoloration and no deterioration. The contractor shall furnish the results of the required ultraviolet testing prior to acceptance of the slab drains.
- As the contractor's option, drains may be field cut. The method of cutting FRP slab drain shall be as recommended by the manufacturer to ensure a smooth, chip free cut.

**Contractor's Notes:**
- Slab drain fabrication shall be performed in accordance with the drawings and specifications provided.
- All materials shall be of the quality specified and shall comply with all applicable standards and specifications.
- Contractor shall ensure that all work is performed in accordance with good engineering practices and in a manner that will ensure the safe and efficient operation of the slab drains.

**Materials:**
- Reinforcing steel shall be ASTM A709 Grade 36 or ASTM A501.
- Slab drain fabrication shall be performed in accordance with the drawings and specifications provided.
- Contractor shall ensure that all work is performed in accordance with good engineering practices and in a manner that will ensure the safe and efficient operation of the slab drains.

**Quality Control:**
- All materials shall be of the quality specified and shall comply with all applicable standards and specifications.
- Contractor shall ensure that all work is performed in accordance with good engineering practices and in a manner that will ensure the safe and efficient operation of the slab drains.

**General Construction Notes:**
- Contractor shall ensure that all work is performed in accordance with good engineering practices and in a manner that will ensure the safe and efficient operation of the slab drains.
- All materials shall be of the quality specified and shall comply with all applicable standards and specifications.

**Sunlight Resistance:**
- Slab drains shall be tested for sunlight resistance in accordance with ASTM D4329 Cycle A. The representative material shall withstand at least 500 hours of testing with only minor discoloration and no deterioration. The contractor shall furnish the results of the required ultraviolet testing prior to acceptance of the slab drains.

**Field Cut:**
- Contractor may perform field cut. The method of cutting FRP slab drain shall be as recommended by the manufacturer to ensure a smooth, chip free cut.

**Coil Inserts:**
- Coil inserts shall have a concrete pull-out strength ultimate load of at least 2,500 pounds in 3,000 psi concrete.
- The bolts required to attach the slab drain bracket assembly to the prestressed beam shall be supplied by the prestressed beam fabricator.
Standard Drawing Guidance (do not show on plans):

1. Replace example Plan of Slab Showing Slab Drain Locations with actual plan. Verify slab drain does not block vent pipe in box beam.

2. Details shown inside the sheet border are for drains transverse to roadway requiring a cantilever 4'-3" or more. Use the below details for drains parallel to roadway requiring a cantilever 3'-11" or more.

3. Use half of the beam depth.

4. Beam manufacturer determines required distance between inserts with coordination between contractor and drain supplier.

Alternate details for Type B barrier (SBC):

PART PLAN OF SLAB AT DRAIN

PART PLAN OF SLAB AT DRAIN

PART SECTION SHOWING BRACKET ASSEMBLY

PLAN OF STEEL DRAIN OPTION

PLAN OF FRP DRAIN OPTION
**General Notes:**

Contractor shall have the option to construct either steel or FRP slab drains. 

All drains shall be of same type.

Slab drain bracket assembly shall be ASTM A709 Grade 36 steel.

Locate drains in slab by dimensions shown in Part Section Near Drain.

Reinforcing steel shall not be obstructed. Approval of the engineer is required.

The coil inserts required for the bracket assembly attachment shall be locked on the prestressed beam shop drawings.

Shop drawings will not be required for the slab drain and the bracket assembly.

Notes for Steel Drain:

Slab drains may be fabricated of either 1/4" mild steel sheet of ASTM A709 Grade 36 steel or from 1/4" structural steel tubing ASTM A500 or A552.

Outside dimensions of drains are 8" x 4".

The drains shall be galvanized in accordance with ASTM A123.

Notes for FRP Drain:

Drains shall be manufactured from thermosetting resin tubing meeting the requirements of ASTM D2996 with the following exceptions:

Shape of drains shall be rectangular with thermostatic resin tubing meeting the requirements of ASTM D2996 with the following exceptions:

The resin used shall be ultraviolet resistant and/or have UV inhibitors mixed in throughout. Drains may have an exterior coating for additional UV resistance.

The color of the slab drain shall be gray (Federal Standard 26373). The color shall be uniform throughout the resin and any coating used.

The combination of materials used in the manufacture of the drainage shall be tested for UV resistance in accordance with ASTM D4329 Cycle A. The requirements of ASTM D2996 shall withstand at least 500 hours of testing with only minor discoloration and shall maintain 1" (min.) clearance to box beam (Typ.).

The coil inserts required for the bracket assembly to the prestressed beam shall be supplied by the prestressed beam fabricator.

Outside dimensions of drains are 8" x 4".

The drains shall be galvanized in accordance with ASTM A123.
**Standard Drawing Guidance (do not show on plans):**

1. **Replace example Plan of Slab Showing Slab Drain Locations with actual plan.** Verify slab drain does not block vent pipe in box beam.

2. **Details shown inside the sheet border are for drains transverse to roadway requiring a cantilever 3'-9 3/8" or more. Use the below details for drains parallel to roadway requiring a cantilever 3'-3 5/8" or more.**

3. **Use half of the beam depth.**

4. **Beam manufacturer determines required distance between inserts with coordination between contractor and drain supplier.**

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**Alternate details for Type B barrier (SBC):**

- **1/2"Ø x 3" Galv. Carriage Bolt with hex nut and lock washer**
- **1/2"Ø x 3" Shear Connector (Typ.)**
- **1/2"Ø x 3" Rod (ASTM A709 Grade 36)**
- **10 Gage (Min.) x 2" Bent Strip**
- **Coil Insert & 9/16"Ø Hole for 1/2"Ø bolt with lock washer**
- **5/8"Ø Steel Spacer to maintain 1" (min.) clearance to box beam (Typ.)**
- **5/8"Ø Prestressed Box Beam**
- **8" x 8" x 74" Drain**
- **PART SECTION SHOWING BRACKET ASSEMBLY**
- **PART PLAN OF SLAB AT DRAIN**
- **PART PLAN OF SLAB AT DRAIN**
- **ELEVATION OF DRAIN**
- **PLAN OF STEEL DRAIN OPTION**
- **PLAN OF FRP DRAIN OPTION**

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**S_DRA09_BXB_angle Guidance & Alternate Details**
General Notes:

Contractor shall have the option to construct either steel or FRP slab drains. All drains shall be of the same type.

Slab drain bracket assembly shall be ASTM A795 Grade 36 steel.

Lolute drains in slab by dimensions shown in Part Section Near Drain.

Reinforcing steel shall be shifted to clear drains.

The bracket assembly shall be galvanized in accordance with ASTM A123.

All bolts, lock washers, nut washers and nuts shall be galvanized in accordance with AASHTO M 232 (ASTM A55), Class C, with AASHTO M 294 (ASTM A325), Class 2.

\[\text{Notes for FRP Drain:}\]

- Slab drains may be fabricated of either 1/4" thick sheets of ASTM A795 Grade 36 or from 1/2" structural steel tubing ASTM A500 or A520.
- Outside dimensions of drains are 8" x 4".
- The drains shall be galvanized in accordance with ASTM A123.

Notes for Steel Drain:

- Slab drains may be fabricated of either 1/4" thick sheets of ASTM A795 Grade 36 steel or from 1/2" structural steel tubing ASTM A500 or A520.
- Outside dimensions of drains are 8" x 4".
- The drains shall be galvanized in accordance with ASTM A123.

Notes for FRP Drain:

- Slab drains may be fabricated of either 1/4" thick sheets of ASTM A795 Grade 36 or from 1/2" structural steel tubing ASTM A500 or A520.
- Outside dimensions of drains are 8" x 4".
- The drains shall be galvanized in accordance with ASTM A123.

Notes for Steel Drain:

- Slab drains may be fabricated of either 1/4" thick sheets of ASTM A795 Grade 36 steel or from 1/2" structural steel tubing ASTM A500 or A520.
- Outside dimensions of drains are 8" x 4".
- The drains shall be galvanized in accordance with ASTM A123.

Notes for FRP Drain:

- Slab drains may be fabricated of either 1/4" thick sheets of ASTM A795 Grade 36 or from 1/2" structural steel tubing ASTM A500 or A520.
- Outside dimensions of drains are 8" x 4".
- The drains shall be galvanized in accordance with ASTM A123.

Notes for Steel Drain:

- Slab drains may be fabricated of either 1/4" thick sheets of ASTM A795 Grade 36 steel or from 1/2" structural steel tubing ASTM A500 or A520.
- Outside dimensions of drains are 8" x 4".
- The drains shall be galvanized in accordance with ASTM A123.

Notes for FRP Drain:

- Slab drains may be fabricated of either 1/4" thick sheets of ASTM A795 Grade 36 or from 1/2" structural steel tubing ASTM A500 or A520.
- Outside dimensions of drains are 8" x 4".
- The drains shall be galvanized in accordance with ASTM A123.

Notes for Steel Drain:

- Slab drains may be fabricated of either 1/4" thick sheets of ASTM A795 Grade 36 steel or from 1/2" structural steel tubing ASTM A500 or A520.
- Outside dimensions of drains are 8" x 4".
- The drains shall be galvanized in accordance with ASTM A123.

Notes for FRP Drain:

- Slab drains may be fabricated of either 1/4" thick sheets of ASTM A795 Grade 36 or from 1/2" structural steel tubing ASTM A500 or A520.
- Outside dimensions of drains are 8" x 4".
- The drains shall be galvanized in accordance with ASTM A123.

Notes for Steel Drain:

- Slab drains may be fabricated of either 1/4" thick sheets of ASTM A795 Grade 36 steel or from 1/2" structural steel tubing ASTM A500 or A520.
- Outside dimensions of drains are 8" x 4".
- The drains shall be galvanized in accordance with ASTM A123.
Standard Drawing Guidance (do not show on plans):

1. Replace example Plan of Slab Showing Slab Drain Locations with actual plan.
2. Details shown inside the sheet border are for drains transverse to roadway.
   Use the below details for drains parallel to roadway.
3. Use 1/6 of web depth.
4. For slab thickness less than 7 3/4", revise dimension to be equal to the slab thickness minus 3 1/4".
5. Type 3 for weathering steel; Type 1 for painted or galvanized steel.
6. Use with weathering steel. Delete for painted or galvanized steel.
7. Total drain length is equal to 9" + maximum girder and haunch + slab thickness, rounded up to the next whole inch.

Alternate details for Type B barrier (SBC):

- See Sec 1080.4
1. Contractor may shift top bars as needed to tie R3 or R4 bars in barrier (4-ft. min. bar spacing).

2. Finish each side of joint with 1/4" radius edging tool.

3. Key to extend full width of full depth slab.

4. Finish each side of joint with 1/4" radius edging tool.

5. Adjust the construction joint to a clearance of 6" from the panel joint.

6. For details of precast prestressed panels, see Sheet No.

7. For reinforcement of barrier not shown, see Sheet No.

8. For Theoretical Bottom of Slab Elevations, Girder Camber Diagram and Theoretical Slab Haunching Diagram, see Sheet No.

9. For Plan of Slab Showing Reinforcement, see Sheet No.

10. For details of precast prestressed panels, see Sheet No.

Note: This drawing is not to scale. Follow dimensions.
Finish each side of joint with 1/4" radius edging tool.

Key to extend full width of slab.

SLAB CONSTRUCTION JOINT

1. Remove if not required.
2. Use the following values for clearance to top longitudinal bars:
   - 3/4" for #5 bars
   - 3" for #6 bars
   - 2 1/2" for #7 bars
   - 2 3/4" for #8 bars
   - Use a triple asterisk when there are different size top bars and add below the single asterisk note the following (modified as needed) (this will be the only asterisk note for CIP decks):
     - For #5 bars:
     - For #6 bars:
     - For #7 bars:
     - For #8 bars:

Clearance values based on the #6 top transverse bar used for this standard slab. Values will need to be revised for other size transverse bars.

3. The larger negative moment reinforcement shown is grouped and can be deleted if the negative moment steel is the same size as the distribution reinforcement. A set of bars the same size as the distribution bars exist behind the larger bars shown, and will become visible when the larger bars are deleted. (No need to resize)

4. The subheadings and negative moment bars are grouped and can be deleted for single span bridges. <Ctrl>U to ungroup

5. Place appropriate slab pouring sequence cell and modify as required.
6. Use alternate detail for CIP decks:

For 8" thick slabs, change top dimension to 3 1/4" and center dimension to 2 1/2".

OPTIONAL SHIFTING TOP BARS AT BARRIER

Contractor may shift or swap bars as needed to tie R4 bar in barrier (4" min. bar spacing).

Alternate detail for Type H barrier

Girder spacing and reinforcement size & spacing shown are not necessarily standard. Follow design.
SLAB01_24ft_symm Guidance & Alternate Details (3 of 3)

3-Beam Panel Deck

3-Beam CIP Deck

HALF SECTION NEAR MIDSPAN
HALF SECTION NEAR INTERMEDIATE BENT

SECTION THRU SLAB

# Alternate bar shape available, see barrier sheet.

Detail A
Symm. about § Structure
Crown of Slab

Detail B
Symm. about § Structure
Crown of Slab

#5-S
#6-S
4" Cl.

16" 24'-0" Roadway
16" 24'-0" Roadway

#5-S
#6-S

1 " Cl.

Bulb-Tee
3-Beam Panel Deck

NU
No Unit

Box
3-Beam CIP Deck

#5-S
#5-S
4" Cl.

16" 24'-0" Roadway
16" 24'-0" Roadway

#5-S
#6-S

1 " Cl.

Symm. about § Structure
Crown of Slab

#5-S
#6-S

4" Cl.

SLAB01_24ft_symm Guidance & Alternate Details (3 of 3)

3-Beam Panel Deck

3-Beam CIP Deck

HALF SECTION NEAR MIDSPAN
HALF SECTION NEAR INTERMEDIATE BENT

SECTION THRU SLAB

# Alternate bar shape available, see barrier sheet.

Detail A
Symm. about § Structure
Crown of Slab

Detail B
Symm. about § Structure
Crown of Slab

#5-S
#6-S
4" Cl.

16" 24'-0" Roadway
16" 24'-0" Roadway

#5-S
#6-S

1 " Cl.

Bulb-Tee
3-Beam Panel Deck

NU
No Unit

Box
3-Beam CIP Deck

#5-S
#5-S
4" Cl.

16" 24'-0" Roadway
16" 24'-0" Roadway

#5-S
#6-S

1 " Cl.

Symm. about § Structure
Crown of Slab

#5-S
#6-S

4" Cl.

SLAB01_24ft_symm Guidance & Alternate Details (3 of 3)

3-Beam Panel Deck

3-Beam CIP Deck

HALF SECTION NEAR MIDSPAN
HALF SECTION NEAR INTERMEDIATE BENT

SECTION THRU SLAB

# Alternate bar shape available, see barrier sheet.

Detail A
Symm. about § Structure
Crown of Slab

Detail B
Symm. about § Structure
Crown of Slab

#5-S
#6-S
4" Cl.

16" 24'-0" Roadway
16" 24'-0" Roadway

#5-S
#6-S

1 " Cl.

Bulb-Tee
3-Beam Panel Deck

NU
No Unit

Box
3-Beam CIP Deck

#5-S
#5-S
4" Cl.

16" 24'-0" Roadway
16" 24'-0" Roadway

#5-S
#6-S

1 " Cl.

Symm. about § Structure
Crown of Slab

#5-S
#6-S

4" Cl.

SLAB01_24ft_symm Guidance & Alternate Details (3 of 3)

3-Beam Panel Deck

3-Beam CIP Deck

HALF SECTION NEAR MIDSPAN
HALF SECTION NEAR INTERMEDIATE BENT

SECTION THRU SLAB

# Alternate bar shape available, see barrier sheet.

Detail A
Symm. about § Structure
Crown of Slab

Detail B
Symm. about § Structure
Crown of Slab

#5-S
#6-S
4" Cl.

16" 24'-0" Roadway
16" 24'-0" Roadway

#5-S
#6-S

1 " Cl.

Bulb-Tee
3-Beam Panel Deck

NU
No Unit

Box
3-Beam CIP Deck

#5-S
#5-S
4" Cl.

16" 24'-0" Roadway
16" 24'-0" Roadway

#5-S
#6-S

1 " Cl.

Symm. about § Structure
Crown of Slab

#5-S
#6-S

4" Cl.

SLAB01_24ft_symm Guidance & Alternate Details (3 of 3)

3-Beam Panel Deck

3-Beam CIP Deck

HALF SECTION NEAR MIDSPAN
HALF SECTION NEAR INTERMEDIATE BENT

SECTION THRU SLAB

# Alternate bar shape available, see barrier sheet.

Detail A
Symm. about § Structure
Crown of Slab

Detail B
Symm. about § Structure
Crown of Slab

#5-S
#6-S
4" Cl.

16" 24'-0" Roadway
16" 24'-0" Roadway

#5-S
#6-S

1 " Cl.

Bulb-Tee
3-Beam Panel Deck

NU
No Unit

Box
3-Beam CIP Deck

#5-S
#5-S
4" Cl.

16" 24'-0" Roadway
16" 24'-0" Roadway

#5-S
#6-S

1 " Cl.

Symm. about § Structure
Crown of Slab

#5-S
#6-S

4" Cl.
SLAB DETAILS

For details of precast prestressed panels, see Sheet No.

For reinforcement of barrier not shown, see Sheet No.

For Theoretical Bottom of Slab Elevations, Girder Camber Diagram and Theoretical Slab Haunching Diagram, see Sheet No.

For Plan of Slab Showing Reinforcement, see Sheet No.

Note: This drawing is not to scale. Follow dimensions.

Sheet No. of
Standard Drawing Guidance (do not show on plans):

1. Remove if not required.
2. Use the following values for clearance to top longitudinal bars:
   - 3 1/4" for #5 bars
   - 3" for #6 bars
   - 2 1/2" for #7 bars
   - 2 1/8" for #8 bars

   Use a triple asterisk when there are different size top bars and add below the single asterisk note the following (modified as needed) (this will be the only asterisk note for CIP decks):
   - **3 1/4" (#5)**
   - **3" (#6)**
   - **2 1/2" (#7)**
   - **2 1/8" (#8)**

   Clearance values based on the #6 top transverse bar used for this standard slab. Values will need to be revised for other size transverse bars.

3. The larger negative moment reinforcement shown is grouped and can be deleted if the negative moment steel is the same size as the distribution reinforcement. A set of bars the same size as the distribution bars exist behind the larger bars shown, and will become visible when the larger bars are deleted. (No need to resize)

4. The subheadings and negative moment bars are grouped and can be deleted for single span bridges.

5. Place appropriate slab pouring sequence cell and modify as required.

6. Use alternate detail for CIP decks:

For 8" thick slabs, change top dimension to 3 1/4" and center dimension to 2 1/2".


Finish each side of joint with 1/4" radius edging tool.

Key to extend full width of slab.

SLAB CONSTRUCTION JOINT

7. Remove for CIP deck

Girder spacing and reinforcement size & spacing shown are not necessarily standard. Follow design.
SLAB DETAILS

1. Contractor may shift top bars at needed to tie R2 bars in barrier (4-min bar spacing).

2. Finish each side of joint with 1/4" radius edging tool.

3. Key to extend full width of full depth slab.

4. Finish each side of joint with 1/4" radius edging tool.

5. **Adjust the construction joint to a clearance of 6 inches minimum from the panel joint.**

6. For details of precast prestressed panels, see Sheet No.

7. For reinforcement of barrier not shown, see Sheet No.

8. For Theoretical Bottom of Slab Elevations, Girder Camber Diagram and Theoretical Slab Haunching Diagram, see Sheet No.

9. For Plan of Slab Showing Reinforcement, see Sheet No.

Note: This drawing is not to scale. Follow dimensions.
Standard Drawing Guidance
(do not show on plans):

1. Remove if not required.
2. Use the following values for clearance to top longitudinal bars:
   - 3/4" for #5 bars
   - 3" for #6 bars
   - 2 3/4" for #7 bars
   - 2 1/4" for #8 bars

Use a triple asterisk when there are different size top bars and add below the single asterisk note the following (modified as needed) (this will be the only asterisk note for CIP decks):

### ***
- 3/4" (#5)
- 3" (#6)
- 2 3/4" (#7)
- 2 1/4" (#8)

Clearance values based on the #6 top transverse bar used for this standard slab. Values will need to be revised for other size transverse bars.

3. The larger negative moment reinforcement shown is grouped and can be deleted if the negative moment steel is the same size as the distribution reinforcement. A set of bars the same size as the distribution bars exist behind the larger bars shown, and will become visible when the larger bars are deleted. (No need to resize)

4. The subheadings and negative moment bars are grouped and can be deleted for single span bridges. <Ctrl> U to ungroup

5. Place appropriate slab pouring sequence cell and modify as required.

6. Use alternate detail for CIP decks:

For 8" thick slabs, change top dimension to 3 1/4" and center dimension to 2 1/2".

Finish each side of joint with 1/4" radius edging tool.

Key to extend full width of slab

Const. Jct.

For 8" thick slabs, change top dimension to 3 1/4" and center dimension to 2 1/2".

Contractor may shift or swap bars as needed to tie R3 bar in barrier (4" min. bar spacing)

OPTIONAL SHIFTING TOP BARS AT BARRIER

Alternate detail for Type H barrier

Girder spacing and reinforcement size & spacing shown are not necessarily standard. Follow design.

Remove for CIP deck
Standard Drawing Guidance  
(do not show on plans):

1. Remove if not required.
2. Use the following values for clearance to top longitudinal bars:
   - 34" for #5 bars
   - 3" for #6 bars
   - 23/4" for #7 bars
   - 2" for #8 bars

Use a triple asterisk when there are different size top bars and add below the single asterisk note the following (modified as needed) (this will be the only asterisk note for CIP decks):

- *** 34" (#5)
- 3" (#6)
- 23/4" (#7)
- 2" (#8)

Clearance values based on the #6 top transverse bar used for this standard slab. Values will need to be revised for other size transverse bars.

3. The larger negative moment reinforcement shown is grouped and can be deleted if the negative moment steel is the same size as the distribution reinforcement. A set of bars the same size as the distribution bars exist behind the larger bars shown, and will become visible when the larger bars are deleted. (No need to resize)

4. The subheadings and negative moment bars are grouped and can be deleted for single span bridges. <Ctrl> U to ungroup

5. Place appropriate slab pouring sequence cell and modify as required.

6. Use alternate detail for CIP decks:

   - For 8" thick slabs, change top dimension to 3 1/4" and center dimension to 2 1/2".
   - Finish each side of joint with 1/4" radius edging tool.

   Key to extend full width of slab

   Const. Jt.

SLAB CONSTRUCTION JOINT

7. Remove for CIP deck

Girder spacing and reinforcement size & spacing shown are not necessarily standard. Follow design.
FULL DEPTH SLAB

SLAB CONSTRUCTION JOINT

Finish each side of joint with 1/4" radius edging tool.

Panel Joints

Finish each side of joint with 1/4" radius edging tool.

Const. Joint

Key to extend full width of deck.

Const. Joint

Finish each side of joint with 1/4" radius edging tool.

Const. Joint

3/8" Grip Groove (Type)

OPTIONAL SHIFITNG TOP BARS AT BARRIER

Contractor may shift or swap bars as needed to tie R2 bar in barrier.

(4" min. bar spacing)

Const. Joint

Contractor may shift or swap bars as needed to tie R3 bar in barrier.

(4" min. bar spacing)

Notes:

1. For details of precast prestressed panels, see Sheet No.

2. For reinforcement of barrier not shown, see Sheet No.

3. For Theoretical Bottom of Slab Elevations, Girder Camber Diagram and Theoretical Slab Haunching Diagram, see Sheet No.

4. For Plan of Slab Showing Reinforcement, see Sheet No.

SLAB DETAILS

Note: This drawing is not to scale. Follow dimensions. Sheet No. of

Detailed Checked

SLAB05_32ft_symm   Effective: Jan. 2022   Supersedes: July 2021
Standard Drawing Guidance
(do not show on plans):

1. Remove if not required.

2. Use the following values for clearance to top longitudinal bars:
   - 3 1/8" for #5 bars
   - 3" for #6 bars
   - 2 7/8" for #7 bars
   - 2 3/4" for #8 bars

   Use a triple asterisk when there are different size top bars and add below the single asterisk note the following (modified as needed): (this will be the only asterisk note for CIP decks):
   - *** 3 1/8" (#5)
   - 3" (#6)
   - 2 7/8" (#7)
   - 2 3/4" (#8)

   Clearance values based on the #6 top transverse bar used for this standard slab. Values will need to be revised for other size transverse bars.

3. The larger negative moment reinforcement shown is grouped and can be deleted if the negative moment steel is the same size as the distribution reinforcement. A set of bars the same size as the distribution bars exist behind the larger bars shown, and will become visible when the larger bars are deleted. (No need to resize)

4. The subheadings and negative moment bars are grouped and can be deleted for single span bridges. <Ctrl> U to ungroup

5. Place appropriate slab pouring sequence cell and modify as required.

6. Use alternate detail for CIP decks:

   For 8" thick slabs, change top dimension to 3 1/4" and center dimension to 2 1/2".

   Finish each side of joint with 1/4" radius edging tool.

   Key to extend full width of slab.

   Const. Jt.

   SLAB CONSTRUCTION JOINT

7. Remove for CIP deck

   Girder spacing and reinforcement size & spacing shown are not necessarily standard. Follow design.
SLAB05_32ft_symm

Guidance & Alternate Details (3 of 3)

4-Beam Panel Deck

4-Beam CIP Deck

HALF SECTION NEAR MIDSPAN

HALF SECTION NEAR INTERMEDIATE BENT

SECTION THRU SLAB

Alternate bar shape available, see barrier sheet.

#5-S

3'-7"

9'-2"

(Min.)

1"

#6-S

4'-7"

8

5

3

2% Slope

Detail B

SECTION THRU SLAB

HALF SECTION NEAR MIDSPAN

HALF SECTION NEAR INTERMEDIATE BENT

1" Cl.

4" Cl.

(Min.)

16"

32'-0" Roadway

16"

16'-0"

16'-0"

16"

32'-0" Roadway

16"

16'-0"

16'-0"
SLAB DETAILS

SLAB CONSTRUCTION JOINT

Finish each side of joint with 1/4" radius edging tool.

Finish each side of joint with 1/4" radius edging tool.

**Adjust the construction joint to a clearance of 1/4" joints minimum from the panel joint.

For details of prestressed panels, see Sheet No.  .

For reinforcement of barrier, see Sheet No.  .

For Theoretical Bottom of Slab Elevations, Girder Camber Diagram and Theoretical Slab Haunching Diagram, see Sheet No.  .

For Plan of Slab Showing Reinforcement, see Sheet No.  .

Note: This drawing is not to scale. Follow dimensions.
Standard Drawing Guidance
(do not show on plans):

1. Remove if not required.

2. Use the following values for clearance to top longitudinal bars:
   - 3 1/4" for #5 bars
   - 3" for #6 bars
   - 2 1/2" for #7 bars
   - 2 1/2" for #8 bars

   Use a triple asterisk when there are different size top bars and add below the single asterisk note the following (modified as needed) (this will be the only asterisk note for CIP decks):
   - *** 3 1/4" (#5)
   - 3" (#6)
   - 2 1/2" (#7)
   - 2 1/2" (#8)

Clearance values based on the #6 top transverse bar used for this standard slab. Values will need to be revised for other size transverse bars.

3. The larger negative moment reinforcement shown is grouped and can be deleted if the negative moment steel is the same size as the distribution reinforcement. A set of bars the same size as the distribution bars exist behind the larger bars shown, and will become visible when the larger bars are deleted. (No need to resize)

4. The subheadings and negative moment bars are grouped and can be deleted for single span bridges. <Ctrl> U to ungroup

5. Place appropriate slab pouring sequence cell and modify as required.

6. Use alternate detail for CIP decks:

   For 8" thick slabs, change top dimension to 3 1/4" and center dimension to 2 1/2".

   Finish each side of joint with 1/4" radius edging tool.

   Key to extend full width of slab.

   Const. Jt.

OPTIONAL SHIFTING TOP BARS AT BARRIER

Contractor may shift or swap bars as needed to tie R4 bar in barrier (4" min. bar spacing)

Alternate detail for Type H barrier

7. Remove for CIP deck

Girder spacing and reinforcement size & spacing shown are not necessarily standard. Follow design.
SLAB DETAILS

SLAB CONSTRUCTION JOINT

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Notes:
1. For details of precast prestressed panels, see Sheet No.
2. For reinforcement of barrier, see Sheet No.
3. For details of theoretical bottom slab elevation, girder camber diagram, and theoretical slab haunching diagram, see Sheet No.
4. For plan of slab showing reinforcement, see Sheet No.

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1. For details of precast prestressed panels, see Sheet No.
2. For reinforcement of barrier, see Sheet No.
3. For details of theoretical bottom slab elevation, girder camber diagram, and theoretical slab haunching diagram, see Sheet No.
4. For plan of slab showing reinforcement, see Sheet No.

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1. For details of precast prestressed panels, see Sheet No.
2. For reinforcement of barrier, see Sheet No.
3. For details of theoretical bottom slab elevation, girder camber diagram, and theoretical slab haunching diagram, see Sheet No.
4. For plan of slab showing reinforcement, see Sheet No.
Standard Drawing Guidance (do not show on plans):

1. Remove if not required.

2. Use the following values for clearance to top longitudinal bars:
   - 3" for #5 bars
   - 3" for #6 bars
   - 2 3/4" for #7 bars
   - 2" for #8 bars

   Use a triple asterisk when there are different size top bars and add below the single asterisk note the following (modified as needed)(this will be the only asterisk note for CIP decks):
   
   *** 3 1/8" (#5)
   3" (#6)
   2 7/8" (#7)
   2 3/4" (#8)

Clearance values based on the #6 top transverse bar used for this standard slab. Values will need to be revised for other size transverse bars.

3. The larger negative moment reinforcement shown is grouped and can be deleted if the negative moment steel is the same size as the distribution reinforcement. A set of bars the same size as the distribution bars exist behind the larger bars shown, and will become visible when the larger bars are deleted. (No need to resize)

4. The subheadings and negative moment bars are grouped and can be deleted for single span bridges. <Ctrl> U to ungroup

5. Place appropriate slab pouring sequence cell and modify as required.

6. Use alternate detail for CIP decks:

   For 8" thick slabs, change top dimension to 3 1/4" and center dimension to 2 1/2".
   
   Finish each side of joint with 1/4" radius edging tool.

   Key to extend full width of slab
   Const. Jt.

   SLAB CONSTRUCTION JOINT

7. Remove for CIP deck

Girder spacing and reinforcement size & spacing shown are not necessarily standard. Follow design.
**Panel Deck**

**CIP Deck**

**Guidance & Alternate Details (3 of 3)**

- **Panel Deck**
  - Section Thru Slab
  - Alternate bar shape available, see barrier sheet.
  - Crown of Slab
  - Symm. about Structure

- **CIP Deck**
  - Section Thru Slab
  - Crown of Slab
  - Symm. about Structure
SLAB DETAILS

Notes:

1. For details of prestressed panels, see Sheet No.

2. For reinforcement of barrier not shown, see Sheet No.

3. For theoretical bottom of slab elevation, girder camber diagram and theoretical slab haunching diagram, see Sheet No.

4. For plan of slab showing reinforcement, see Sheet No.

5. Note: This drawing is not to scale. Follow dimensions.

SLAB CONSTRUCTION JOINT

Finish each side of joint with 1/4" radius edging tool.

Finish each side of joint with 1/4" radius edging tool.

Contractor may shift or swap bars as needed to tie R3 bar in panels (4" min. bar spacing).

Contractor may shift or swap bars as needed to tie R3 bar in panels (4" min. bar spacing).

Const. Jt. (Extend full width of deck)

Const. Jt. (Extend full width of deck)

Panel Joint

Panel Joint

---

Optional Shifting Top Bars at Barrier

Key to extend full slab:

Key to extend full slab:

Full Depth Slab

Full Depth Slab

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Jefferson City, MO 65102
105 West Capitol

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Missouri Highways and Transportation Commission

SLAB DETAILS

Effective: Jan. 2022
Supersedes: July 2021

Sheet No. 1 of 1
Alternate detail for Type H barrier

Finish each side of joint with 1/4" radius edging tool.

Key to extend full width of slab.

SLAB CONSTRUCTION JOINT

1. Remove if not required.
2. Use the following values for clearance to top longitudinal bars:
   - 3" for #5 bars
   - 2 1/2" for #7 bars
   - 2 1/2" for #8 bars

   Use a triple asterisk when there are different size top bars and add below the single asterisk note the following: (Modified as needed)(this will be the only asterisk note for CIP decks):
   - *** 3" (#5)
   - 3" (#6)
   - 2 1/2" (#7)
   - 2 1/2" (#8)

   Clearance values based on the #6 top transverse bar used for this standard slab. Values will need to be revised for other size transverse bars.

3. The larger negative moment reinforcement shown is grouped and can be deleted if the negative moment steel is the same size as the distribution reinforcement. A set of bars the same size as the distribution bars exist behind the larger bars shown, and will become visible when the larger bars are deleted. (No need to resize)

4. The subheadings and negative moment bars are grouped and can be deleted for single span bridges. <Ctrl> U to ungroup

5. Place appropriate slab pouring sequence cell and modify as required.

6. Use alternate detail for CIP decks:

For 8" thick slabs, change top dimension to 3 1/4" and center dimension to 2 1/2".

1. Remove for CIP deck

Girder spacing and reinforcement size & spacing shown are not necessarily standard. Follow design.
For reinforcement of barrier not shown, see Sheet No. 6.
For theoretical bottom of slab elevations, girder camber diagram and theoretical slab haunching diagram, see Sheet No. 7.
For plan of slab showing reinforcement, see Sheet No. 8.
Finish each side of joint with 3/4" radius edging tool.
Adjust the construction joint to a clearance of 4 inches minimum from the panel joint.
Standard Drawing Guidance (do not show on plans):

1. Remove if not required.
2. Use the following values for clearance to top longitudinal bars:
   - 3/8" for #5 bars
   - 3" for #6 bars
   - 2 7/8" for #7 bars
   - 2 3/4" for #8 bars

   Use a triple asterisk when there are different size top bars and add below the single asterisk note the following (modified as needed) (this will be the only asterisk note for CIP decks):
   - 3/4" (#5)
   - 3" (#6)
   - 2 7/8" (#7)
   - 2 3/4" (#8)

   Clearance values based on the #6 top transverse bar used for this standard slab. Values will need to be revised for other size transverse bars.

3. The larger negative moment reinforcement shown is grouped and can be deleted if the negative moment steel is the same size as the distribution reinforcement. A set of bars the same size as the distribution bars exist behind the larger bars shown, and will become visible when the larger bars are deleted. (No need to resize)
4. The subheadings and negative moment bars are grouped and can be deleted for single span bridges. <Ctrl> U to ungroup
5. Place appropriate slab pouring sequence cell and modify as required.
6. Use alternate detail for CIP decks:

For 8" thick slabs, change top dimension to 3 1/4" and center dimension to 2 1/2".

Finish each side of joint with 1/4" radius edging tool.

Key to extend full width of slab

SLAB CONSTRUCTION JOINT

7. Remove for CIP deck

Girder spacing and reinforcement size & spacing shown are not necessarily standard. Follow design.
Notes:

1. For details of precast prestressed panels, see Sheet No.
2. For reinforcement of barrier not shown, see Sheet No.
3. For theoretical section of slab cross sections, barrier camber diagram, and theoretical slab haunching diagram, see Sheet No.
4. For Plan of Slab Showing Reinforcement, see Sheet No.

For Plan of Slab Showing Reinforcement, see Sheet No.

Full Depth Slab

Finish each side of joint with 1/4" radius edging tool.

Const. Joint (Extend full width of joint)

Panel Joint

Finish each side of joint with 1/4" radius edging tool.

Const. Jt. (Extend full width of deck)

Optional Shifting Top Bars at Barrier

Contractor may shift or swap bars as needed to tie R2 bar in barrier.

(4" min. bar spacing)
Standard Drawing Guidance
(do not show on plans):

1. Remove if not required.

2. Use the following values for clearance to top longitudinal bars:
   - 3" for #5 bars
   - 2 1/2" for #6 bars
   - 2 1/4" for #7 bars
   - 2 1/8" for #8 bars

   Use a triple asterisk when there are different size top bars and add below the single asterisk note the following (modified as needed): [this will be the only asterisk note for CIP decks]:
   - *** 3/4" (#5)
   - 3" (#6)
   - 2 1/2" (#7)
   - 2 1/4" (#8)

3. Clearance values based on the #6 top transverse bar used for this standard slab. Values will need to be revised for other size transverse bars.

4. The larger negative moment reinforcement shown is grouped and can be deleted if the negative moment steel is the same size as the distribution reinforcement. A set of bars the same size as the distribution bars exist behind the larger bars shown, and will become visible when the larger bars are deleted. (No need to resize)

5. The subheadings and negative moment bars are grouped and can be deleted for single span bridges. <Ctrl> U to ungroup

6. Place appropriate slab pouring sequence cell and modify as required.

7. Use alternate detail for CIP decks:

For 8" thick slabs, change top dimension to 3 1/4" and center dimension to 2 1/2".

Finish each side of joint with 1/4" radius edging tool.

Key to extend full width of slab

Const. Jt

SLAB CONSTRUCTION JOINT

7. Remove for CIP deck

Girder spacing and reinforcement size & spacing shown are not necessarily standard. Follow design.
Expansion joint system shall be fabricated in one section, except for staged construction and when the length is over 50 feet. A complete joint generation groove welded splice shall be required. Welds shall be ground flush to provide a smooth surface. Expansion joint system shall be fabricated and installed to the crown and grade of the roadway.

The strip seal gland shall be installed in joints in one continuous piece without field splices. Factory splicing will be permitted for joints over 50 feet.

Structural steel for the expansion joint system shall be ASTM A992 Grade 50 except the steel armor may be ASTM A505 Grade 50. Anchors for the expansion joint system shall be in accordance with Sec 21.2.

Structural steel for the expansion joint system shall be coated with a minimum of two coats of inorganic zinc primer to provide a total dry film thickness of 4 mil minimum, 6 mil maximum, or galvanized in accordance with ASTM A653. Anchors need not be protected from overspray.

Longitudinal reinforcing steel shall be placed so that ends shall be 1/2 inch from the vertical leg of the steel armor at the expansion joint system.

Concrete shall be placed and cured as per the standards of the construction agency. Proper consolidation of the concrete shall be achieved by localized internal vibration.

Proper consolidation of the concrete shall be achieved by localized internal vibration. Concrete shall be forced under and around steel armor and anchors.

Proper consolidation of the concrete shall be achieved by localized internal vibration. Concrete shall be forced under and around steel armor and anchors. In the event of additional consolidation required, consolidation shall be provided by a proper method such as added vibration.

Proper consolidation of the concrete shall be achieved by localized internal vibration. Concrete shall be forced under and around steel armor and anchors. In the event of additional consolidation required, consolidation shall be provided by a proper method such as added vibration.

Table of Allowed Transverse Strip Seal Expansion Joint System

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Strip Seal System (Designated Name)</th>
<th>Movement to RDWY</th>
<th>Normal Installation Gap</th>
</tr>
</thead>
<tbody>
<tr>
<td>D S Brown</td>
<td>Strip seal 200</td>
<td>XXX</td>
<td>XXX</td>
</tr>
<tr>
<td>D S Brown</td>
<td>Strip seal 2500</td>
<td>XXX</td>
<td>XXX</td>
</tr>
<tr>
<td>Watson Bowman</td>
<td>Strips seal 80-500</td>
<td>XXX</td>
<td>XXX</td>
</tr>
<tr>
<td>Watson Bowman</td>
<td>Strip seal 80-500</td>
<td>XXX</td>
<td>XXX</td>
</tr>
<tr>
<td>Watson Bowman</td>
<td>Strips seal 80-500</td>
<td>XXX</td>
<td>XXX</td>
</tr>
<tr>
<td>Watson Bowman</td>
<td>Strip seal 80-500</td>
<td>XXX</td>
<td>XXX</td>
</tr>
</tbody>
</table>

Note: This drawing is not to scale. Follow dimensions. Sheet No. 11 of 11
Standard Drawing Guidance (do not show on plans):
Modify drawing as necessary.

Remove non-applicable rows in table.

- Place angle length to center of first slotted hole.
- Use squared, left advanced or right advanced Part Plan as needed.

- = 3/4" (Min.) @ 60°. Verify only.
- = 3/4" x 3/4" upper lip + 3/8" (Min.)
- Verify only.
- Remove precast panel for CIP slab.

Alternate details for Type B barrier (SBC)
Standard Drawing Guidance (do not show on plans):

1. Modify drawing as necessary.
2. Remove non-applicable rows in table.
3. Piece angle length to center of first slotted hole.
4. Use squared, left advanced or right advanced Part Plan as needed.
5. \( A \) Piece angle 6 x 3 1/2 x 3/8
6. See Detail B (Typ.)
7. \( B \) Use squared, left advanced or right advanced Part Plan as needed.
8. \( C \) = 3/4” (Min.) @ 60° Verify only.
9. \( D \) = 1 @ 60° + 1/2” upper lips + 3/4” (Min.) Verify only.
10. \( E \) Remove precast panel for CIP slab.

Left Advanced

Right Advanced
GENERAL NOTES:

Expansion joint system shall be fabricated in one section, except for tapered construction and when the length is over 50 feet. A complete joint connection groove welded splice shall be required. Welds shall be ground flush to provide a smooth surface. The expansion joint system shall be fabricated and installed to the crown and grade of the roadway.

The strip seal gland shall be installed in joints in one continuous piece without field splices. Factory splicing will be permitted for expansion joint system.

Structural steel for the expansion joint system shall be ASTM A36 Grade 36 except the steel armor may be ASTM A500 Grade 50. Anchors for the expansion joint system shall be in accordance with Sec. 1057. The strip seal expansion joint system shall be in accordance with Sec. 1037.

Structural steel for the expansion Joint system shall be coated with a minimum of two coats of inorganic zinc primer. The steel armor may be ASTM A572 Grade 50. Anchors need not be protected from overspray.

Longitudinal reinforcing steel shall be placed so that ends shall be from the vertical leg of the steel armors at the expansion joint system.

Concrete shall be formed under and around steel armor and anchors. Proper consolidation of the concrete shall be achieved by localized internal vibration.

The installation temperature shall be taken as the actual air temperature averaged over the 24-hour period immediately preceding installation.

MODOT Construction personnel will indicate the strip seal expansion joint system installed.

Steel armor may also be referred to as extrusion or rail.

Table of Allowed Transverse Strip Seal Expansion Joint System

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Strip Seal System Designated Name</th>
<th>Movement Allowed</th>
<th>Linear Size Limit</th>
<th>Installation Gap (Inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>D S Brown</td>
<td>Str S100</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
</tr>
<tr>
<td>D S Brown</td>
<td>Str S200</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
</tr>
<tr>
<td>D S Brown</td>
<td>Str S300</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
</tr>
<tr>
<td>Watson Bowman</td>
<td>Acme (Wabo)</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
</tr>
<tr>
<td>Watson Bowman</td>
<td>Acme (Wabo)</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
</tr>
<tr>
<td>Watson Bowman</td>
<td>Str S100</td>
<td>XXX</td>
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</tr>
<tr>
<td>Watson Bowman</td>
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<tr>
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<tr>
<td>Watson Bowman</td>
<td>Acme (Wabo)</td>
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<td>XXX</td>
</tr>
<tr>
<td>Watson Bowman</td>
<td>Acme (Wabo)</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
</tr>
</tbody>
</table>

Note: This drawing is not to scale. Follow dimensions. Steel No. of
Standard Drawing Guidance (do not show on plans):

- Modify drawing as necessary.
- Remove non-applicable rows in table.
- Dimension to clear bearing stiffener (3 1/2" Min.). For rehab bridge, dimension should be based on shop drawing or field check.
- Use 3" for rehab bridge, dimension should be based on shop drawing or field check.
- Use squared, left advanced or right advanced Part Plan as needed.
- D = 3/4" (Min.) @ 60° Verify only.
- E = 1 @ 60° + 1/2" upper lips + 3/4" (Min.) Verify only.
- F = Use 6" long angle. For rehab bridge, modify angle length based on shop drawing or field check.
- G Delete precast panel for CIP slab.

Alternate details for Type B barrier (SBC)
GENERAL NOTES:

Expansion Joint System shall be fabricated in one section, except for staggered construction and when the length is over 30 feet. A complete joint generation groove welded steel shall be required. We do, shall be spaced evenly to provide a smooth stainless steel to the allowable temperature.

Table of Allowed Transverse Strip Seal Expansion Joint System

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Strip Seal System</th>
<th>Movement</th>
<th>Movement</th>
<th>Movement</th>
<th>Movement</th>
</tr>
</thead>
<tbody>
<tr>
<td>D S Brown</td>
<td>Str &amp; Seal</td>
<td>XXX</td>
<td>XXX</td>
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<td>XXX</td>
</tr>
<tr>
<td>D S Brown</td>
<td>Str &amp; Seal</td>
<td>XXX</td>
<td>XXX</td>
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<td>XXX</td>
</tr>
<tr>
<td>Watson Bowman</td>
<td>Str &amp; Seal</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
</tr>
<tr>
<td>Watson Bowman</td>
<td>Str &amp; Seal</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
</tr>
</tbody>
</table>

Detailed Notes:

1. Expansion Joint System shall be installed in joints or one continuous length without field splice or repair. Splicing will be permitted for lengths exceeding 30 feet.

2. The expansion joint system shall be fabricated and installed in accordance with the contract documents. The expansion joint system shall be fabricated and installed to the crown and grade of the roadway.

3. The expansion joint system shall be fabricated in one section, except for staggered construction and when the length is over 30 feet. A complete joint generation groove welded steel shall be required. We do, shall be spaced evenly to provide a smooth stainless steel.
Guidance & Alternate Details

Standard Drawing Guidance (do not show on plans):

Modify drawing as necessary.

Remove non-applicable rows in table.

A. Dimension to clear bearing stiffener (1 1/2” Min.). For rehab bridge, dimension should be based on shop drawing or field check.

B. Use 3”. For rehab bridge, dimension should be based on shop drawing or field check.

C. Use squared, left advanced or right advanced Part Plan as needed.

D. = 3/4” (Min.) @ 60° Verify only.

E. = 1@ 60° + 1/2” upper lips + 3/4” (Min.)

F. = Use 6” long angle. For rehab bridge, modify angle length based on shop drawing or field check.

G. Delete precast panel for CIP slab.

Alternate details for Type B barrier (SBC)
GENERAL NOTES:

Expansion joint system shall be fabricated in one section, except for staged construction and when the length is over 50 feet. A complete joint penetration groove welded splice shall be required. Welds shall be ground flush to provide a smooth surface. The expansion joint system shall be fabricated and installed in accordance with Sec 1037. General notes shall be in accordance with Sec 1037.

Structural steel for the expansion joint system shall be ASTM A325 Grade 50, except the steel armor may be ASTM A709 Grade 50W. Anchors for the expansion joint system shall be in accordance with Sec 1037. Expansion joint system shall be in accordance with Sec 1037.

Structural steel for the expansion joint system shall be coated with at least two coats of inorganic zinc primer to provide a total dry film thickness of at least 4 mils. Welds may be galvanized in accordance with ASTM A123. Anchors need not be protected from overspray.

Structural reinforcement steel shall be placed so that ends shall be embedded in the vertical leg of the steel girder at the expansion joint system.

Concrete shall be cast under and around steel armor and anchors. Finger consolidation of the concrete shall be achieved by localized overspray.

The installation temperature shall be taken as the actual air temperature averaged over the 24-hour period immediately preceding installation.

The installation temperature shall be taken as the actual air temperature averaged over the 24-hour period immediately preceding installation.

NoDOT construction personnel shall inspect the steel expansion joint system installed.

Steel armor may also be referred to as extrusion or rail.

Table of Allowed Transverse Strip Seal Expansion Joint System

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Strip Seal Expansion Joint System</th>
<th>Movement Designated Name</th>
<th>Normal to Joins</th>
<th>Parallel to ROW</th>
<th>Long</th>
<th>Short</th>
<th>Long</th>
<th>Short</th>
</tr>
</thead>
<tbody>
<tr>
<td>D S Brown</td>
<td>7/16&quot; x 1&quot; x 1/2&quot;</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
</tr>
<tr>
<td>D S Brown</td>
<td>7/16&quot; x 1&quot; x 1/2&quot;</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
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<tr>
<td>Watson Bowman</td>
<td>Strip Seal Armor (Arch)</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
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<td>XXX</td>
<td>XXX</td>
</tr>
<tr>
<td>Watson Bowman</td>
<td>Strip Seal Armor (Web)</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
</tr>
<tr>
<td>Watson Bowman</td>
<td>Strip Seal Armor (Web)</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
</tr>
<tr>
<td>Watson Bowman</td>
<td>Strip Seal Armor (Web)</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
</tr>
</tbody>
</table>

Note: This drawing is not to scale. Follow dimensions. Sheet No. of
Standard Drawing Guidance (do not show on plans):
- Modify drawing as necessary.
- Delete non-applicable rows in table.
- Piece angle length to center of first slotted hole.
- Dimensions to clear bearing stiffener (3 1/2" Min.). For rehab bridge, dimension should be based on shop drawing or field check.
- Use 4" for rehab bridge; dimension should be based on shop drawing or field check.
- Use Square, Right Advanced or Left Advanced Part Plan as needed.
- 1/4" (Min.) @ 60° Verify only.
- 1/4" @ 12" upper lips
- [2 x 3/4" (Min.)]
- Verify only.
- Use 6" long angle. For rehab bridge, modify angle length based on shop drawing or field check.
- Delete prestressed panel for CIP slab.

Alternate details for Type B barrier (SBC)
(4 @ 40') PREFABRICATED SIMPLE SEGMENTED WIDE FLANG BEAM SPANS

**General Notes**

- **Design Specifications:** 2002 AASHTO LFD (17th Ed.) Standard Specifications
- **Seismic Coefficient:**
- **Design Loading:**
  - **Earthquake:**
  - **Wind:**
- **Design Unit Weights:**
  - Structural Steel (ASTM A572 Grade 50): \( f_y = 50,000 \) psi
  - Structural Steel (ASTM A709 Grade 36): \( f_y = 36,000 \) psi
  - Steel Tie (ASTM A572 Grade 50): \( f_y = 50,000 \) psi
- **Design Unit Stress:**
  - Structural Steel: \( f_y = 50,000 \) psi
- **Bolts:**
  - All bolts shall be ASTM F1554 Grade 8 in.
  - All ASTM A325 bolts and their accompanying nuts shall be galvanized in accordance with ASTM A325 Grade 10.
- **Bracing:**
  - All bracing shall be ASTM A500 Grade 120.
- **Foundation:**
  - For the best results, all concrete shall be of class C and shall be placed and consolidated in accordance with Sec 728.

**Estimated Quantities**

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Unit</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural Steel (ASTM A572)</td>
<td>ea.</td>
<td>4</td>
</tr>
<tr>
<td>Fabricated Structural Steel (10&quot;)</td>
<td>ea.</td>
<td>4</td>
</tr>
<tr>
<td>All-substructure Items</td>
<td>ea.</td>
<td>2</td>
</tr>
<tr>
<td>Base Flood Elevation</td>
<td>ft</td>
<td>2</td>
</tr>
<tr>
<td>Design Flood Elevation</td>
<td>ft</td>
<td>2</td>
</tr>
<tr>
<td>Design Flood (100-year)</td>
<td>ft</td>
<td>2</td>
</tr>
<tr>
<td>Design Flood (500-year)</td>
<td>ft</td>
<td>2</td>
</tr>
</tbody>
</table>

**Hydrologic Data**

- Drainage Area: ___ mi²
- Design Flood Frequency: ___ years
- Design Flood 100-year Elevation: ___ ft
- Base Flood Elevation: ___ ft
- Base Flood Discharge: ___ cfs
- Overtopping Flood Discharge: ___ cfs

**Notes:**

- This drawing is not to scale. Follow dimensions.
- All piling shall be driven to a minimum nominal axial compressive resistance equal to 3.5 times the Design Bearing as shown on the plans.

---

**Standard Drawing Guidance:**

- Only show on plans:
  - Foundations:
  - Structural Steel Tubing (ASTM A500)    \( f_y = 46,000 \) psi
  - Structural Steel (ASTM A709 Grade 50)    \( f_y = 50,000 \) psi
  - Structural Steel (ASTM A709 Grade 36)    \( f_y = 36,000 \) psi

---

**Design Specifications:**

- **Lightning Protection:**
  - For the best results, all concrete shall be of class C and shall be placed and consolidated in accordance with Sec 728.
HALF PLAN OF END BENT CAP
(Bearing plates and piles not shown)

DETAILS OF END BENTS NO. 1 & 5
(Typical sections not shown)

Section A-A

Section B-B

Section C-C

Note: This drawing is not to scale. Follow dimensions.
Steel bridge flooring shall be Foster 5-Inch RB/8.2M open steel bridge flooring or equivalent. Trim bars will be required at the sides and ends of each 39'-10 1/2" unit. Steel bridge flooring shall be Foster 5-Inch RB/8.2M open steel bridge flooring or equivalent. Trim bars will be required at the sides and ends of each 39'-10 1/2" unit. Trim bars will be required at the sides and ends of each 39'-10 1/2" unit. U-bolts lifting device shall be on the inside top flange at both ends of each exterior beam of each unit. U-bolts shall be removed during the time the bridge is open to traffic. Position of the U-bolts may be shifted to miss the bars in the flooring.

Note: Field connections shall be made with 7/8" ASTM A307 Grade A325 Type 3 bolts and 1 1/16"Ø holes except as noted. Use 1 1/16"Ø holes thru hex nuts and lock nuts.

Field connections shall be made with 7/8" ASTM A307 Grade A325 Type 3 bolts and 1 1/16"Ø holes except as noted. Use 1 1/16"Ø holes thru hex nuts and lock nuts.

Note: This drawing is not to scale. Follow dimensions.
NOTICE OF CANCELLATION 

NO CLASSES 

12/1/2024

JERRY GORE

P.O. BOX 976

COLUMBIA, MO 65205


do not distribute

FABRICATION OF STRUCTURAL STEEL SHALL BE ACCORDANCE WITH NO SPECIAL DRILLING OF THE THRIE BEAM MAY BE REQUIRED AT THE SPICIES. ALL DRILLING DETAILS SHALL BE SHOWN ON THE SHOP DRAWINGS.

SPECIAL BEAMS AND BEAMS SHALL BE FABRICATED FROM ASTM A709 Grade 50 steel and galvanized.

ALL BOLTS, NUTS, WASHERS AND PLATES WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

THE RAIL POSTS SHALL BE SET PERPENDICULAR TO ROADWAY PROFILE IN ACCORDANCE WITH SEC 713 EXCEPT THAT THE RAIL POSTS SHALL BE GRADE, VERTICALLY IN CROSS SECTION AND ALIGNED IN ACCORDANCE WITH SECTION 715. THE JUDD POSTS SHALL BE BURIED TO THE FULL HEIGHT OF THE thrie beam rail. THE THRIE BEAM RAIL SHALL BE BURIED IN ACCORDANCE WITH SECTION 1040.

Rail guards shall be supported perpendicularly to roadway profile horizontally in cross section and aligned in accordance with Section 713. The rail posts shall be aligned by the use of 3 a 1/2 inch shims such that the post deviates not more than 1/2 inch from true centerline. The rail shall be made to the ends of the thrie beam rail. The thickness of the shims shall be determined by the contractor and verified by the engineer before ordering material for this work.

At the expansion joints in the thrie beam rails and channels, the bolts shall be tightened after one-half turn and the threads shall be squared. Minimum length of thrie beam sections is equal to one post space. A 5/8-inch diameter button head, oval shoulder bolt with a minimum 4 inch high hex nut shall be used at all splice. Thrie beam guardrail on the bridge shall be 12 inch steel.

Minimum length of thrie beam sections is equal to one post space. A 5/8-inch diameter button head, oval shoulder bolt with a minimum 4 inch high hex nut shall be used at all splice. Thrie beam guardrail on the bridge shall be 12 inch steel.

Fabrication of structural steel shall be accordance with Section 1000. If Type A guardrail is not attached to ends of the temporary structure, flared ends shall be provided. The flared ends shall be considered completely covered by the contract unit price for other items.

Contractor shall verify all dimensions in field before finalizing the shop drawings. At the bridge ends for head to head traffic, guardrail shall be used at the thrie beam connection to posts on wings, the bolts shall be tightened and backed off one-half turn and the threads shall be squared. Minimum length of thrie beam sections is equal to one post space. A 5/8-inch diameter button head, oval shoulder bolt with a minimum 4 inch high hex nut shall be used at all splice. Thrie beam guardrail on the bridge shall be 12 inch steel.

Fabrication of structural steel shall be accordance with Section 1000. If Type A guardrail is not attached to ends of the temporary structure, flared ends shall be provided. The flared ends shall be considered completely covered by the contract unit price for other items.
This system meets NCHRP 350 TL-3 bridge railing requirements.

**Standard Drawing Guidance**

Do not show on plans:

- 3/8" Ø京 bolt at splices between posts
- 26" x 47" Slots (Regular splice)
- 1" x 47" Slots (Expansion splice at post)

**General Notes:**

- Design Specification: 2002 AASHTO LRFD (17th Ed.)
- For MO Design Specifications: 2002 AASHTO LRFD (17th Ed.)
- For Bridge Guardrail (Thrie Beam)

**Contractor Notes:**

- Guardrail delineators shall be attached to the top of the guardrail and shall be spaced as shown on the shop drawings. All panels shall be galvanized after fabrication. Protective coating and material requirement of steel railing shall be in accordance with Section 1005.

**Bridge Guardrail (Thrie Beam) Details:**

- The thrie beam rail system as shown shall be used at all locations required by the design.
- The thrie beam shall be galvanized after fabrication. Protective coating of steel railing shall be in accordance with Section 1005.
- All bolts, nuts, washers, plates, reinforcement and all anchors shall be galvanized after fabrication. Protective coating of steel railing shall be in accordance with Section 1005.
- All drilling details shall be shown on the shop drawings.
- Fabrication of structural steel shall be in accordance with Section 1005.

**Expansion Splice:**

- Expansion splice in the thrie beam shall be made at each post and at splices between posts. The splice shall be at the first or second post on either side of an expansion splice.

**Structural Steel:**

- The thrie beam rail shall be made from ASTM A572 Grade 50 structural steel.
- All steel shall be galvanized after fabrication. Protective coating of steel railing shall be in accordance with Section 1005.

**Thrie Beam Rail Splice:**

- All drilling details shall be shown on the shop drawings.
- Fabrication of structural steel shall be in accordance with Section 1005.

**Design Specifications:**

- 2002 AASHTO LRFD (17th Ed.)
- For MO Design Specifications: 2002 AASHTO LRFD (17th Ed.)
- For Bridge Guardrail (Thrie Beam)

**Technical Information:**

- Design Specification: 2002 AASHTO LRFD (17th Ed.)
- For MO Design Specifications: 2002 AASHTO LRFD (17th Ed.)
- For Bridge Guardrail (Thrie Beam)

**Contractor Notes:**

- Guardrail delineators shall be attached to the top of the guardrail and as shown on the shop drawings. All panels shall be galvanized after fabrication. Protective coating of steel railing shall be in accordance with Section 1005.

**Bridge Guardrail (Thrie Beam) Details:**

- The thrie beam rail system as shown shall be used at all locations required by the design.
- The thrie beam shall be galvanized after fabrication. Protective coating of steel railing shall be in accordance with Section 1005.
- All bolts, nuts, washers, plates, reinforcement and all anchors shall be galvanized after fabrication. Protective coating of steel railing shall be in accordance with Section 1005.
- All drilling details shall be shown on the shop drawings.
- Fabrication of structural steel shall be in accordance with Section 1005.

**Expansion Splice:**

- Expansion splice in the thrie beam shall be made at each post and at splices between posts. The splice shall be at the first or second post on either side of an expansion splice.

**Structural Steel:**

- The thrie beam rail shall be made from ASTM A572 Grade 50 structural steel.
- All steel shall be galvanized after fabrication. Protective coating of steel railing shall be in accordance with Section 1005.

**Thrie Beam Rail Splice:**

- All drilling details shall be shown on the shop drawings.
- Fabrication of structural steel shall be in accordance with Section 1005.
One shop or field splice per panel may be provided at any location.
PART SECTION AT RAIL POST

See side sheet for rail post spacing.

1) Required on one side of wall only, but may be provided on both sides as well at the contractor's option.

2) Three 1-inch diameter ASTM A516 Grade 36 anchor bolts with ASTM A563 Grade A hex nuts and ASTM F436 hardened washers.

3) Three 1-in diameter ASTM A516 Grade 36 anchor bolts with ASTM A563 Grade A hex nuts and ASTM F436 hardened washers.

Neutral Axis: Sym. Abt. 0.5

SECTION THRU THRIE BEAM RAIL

Adjust the rail post spacing to meet the requirements as shown below.

PART PLAN AT INTERMEDIATE BENT
ELEVATION OF THRIE BEAM RAIL

PART SECTION AT RAIL POST

For Elevation C-1 see Sheet No.

See slab sheet for rail post spacing.

(1) Required on one side of web only, may not be provided on both sides of web of the contractor's option.

(2) The two Reais Anchor System each with a minimum ultimate pullout strength of 16 kips and 4,000 psi concrete and each to include:
- 1 1/2" Min. 3 3/8" dia. hole in slab as recommended by manufacturer
- 3 3/4" Min. 3 3/8" dia. hole in slab
- 1 1/2" long 3/8" x 13/16" e-13 hex head bolts with washers and hex nut
- 2 1/2" long 3/8" x 13/16" e-13 hex head bolts with washers and hex nut

THREE BEAM-TO-BLOCKOUT CONN.

12' Grip Length

THREE BEAM-TO-BLOCKOUT CONN.

CONTACT MATERIAL

(1) The three beam connection to blockout on the wings of the post shall be tightened and backed off one-half turn and the threads shall be lubricated.

(2) The thrie beam guardrail on the bridge shall be 12-gauge steel.

(3) The top of the slab or wearing surface shall be at the same elevation as the top of the post and the channel member as required.

(4) The thrie beam connection to blockout on wings, the bolts shall be tightened and backed off one-half turn and the threads shall be lubricated.

(5) The minimum length of thrie beam sections is equal to one post space.

(6) A 5/8-inch diameter button head, oval shoulder bolt with a minimum 3/8-inch thick hex nut shall be used at all posts.

(7) The thrie beam guardrail on the bridge shall be 12-gauge steel.

(8) The thrie beam guardrail shall have a top edge height of 1.5 feet. The guardrail shall have a top edge height of 1.5 feet and shall be set perpendicular to roadway and made of lightweight material.

(9) All bolts, nuts, washers and plates will be considered completely covered by the contract unit price for Bridge Guardrail (Thrie Beam).

(10) The thrie beam guardrail shall be 12-gauge steel.

(11) The thrie beam guardrail shall be 12-gauge steel.

(12) The thrie beam guardrail shall be 12-gauge steel.

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(99) The thrie beam guardrail shall be 12-gauge steel.

(100) The thrie beam guardrail shall be 12-gauge steel.
Standard Drawing Guidance (do not show on plans):

This system meets NCHRP 350 TL-3 bridge railing requirements.

Max. post spacing = 6'-3"

Design weight of 12-gauge thrie beam bridge rail equals 35 lb/lf.

1. For 22 thru 31-inch voided slab depth, use 10 inches from top of original slab plus overlay depth. For 20-inch voided slab depth, reduce to 8 inches plus overlay depth.

2. Remove and show total of 2'-6\( \frac{3}{8} \)" plus overlay depth; give total depth of slab plus overlay depth.
**THREE systems details**

**Effective:** July 2020  
**Supersedes:** Mar. 2018

- **Hardened Locking**
  - 7/8"Ø (Min.) Drilled
  - 2 1/2"Ø Hardened Washer and Hex Nut

**SECTION E-E**
- **Details of Post Plate**
  - 3/4" x 3/4" Post Stiffeners
  - 3/4" x 3/4" Post Stiffeners and 1/4" x 3/4" Wedge Brackets

**SECTION D-D**
- **Details of Post**
  - 1" x 1" Wedge Bracket (Typ. 1)
  - 1/2" x 1/2" Weld Plate (Typ. 1)
  - W6x20 Post Plate

**ELEVATION OF TYPICAL SPLICE**
- Splice Plate
  - 2 1/2"Ø Button Head Bolts with washers & hex nut

**PLAN OF TYPICAL SPLICE**
- Plan of Rail Post Connection
  - Cap Rail Angle
  - 1/4"Ø Holes Slotted

**OPTIONAL SPLICE**
- One shop or field splice per panel may be provided at any location.

**ELEVATION OF EXPANSION SPLICE**
- Expansion Cap Rail Angle
  - Expansion Cap Plate
  - Expansion Cap Rail Angle
  - Expansion Cap Rail Plate

**PLAN OF RAIL POST CONNECTION**
- Cap Rail Angle
  - 1/4"Ø Holes Slotted

**NOTICE:** This drawing is not to scale. Follow dimensions.
**THREE BEAM RAIL**

**PART SECTION AT RAIL POST**

For Section C see Sheet No. __________.

(b) Required on one side of web only, but may be provided on both sides of web at the

(2) Post-Top Bent Plate Connection

Two 5/8" x 3 1/2" Vertical Slotted Holes (Expansion splice between posts)

Two 1 1/2" x 6" Washers

(3) Bent Plate to-Deck Connection

Three 1 1/2" x 3/8" Oval Shoulder Bolts in slab

Three 1 1/2" x 3/8" Oval Shoulder Bolts in slab with washers and hex nuts

**NOTE:** This drawing is not to scale, follow dimensions.

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**ELEVATION OF THREE BEAM RAIL**

**DETAIL A**

**DETAIL B**

**SECTION B-B**

**SECTION THRU THREE BEAM RAIL**

See Missouri Standard Plan 606.00 for details not shown.

**NOTE:** This drawing is not to scale, follow dimensions.

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**GENERAL NOTES:**

Design Specifications: 2002 AASHTO LFD (17th Ed.)

Standard Specifications

Guardrail delineators shall be attached to the top of the guardrail with a minimum of four posts and a maximum of six posts (except at end bents).

*SHRINK* length of channel members shall be attached to the top of the guardrail with a minimum of four posts and a maximum of six posts (except at end bents).

All bolts, nuts, washers and plates will be considered completely covered by the contract unit price for Bridge Guardrail (Three Beam).

All steel connecting bolts and fasteners for posts and rails, and all bolts, nuts, washers and plates shall be galvanized after fabrication. Protective coating and material requirement of steel railing shall be in accordance with Sec 1040.

Rail posts shall be set perpendicular to roadway profile grade, vertically in cross section and aligned in accordance with Sec 273 except that the rail posts shall be aligned by the use of a 1 3/4" x 1 3/4" or 2 x 2" channel member, the bolts shall be tightened and backed off one-half turn and the threads shall be burried.

At the expansion slots in the three beam rails and channels, the bolts shall be tightened and backed off one-half turn and the threads shall be burried.

Minimum length of three beam sections is equal to one post spacing.

A 5/8-inch diameter button-head, oval shoulder bolts with a minimum 2 3/4-inch long stud shall be used at all slots.

The three beam guardrail on the bridge shall be 12-gauge steel.

Posts, cap rail angles, bent plates, blocks, channels, and channel splice plates shall be fabricated from ASTM A520 Grade B steel and galvanized.

Flat washers 3 1/4 x 3 1/4 x 3/8-inch thickness shall be used at all post bolts between the bent head and cap rail. The flat washers shall be 3 1/4 x 3 1/4 x 3/8-inch thickness when necessary of such design as to fit the contour of the beam. Rectangular washers shall be used between the channel and the three beam rail.

Special drilling of the three beam guardrail may be required at the splices. All drilling details shall be shown on the shop drawings.

Fabrication of structural steel shall be in accordance with Sec 1060.

Expansion splices in the three beam rail shall be made at either the first or second post on either side of the joint and shall be provided for vertical alignment. Gapping devices shall be fabricated for the thrie beam rail and the channel shall be provided at all locations so that the maximum expansion gapping shall not exceed 200 feet.

Shear plates, 4 x 1 3/4-inch, may be used between the top of the post and the channel member as required for vertical alignment. Shim plates shall be galvanized after fabrication.

Contractor shall verify all dimensions in field before finalizing the shop drawings.

Outline of existing work is indicated by light dashed lines. Heavy lines indicate new work.

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**SHEET NO.** 1

**DISTRICT** 3

**COMMISSION** 7

**BRIDGE NO.** 105 WEST CAPITOL

**JEFFERSON CITY, MO 65102**

**DATE PREPARED** 3/7/2024

**CONTRACT ID.** 6

**ELEVATION OF THRIE BEAM RAIL**

**DETAIL A**

**DETAIL B**

**SECTION B-B**

**SECTION THRU THREE BEAM RAIL**

See Missouri Standard Plan 606.00 for details not shown.

**NOTE:** This drawing is not to scale, follow dimensions.

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**THREE BEAM RAIL SPICE**

**GENERAL NOTES:**

Design Specifications: 2002 AASHTO LFD (17th Ed.)

Standard Specifications

Guardrail delineators shall be attached to the top of the guardrail with a minimum of four posts and a maximum of six posts (except at end bents).

*SHRINK* length of channel members shall be attached to the top of the guardrail with a minimum of four posts and a maximum of six posts (except at end bents).

All bolts, nuts, washers and plates will be considered completely covered by the contract unit price for Bridge Guardrail (Three Beam).

All steel connecting bolts and fasteners for posts and rails, and all bolts, nuts, washers and plates shall be galvanized after fabrication. Protective coating and material requirement of steel railing shall be in accordance with Sec 1040.

Rail posts shall be set perpendicular to roadway profile grade, vertically in cross section and aligned in accordance with Sec 273 except that the rail posts shall be aligned by the use of a 1 3/4" x 1 3/4" or 2 x 2" channel member, the bolts shall be tightened and backed off one-half turn and the threads shall be burried.

At the expansion slots in the three beam rails and channels, the bolts shall be tightened and backed off one-half turn and the threads shall be burried.

Minimum length of three beam sections is equal to one post spacing.

A 5/8-inch diameter button-head, oval shoulder bolts with a minimum 2 3/4-inch long stud shall be used at all slots.

The three beam guardrail on the bridge shall be 12-gauge steel.

Posts, cap rail angles, bent plates, blocks, channels, and channel splice plates shall be fabricated from ASTM A520 Grade B steel and galvanized.

Flat washers 3 1/4 x 3 1/4 x 3/8-inch thickness shall be used at all post bolts between the bent head and cap rail. The flat washers shall be 3 1/4 x 3 1/4 x 3/8-inch thickness when necessary of such design as to fit the contour of the beam. Rectangular washers shall be used between the channel and the three beam rail.

Special drilling of the three beam guardrail may be required at the splices. All drilling details shall be shown on the shop drawings.

Fabrication of structural steel shall be in accordance with Sec 1060.

Expansion splices in the three beam rail shall be made at either the first or second post on either side of the joint and shall be provided for vertical alignment. Gapping devices shall be fabricated for the thrie beam rail and the channel shall be provided at all locations so that the maximum expansion gapping shall not exceed 200 feet.

Shear plates, 4 x 1 3/4-inch, may be used between the top of the post and the channel member as required for vertical alignment. Shim plates shall be galvanized after fabrication.

Contractor shall verify all dimensions in field before finalizing the shop drawings.

Outline of existing work is indicated by light dashed lines. Heavy lines indicate new work.

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**SHEET NO.** 1
THREE8b System Details

Checked

Effective: July 2020

Supersedes: Mar. 2018

1. (1) Two 1"Ø ASTM F3125 Grade A325 Type 1 Bolts with hardened washers and hex nuts

2. (2) Two 1 1/16"Ø Drilled Holes in slab

3. (3) Two 1 5/8" x 2 1/8" Bolt Diameter Holes in washer plate, inside lower post flange and both bent plates

4. (4) Two 1"Ø ASTM A709 Grade 36 Head Bolts with washers & hex nut

5. (5) Two 5/8"Ø Button Head Bolts with washers & hex nut

6. (6) Expansion Cap Rail Angle

7. C8x11.5 C8x11.5

8. (7) Two 6"x3" Expansion plates 6 x 3 x 1/16-inch may be used between the W6 x 20 post and 1/2"-inch post plate connection as required for horizontal alignment.

Shim plates may vary in thickness from 1/8" to 1/4". Shim plates shall be galvanized after fabrication.

Note: This drawing is not to scale. Follow dimensions.

Sheet No. of

10/17/2023

ECRI: 5502A

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

District

Contract ID.

Date

Date Prepared

Bridge No.

County

Sheet No.

105 West Capitol

1-888-ASK-MODOT (1-888-275-6636)
Standard Drawing Guidance (do not show on plans):

This system meets NCHRP 350 TL-3 bridge railing requirements.

Max. post spacing = 6'-3"

If slab cantilever length exceeds 6", consideration shall be given to:
(with the result that anchorage into slab lies in the cantilever part of slab)

(1) Anchorage into cantilever portion of slab provided original slab thickness allows for min. embedment & 1" cover (check negative moment in cantilever).

(2) Extending bent plate (within reason).

(3) Alternating method of attachment, i.e. System 1 or System 3 types and variations thereof. Consult Structural Project Manager.
SECTION C-C

(1) UPPER POST-TO-BENT PLATE CONNECTION
- 1/8" Ø Hole in inside post flange and both 7/8" Ø Drilled Hole in girder or as indicated.
- 1/16" Ø Hole in washer plate and bent plate

(2) BENT PLATE-TO-DECK CONNECTION
- Washers Anchors System may be included.
- 1/8" Ø Hole in girder flange and both 7/8" Ø Drilled Hole in post flange and bent plate

ELEVATION OF TYPICAL SPlice

PLAN OF TYPICAL SPlice

ELEVATION OF RAIL POST CONNECTION

PLAN OF RAIL POST CONNECTION

OPTIONAL SPlice

One shop or field splice per panel may be provided at any location.

EXPANSION SPLICE PLATE

Shim plates may vary in thickness from 1/16 inch to 3/16 inch. The thickness required and may be used in all thicknesses.

EXPANSION SPLICE PLATE

Note: This drawing is not to scale. Follow dimensions.
THRIE4b_system4_details     Guidance

Standard Drawing Guidance (do not show on plans):
① Remove these details when this sheet is used in combination with drawing THRIE 4D, and use 15/16" for diameter of the bottom two holes in the Details of Post.
② Replace with below notes when this sheet is used in combination with drawing THRIE 4D.

- 1/4" ASTM F3125 Grade A325 Type 1 Bolts with hex nuts and hardened loc washers
- 1/8" Drilled Holes in slab
- 1/4" Holes in bent plate and bearing plate
When a latex, low slump or silica fume concrete overlay is used, add these details.
**Bridge Rail Notes:**

Rail posts shall be set perpendicular to roadway profile grade, vertically (if cross section and alignment are to be set prior to slab placement) or at site, horizontally, and aligned in accordance with Sec 315 except that the rail posts shall be aligned by the use of plumb battens such that the post deviates not more than 1/2 inch from true horizontal alignment along the rail alignment. The shims (as required) shall be placed at the base plate and the rail. The thickness of the shims shall be determined by the contractor and verified by the engineer before ordering material for this work.

Rail posts shall be seated on elastomeric pads having the same dimensions as the base plate and 1/2 inch thick. Pads may be any elastomeric material, plain or fibered, having a hardness (Durometer) of 50 or greater and certified by the manufacturer. Additional shims may be required to adjust for horizontal alignment. Post height shown will increase by the thickness of the pad.

**HSS = Hollow Structural Section**

Dimensions of bridge rails are measured horizontally.

Bridge Rails will be measured to the nearest linear foot for each structure measured from end of slab to end of slab.

Payment for furnishing all materials and labor necessary to install Bridge Rail, complete-in-place, will be considered completely covered by the contract unit price for Bridge Rail (Two Tube Structural Steel) per linear foot. Guardrail delineators shall be attached to the top of the bracket for installing guardrail as shown in Missouri Standard Plan 606.50 and in accordance with Sec 606. Delineators on bridges with two-lane, two-way traffic shall have reflective sheeting on both sides. Guardrail delineators will be considered completely covered by the contract unit price for Bridge Rail (Two Tube Structural Steel).

**Curb Notes:**

Top of curb shall be built parallel to grade.

All exposed edges of curb shall have either a 3/4" radius or a 2 1/2" bevel, unless otherwise noted.

Use a minimum lap of 2'-11" for #5-R1 bars.

The cross-sectional area of curb above the slab = 0.66 sq. ft.

Concrete in the curb shall be Class B-2.

The curb shall be cored by application of Type 1-D Liquid Membrane Forming Curing Compound in accordance with Sec 1055 and deleted in accordance with Sec 1055. The contractor shall consult with the manufacturer's recommendations before the concrete sealer is applied.

Measurement of the curb is to the nearest linear foot for each structure measured from end of slab to end of slab.

Payment for all concrete and reinforcement, complete-in-place, will be considered completely covered by the contract unit price for Concrete Curb (Bridge Rail) per linear foot.

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**Bridge Rail (Two Tube Structural Steel) per linear foot.**

Bridge Rails shall be measured to the nearest linear foot for each structure measured from end of slab to end of slab.

Payment for furnishing all materials and labor necessary to install Bridge Rail, complete-in-place, will be considered completely covered by the contract unit price for Bridge Rail (Two Tube Structural Steel) per linear foot. Guardrail delineators shall be attached to the top of the bracket for installing guardrail as shown in Missouri Standard Plan 606.50 and in accordance with Sec 606. Delineators on bridges with two-lane, two-way traffic shall have reflective sheeting on both sides. Guardrail delineators will be considered completely covered by the contract unit price for Bridge Rail (Two Tube Structural Steel).

**Curb Notes:**

Top of curb shall be built parallel to grade.

All exposed edges of curb shall have either a 3/4" radius or a 2 1/2" bevel, unless otherwise noted.

Use a minimum lap of 2'-11" for #5-R1 bars.

The cross-sectional area of curb above the slab = 0.66 sq. ft.

Concrete in the curb shall be Class B-2.

The curb shall be cored by application of Type 1-D Liquid Membrane Forming Curing Compound in accordance with Sec 1055 and deleted in accordance with Sec 1055. The contractor shall consult with the manufacturer's recommendations before the concrete sealer is applied.

Measurement of the curb is to the nearest linear foot for each structure measured from end of slab to end of slab.

Payment for all concrete and reinforcement, complete-in-place, will be considered completely covered by the contract unit price for Concrete Curb (Bridge Rail) per linear foot.
Standard Drawing Guidance (do not show on plans):

1. Modify as required.

TL-4 (NCHRP 350) bridge rail is typically used on spread box beam bridges and may be used on adjacent box beam bridges where reinforcement is embedded in the beam.

Use only in certain applications because of cost. Acceptable for use when roadway width or site distance is a concern. Curb shall be used to prevent drainage over deck.
GUARDRAIL CONNECTION PLATE ASSEMBLY DETAILS

- Drill and tap 3 holes for 7/8" ASTM F3125 Grade A325 Type 1 bolts.
- Four 1" holes for 7/8" ASTM F3125 Grade A325 Type 1 bolts and nuts

TERMINAL CONNECTOR

Note: This drawing is not to scale. Follow dimensions.

Bridge Anchor Section

- Bridge anchor section shall be in accordance with Missouri Standard Plan 60E.22 except bearing plate and connector plate will not be required.

PART SECTION THRU SLAB SHOWING LEFT BRIDGE RAIL

(Right bridge rail similar)
TL-4 (NCHRP 350) bridge rail is typically used on spread box beam bridges and may be used on adjacent box beam bridges where reinforcement is embedded in the beam.

Use only in certain applications because of cost. Acceptable for use when roadway width or site distance is a concern. Curb shall be used to prevent drainage over deck.
DETAIL OF 3/8" ROUND HEAD BOLT

RAIL SPLICE CONNECTION AT EXPANSION JOINT

PLAN BOTTOM SPlice PLATE TYPICAL

END OF RAIL DETAILS

SECTION C-C

Notes:
Fabrication of structural steel shall be in accordance with Sec 712 and 1080.
Hollow structural sections shall be in accordance with ASTM designation A 500 Grade B Structural Steel Tubing and shall meet the longitudinal CVN requirements of 15 ft-lbs at 0°F, see Sec 1080 for reporting.
All other steel shapes and plates shall be in accordance with AASHTO M 270 Grade 36 except posts shall be in accordance with AASHTO M 270, Grade 50.
All anchor bolts shall be ASTM F1554 Grade 36 with ASTM A563 Grade A hex nuts and ASTM F436 hardened washers.
Bolts, cap screws, and nuts shall be in accordance with ASTM designation A307 except for high strength bolts, nuts and washers noted which shall be in accordance with AASHTO M 164.
All anchor bolts, bolts, nuts, cap screws, washers and lock washers shall be galvanized in accordance with AASHTO M 232 (ASTM A153), Class C.
All posts, railing, rail splices, and angles shall be galvanized after shop fabrication in accordance with AASHTO M 111 and ASTM A385.
Galvanized rail shall not be painted.
Railing shall be in accordance with Sec 713, except as noted.
All field drilled holes shall be coated with an approved zinc rich paint before erection.
HSS = Hollow Structural Section

Note: This drawing is not to scale. Follow dimensions.

Note: This drawing is not to scale. Follow dimensions.
38-INCH TWO-TUBE RAIL

Bridge Rail Notes:
Rail joints shall be set perpendicular to roadway profile grade, vertically in cross section and aligned in accordance with Sec 1124, except that the rail posts shall be aligned by the use of 6 1/2 x 6 1/2-inch shims such that the post deviates not more than 1/2-inch from true horizontal alignment after final adjustment. The shims shall be replaced as necessary to maintain the alignment after final adjustment. The thickness of the shims shall be determined by the contractor and verified by the engineer before ordering material for this work.

Rail posts shall be set plumb and aligned in accordance with Sec 713.

Payment for furnishing all materials and labor necessary to install bridge rail, complete in place, shall be considered completely covered by the contract unit price for Bridge Rail (Two Tube Structural Steel) per linear foot.

Guardrail delineators shall be attached to the top of the guardrail post using galvanized anchorage as shown on Missouri Standard Plan 606-50 and in accordance with Sec 606. Delineators on bridge decks with two lanes, two-way traffic shall be spaced at 50 feet maximum. Delineators on bridge decks with one lane, one-way traffic shall be spaced at 50 feet maximum. Guardrail delineators shall be considered completely covered by the contract unit price for Bridge Rail (Two Tube Structural Steel).

HSS = Hollow Structural Section

Dimensions of bridge rails are measured horizontally.

Bridge rails will be measured to the nearest linear foot for each structure measured from end of wing to end of wing.

Fabrication of structural steel shall be in accordance with Sec 1000.

Hollow structural sections shall be in accordance with ASTM A500 Grade B Structural Steel Tubing and shall meet the longitudinal CVN requirements of 15 ft-lbs at 0° F, see Sec 1080 for reporting.

All other steel shapes and plates shall be in accordance with ASTM A709 Grade 50.

All anchor bolts shall be ASTM A490 Type 1 with ASTM A500 Grade B hex nuts and ASTM A563 hardened washers.

All anchor bolts, nuts, and washers shall be galvanized in accordance with AASHTO M 332 (ASTM A153), Class C.

All posts, railing, rail splices, and plates shall be galvanized after shop fabrication in accordance with AASHTO M 332 and ASTM A385. Galvanized rail shall not be painted.

Provide railing expansion joints at 50 foot maximum intervals. Railing shall be continued over two posts minimum. Railing expansion joints are required in rail sections that span bridge expansion joints.

Use grout with a minimum 24-hour f'c of 3000 psi in single placement.

Curb Notes:
Top of curb shall be built parallel to grade and curb joints (except at end bents) normal to grade.

All exposed edges of curb shall have either a 1/2-inch radius or a 3/16-inch bevel, unless otherwise noted.

Minimum lap for longitudinal x-bars is 2-1/2.

The cross-sectional area of curb above the slab = 0.75 sq. ft.

Concrete in the curb shall be Class B or B2.

The curb shall be cured by application of Type 1-D Liquid Membrane-Forming Curing Compound in accordance with Sec 1055 and sealed in accordance with Sec 703. The contractor shall remove all curing compound in accordance with the manufacturer's recommendations before the concrete sealer is applied.

Measurement of the curb is to the nearest linear foot for each structure, measured along the outside top of slab from end of wing to end of wing.

Payment for all concrete and reinforcement, complete in place, will be considered completely covered by the contract unit price for concrete curb (bridge rail) per linear foot.
PART PLAN SHOWING JOINT LOCATION

(For skewed structures only)
38-INCH TWO-TUBE RAIL

Note: Work this sheet with Sheet No. 8.

ELEVATION OF LEFT CURB AND RAIL

Bridge Approach Transition not shown for clarity (Roadway item)

PART ELEVATION SHOWING END OF RAIL ON WING

Bridge Approach Transition not shown for clarity (Roadway item)

PART PLAN OF LEFT CURB AT END BENTS SHOWING REINFORCEMENT

Note: This drawing is not to scale. Follow dimensions.
Standard Drawing Guidance (Do not show on plans)
- Large skew may require additional R1 bars.
- 6'' min., 12'' max. to avoid anchor bolts by 3'' min.

Use for shallow superstructure where 27'' embedment is not possible. (Shape 6 with E=12'')

Post spacing guidance:

Copy and paste this detail to Bridge Approach Slab sheet to replace Section Between Curb and Barrier. This detail is scaled to match the scale of the MAJOR Bridge Approach Slab sheets.

Copy and paste this detail to Bridge Approach Slab sheet to replace Section Between Curb and Barrier. This detail is scaled to match the scale of the MINOR Bridge Approach Slab sheet.
Standard Drawing Guidance

Do not show on plans:

Remove details that do not apply.

Revising for skewed end bent is not necessary or required unless unusual details of drainage need to be shown.

For end bents with intermediate wing, see Bridge Standard Drawing sheet DRAIN01.

If the drain pipe discharges onto soil, front or side slope (Case 3 and 4 of Standard Plan 609.40), and discharges at greater than 20 feet above the toe of slope, then the possible solution to the slope should be considered and prevention coordinated with the district.

Possible solutions:

A. Provide a drain flume consistent with 609.40.
B. Extend the drain to the toe of slope using the following note (or similar) added to the general notes:

   The unperforated drain pipe shall be extended parallel to the slope at a depth of 30 inches until the drain discharges onto rock blanket or the ditch flowline.
C. Add a detail showing the drain extension.

General Notes:

All drain pipe shall be sloped 1 to 2 percent.

Drain pipe may be either 6-inch diameter corrugated metallic-coated steel pipe underdrain, 6-inch diameter corrugated polyvinyl chloride (PVC) drain pipe, or 4-inch diameter corrugated polyethylene (PE) drain pipe.

Drain pipe shall be placed at fill face of end bent and outside face of wings. The pipe shall slope toward the drain head and be extended also existing the drain head of end bent by a minimum of 3 to 6 inches.

Perforated pipe shall be placed at fill face side and inside face of wings at the bottom of end bent and pipe pipe shall be used where the vertical drain ends at the exit at ground line.

Note: This drawing is not to scale. Follow dimensions.

ELEVATION OF WING

OPTIONAL TURNED DRAIN

(Use only when straight drain is not practical.)

VERTICAL DRAIN AT END BENTS

(Squared end bent shown. Skewed end bent similar.)
V_DRA01_i  Alternate Details

ELEVATION OF WING

USE FOR TYPE H OR B (SBC)

ELEVATION OF END BENT

USE FOR TYPE B BARRIER (SBC)
Standard Drawing Guidance

(Do not show on plans)

Remove details that do not apply.

Revising for skewed end bent is not necessary or required unless unusual details of drainage need to be shown.

If the drain pipe discharges onto soil, front or side slope (Case 3 and 4 of Standard Plan 609.40), and discharges at greater than 20 feet above the toe of slope, then the possible erosion of the slope should be considered and prevented coordinated with the district.

Possible solutions:

A. Provide a drain flume consistent with 609.40.
B. Extend the drain to the toe of slope using the following note (or similar) added to the general notes:

The unperforated drain pipe shall be extended parallel to the slope at a depth of 30 inches until the drain discharges onto rock blanket or the ditch flowline.
C. Add a detail showing the drain extension.

General Notes:

All drain pipe shall be sloped 1 to 2 percent.

Drain pipe may be either 6-inch diameter corrugated metallic-coated steel pipe underdrain, 4-inch diameter corrugated polyvinyl chloride (PVC) drain pipe, or 4-inch diameter corrugated polyethylene (PE) drain pipe.

Drain pipe shall be placed at fill face of end bent and inside face of wings. The pipe shall be placed on a firm base and also missing the lower beam of end bent by a minimum of 1/2 inch.

Perforated pipe shall be placed at fill face of end bent and outside face of wings at the bottom of end bent and plain pipe shall be used where the vertical drain ends to the exit at ground line.
**Alternate Details**

**V_DRA02_ni**

**ELEVATION OF WING**

- Ground Line
- Cut coupler flush with ground line

**ELEVATION OF END BENT**

- Vertical Drain Core
- Unperforated Drain Pipe
- Perforated Drain Pipe
- Cap

**USE FOR TYPE H OR B (SBC)**

**USE FOR TYPE B BARRIER (SBC)**

**ELEVATION OF WING**

- Ground Line
- Cut coupler flush with ground line

**USE FOR TYPE H OR B (SBC)**
General Notes:

All drain pipe shall be sloped 1 to 2 percent.

Drain pipe may be either 8-inch diameter corrugated metallic-coated steel pipe, 4-inch diameter corrugated polyvinyl chloride (PVC) drain pipe, or 4-inch diameter corrugated polyethylene (PE) drain pipe.

Drain pipe shall be placed at fill face of end bent and inside face of wings. The pipe shall be placed at least 2 inches below the face of the end bent, with the bottom of the pipe at least 1 1/2 inches below the bottom of the wing.

Possible solutions:

A. Provide a drain flume consistent with SDM 40.
B. Extend the drain to the toe of slope using the following note (or similar) added to the general notes:
   The unperforated drain pipe shall be extended parallel to the slope at a depth of 30 inches until the drain discharges onto rock blanket or the ditch flowline.
C. Add a detail showing the drain extension.

Standard Drawing Guidance (do not show on plans):

Remove details that do not apply.

Revise for skewed end bent is not necessary or required unless unusual details of drainage need to be shown.

If the drain pipe discharges onto soil, front or side slope (Case 3 and 4 of Standard Plan 609.40), and discharges at greater than 20 feet above the toe of slope, then the possible erosion of the slope should be considered and prevention coordinated with the district.

Possible solutions:

A. Provide a drain flume consistent with SDM 40.
B. Extend the drain to the toe of slope using the following note (or similar) added to the general notes:
   The unperforated drain pipe shall be extended parallel to the slope at a depth of 30 inches until the drain discharges onto rock blanket or the ditch flowline.
C. Add a detail showing the drain extension.

Note: This drawing is not to scale. Follow dimensions.
ELEVATION OF WING

USE FOR TYPE H OR B (SBC)

USE FOR TYPE H OR B (SBC)

USE FOR TYPE B BARRIER (SBC)