ACEC/Maine DOT Bridge Design Subcommittee

MEETING MINUTES

11 June 2013

Attendees:		**Location:** MaineDOT Room 317A/B
Wayne Frankhauser	MaineDOT	
Laura Krusinski	MaineDOT	
Leanne Timberlake	MaineDOT	**Time**: 1:00PM – 2:15PM
Marie Malloy	MaineDOT	
Chris Snow	GZA	
Jason Gallant	CMA Engineers	
Craig Weaver	Kleinfelder	
Steve Hodgdon	VHB	
Steve Percassi	Erdman Anthony	**Notes Taken By:** Steve Hodgdon

This is the second quarter ACEC/MaineDOT Bridge Design Subcommittee meeting.

- **Information from MaineDOT**

  - The 2-year (2014/2015) work plan is now posted on line. Many of the projects will be kicked-off this summer and fall.

  - The 2013 bridge load ratings have been assigned. Leanne Timberlake is assembling another batch of ratings for assignment in 2014.

  - The Department continues to see competitive construction bids. Nearly all projects are coming in at or below the PS&E estimate.

  - The Department is short-handed with contract specialists and looking to hire another. She also reiterated that consultant invoices need to be complete and include all the necessary backup including timecards, A-1 sheets (when there is a pay rate change or new person), and documentation of all receipts/expenses. Only approved wage rates may be billed.

  - The MaineDOT Chief Engineer is retiring the end of June. Finding a replacement is in progress.

  - The scheduled date for the new Standard Specifications Book is January 2014.

- The Chief Engineer is working on the review of the Chapter 5 rewrite of the Bridge Design Guide (BDG). The Department hopes it will become part of the BDG once all comments are addressed and final revisions incorporated.

- Copies of the last three (3) Designer Meeting minutes (5/1, 5/15, and 5/29) were distributed by the Department (see attached). Two of the meetings consisted of presentations. One by DS Brown on a spray applied deck membrane system (Deckguard) and the other by Lochner on their Route 1 Gateway bridges in New Brunswick, Canada.

  - The May 15 meeting included an assessment of elastomeric bearing design inconsistencies in the Bridge Design Guide, Specifications, and AASHTO. The Department will work on drafting revisions to the BDG and Specifications for internal review.
  - The May 15 meeting also included "lessons learned" regarding a box culvert project on Mount Desert Island and splice locations for steel finger joint assemblies.

- MaineDOT is in final design of a NEXT beam bridge in Kittery that includes carbon prestressing strands. The project includes techniques from the latest ABC Toolkit manual that was recently published and funds from a SHRP2 Grant. It is anticipated to be advertised in January 2014.

- **Strip Seal or Gland Seal Expansion Joints**

  - MaineDOT's current gland seal detail is not performing well and the Department is considering revisions for improved durability. The consultant members presented the Department with an overview of expansion joint details and practices used in neighboring states including: New York, Pennsylvania, Connecticut, Massachusetts, Vermont, and New Hampshire.

  - **Connecticut** – Craig Weaver provided a packet (see attached) to the committee with a summary of the Connecticut DOT Expansion Joint Systems including a 2/25/2011 memorandum that includes revisions to their strip seal expansion joint for new construction and rehabilitation projects.

  - **New York and Pennsylvania –** Steve Percassi provided standard detail sheets used by each of these states (see attached). Also, Steve noted that NYSDOT prefers/uses the modular joint compared to the finger-type joint.

  - **Massachusetts and Vermont** – Steve Hodgdon provided information and details by each of these states (see attached). VTrans does not use a gland-seal as a standard. They have been using their "Vermont Joint" for many years. Massachusetts does use a strip seal.

- **New Hampshire** – Jason provided NHDOT details and guidelines from their Bridge Design Manual (see attached). The New Hampshire joint details are robust in comparison to the other state details presented.

- **Subcommittee Rotation**
  - Steve Percassi has his last meeting at the Q3 meeting this year. Keith Donnington is taking his place starting at the Q4 meeting this year.

- **Future Meeting Topics**
  - Steve Percassi will prepare and summarize their recent experience rehabilitating and strengthening a concrete through girder bridge using FRP wrap.
  - Laura Krusinski noted that some research projects are expected to be complete at the University of Maine. The projects included a compilation of pile load test data and potential refinements in the Nordlund method for capacity in/on rock. Once the projects are finalized, the information can be discussed at a future meeting.

- **Next Meeting Date**
  - Tentatively August 20, 2013 at 1:00 PM, MaineDOT Conference Room 317A/B. Wayne will send a confirmation email.

Attachments:
Designer Meeting Minutes from May 2013
Expansion Joint Information from NY, PA, CT, MA, VT, and NH

I have attempted to summarize discussions held during this meeting as accurately as possible. If there are any items discussed herein that are misrepresented in any way, please contact me within ten working days. In the absence of any corrections or clarifications, it will be understood that these minutes accurately summarize the discussions at the meeting.

Respectfully Submitted,

Steven Hodgdon

Designers Meeting Agenda

Wednesday, May 1, 2013
Conference Room 317 A&B
1:00 – 2:30 PM

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1) Deckguard™ Spray Membrane – Edwin Bechstein

http://www.dsbrown.com/Bridges/Deckguard.aspx

Attendees: Mike Wight, Jonathan Buck, Joel Veilleux, Roger Naous, Devan Eaton, Doug Gayne, Joe Stilwell, Garrett Gustafson, Brian Reeves, Rich Myers, Wayne Frankhauser and Dale Peabody

1) Deckguard™ Spray Membrane – Edwin Bechstein

Bill Kudrenski, D. S. Brown's consultant, gave a presentation on spray applied membranes. Edwin Bechstein of D. S. Brown handed out datasheets on Deckguard™ Spray Membrane (digital version linked below) and discussed the specifics of this product.

DS Brown Datasheets

Notable aspects of the Deckguard™ Spray Membrane

- Requires special tack coat applied by membrane applicator
- Manufactured in United States
- Recommend increased thickness on curves and grades over 4%. Cast aggregate into additional membrane layer to improve pavement bond.
- $5.50-10.00/sq ft. Larger and simplistic applications drop the price to the lower end of the range.
- Aggregate can also be cast into the membrane to run traffic on it. $7.50-12.50/sq ft
- Currently exploring options for northern New England applicators
- Can coat pipe piles
- D. S. Brown to send special provisions

Identification of a trial deck for this product is underway.

Designers Meeting Agenda

Wednesday, May 15, 2013
Conference Room 317 A&B
1:00 – 2:30 PM

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1) Elastomeric Bearing information/update – Brian Reeves (45 minutes)
2) Mount Desert lesson learned – Rich Myers (20 minutes)
3) Weld location for staged finger joint construction – Devan Eaton (5 minutes)

Attendees: Rich Myers, Brian Reeves, Devan Eaton, Wayne Frankhauser, Mike Wight, Roger Naous, Bob Bulger, Joe Stilwell, Joel Veilleux, Brian Nichols, Nate Benoit, Mark Parlin and Garrett Gustafson

1) Elastomeric Bearing information/update – Brian Reeves (45 minutes)

   Review of the Bridge Design Guide (BDG), Maine DOT Standard Specifications, and standard notes confirmed that updates are necessary to bring each up to date with current AASHTO standards. It was noted that suppliers feel the limitations of current Maine DOT practices are overly restrictive. An outline of the BDG review in comparison to the current AASHTO LRFD Bridge Design Specifications is attached.

   Designers should note that it is only necessary to specify a single shear modulus number. The supplier is allowed a +/-15% range from the specified value and the designer should check their design for the minimum and maximum ends of this range.

   Brian Reeves will draft revisions to the appropriate sections and present these changes at a future designers meeting.

2) Mount Desert lesson learned – Rich Myers (20 minutes)

   A recap of the lessons learned on this project is attached. Additional key points discussed are outlined below with numbering corresponding to the attachment.

   1. Price was also affected by being located on Mount Desert Island and abutting Acadia National Park.
   3. Despite typical practice, in rare instances it may be necessary to have a written agreement with the town allowing the contractor to use a town parking lot. In this case, utility work necessitated use of the parking lot and due to the high summer demand for parking, a clear agreement with the town before construction would have been advisable.
   5. Tide gates are typically used in cases with a large hydraulic head. Additional research is necessary to specify appropriate tide gates for lower flow, catch basin outlet applications.
   9. Field fit up issues were addressed by saw cutting and grouting

3) Weld location for staged finger joint construction – Devan Eaton (5 minutes)

   Reminder to designers that break lines in finger joints should not be located through a finger. Standard detail attached.

April 22, 2013

Elastomeric Bearings

Bridge Design Guide Review for conflict with current LRFD Bridge Design Specification (6th Edition 2012)

<u>BDG 4.11.3 Steel-Reinforced Elastomeric Bearings</u>

P1: AISI/NSBA Guide Spec (draft 2003)
- Outdated and inconsistent with references at end of Chapter 4

P2: OK

P3: Shear Modulus for design is 100 to 130 psi
- Appendix D.10 Standard Note #1 uses inconsistent shear modulus range stating 80-175 psi
- LRFD 14.7.5.2 Materials Properties
  * 80-175 psi
  * +/- 15%
  * Min. of 80 psi
- LRFD Table 14.6.2-1 Correlated Material Properties
  * Hardness (Shore A) = 50, Shear Modulus 95-130 psi
  * Hardness (Shore A) = 60, Shear Modulus 130-200 psi

P4: Necessity?

<u>BDG 4.11.3.1 Design Rotation</u>

-LRFD has removed rotation for Steel-Reinforce Elastomeric Bearing and the Department does not allow Cotton-duck Pads (CDP). REMOVE SECTION

<u>BDG 4.11.3.2 Design Movement</u>

P1: temperatures in the range of 60° F to 90° F
- Appendix D.10 Standard Note #7 uses inconsistent temperature range stating 65° F to 90° F.
- LRFD design temperature range is -30° F to 120° F
  *What temperature range should the Designer use; I have adopted use of the greater of <u>-30°F to 90° F</u> (120° F Range; Controls) and 60° F to 120° F (60° F Range).

<u>BDG References</u>

AISI/NSBA Steel Bridge Collaboration Task Group 9, 2002 (draft), Guide Specification for Steel Bridge Bearing Design and Detailing, December 10
- Outdated, Newer Version 2004

AISI/NSBA, 1996, Steel Bridge Bearing Selection and Design Guide, December
- Outdated, Newer Version 2006

Wight, Michael 2/21/13

Subject: Mt. Desert, Stanley Brook Bridge #5570, WIN 016718.00 (Route 3 over Stanley Brook)

Lessons learned

1. Need to program more money especially considering 1.2 bankfull width requirements, 2' raise in grade to deal with sea level rise and esthetic issues for a tourist town.
   Programmed $500,000
   Current total project cost $2,128,362
2. Need better communication with the public and town officials on the construction schedule. The construction schedule along with the traffic impacts should have been discussed in more detail. A formal construction schedule should have been developed by MDOT to use as part of the public process.
3. Should have had a discussion with the town impacts to the beach parking lot with a possible agreement before construction.
4. Do not use pavement for beach access when the ramp is impacted by tides or wave action. The VE for the boat ramp should not have been approved by MDOT.
5. Reconsider use of tide gates on the end of closed drainage system on future projects. Tough to specify. The final gates are lightly open at low flow conditions.
6. Need be sure to ask towns about special events such as running events (i.e. marathons).
7. Consider alternative contracting method like A+ B bidding to reduce construction time
8. Need to the modify timber rail spec to insure that there are no markings on the rail. Also need to make sure the specification is enforced.
9. Need to be sure to enforce the box culvert spec in the fab shop. Some pieces did not meet tolerance requirements that had to be addressed in the field.
10. Need to clarify the 534 spec on what is allowed for connection details between pieces for precast elements.
11. When using new products (i.e. Stainless steel rebar), MDOT needs to educate contractors, suppliers and fabricators.
12. Need to be aware of sediment issues for culverts located on beaches in coastal locations. Significant volumes of materials can be moved in and out of culverts in these locations.
13. Need to be clear with contractors on what is happening with the aerial utilities in regards to installation of the box culvert.
14. Need to research existing drainage systems before design need drainage system.
15. Need to clarify planting specification for plantings in riprap. Need to use natural pockets in riprap between stones whenever possible.

16. Need more time in the project schedule to get ROW from the Federal government. The project was advertised with the ROW process not complete with the Acadia National Park property.

17. MaineDOT extended the sidewalk at the westerly end of the project per the town's request. The town wants to extend sidewalk beyond the project to the west. This issue should ideally have been addressed before advertise.

18. Need to properly seal off old discontinued drain pipes that are encountered during construction.

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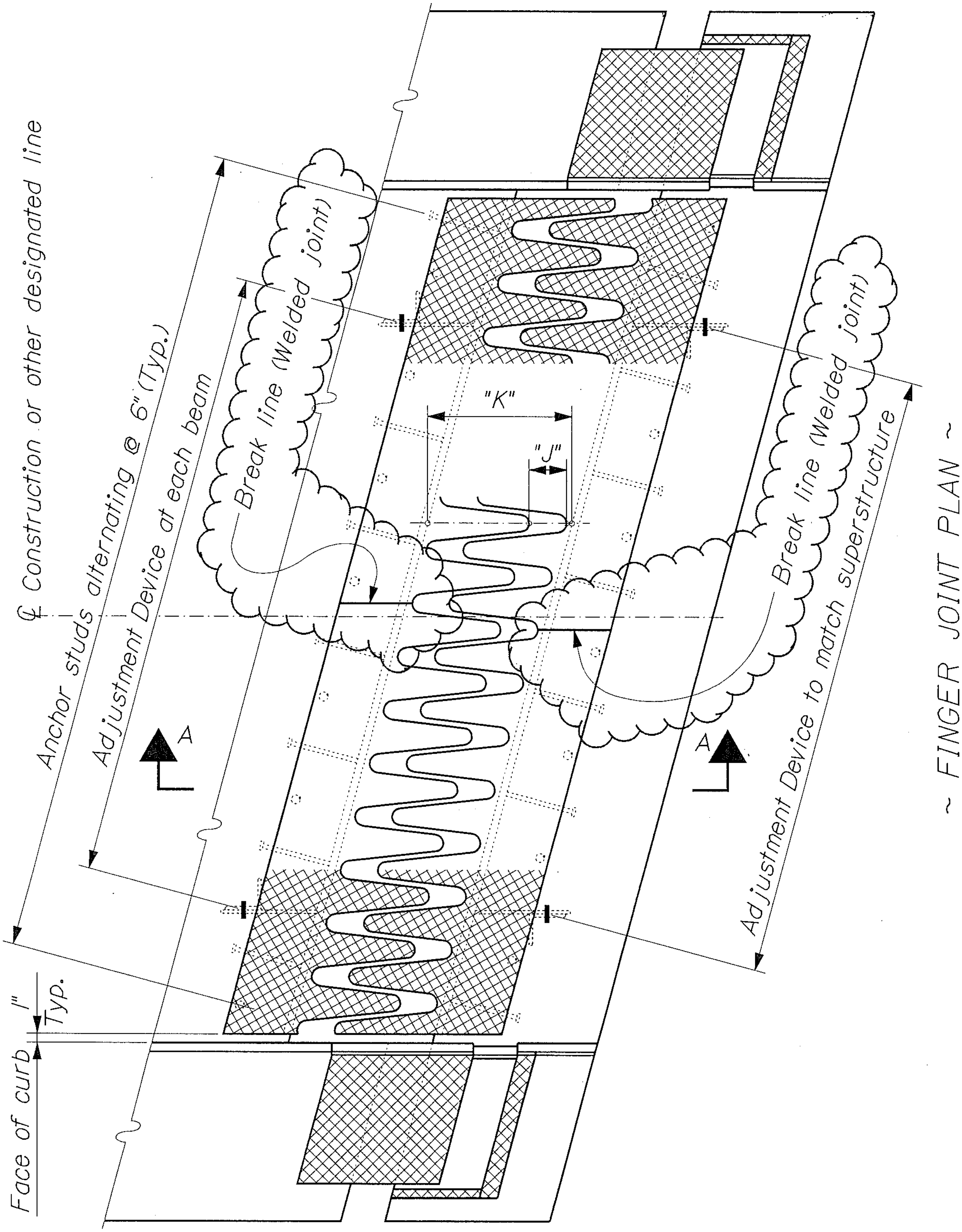

EXPANSION DEVICE - FINGER JOINT

521(01)

Designers Meeting Agenda

Wednesday, May 29, 2013
Conference Room 317 A&B
1:00 – 2:30 PM

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1) Bridge names and numbers for strut to bridge projects – Wayne (5 mins)
2) Design of Route 1 Gateway bridges in New Brunswick, Canada – LOCHNER presentation (60 minutes)

   - General overview of the project
   - SDCL, Simple for Dead Load, Continuous for Live Load detailing
   - River foundations (2 m diameter driven piles)
   - Options for construction and structure type at the Digdeguash River crossing (8 m tides, steep rock faces, adjacent structure, skew, etc.)

Attendees: Mike Wight, Wayne Frankhauser, Brian Nichols, Garrett Gustafson, Laura Krusinski, Kate Maguire, Nate Benoit, Bob Bulger, Rich Myers, Devan Eaton, Brian Reeves, Joel Veilleux and Joe Stilwell

1) Bridge names and numbers for strut to bridge projects – Wayne (5 mins)

   Please see Ben Foster as early as possible if you are working on a strut to bridge project.

2) Design of Route 1 Gateway bridges in New Brunswick, Canada – LOCHNER presentation (60 minutes)

   Brian Byrne of H. W. Lochner, Inc. gave a presentation on the Route 1 Gateway bridges in New Brunswick, Canada, just over the border from Calais. The presentation is linked below.

   Lochner Presentation

KLEINFELDER
Bright People. Right Solutions.

Summary of Expansion Joints Specified by the Connecticut Department of Transportation

Table of Contents

151 Capitol Street, 2nd Floor, Augusta, Maine 04330 **p** | 207.623.0648 **f** | 207.623.0486

10.1.4 Temperature Range

The temperature range used for the calculation of thermal movement of deck joints shall be 120°F. This temperature range is based on a mean low temperature of -10°F and a mean high temperature of +110°F. The median temperature for design of joints shall be +50°F.

10.1.5 Coefficient of Thermal Expansion

For the design of deck joints, a coefficient of thermal expansion shall be taken as 6.4×10^{6}/°F. This equates to approximately 2¾″ total movement for a 300-foot long bridge.

10.1.6 Movement Due to Seismic Events

If the bridge is designed for seismic events where significant movement is important to the proper function of bridge elements (such as seismic isolation bearings), the movement due to seismic forces shall be accommodated in the design of the joints. For other bridges, the joint need not be designed for seismic movement, and should not be designed to survive the seismic event undamaged.

10.2 TRANSVERSE JOINTS

10.2.1 Fixed Joints

10.2.1.1 *Abutment Joints*

For fixed joints at abutments, the first preference for joint type should be the Asphaltic Plug Expansion Joint System.

10.2.1.2 *Pier Joints*

For fixed joints at piers, the first preference for joint type should be the Asphaltic Plug Expansion Joint System.

10.2.2 Expansion Joints with Movement Up to 5/8″

10.2.2.1 *Abutments Joints*

For joints at abutments where the total movement is less than 5/8″, the first preference for joint type should be the Asphaltic Plug Expansion Joint System.

10.2.2.2 *Pier Joints*

For joints at piers where the total movement is less than 5/8″, the first preference for joint type should be the Asphaltic Plug Expansion Joint System.

10.2.2.3 *Box Culverts*

For joints along the side edges of reinforced concrete box culverts, the first preference for joint type should be a sawed joint in the Bituminous Concrete (Class 1) Overlay filled with Silicone Joint Filler.

10.2.3 Expansion Joints with Movement Between 5/8″ to 1½″

10.2.3.1 *Normal Bridges*

The first preference for joint type should be the Asphaltic Plug Expansion Joint System.

10.2.3.2 *Skews*

For joints with skews greater than 45°, where the effects of skew cause significant racking (transverse movement) of the joint, and where the length of travel of the truck wheels can cause severe rutting, the first preference for joints should be Elastomeric Concrete Headers with a Silicone Sealant ("Silicone Expansion Joint System").

10.2.3.3 *Pin and Hanger Joints*

For existing joints that have pin and hanger expansion devices connecting the beams where there is potential for differential vertical movement across the joints, the first preference for joints should be Elastomeric Concrete Headers with a Silicone Sealant ("Silicone Expansion Joint System").

10.2.4 Expansion Joints with Movement Between 1 ½″ and 3″

For joints where the total movement is between 1½″ and 3″, the first preference for joints should be Elastomeric Concrete Headers with a Silicone Sealant ("Silicone Expansion Joint System").

10.2.5 Expansion Joints with Movement Between 3″ and 4″

For joints where the total movement is between 3″ and 4″, the first preference for joints should be Elastomeric Concrete Headers with a Neoprene Strip Seal ("Elastomeric Concrete Expansion Joint System").

10.2.6 Expansion Joints with Movement Greater Than 4″

10.2.6.1 *Joints at Abutments*

10.2.6.1.1 Modular Joints

Modular expansion joints may be used at abutments, provided that the distance between the abutment backwall and the ends of the beams and diaphragms is kept to two feet minimum in order to facilitate inspection and future maintenance.

10.2.6.1.2 Finger Joints

Where a proper drainage structure can be constructed behind the abutment backwall, an open finger joint can be considered. The drainage structure should be provided with an access door or manhole for cleaning. The structure should also be connected to a storm drainage system or a standard outlet. Where the bottom of the drainage structure is not the top of the abutment footing, a two feet deep sump should be detailed to catch sedimentation.

10.2.6.2 *Joints at Piers*

10.2.6.2.1 Modular Joints

The first preference for joint type at piers should be Modular expansion joints. The distance between adjacent diaphragms shall be kept to two feet minimum in order to facilitate inspection and future maintenance. The beam-ends may be kept closer if proper maintenance can be accomplished. Joint manufacturers should be contacted for specific requirements for each joint.

10.2.6.2.2 Finger Joints

Where the location of the joint is at the crest of a vertical curve, an open finger joint can be considered. A drainage trough shall be provided that is connected to a proper piping system (see Section 11).

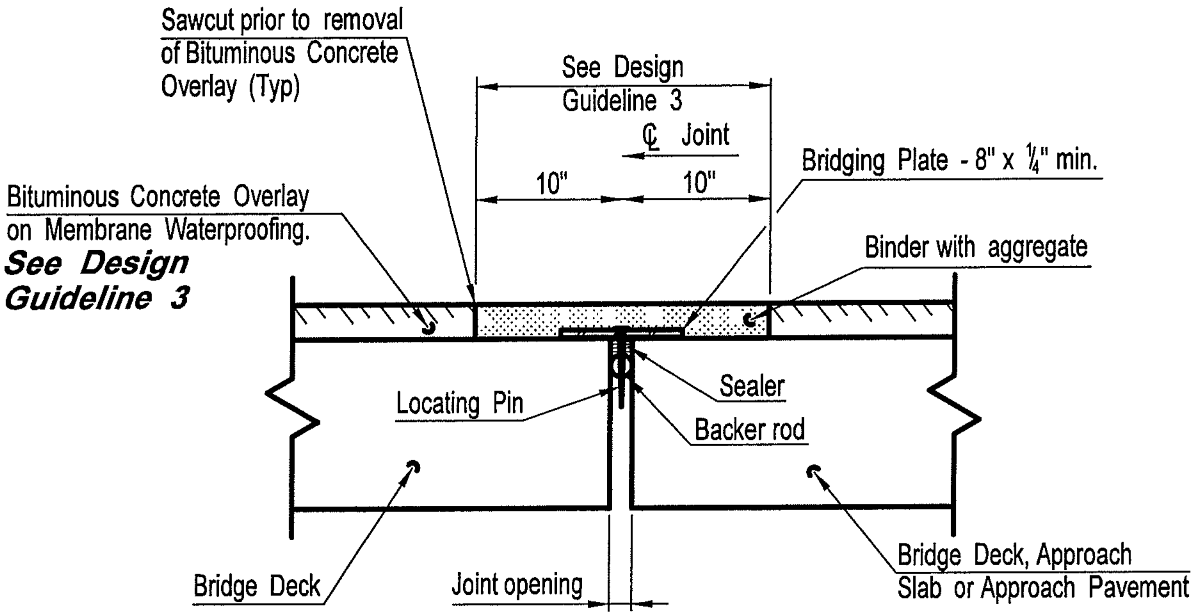
10.3 LONGITUDINAL JOINTS

10.3.1 Deck Joints

Longitudinal deck joints should be avoided wherever possible due to problems with motorcycle safety and difficulties associated with the intersection of the transverse deck joints. If longitudinal joints are unavoidable, they shall be located out of the traveled way. Since differential vertical movement is common in longitudinal joints, the only joints that should be considered are Elastomeric Concrete Headers with a Silicone Sealant or a Neoprene Strip Seal. A Silicone Sealant is preferred.

10.3.2 Concrete Median Barrier

Where split concrete median barrier is used, the longitudinal joint between the barriers should not be sealed. A one-inch open joint should be detailed for this situation.



PLAN NOTES:

1. Remove new bituminous concrete overlay and membrane waterproofing. Replace with Asphaltic Plug Expansion Joint System. To be paid for under the item "Asphaltic Plug Expansion Joint System". (See Special Provision)

DESIGN GUIDELINES:

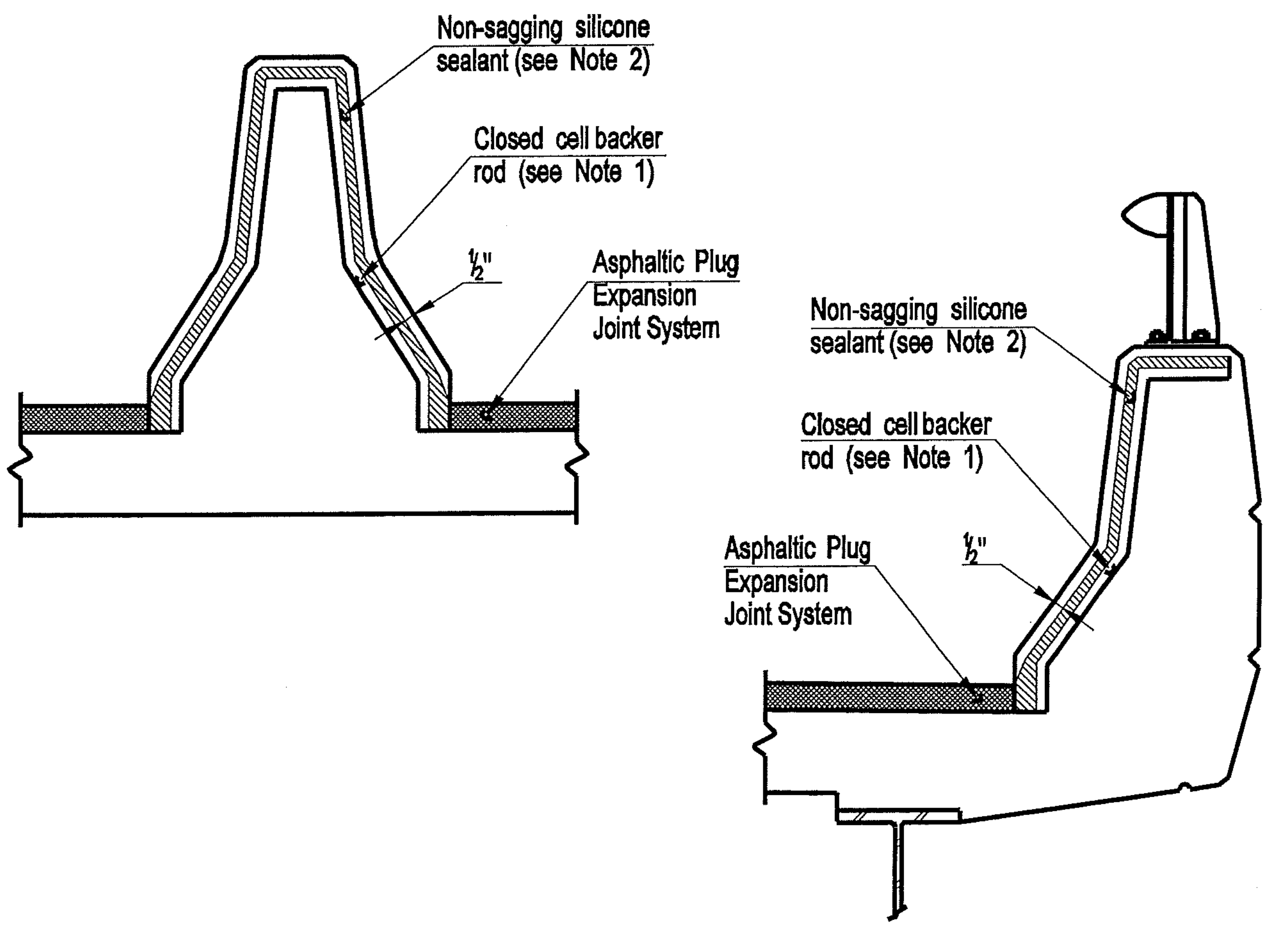
1. Asphaltic Plug Expansion System shall be used at fixed and expansion joints with computed movements from 0" to 1½" based on a moderate climate in accordance with AASHTO.

2. Asphaltic Plug Expansion joints shall be installed when the ambient air temperature is between 40° F and 80° F.

3. Bituminous Concrete Overlay depth shall be indicated.

CONNECTICUT BRIDGE DESIGN MANUAL	ASPHALTIC PLUG EXPANSION JOINT SYSTEM	Issue Date:	10/05
		Revision Date:	2/11
		Plate Number:	7.1.1a

TOTAL MOVEMENT < 1½" (SKEW ≤ 45°) ; TOTAL MOVEMENT < ⅝" (SKEW > 45°)



ASPHALTIC PLUG EXPANSION JOINT TREATMENT AT PARAPETS AND MEDIAN BARRIER

NOTES:

1: The Closed Cell Backer Rod shall be placed a minimum of 2" from the outside face of parapets and median barriers.

2: The non-sagging silicone sealant shall be placed on the backer rod ½" thick. At the gutter, the silicone sealant shall be placed flush with the outside face of concrete.

3: Prior to installing the silicone sealant, clean joint sides by sandblasting. Dust shall be removed by the method approved by the Engineer. This work shall be paid for under the item "Asphaltic Plug Expansion Joint System". (see special provisions)

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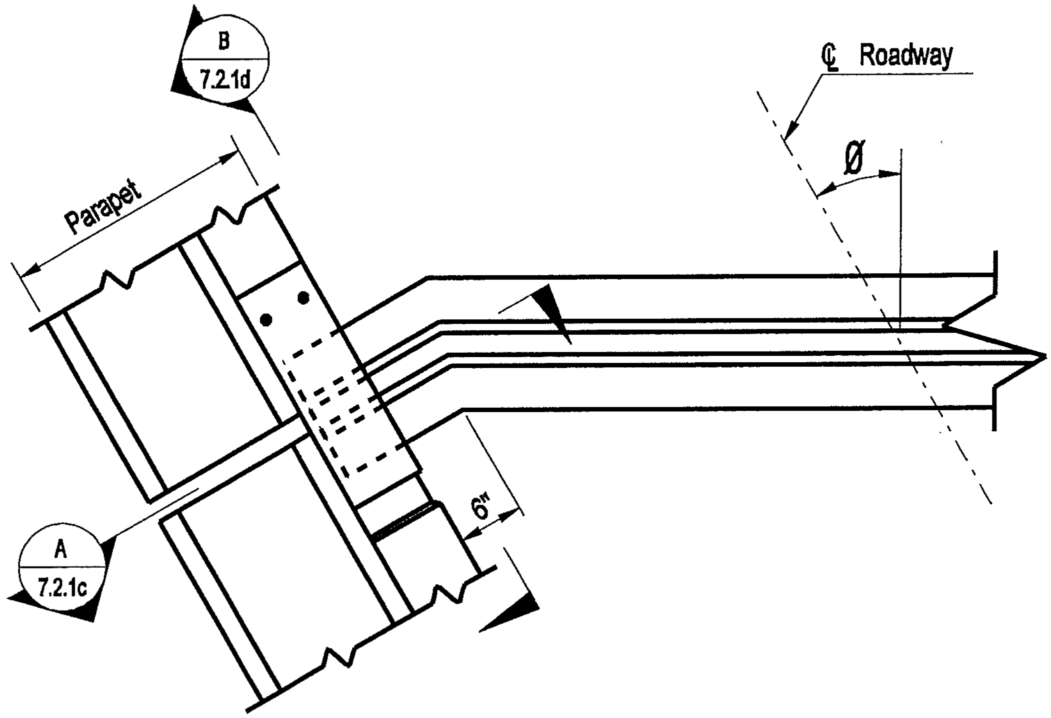
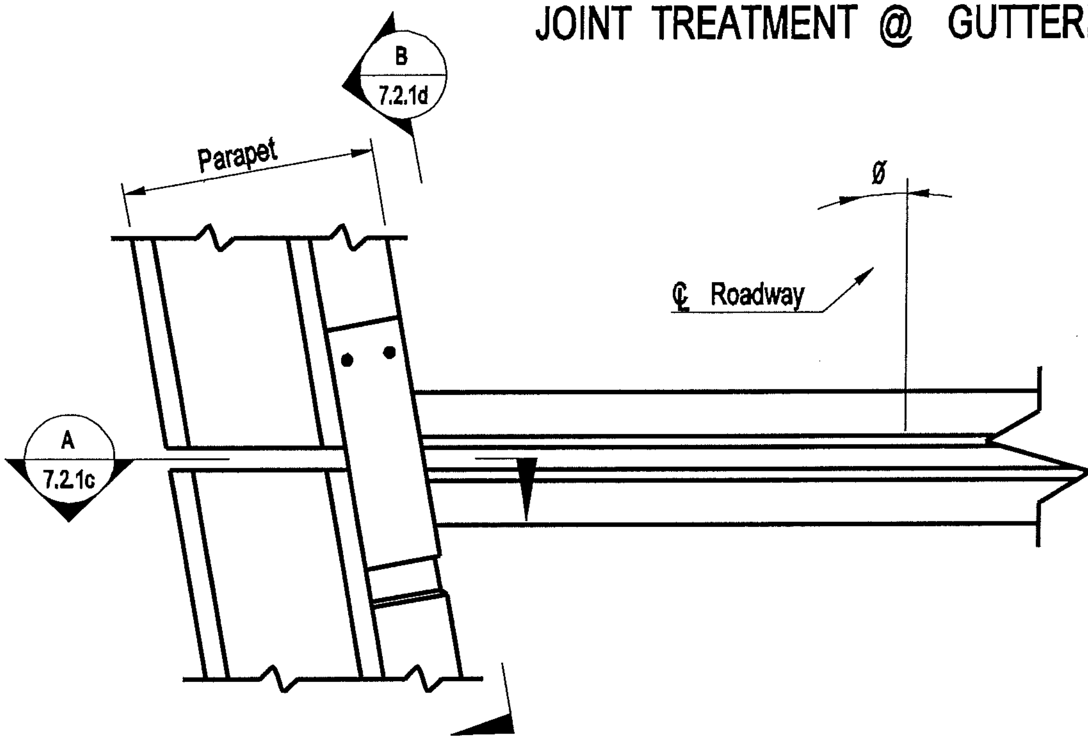


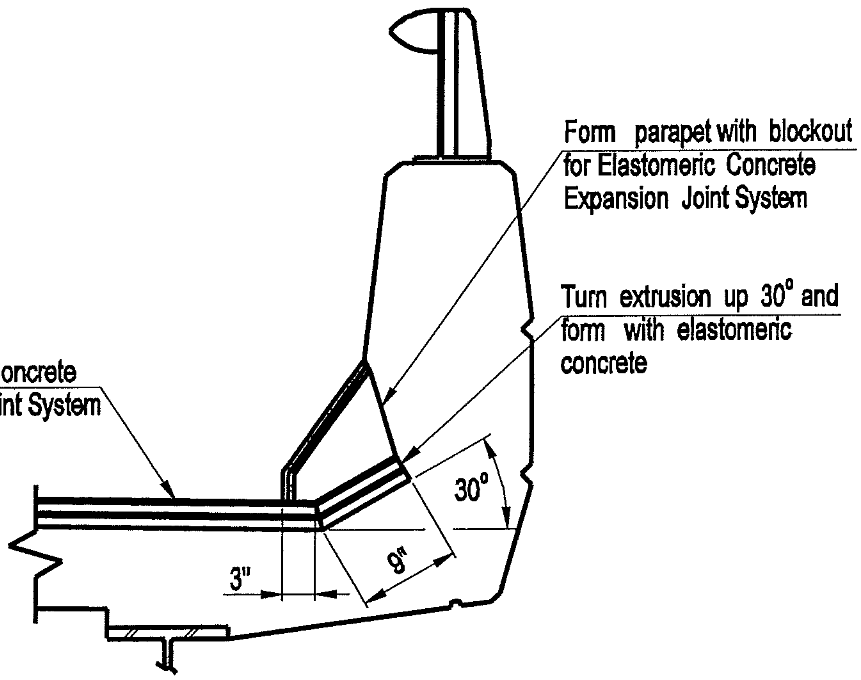
JOINT TREATMENT @ GUTTERLINE Ø > 35°



JOINT TREATMENT @ GUTTERLINE Ø ≤ 35°

CONNECTICUT BRIDGE DESIGN MANUAL	ELASTOMERIC CONCRETE EXPANSION JOINT SYSTEM	Issue Date: 10/03 Revision Date: Plate Number: 7.2.1b

TOTAL MOVEMENT 3" - 4"



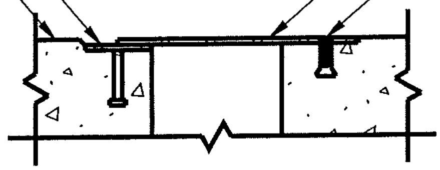
SECTION A

JOINT TREATMENT AT CONCRETE PARAPET

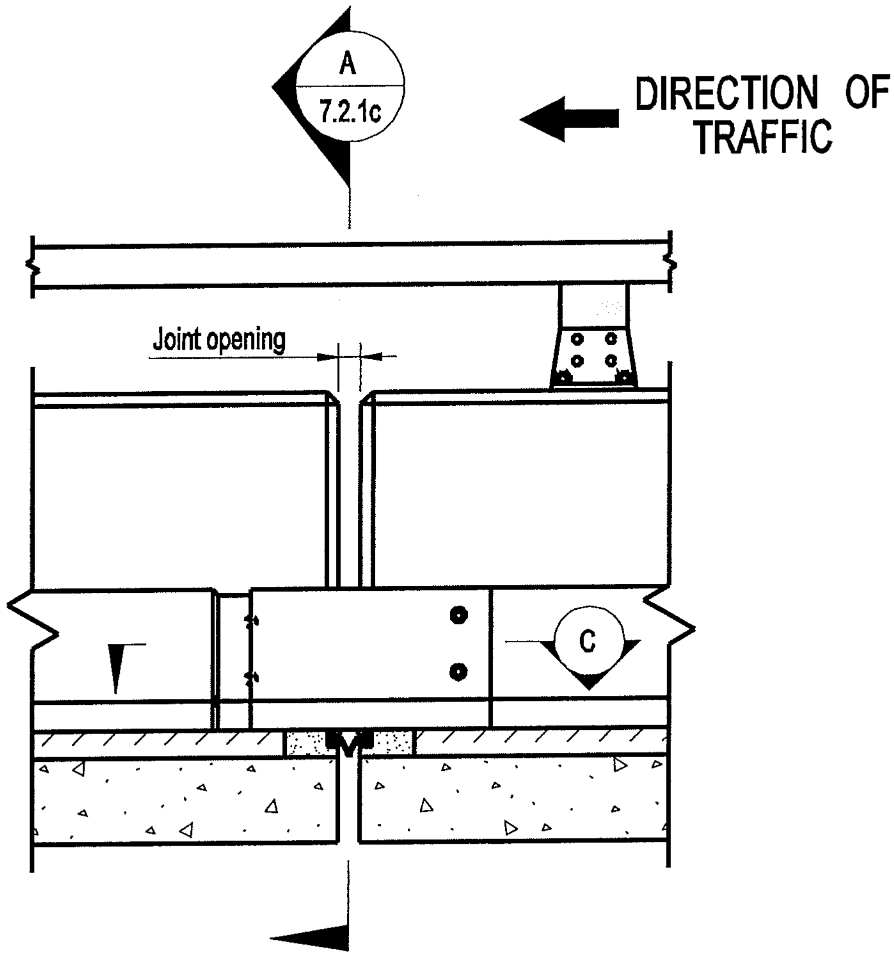
DESIGN INFORMATION

1. This plate shall be used in conjunction with Plate 7.2.1b and 7.2.1d.

CONNECTICUT BRIDGE DESIGN MANUAL	ELASTOMERIC CONCRETE EXPANSION JOINT SYSTEM	Issue Date: 10/03 Revision Date: Plate Number: 7.2.1c



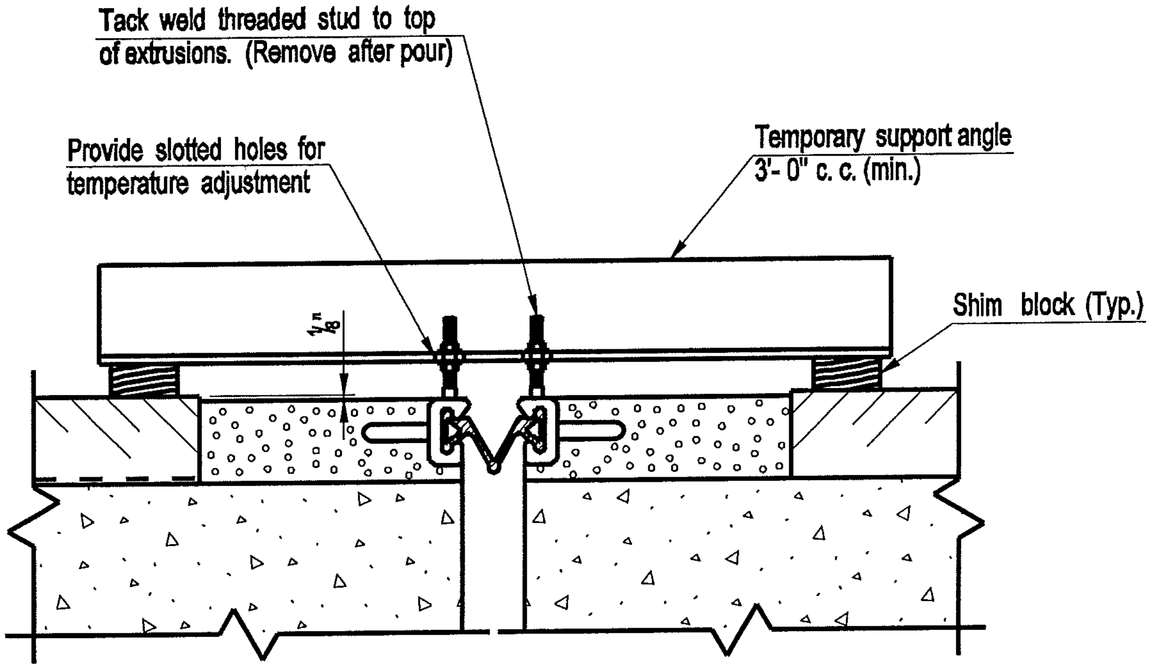
SECTION C



VIEW B 7.2.1b

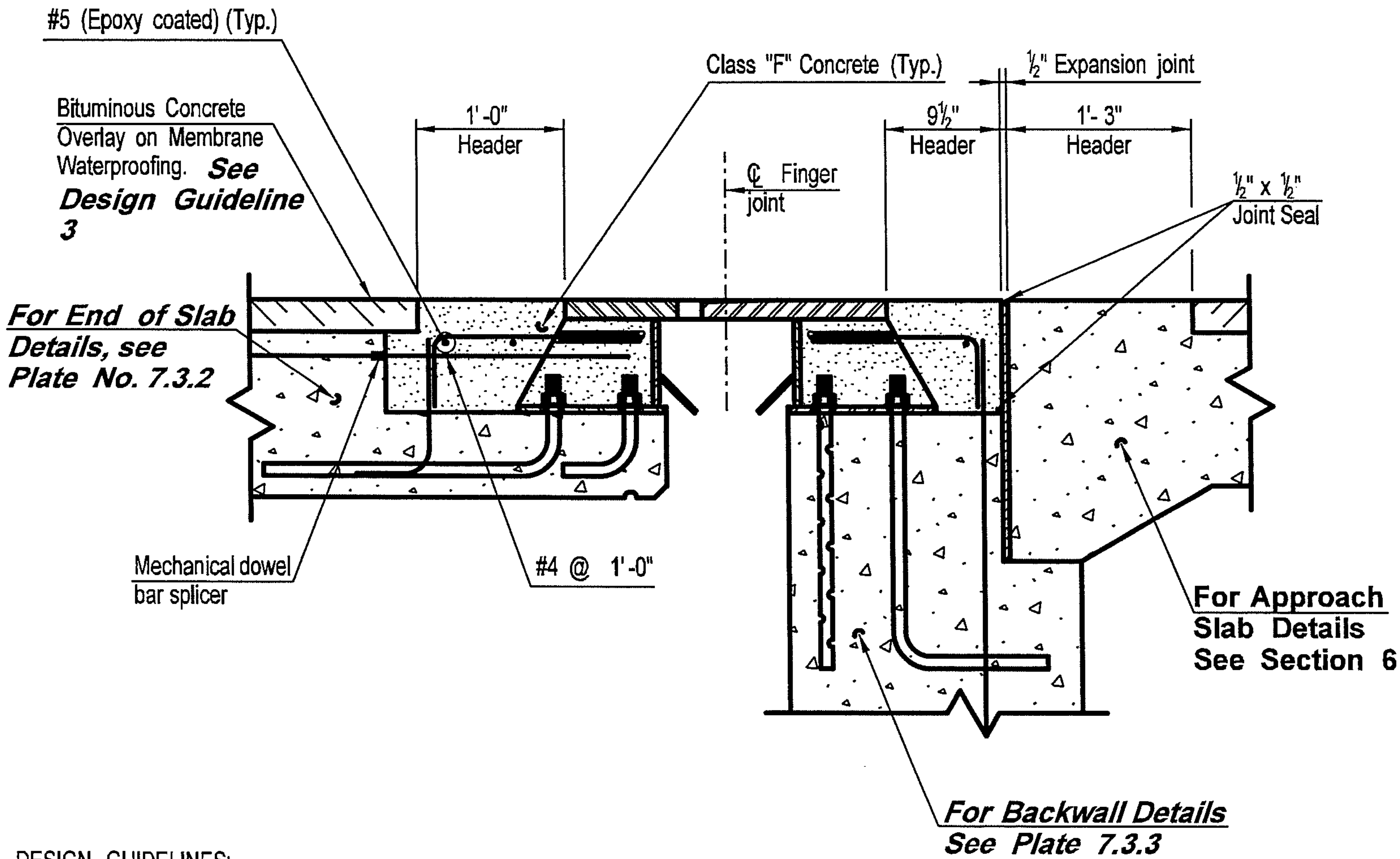
JOINT TREATMENT AT CONCRETE PARAPET

CONNECTICUT BRIDGE DESIGN MANUAL	ELASTOMERIC CONCRETE EXPANSION JOINT SYSTEM	Issue Date: 10/03 Revision Date: 01/05 Plate Number: 7.2.1d



INSTALLATION DETAIL

CONNECTICUT BRIDGE DESIGN MANUAL	ELASTOMERIC CONCRETE EXPANSION JOINT SYSTEM	Issue Date: 10/03 Revision Date: Plate Number: 7.2.1e



DESIGN GUIDELINES:

1. *Finger joints to be used for joint movement greater than 4" at pedestal type abutments only, (See Plates 3.1.2a thru 3.1.2e)*

2. *All structural steel, weldable bars and anchor bolts shall be included in the pay item for "Finger Joint".*

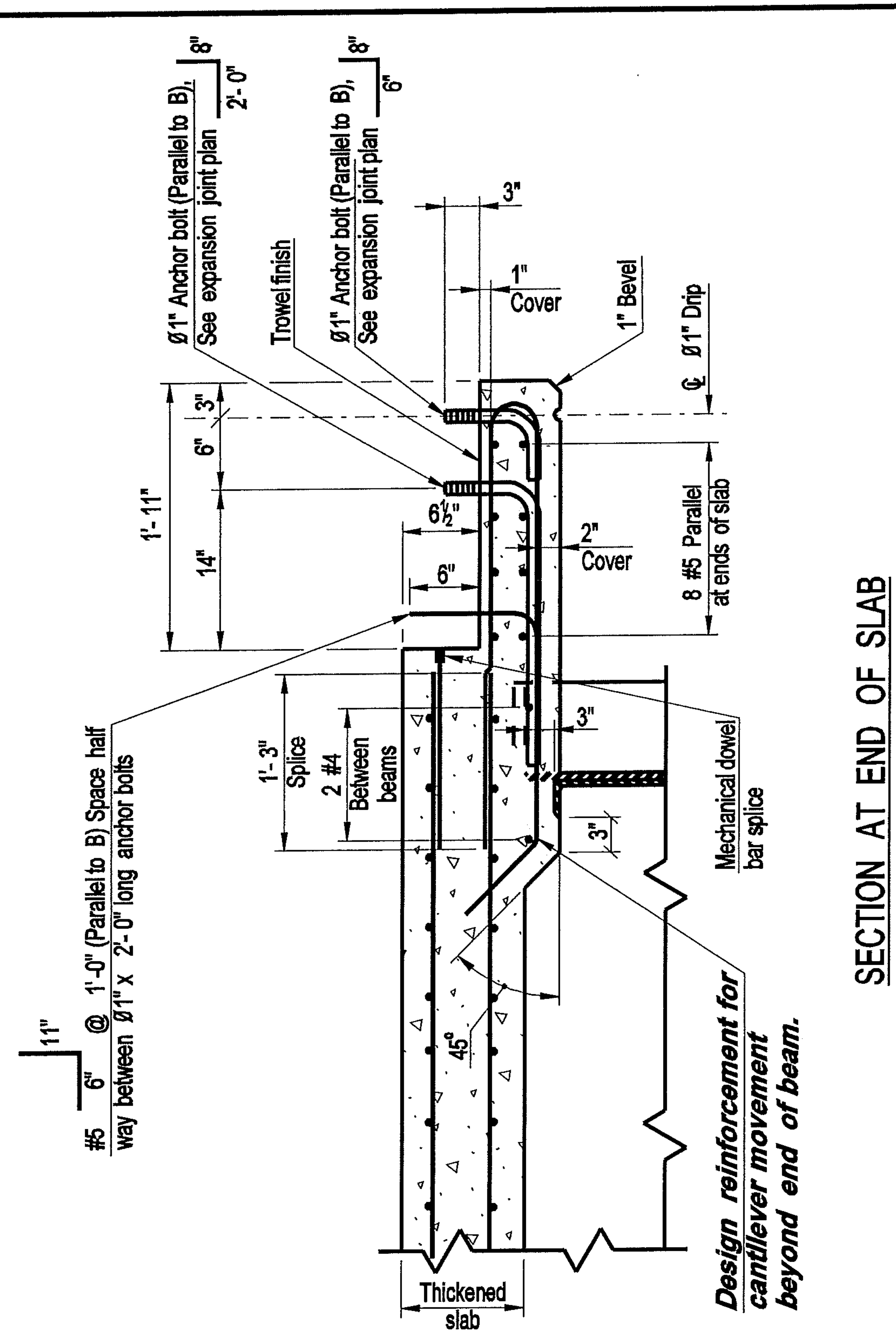
3. *Depth of Bituminous Overlay shall be indicated.*

CONNECTICUT BRIDGE DESIGN MANUAL

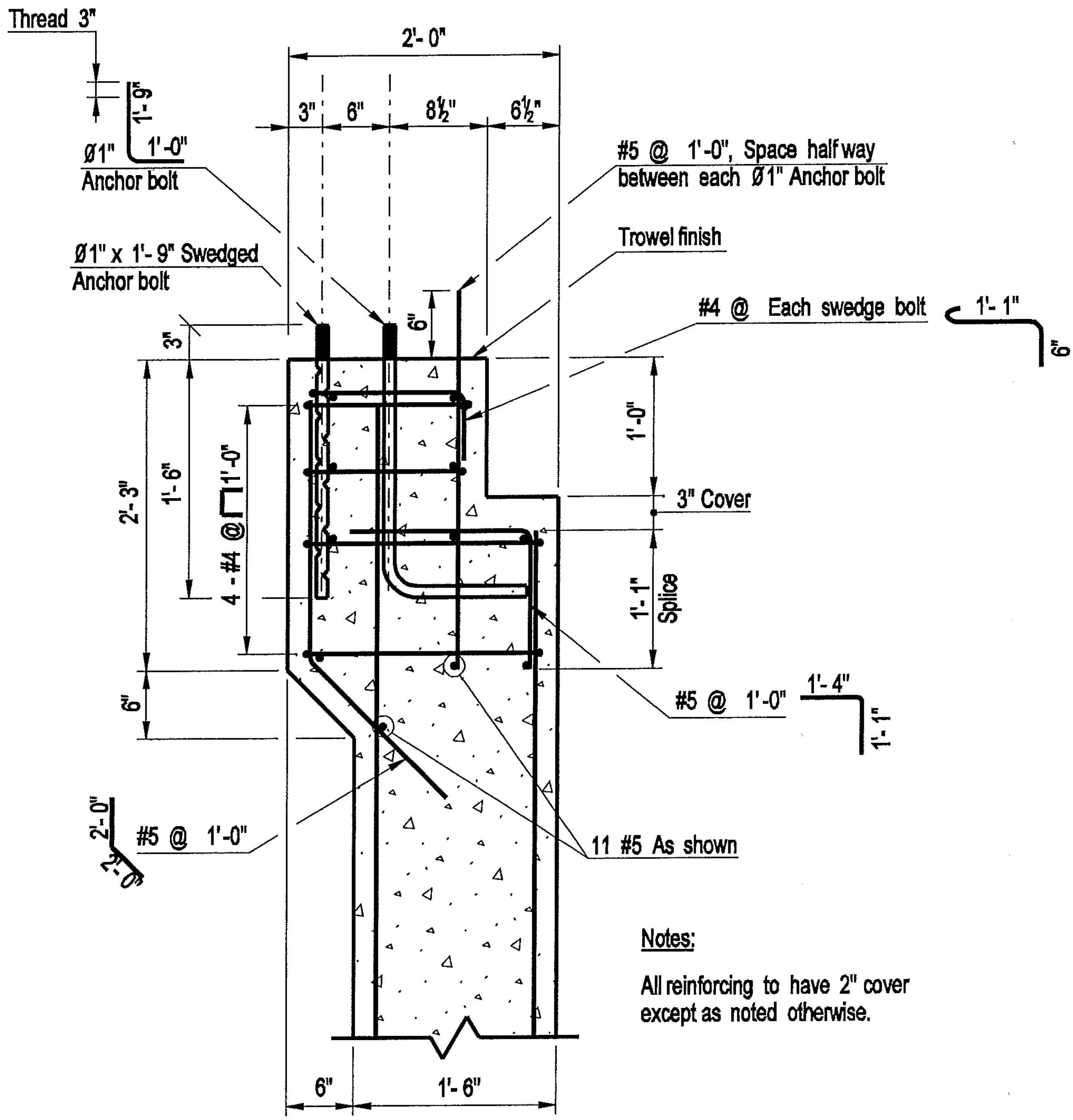
FINGER JOINT DETAILS AT ABUTMENT

Issue Date:	10/03
Revision Date:	2/11
Plate Number:	7.3.1

TOTAL MOVEMENT > 4"



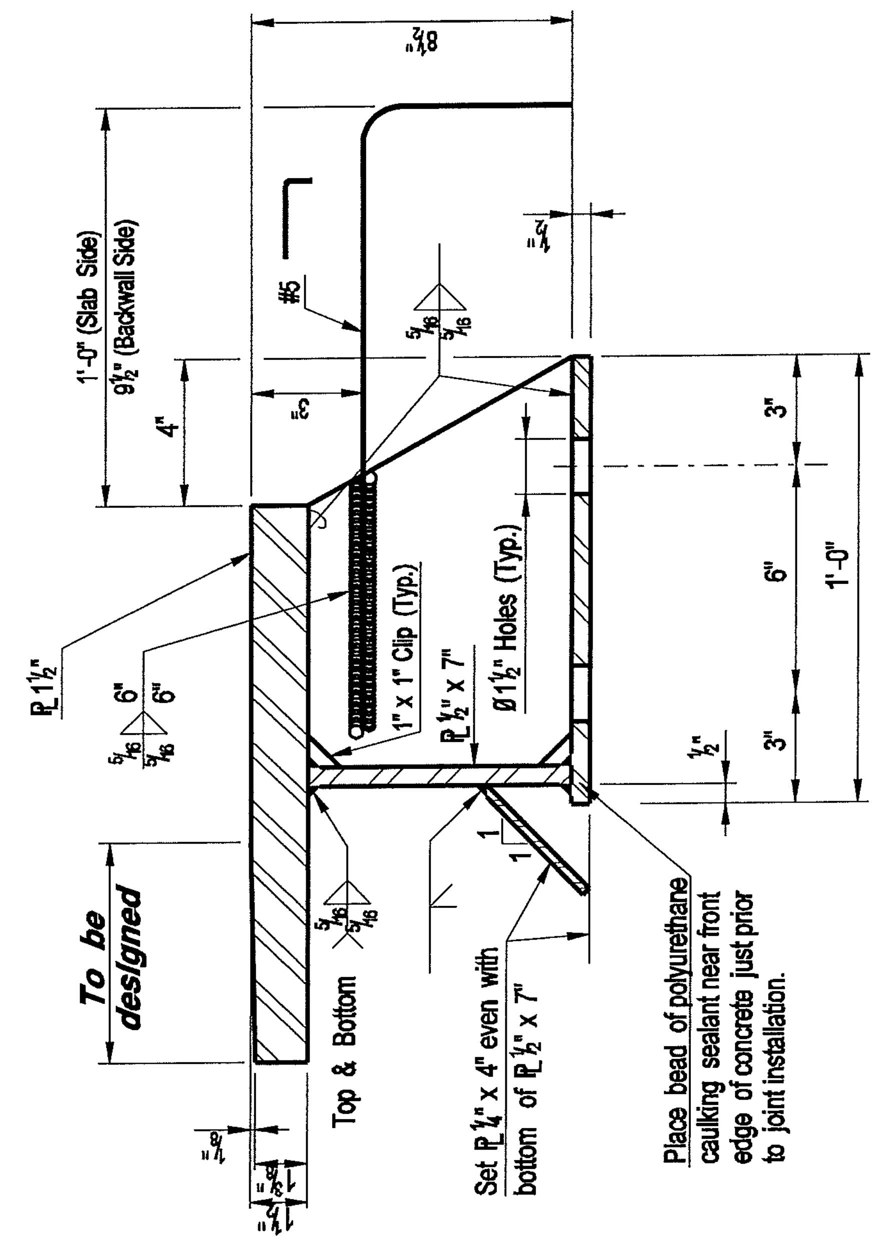
CONNECTICUT BRIDGE DESIGN MANUAL	FINGER JOINT DETAILS AT ABUTMENTS (END OF SLAB SECTION)	Issue Date: 10/03 Revision Date: Plate Number: 7.3.2



Notes:

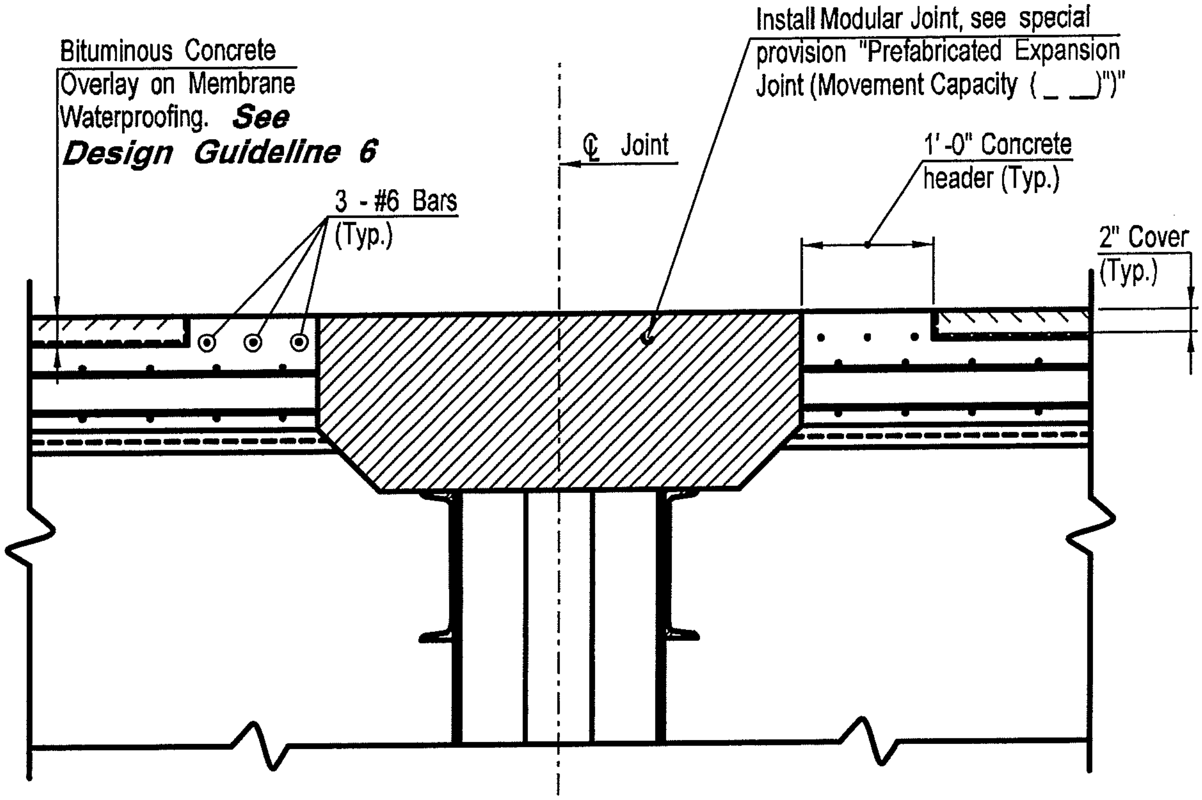
All reinforcing to have 2" cover except as noted otherwise.

CONNECTICUT BRIDGE DESIGN MANUAL	FINGER JOINT DETAILS AT ABUTMENT (BACKWALL SECTION)	Issue Date: 10/03 Revision Date: Plate Number: 7.3.3



SECTION AT FINGER JOINT

CONNECTICUT BRIDGE DESIGN MANUAL	FINGER JOINT DETATILS AT ABUTMENT (FINGER JOINT)	Issue Date: 10/03 Revision Date: Plate Number: 7.3.4



TYPICAL SECTION

PLAN NOTES:

1. See special provision "Prefabricated Expansion Joint (Movement Capacity (_) ")".

DESIGN GUIDELINES:

1. The temperature range used for computation of movement shall be based on a moderate climate in accordance with AASHTO.

2. The required movement capacity of each joint shall be determined by the Designer and shown on the plans.

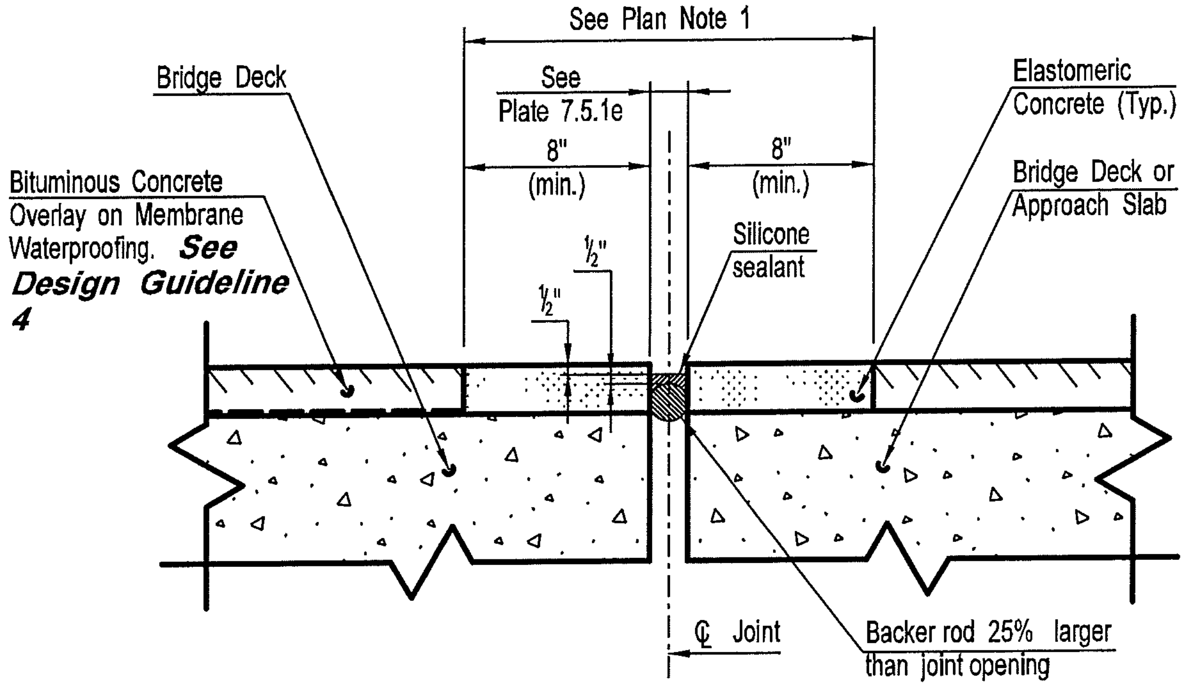
3. The contract plans shall show a blocked out area for the Modular Joint. The manufacturer will be responsible for the joint and anchorage details in accordance with the special provisions.

4. Modular joints should be used for joint movements greater than 4" at piers.

5. Depth of Bituminous Concrete overlay shall be indicated.

CONNECTICUT BRIDGE DESIGN MANUAL	MODULAR EXPANSION JOINT SYSTEM	Issue Date: 10/03 Revision Date: 2/11 Plate Number: 7.4.1

TOTAL MOVEMENT > 4"



PLAN NOTES;

1. Remove new bituminous concrete overlay and membrane waterproofing and replace with Silicone Expansion Joint System. To be paid for under the item "Silicone Expansion Joint System". (See Special Provision)

2. Silicone sealant shall be installed when the ambient temperature is between 50° F and 80° F.

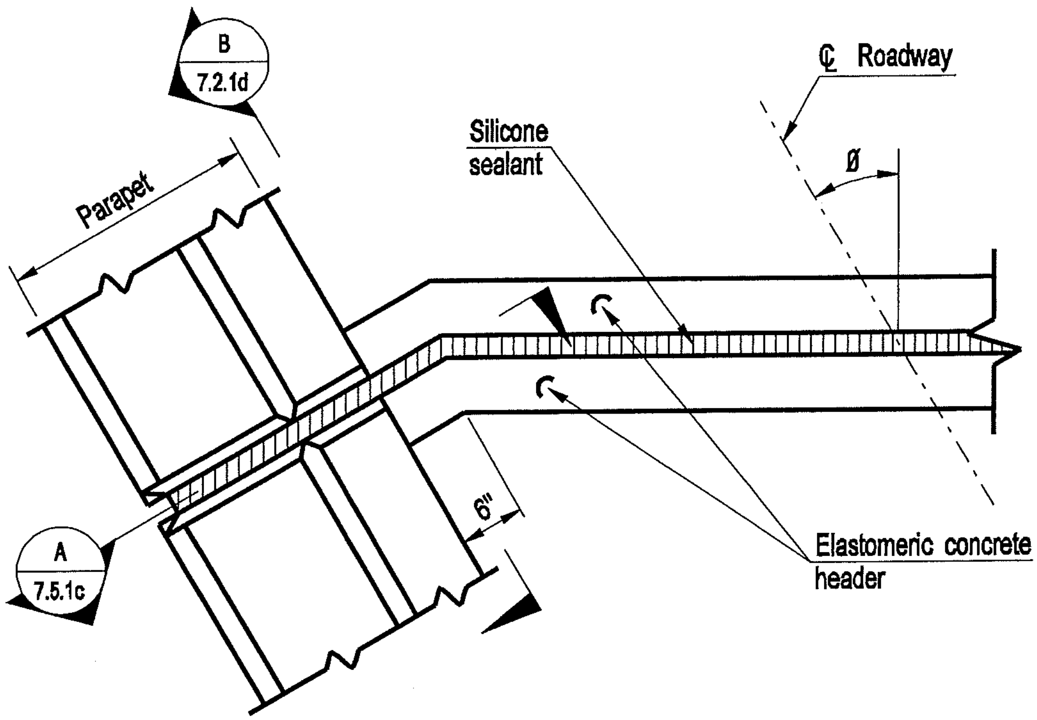
DESIGN GUIDELINES:

1. Silicone Expansion Joint System shall be used at expansion joints with computed movements between 1½" and 3".

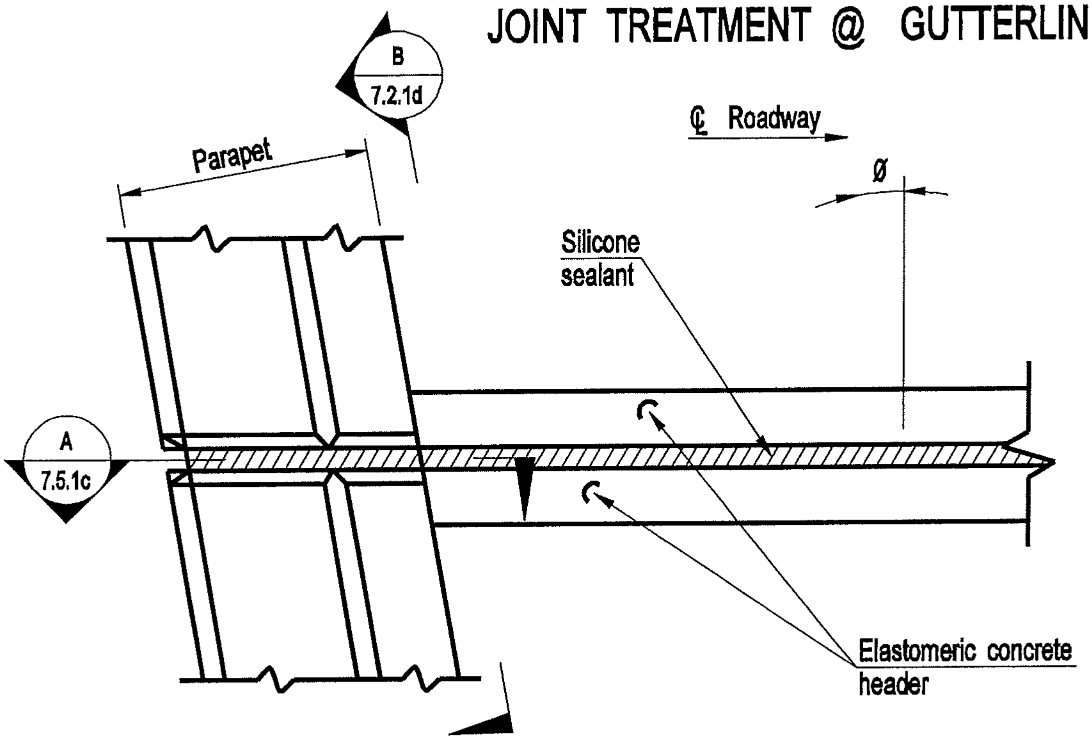
2. Depth of Bituminous Concrete Overlay shall be indicated.

CONNECTICUT BRIDGE DESIGN MANUAL	SILICONE EXPANSION JOINT SYSTEM	Issue Date:	10/03
		Revision Date:	2/11
		Plate Number:	7.5.1a

TOTAL MOVEMENT 1½" - 3" (SKEW ≤ 45°) ; TOTAL MOVEMENT 5/8" - 3" (SKEW > 45°)

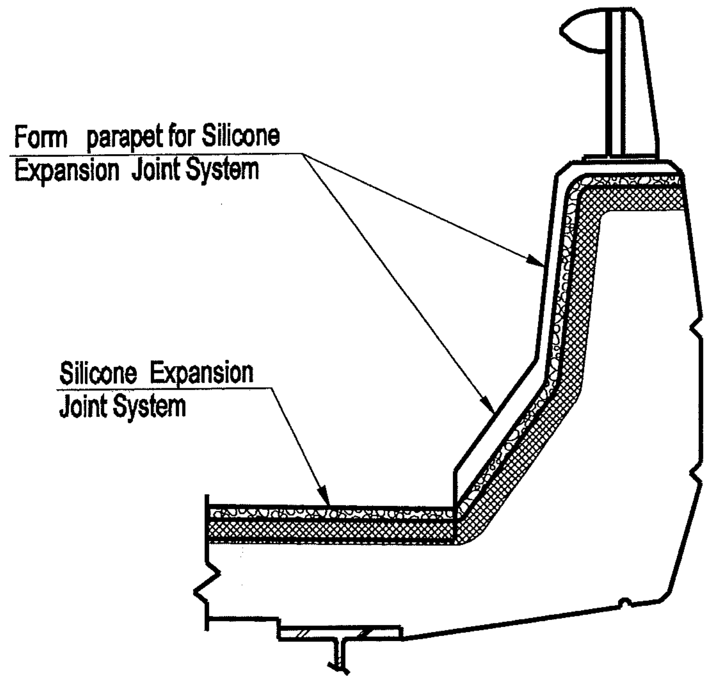


JOINT TREATMENT @ GUTTERLINE Ø > 35°



JOINT TREATMENT @ GUTTERLINE Ø ≤ 35°

CONNECTICUT BRIDGE DESIGN MANUAL	SILICONE EXPANSION JOINT SYSTEM	Issue Date: 10/03 Revision Date: 01/05 Plate Number: 7.5.1b



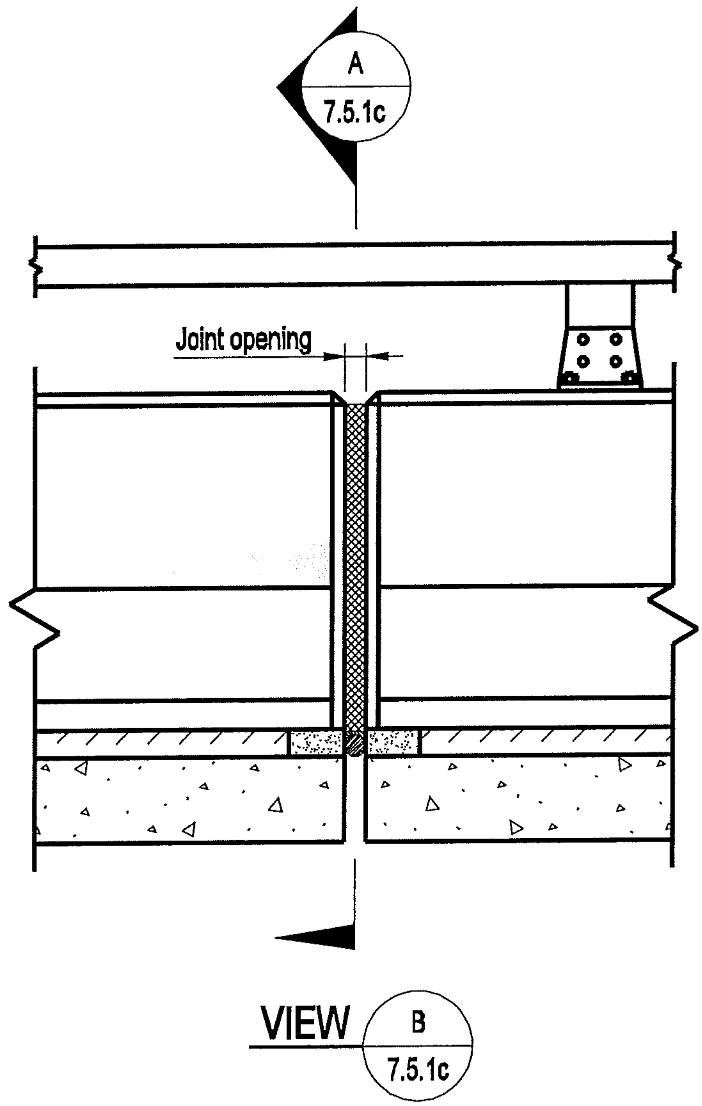
SECTION A

JOINT TREATMENT AT CONCRETE PARAPET

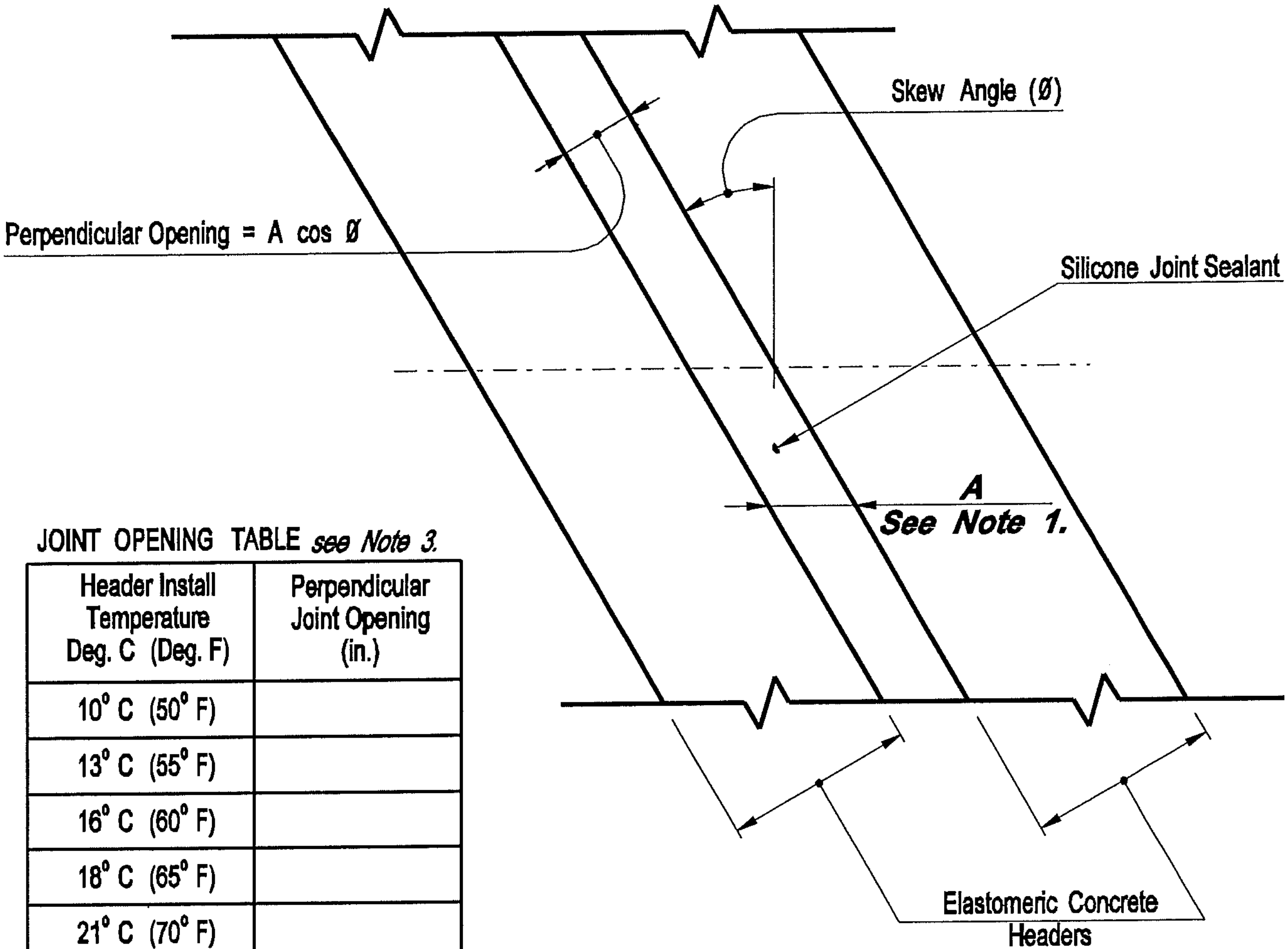
DESIGN INFORMATION

1. This plate shall be used in conjunction with Plate 7.5.1b and 7.5.1d.

CONNECTICUT BRIDGE DESIGN MANUAL	SILICONE EXPANSION JOINT SYSTEM	Issue Date: 10/03 Revision Date: Plate Number: 7.5.1c



JOINT TREATMENT AT CONCRETE PARAPET



JOINT OPENING TABLE *see Note 3.*

Header Install Temperature Deg. C (Deg. F)	Perpendicular Joint Opening (in.)
10° C (50° F)	
13° C (55° F)	
16° C (60° F)	
18° C (65° F)	
21° C (70° F)	
24° C (75° F)	
27° C (80° F)	

SILICONE EXPANSION JOINT SYSTEM PLAN VIEW

DESIGN INFORMATION:

1. The joint opening along the skew (Dimension A) shall be set such that it is equal to the actual computed movement at the joint at 10° C (50° F).

2. The temperature range used for computation of movement shall be as specified in Division 1.

3. The designer shall provide a table on the plans specifying the perpendicular opening to be provided at all header installation temperatures between 10° C (50° F) and 27° C (80° F).

CONNECTICUT BRIDGE DESIGN MANUAL	SILICONE EXPANSION JOINT SYSTEM	Issue Date: 01/05 Revision Date: Plate Number: 7.5.1e

CONSULTING ENGINEERS
GENERAL MEMORANDUM 12-03

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING AND CONSTRUCTION
OFFICE OF ENGINEERING

New Bridge Design Standard Practices
Revised Asphaltic Plug Expansion Joint
Revised Approach Slab Limits

June 18, 2012

To: CONSULTING ENGINEERS

The Bridge Design Standard Practices are hereby revised to include new standard practices regarding selection and use of the "Asphaltic Plug Expansion Joint System," an update to the special provision for the "Asphaltic Plug Expansion Joint System," and revised limits for the design of bridge approach slabs on bridges with sidewalks (enclosed). The revised special provision for the "Asphaltic Plug Expansion Joint System" is posted electronically on the Department of Transportation's (Department) website in the "Owned Special Provisions" folder located under "Contract Development and Cost Estimating." The Bridge Design Manual located on the Department's website will be revised accordingly to incorporate the subject revisions in the near future. These new design practices should be immediately incorporated in all on-going design projects including contract addendum phases where possible.

Very truly yours,

Timothy M. Wilson, P.E.
Manager of Highway Design
Bureau of Engineering and Construction

Enclosure

New Bridge Design Standard Practices

Asphaltic Plug Expansion Joint System

The revisions to the special provision for the Asphaltic Plug Expansion Joint System and related Bridge Design Manual sections noted below are to clarify and refine the construction installation requirements and to assure the joint applications will comply with manufacturer's expansion joint limitation criteria. Described below is a new standard practice that updates Sections 10.2.1 through 10.2.3 of the Bridge Design Manual in regard to the design selection of bridge deck expansion joints and includes revisions to the special provision for the "Asphaltic Joint Expansion Joint System".

New design practice:

The attached revised special provision for the Asphaltic Plug Expansion Joint system shall be incorporated in all projects that require this construction item. The special provision has been updated to refine installation requirements to assure the joint is installed in a manner that will not exceed its movement capacity. Designers shall include on the contract plans a table of expansion joint thermal movement ranges for each proposed asphaltic plug expansion joint installation location. The maximum design thermal movement range at each bridge deck expansion joint location to receive an asphaltic plug expansion joint shall be indicated in the table. The revised special provision provides ambient temperature installation limitations that are referenced to the maximum thermal movement range of the expansion joint. These new requirements will assure that an asphaltic plug expansion joint will not be installed outside an allowable ambient temperature range that would exceed its movement capacity. The asphaltic plug joint must not be installed in any applications where the bridge joint skew angle exceeds 45^0. In addition, the asphaltic plug expansion joint shall not be installed in a bridge joint location where both highway grade exceeds 4% and joint is located within 150 feet of a traffic intersection, unless otherwise approved by the Department.

Bridge Design Manual Revisions

Section 10.2.1 through 10.2.3 shall be replaced with the following:

10.2.1 Fixed Joints

10.2.1 Abutment Joints

For joints at abutments, the first preference for joint type should be the asphaltic plug expansion joint system except where the joint skew angle is greater than 45^0, or where both the bridge grade exceeds 4% and joint location is within 150 feet of an intersection. For these exceptions the Silicone Expansion joint system should be used unless otherwise approved by the Department.

10.2.1.2 Pier Joints

For joints at piers, the first preference for joint type should be the asphaltic plug expansion joint system except where the joint skew angle is greater than 45^0, or where both the bridge grade exceeds 4% and joint location within 150 feet of an intersection. For these exceptions the Silicone Expansion joint system should be used unless otherwise approved by the Department.

10.2.1.3 Box Culverts

Joints in the roadway surface above the edge (horizontal limit) of a reinforced concrete box culvert shall be considered only where the depth of pavement above the top of box culvert is 4 inches or less. In such cases where the depth of bituminous cover above the top of box culvert is less than 4", the designer shall consult with the Department for optimal joint selection on a case-by case basis.

Section 10.2.2 Expansion joint with Movement up to 5/8" shall be replaced with the Following:

10.2.2 Expansion joints with movements up to 1-1/2"

10.2.2.1 Abutment Joints

For joints at abutments, the first preference for joint type should be the asphaltic plug expansion joint system except where the joint skew angle is greater than 45^0, or where both the bridge grade exceeds 4% and joint location is within 150 feet of an intersection. For these exceptions the Silicone Expansion joint system should be used unless otherwise approved by the Department.

CONSULTING ENGINEERS
GENERAL MEMORANDUM 11-04

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING AND CONSTRUCTION
OFFICE OF ENGINEERING

New Bridge Design Standard Practice

February 25, 2011

To: CONSULTING ENGINEERS

The current Strip Seal Expansion Joint System has a history of performing poorly, primarily related to the steel extrusions pulling away from the elastomeric concrete headers. The "Bridge Design Standard Practices" are hereby revised to address this concern.

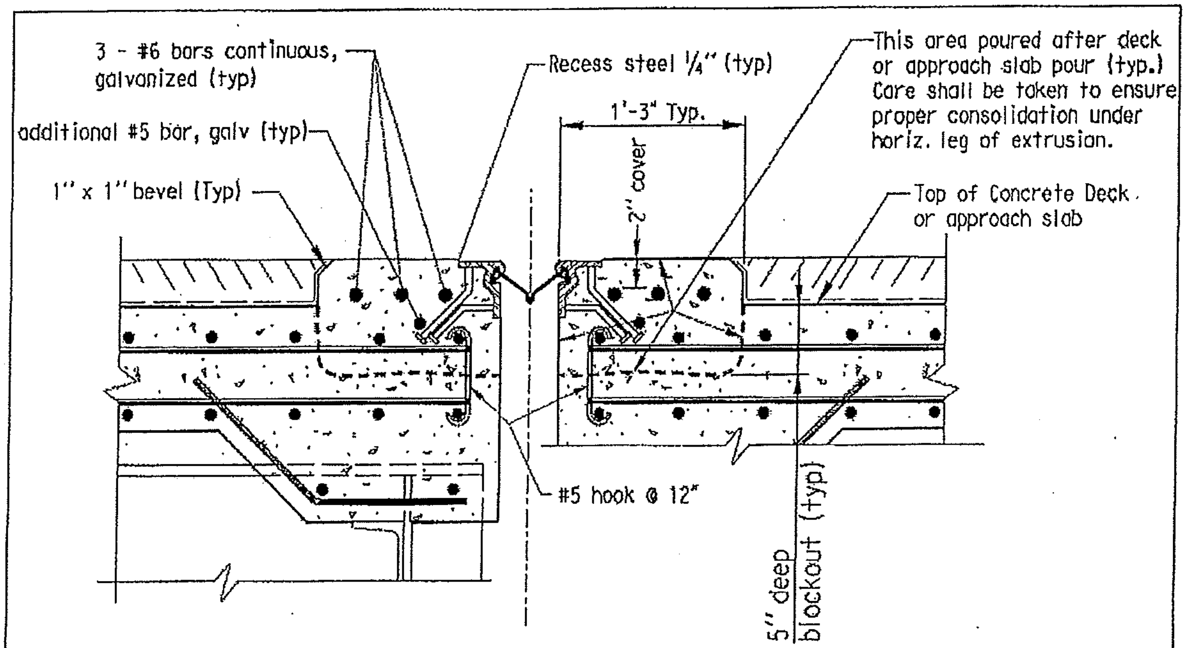
Proposed New Practice
A new Strip Seal Expansion Joint System has been developed to handle the movement (3" – 4") of the previous Strip Seal Expansion Joint System, while eliminating the concerns regarding its poor performance by replacing the elastomeric headers with concrete headers.

The new bridge plates are enclosed as well as the new owned special provision for new bridges. Bridge plates and a new owned special provision for providing a new strip seal joint in an existing bridge (for rehabilitation projects) are also enclosed. The Bridge Design Manual will be revised accordingly.

Very truly yours,

Timothy M. Wilson, P.E.
Manager of Consultant Design
Bureau of Engineering and Construction

Enclosure



Note To Designer: Pay item includes only furnishing and installing the elements of the strip seal joint. Other materials and work shown above (concrete, reinf., etc..) must be accounted for with separate items and quantities.

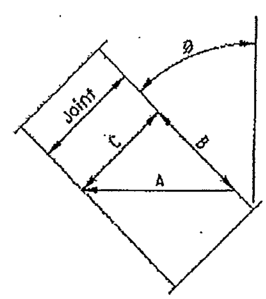
DESIGN INFORMATION:

1. *Concrete headers with strip seals shall be used at expansion joints with computed movements between 3" and 4".*

2. *The temperature range used for computation of movement shall be in accordance with Section 10.1 of the CTDOT Bridge Design Manual.*

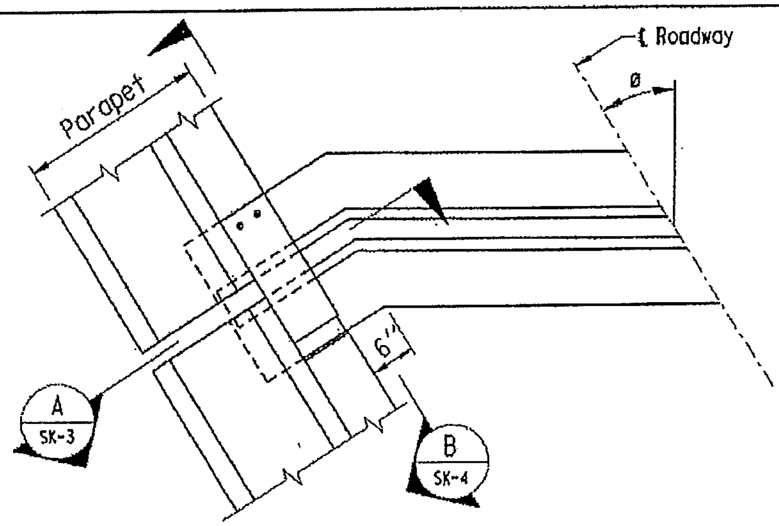
3. *The strip seal movement capacity and opening @ 50deg F. shall be determined by the Designer in-accordance with approved product information.*

4. *The Designer shall consider the effects of skew when determining the strip seal movement capacity. The movement rating of the gland shall be greater than or equal to the computed movements along the skew, normal to the joint or along the centerline of bridge. Additionally, review anticipated movements for conformance with manufacturer's recommendations.*

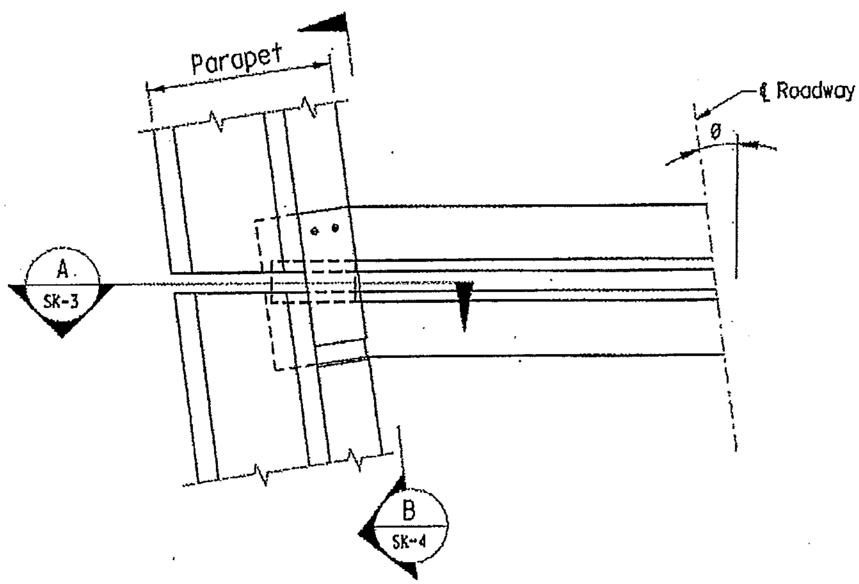


Ø = Skew Angle
A = movement along ℄ Bridge
B = movement along Skew B = A sin Ø
C = movement mormal to joint C = A cos Ø

STRIP SEAL IN CONCRETE HEADER EXPANSION JOINT SYSTEM -- NEW CONSTRUCTION	SK-1

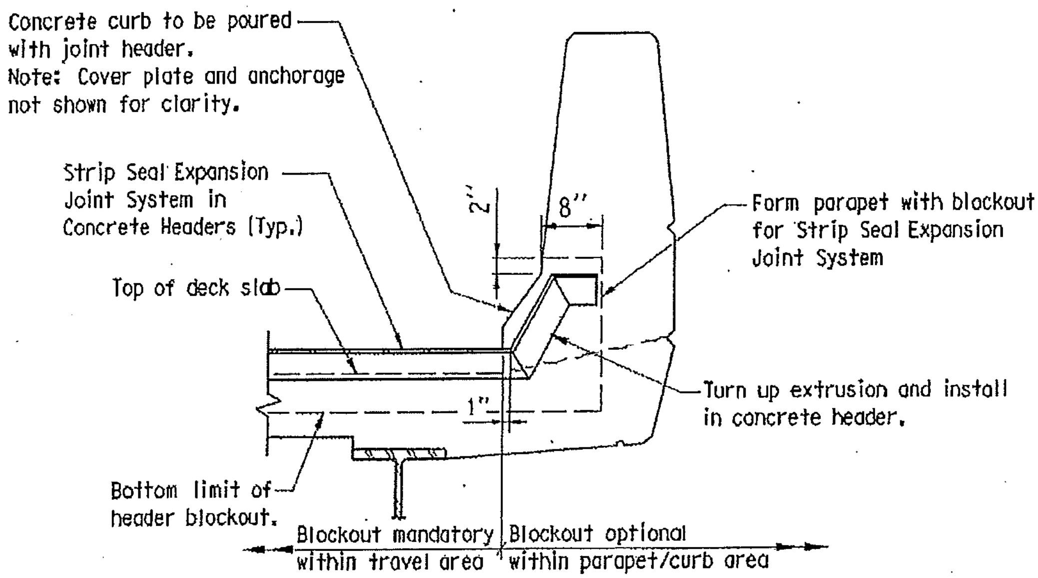


JOINT TREATMENT AT GUTTERLINE -- Ø > 35



JOINT TREATMENT AT GUTTERLINE -- Ø ≤ 35

STRIP SEAL IN CONCRETE HEADER EXPANSION JOINT SYSTEM -- NEW CONSTRUCTION	SK-2



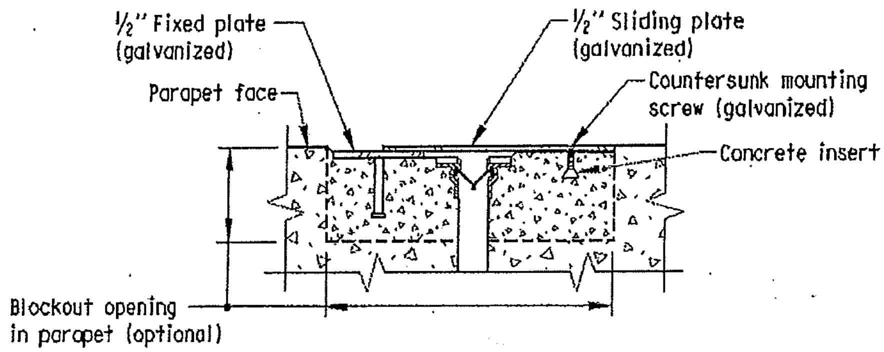
SECTION (A)

JOINT TREATMENT AT CONCRETE PARAPET

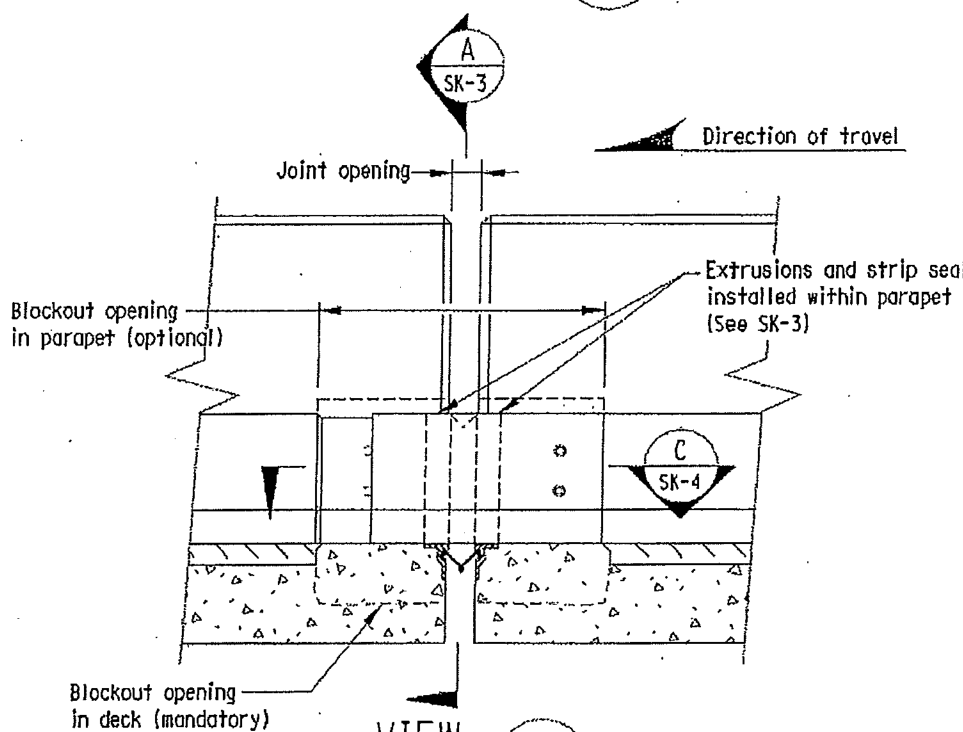
DESIGN INFORMATION

1. *This plate shall be used in conjunction with drawings SK-2 and SK-4.*

STRIP SEAL IN CONCRETE HEADER EXPANSION JOINT SYSTEM -- NEW CONSTRUCTION	SK-3



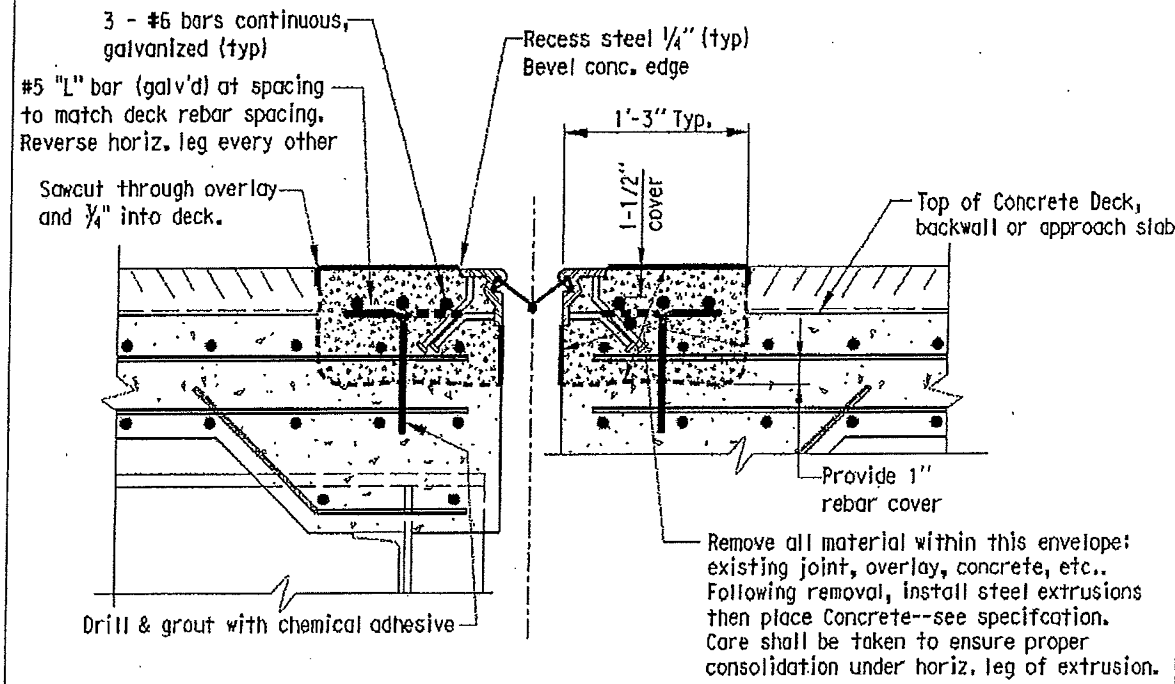
SECTION C



VIEW B SK-2

JOINT TREATMENT AT CONCRETE PARAPET

STRIP SEAL IN CONCRETE HEADER EXPANSION JOINT SYSTEM -- NEW CONSTRUCTION	SK-4



Note To Designer: Pay item includes all labor and equipment including furnishing and installing all elements of the strip seal joint, concrete, and reinforcement necessary to completely remove existing joint and install new strip seal joint in concrete headers.

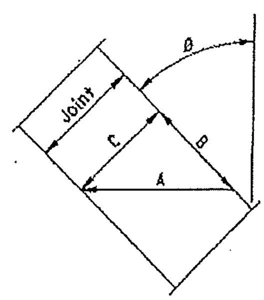
DESIGN INFORMATION:

1. *Concrete headers with strip seals shall be used at expansion joints with computed movements between 3" and 4".*

2. *The temperature range used for computation of movement shall be in accordance with Section 10.J of the CTDOT Bridge Design Manual.*

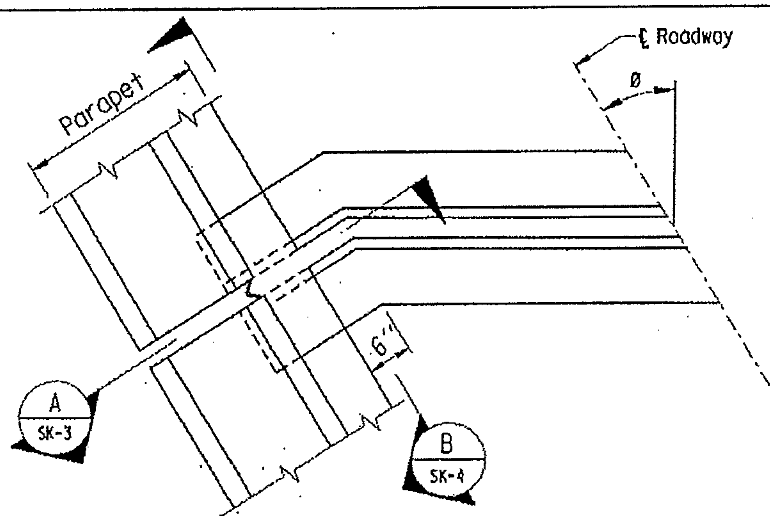
3. *The strip seal movement capacity and opening @ 50deg F. shall be determined by the Designer in-accordance with approved product information.*

4. *The Designer shall consider the effects of skew when determining the strip seal movement capacity. The movement rating of the gland shall be greater than or equal to the computed movements along the skew, normal to the joint or along the centerline of bridge. Additionally, review anticipated movements for conformance with manufacturer's recommendations.*

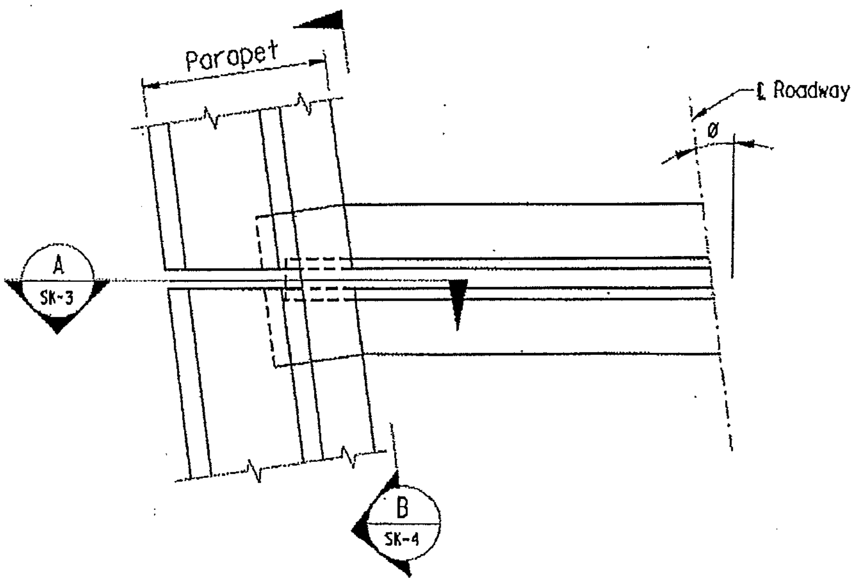


Ø - Skew Angle
A - movement along ℄ Bridge
B - movement along Skew   B = A sin Ø
C - movement normal to joint C = A cos Ø

STRIP SEAL IN CONCRETE HEADER EXPANSION JOINT SYSTEM -- REHAB PROJECT	SK-1



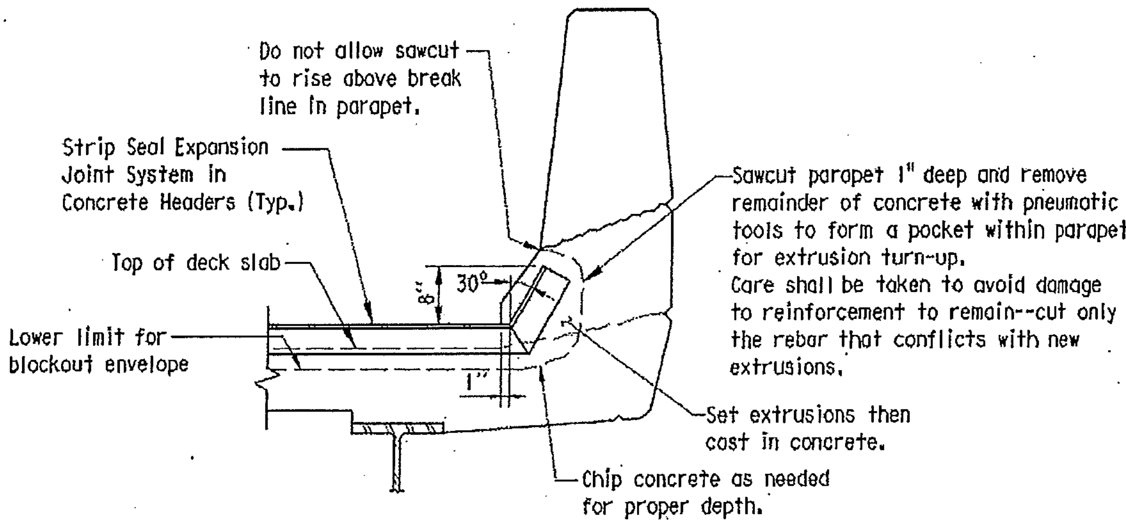
JOINT TREATMENT AT GUTTERLINE -- Ø > 25



JOINT TREATMENT AT GUTTERLINE -- Ø ≤ 25

STRIP SEAL IN CONCRETE HEADER EXPANSION JOINT SYSTEM -- REHAB PROJECT	SK-2

Note: Detail shown is for "F" shaped parapet. Modify as needed for different parapet shape configuration.



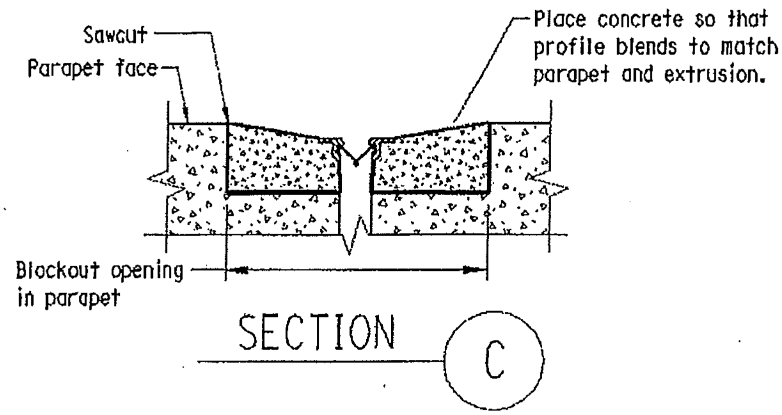
SECTION (A)

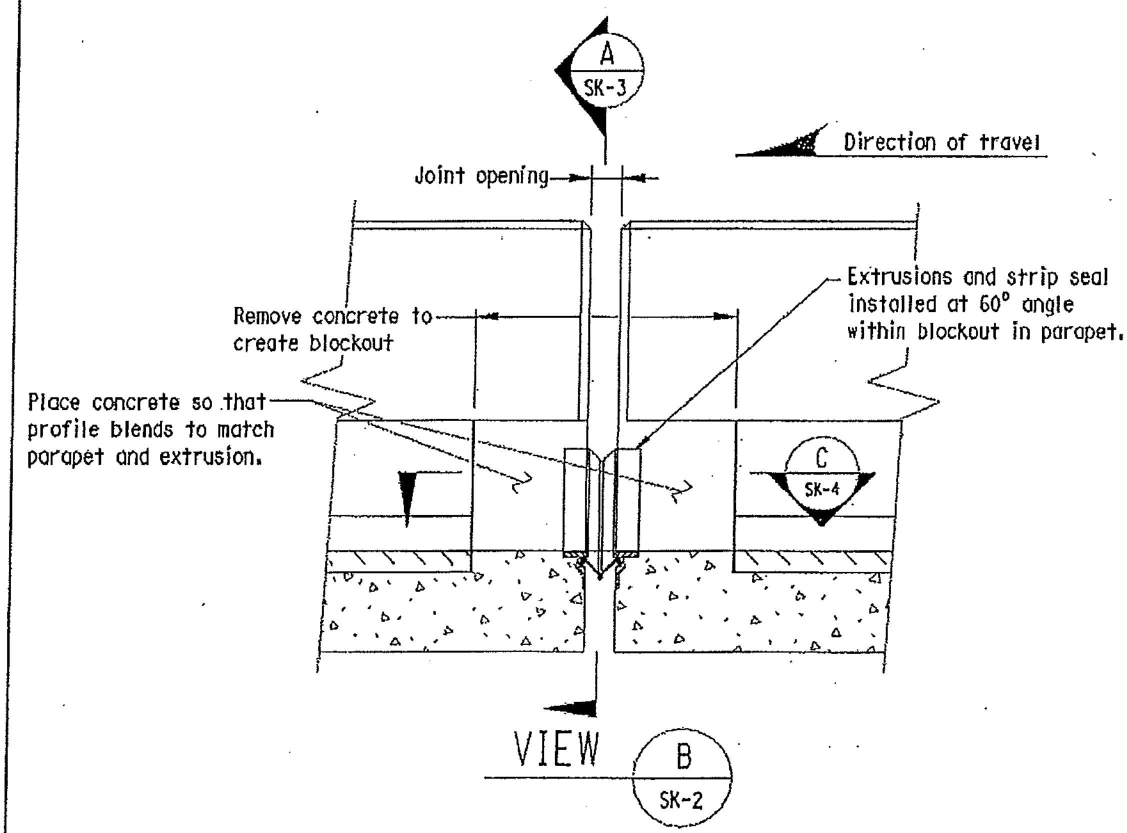
JOINT TREATMENT AT CONCRETE PARAPET

DESIGN INFORMATION

1. *This plate shall be used in conjunction with plate SK-3 and SK-4.*

STRIP SEAL IN CONCRETE HEADER EXPANSION JOINT SYSTEM -- REHAB PROJECT	SK-3

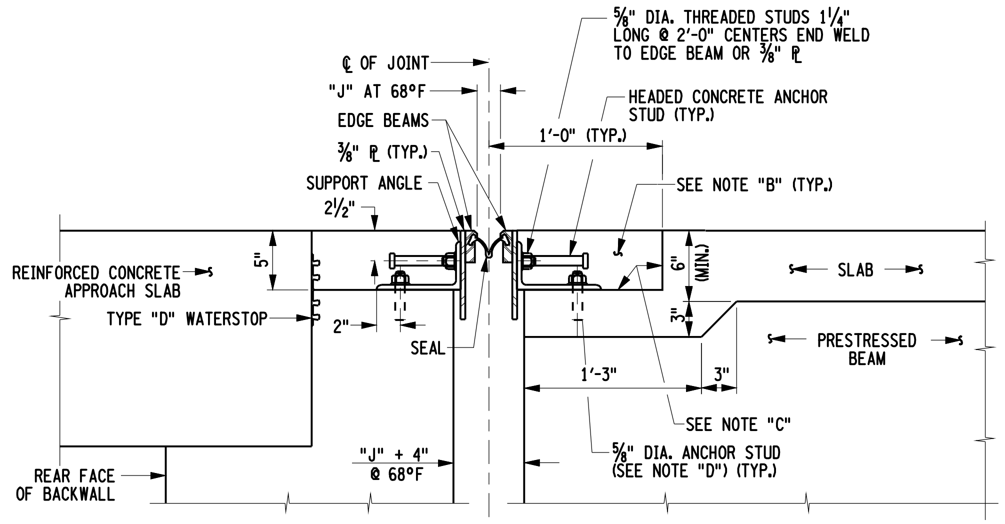




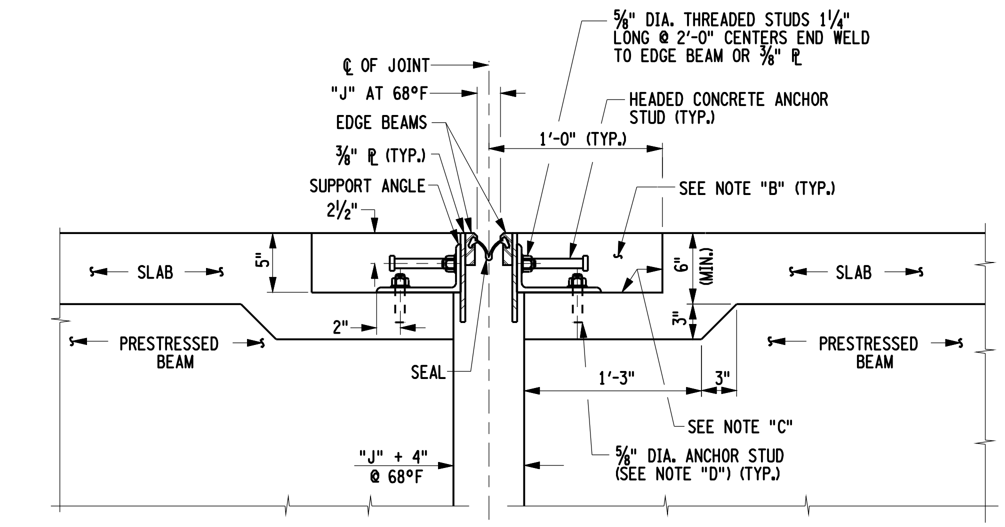
JOINT TREATMENT AT CONCRETE PARAPET

STRIP SEAL IN CONCRETE HEADER EXPANSION JOINT SYSTEM -- REHAB PROJECT	SK-4

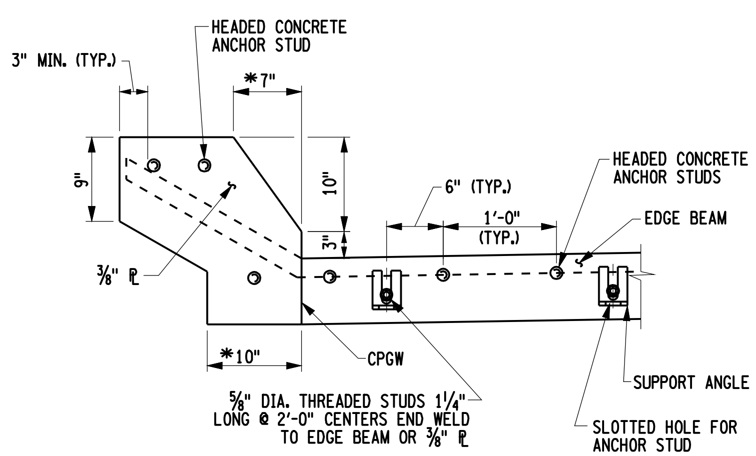
BD-JM3E



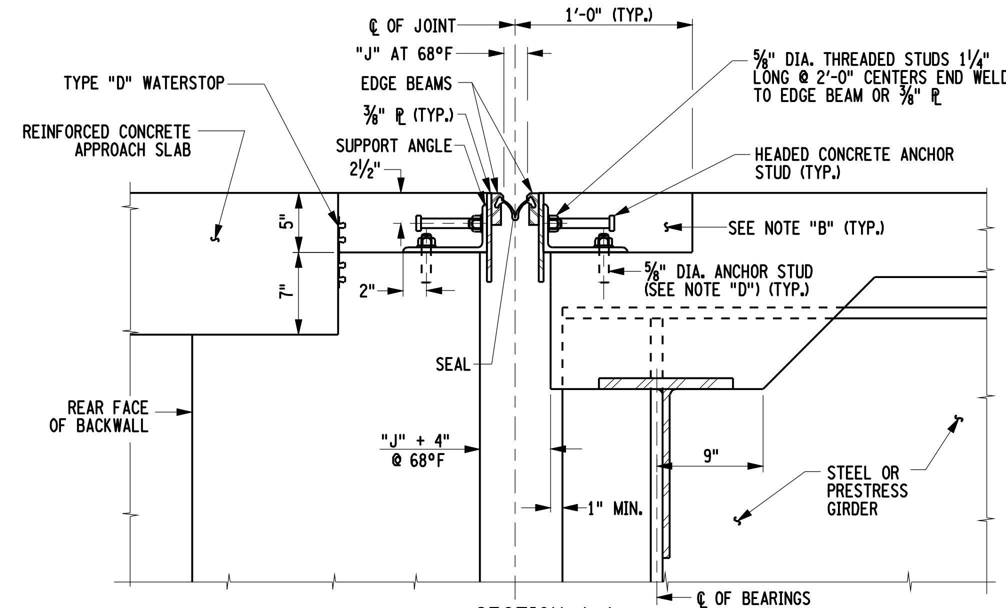
SECTION A-A
SECTION @ ABUTMENT
ADJACENT PRESTRESS BEAMS
NOT TO SCALE



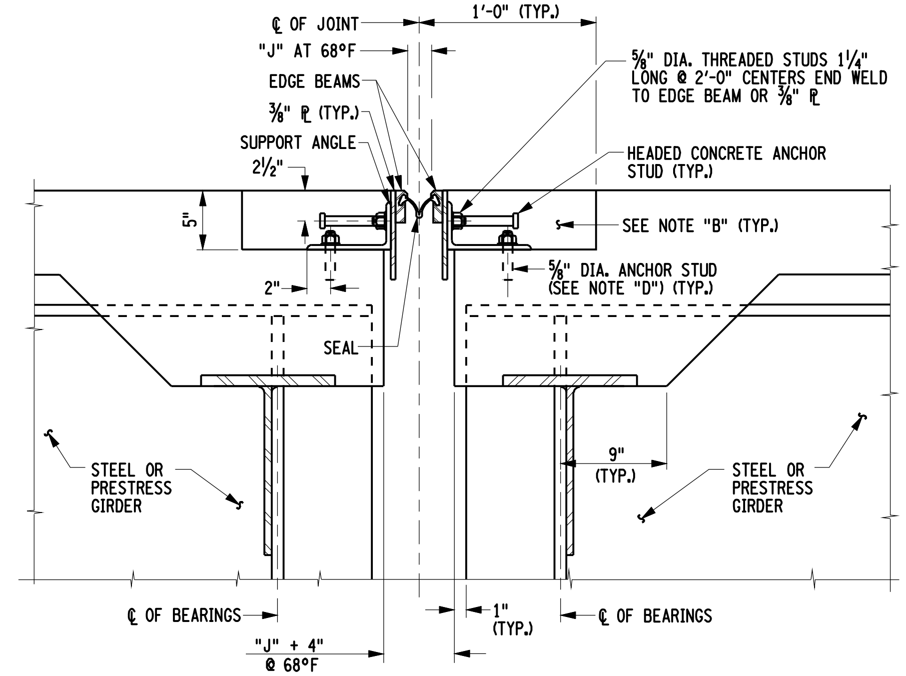
SECTION A-A
SECTION @ PIER
ADJACENT PRESTRESS BEAMS
NOT TO SCALE



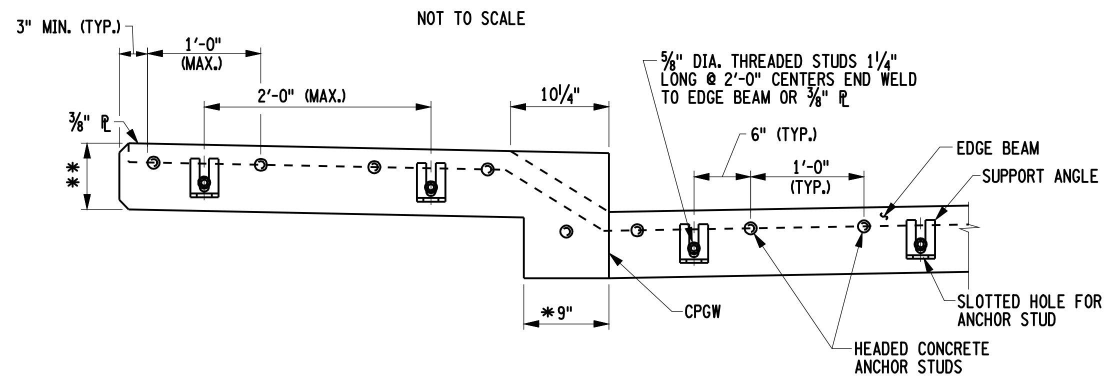
SECTION C-C (CONCRETE TRAFFIC BARRIER)
(ONLY THE STEEL SHOWN)
NOT TO SCALE



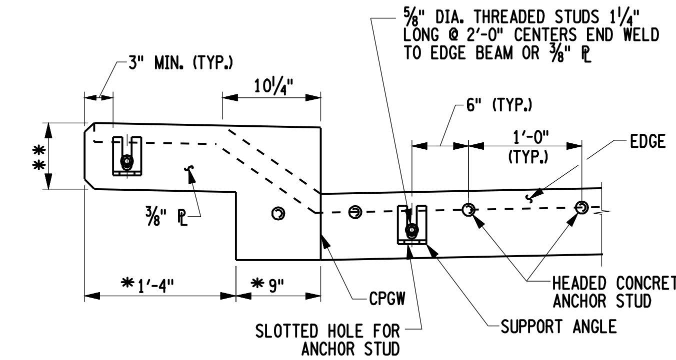
SECTION A-A
SECTION @ ABUTMENT
MULTI-GIRDER SYSTEM
NOT TO SCALE



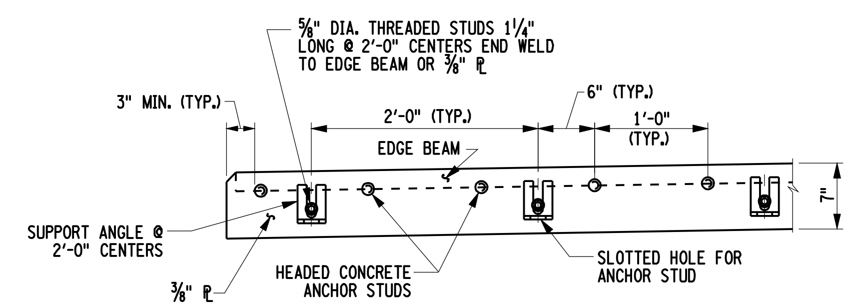
SECTION A-A
SECTION @ PIER
MULTI-GIRDER SYSTEM
NOT TO SCALE



SECTION C-C (SIDEWALK)
(ONLY THE STEEL SHOWN)
NOT TO SCALE



SECTION C-C (BRUSH CURB)
(ONLY THE STEEL SHOWN)
NOT TO SCALE



SECTION C-C (CURBLESS)
(ONLY THE STEEL SHOWN)
NOT TO SCALE

* INCREASE DIMENSION AS REQUIRED ON SKEWED BRIDGES.

** DIMENSION MUST BE CALCULATED FOR EACH STRUCTURE AT EACH FASCIA.

FOR LOCATIONS OF SECTIONS A-A AND C-C, SEE BD-JM1E AND BD-JM2E.

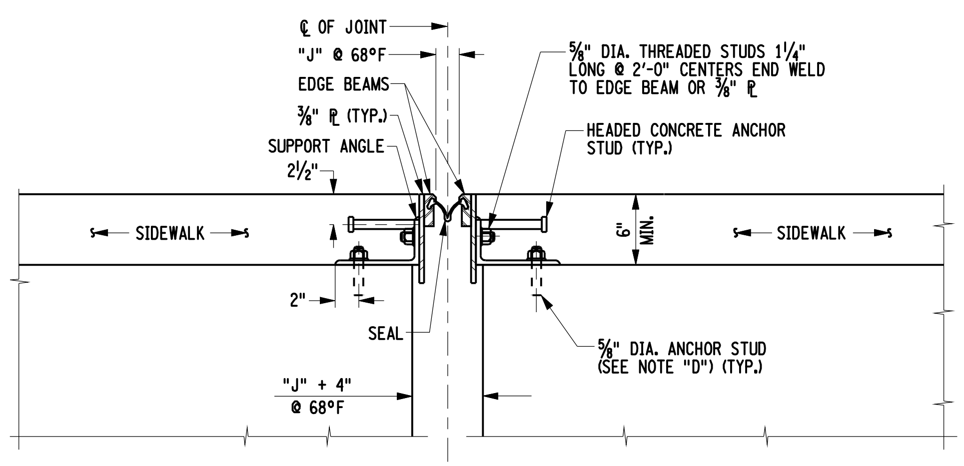
FOR NOTES B, C, AND D, SEE BD-JM5E.

FOR DIMENSION J, SEE BD-JM5E.

NOTE:
DETAILS ARE SHOWN WITH STRIP SEAL. BOX SEAL MAY BE SUBSTITUTED AT THE CONTRACTOR'S OPTION.

DETAILS ON THE DRAWINGS LABELED AS "NOT TO SCALE" ARE INTENTIONALLY DRAWN NOT TO SCALE FOR VISUAL CLARITY. ALL OTHER DETAILS, FOR WHICH NO SCALE IS SHOWN, ARE DRAWN PROPORTIONAL AND ARE FULLY DIMENSIONED.

ISSUED 5/01/08	STATE OF NEW YORK DEPARTMENT OF TRANSPORTATION OFFICE OF STRUCTURES
REVISED	MODULAR JOINT SYSTEM ONE CELL SECTIONS A-A & C-C
	APPROVED: 1/18/08 ORIGINAL SIGNED BY GEORGE A. CHRISTIAN, P.E. DEPUTY CHIEF ENGINEER (STRUCTURES) — ISSUED UNDER EB 08-002 EFFECTIVE WITH THE LETTING OF 1/08/09



SKEW ANGLE	SUPERSTRUCTURE TYPE	MAXIMUM ALLOWABLE SPAN	NO. CELLS	DIM. "J" @ 68°F.
LESS THAN 45°	STEEL	155'-10"/COS SKEW	1	2"
	CONCRETE	364'-6"/COS SKEW	1	2"
LESS THAN 45°	STEEL	155'-10"/SIN SKEW	1	2"
	CONCRETE	364'-6"/SIN SKEW	1	2"

DETAILS PROVIDED ON THESE SHEETS ARE DEVELOPED FOR CONVENTIONAL MONOLITHIC AND ISOTROPIC DECKS. THE DESIGNER MUST VERIFY THE SUITABILITY OF THESE DETAILS FOR OTHER DECK SYSTEMS AND MODIFY THEM AS NECESSARY.

FOR LOCATION OF SECTION D-D, SEE BD-JM1E AND BD-JM2E.

BRIDGES WITH A SKEW GREATER THAN 30° MUST USE COVER PLATES.

FOR COVER PLATE DETAILS, SEE BD-JM11E AND BD-JM12E.

NOTE "B"

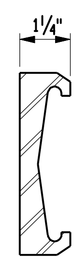
THE CONCRETE FURNISHED AND PLACED IN THE RECESSES FOR INSTALLING THE JOINT SYSTEM SHALL COMPLY WITH THE SPECIFICATIONS FOR THE CURRENT SLAB ITEM, EXCEPT THAT MACHINE FINISHING WILL NOT BE REQUIRED. THE COST FOR FURNISHING AND PLACING THIS CONCRETE SHALL BE INCLUDED IN THE UNIT PRICE OF THE SLAB ITEM.

NOTE "C"

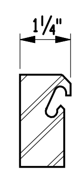
PREPARE EXISTING SURFACES IN ACCORDANCE WITH STANDARD SPECIFICATION 566-3.03.

NOTE "D"

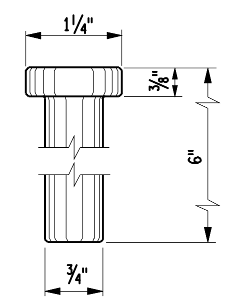
⅝" DIA. ANCHOR STUD TO BE DRILLED AND GROUTED IN PLACE IN ACCORDANCE WITH THE REQUIREMENTS OF SUBSECTION 586-3.02. GROUTING MATERIALS SHALL BE IN ACCORDANCE WITH MATERIALS SUBSECTION 701-07, ANCHORING MATERIALS-CHEMICALLY CURING. HOLES TO BE DRILLED TO THE DIAMETER AND DEPTH RECOMMENDED BY THE MANUFACTURER OF THE GROUTING MATERIAL (MIN. DEPTH OF 4"). THE COST OF THE ANCHORS, INCLUDING DRILLING AND GROUTING, SHALL BE INCLUDED IN THE UNIT PRICE BID FOR THE JOINT SYSTEM ITEM.



EDGE BEAM
FOR BOX SEAL
NOT TO SCALE



EDGE BEAM FOR
STRIP SEAL
NOT TO SCALE



DETAIL OF HEADED CONCRETE
ANCHOR STUD
NOT TO SCALE

NOTES:

IT IS DESIRABLE TO HAVE THE MODULAR JOINT WITH ITS SEAL ASSEMBLED IN THE SHOP AND DELIVERED TO THE JOB SITE ALL SET FOR INSTALLATION IN ITS PREFORMED RECESS IN THE STRUCTURAL SLAB. IN CASES WHERE THE JOINT CANNOT BE ASSEMBLED IN THE SHOP, DUE TO ITS EXCESSIVE LENGTH CAUSING SHIPPING PROBLEMS, THE JOINT SHALL HAVE THE SEAL IN PLACE BEFORE THE STRUCTURE IS OPENED TO TRAFFIC, INCLUDING CONSTRUCTION TRAFFIC, AND BEFORE DISCONTINUING OPERATION WHEN WORK IS SUSPENDED DURING THE WINTER.

MODULAR JOINT SHOWN IS FOR ILLUSTRATIVE PURPOSES ONLY. ACTUAL JOINT SUPPLIED MAY VARY SIGNIFICANTLY FROM THE ONE SHOWN HERE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ADJUST ALL REQUIRED DIMENSIONS IN THE FIELD, BASED ON FIELD VERIFIED DIMENSIONS, TO ACCOMMODATE THE ACTUAL MODULAR JOINT SUPPLIED.
STRIP SEAL OR BOX SEAL MAY BE USED AT THE CONTRACTOR'S OPTION.

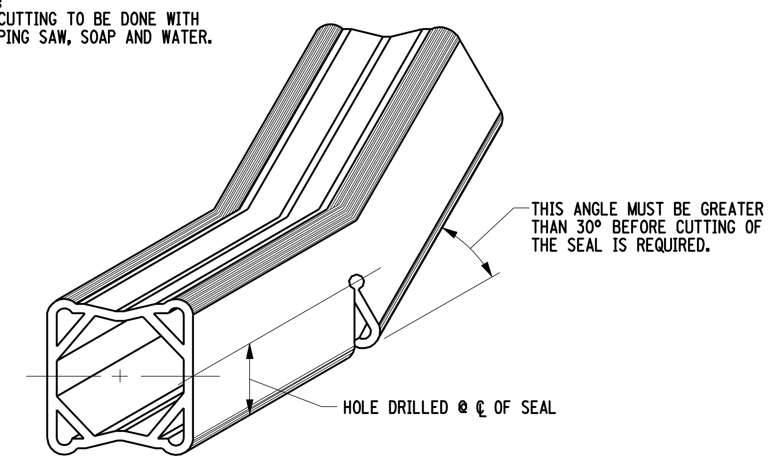
THE ASSUMED DIMENSIONS OF THE BLOCKOUT (DEPTH AND WIDTH) ARE PLACED ON THE PLANS. IF THE JOINT SYSTEM SUPPLIED BY THE FABRICATOR/CONTRACTOR REQUIRES A CHANGE TO THE BLOCKOUT SIZE OR SUPPORT SYSTEM (I.E. END DIAPHRAGM, ETC.) DETAILED IN THE PLANS, THAT CHANGE TO THE BLOCKOUT OR SUPPORT SYSTEM SHALL BE THE CONTRACTOR'S RESPONSIBILITY. NO ADDITIONAL PAYMENT WILL BE MADE FOR THE CHANGES TO THE BLOCKOUT OR SUPPORT SYSTEM AS A RESULT OF THE SUPPLIED JOINT SYSTEM.

ENDS OF BOX SEAL TO BE CAPPED WITH NEOPRENE SPONGE.

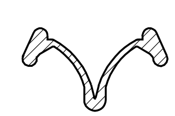
CAULKING COMPOUND FOR STRUCTURES CONFORMING TO N.Y.S. STANDARD SPECIFICATIONS SUBSECTION 705-06 SHALL BE USED TO SEAL BETWEEN THE CURB AND THE ⅜" PLATE. COST TO BE INCLUDED IN THE UNIT PRICE FOR THE CURB ITEM.

DETAILS ON THE DRAWINGS LABELED AS "NOT TO SCALE" ARE INTENTIONALLY DRAWN NOT TO SCALE FOR VISUAL CLARITY. ALL OTHER DETAILS, FOR WHICH NO SCALE IS SHOWN, ARE DRAWN PROPORTIONAL AND ARE FULLY DIMENSIONED.

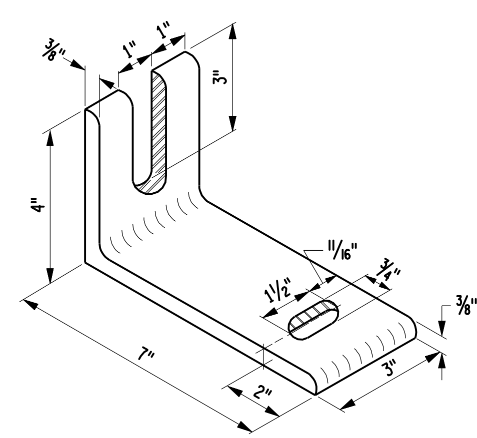
NOTE:
ALL CUTTING TO BE DONE WITH A COPING SAW, SOAP AND WATER.



DETAIL FOR CUTTING
BOX SEAL
NOT TO SCALE



STRIP SEAL
NOT TO SCALE



DETAIL OF SUPPORT ANGLE
(ASTM A36)

ISSUED 5/01/08
REVISED

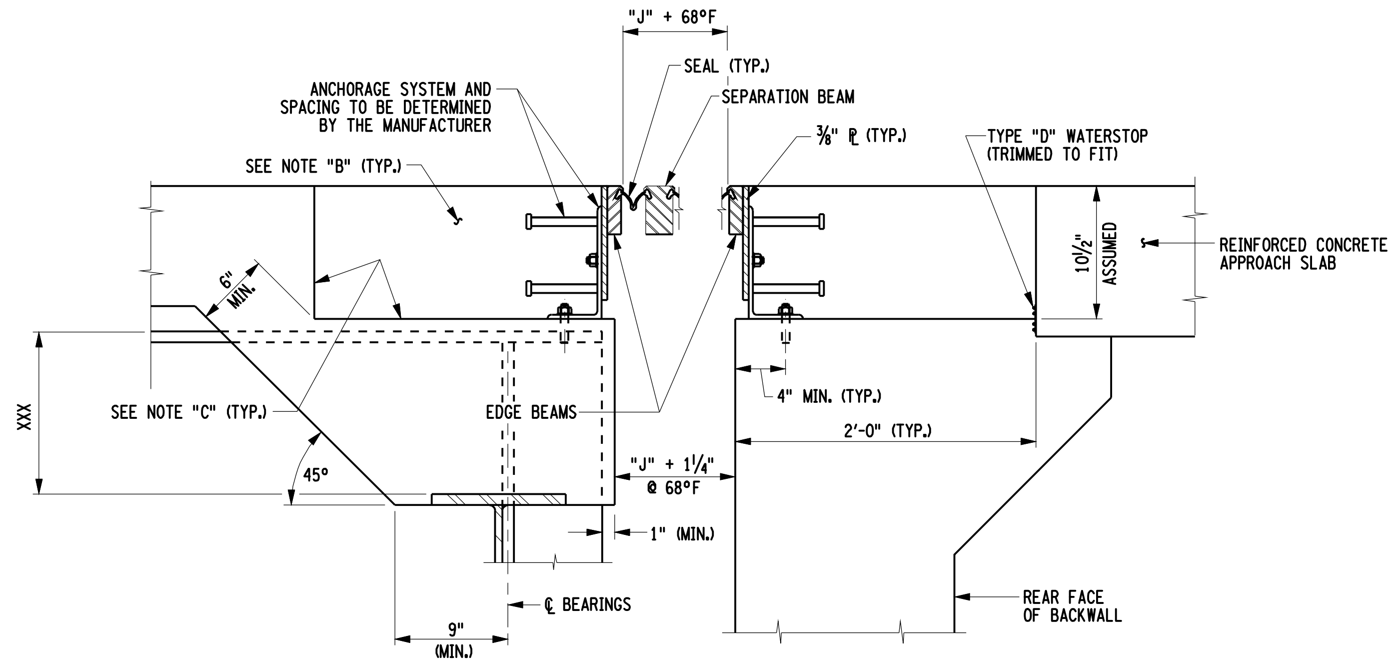
STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
OFFICE OF STRUCTURES

MODULAR JOINT SYSTEM
ONE CELL
MISCELLANEOUS DETAILS

APPROVED: 1/18/08
ORIGINAL SIGNED BY
GEORGE A. CHRISTIAN, P.E.
DEPUTY CHIEF ENGINEER
(STRUCTURES)

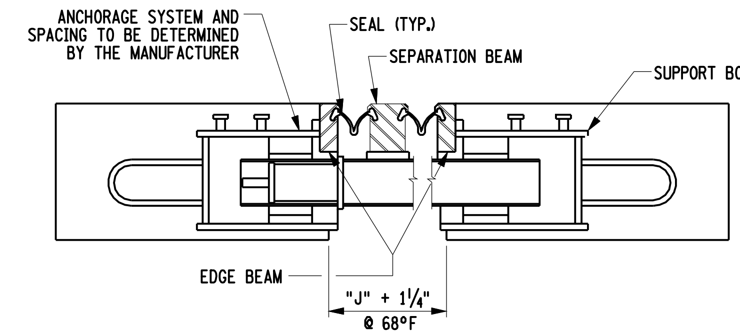
ISSUED UNDER EB 08-002
EFFECTIVE WITH THE
LETTING OF 1/08/09

BD-JM8E

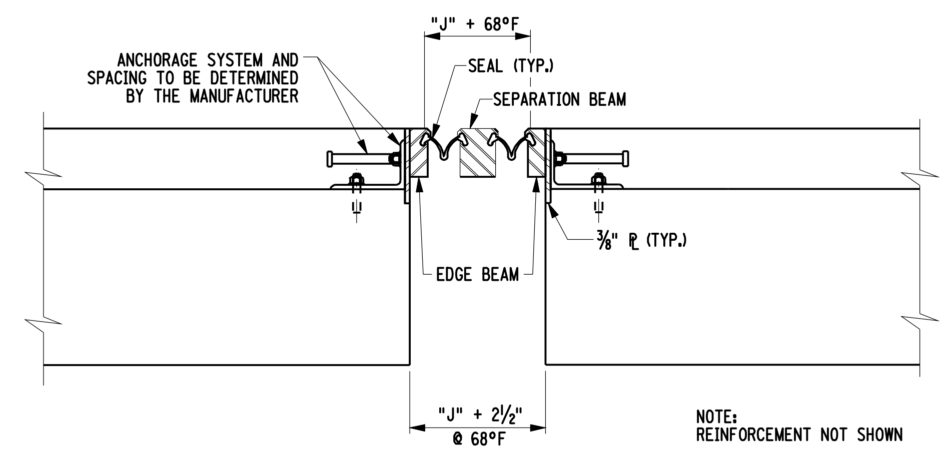


NOTE:
IN LIEU OF THE CORBEL TYPE BACKWALL SHOWN, THE CONTRACTOR HAS THE OPTION OF USING A FULL THICKNESS BACKWALL. THE EXTRA CONCRETE SHALL BE PROVIDED AT NO EXTRA COST TO THE STATE.

SECTION A-A
SECTION @ ABUTMENT
MULTIGIRDER SYSTEM
NOT TO SCALE

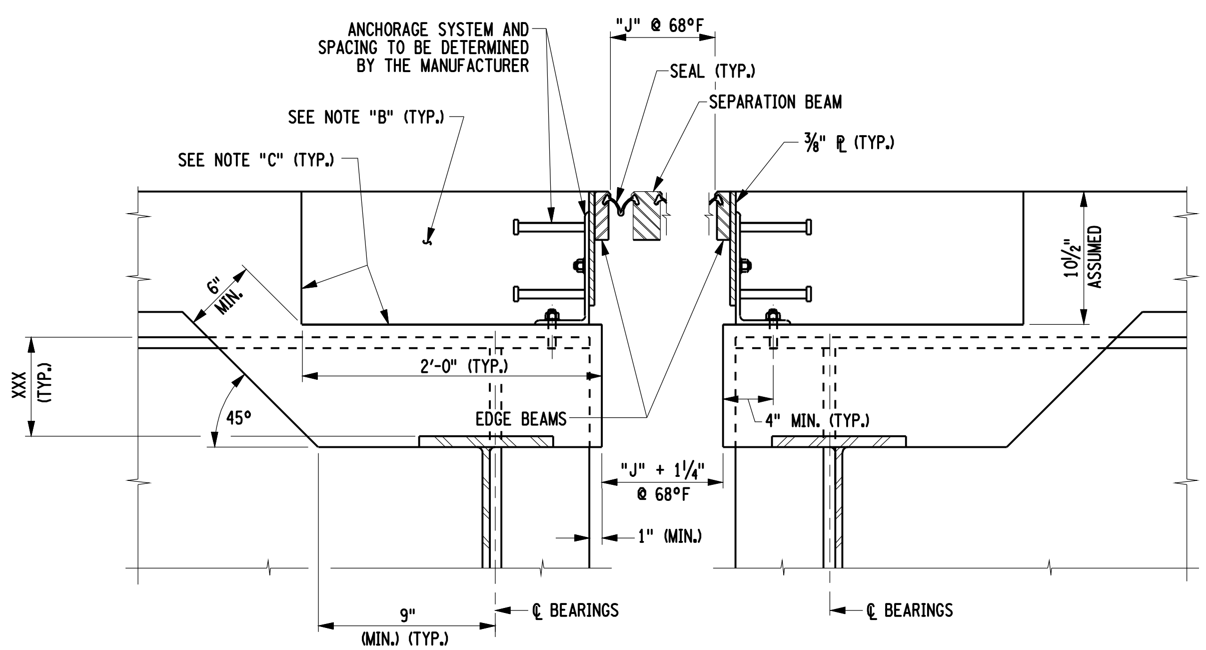


SECTION E-E
(HEADER ONLY SHOWN FOR CLARITY)
NOT TO SCALE



NOTE:
REINFORCEMENT NOT SHOWN

SECTION D-D
NOT TO SCALE



SECTION A-A
SECTION @ PIER
MULTIGIRDER SYSTEM
NOT TO SCALE

XXX THIS DIMENSION SHALL BE CALCULATED BY THE DESIGNER. DIAPHRAGM DETAILS MUST BE MODIFIED IF NECESSARY.

FOR LOCATIONS OF SECTIONS A-A, D-D, AND C-C, SEE BD-JM6E AND BD-JM7E.

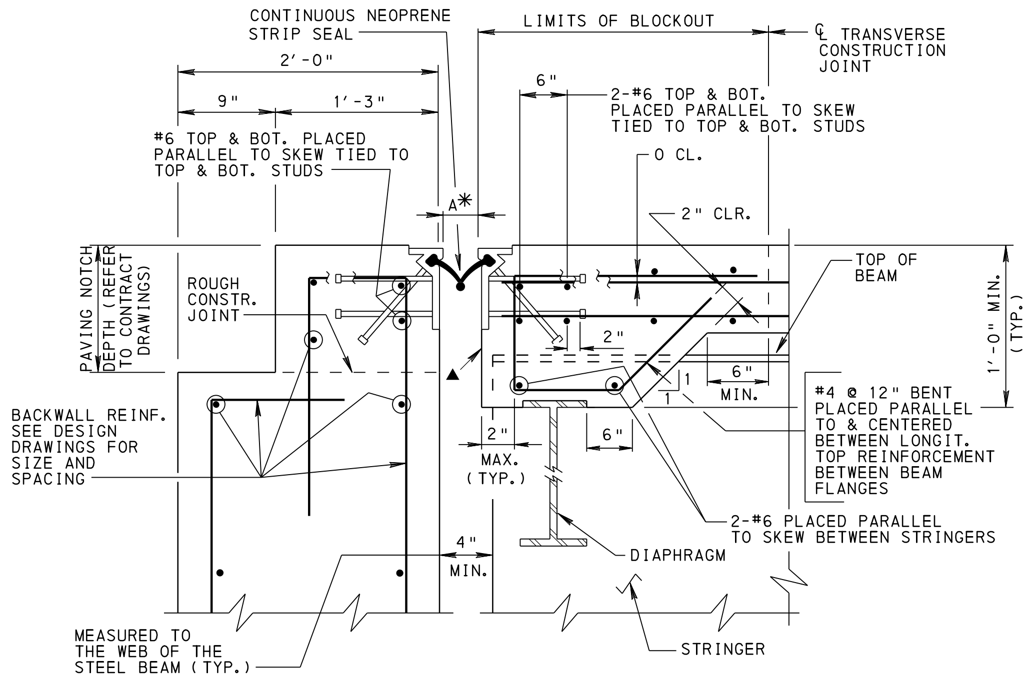
FOR NOTES B AND C AND DIMENSION J, SEE BD-JM12E.

NOTE:
DETAILS ARE SHOWN WITH STRIP SEAL. BOX SEAL MAY BE SUBSTITUTED AT THE CONTRACTOR'S OPTION.

DETAILS ON THE DRAWINGS LABELED AS "NOT TO SCALE" ARE INTENTIONALLY DRAWN NOT TO SCALE FOR VISUAL CLARITY. ALL OTHER DETAILS, FOR WHICH NO SCALE IS SHOWN, ARE DRAWN PROPORTIONAL AND ARE FULLY DIMENSIONED.

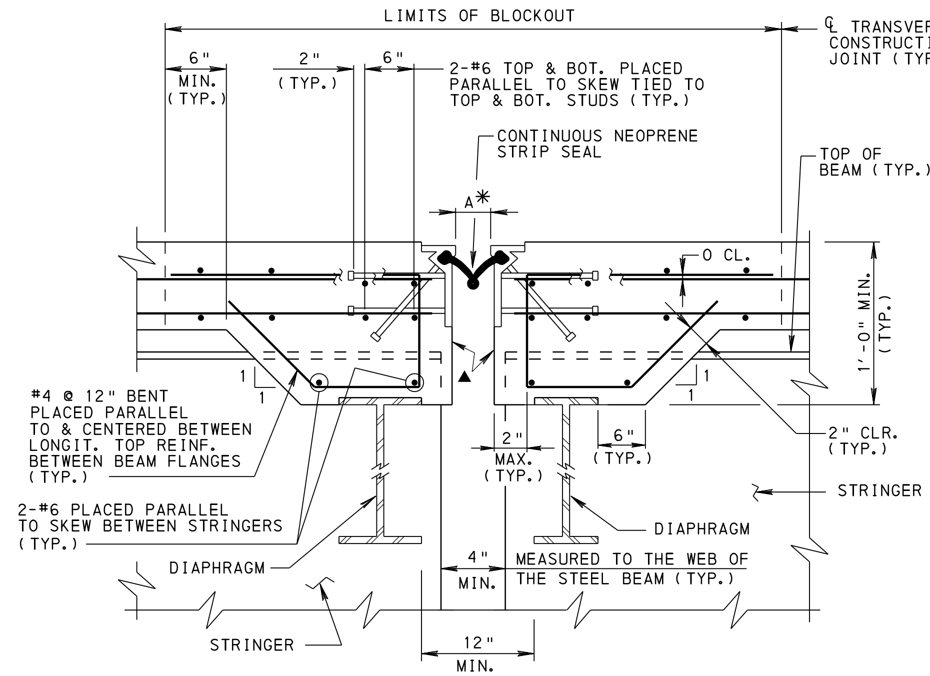
ISSUED 5/01/08	STATE OF NEW YORK DEPARTMENT OF TRANSPORTATION OFFICE OF STRUCTURES
REVISED	MODULAR JOINT SYSTEM MULTICELL SECTIONS A-A, D-D & E-E
APPROVED: 1/18/08 ORIGINAL SIGNED BY GEORGE A. CHRISTIAN, P.E. DEPUTY CHIEF ENGINEER (STRUCTURES)	ISSUED UNDER EB 08-002 EFFECTIVE WITH THE LETTING OF 1/08/09

PENNDOT DETAILS
Full set of details available at:
ftp://ftp.dot.state.pa.us/public/Bureaus/design/bqad/2012/BC/bc767m.pdf

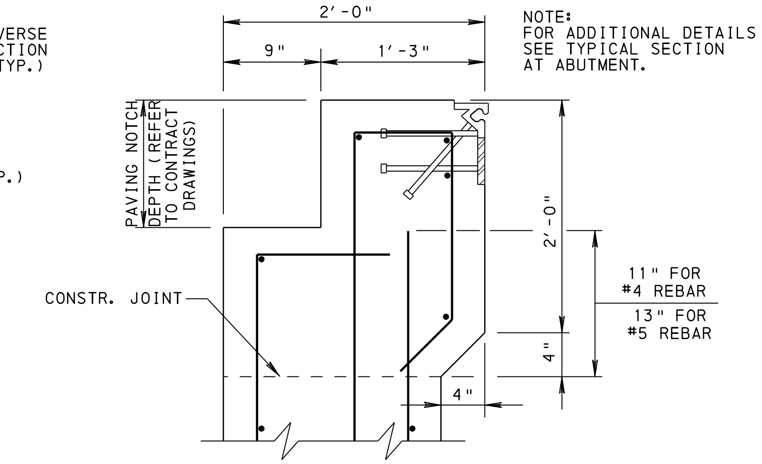


TYPICAL SECTION AT ABUTMENT
FIXED & EXPANSION
FOR STEEL BEAMS

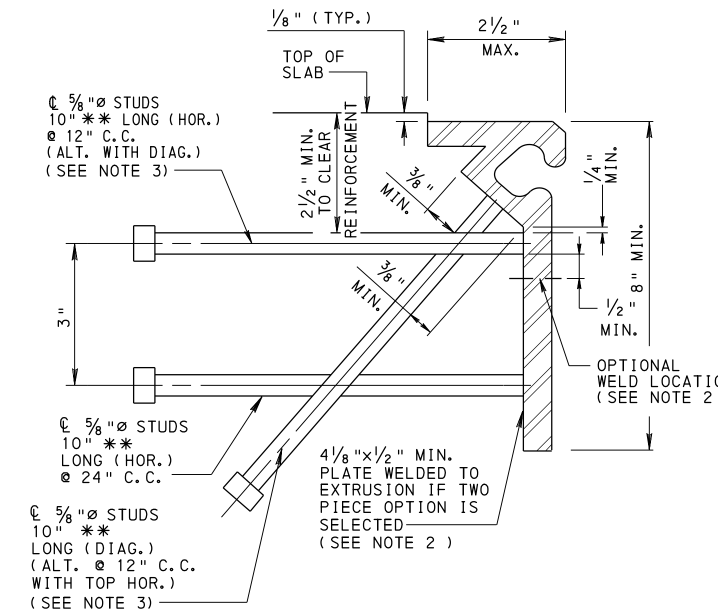
✱ - "A", IS INSTALLATION WIDTH AS PER DIMENSION "A" TABLE
▲ - SEE NOTE 20 ON SHEET 1



TYPICAL SECTION AT PIER
FIXED & EXPANSION
FOR STEEL BEAMS



OPTIONAL BACKWALL

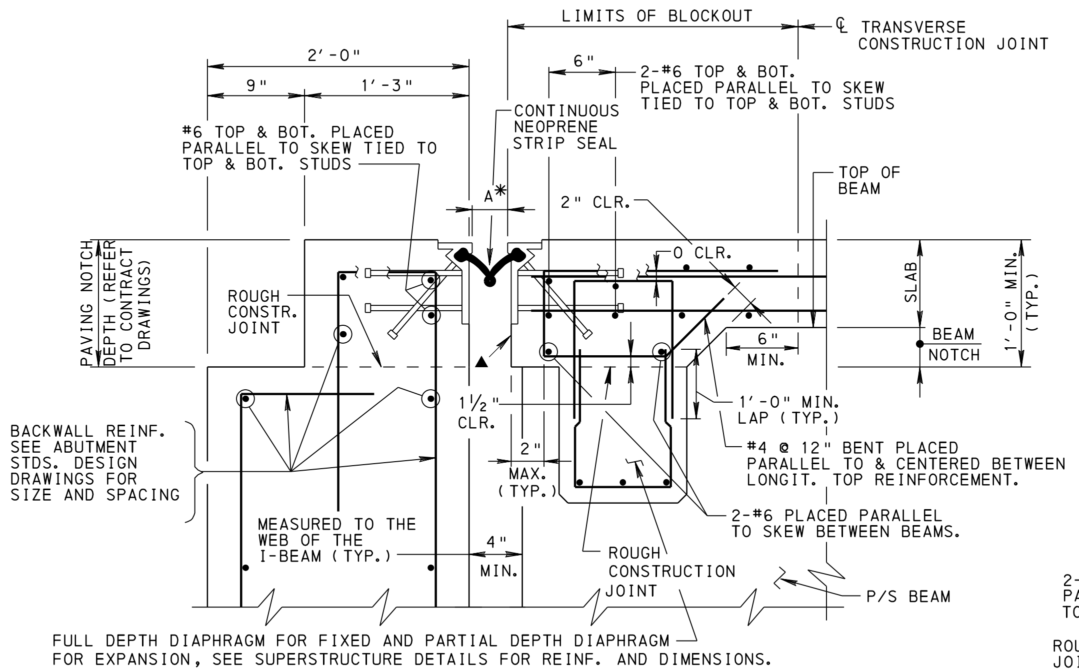


EXTRUSION SCHEMATIC

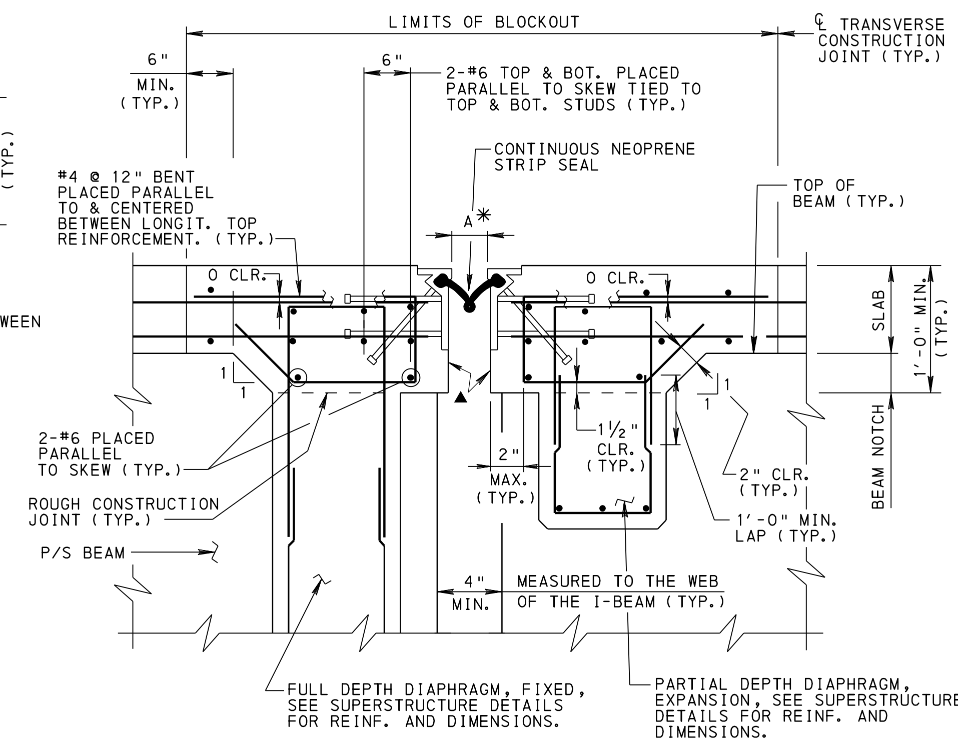
** NOTE
IF 10″ STUDS CANNOT BE ACCOMMODATED IN THE SPACE AVAILABLE, REQUEST SPECIFIC LENGTH APPROVAL FROM THE DISTRICT BRIDGE ENGINEER AT THE SHOP DRAWINGS APPROVAL STAGE.

EXTRUSION NOTES:

1. EXTRUSION THICKNESS 1/2″.
2. TWO PIECE MEMBER (EXTRUSION AND PLATE COMBINATION) IN LIEU OF ONE PIECE EXTRUSION IS PERMITTED. WELD IN ACCORDANCE WITH AASHTO/AWS SPECIFICATIONS. (FULL PENETRATION WELD AND N.D.T. REQUIRED)
3. STUD SPACING IS 12″ MAX. UNLESS SPECIFIED ON AN APPROVED DETAIL.



TYPICAL SECTION AT ABUTMENT
FIXED & EXPANSION
FOR P/S SPREAD BEAMS
NOTE: BOX BEAM SHOWN, I-BEAM SIMILAR



TYPICAL SECTION AT PIER
FIXED & EXPANSION
FOR P/S SPREAD BEAMS
NOTE: BOX BEAM SHOWN, I-BEAM SIMILAR.

DIMENSION "A" TABLE
(INSTALLATION DIMENSION "A" @ VARIOUS TEMPERATURES)

LOCATION	TEMPERATURE														
	(°C)	-23	-20	-15	-10	-5	0	5	10	15	20	25	30	35	40	43
	(°F)	-10	-5	5	15	25	32	40	50	60	68	80	85	95	105	110

NOTE: TABLE TO BE SHOWN AND COMPLETED ON FABRICATORS SHOP DRAWINGS.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

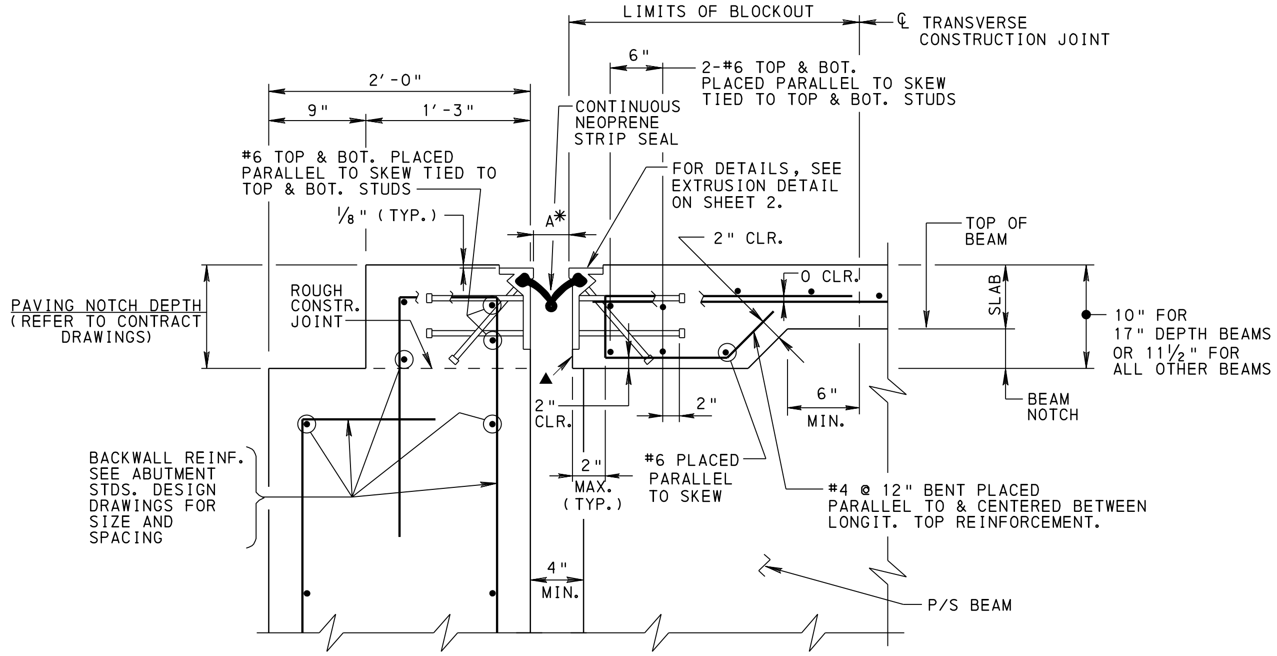
STANDARD
NEOPRENE STRIP SEAL DAM
FOR PRESTRESSED CONCRETE
& STEEL I-BEAM BRIDGES

RECOMMENDED MAY 18, 2012	RECOMMENDED MAY 18, 2012	SHEET 2 OF 6
Thomas P. Macioce CHIEF BRIDGE ENGINEER	R. Wyse Willey ACTING DIR., BUR. OF PROJECT DIRECTOR	BC-767M

PENNDOT DETAILS

Full set of details available at:

ftp://ftp.dot.state.pa.us/public/Bureaus/design/bqad/2012/BC/bc767m.pdf



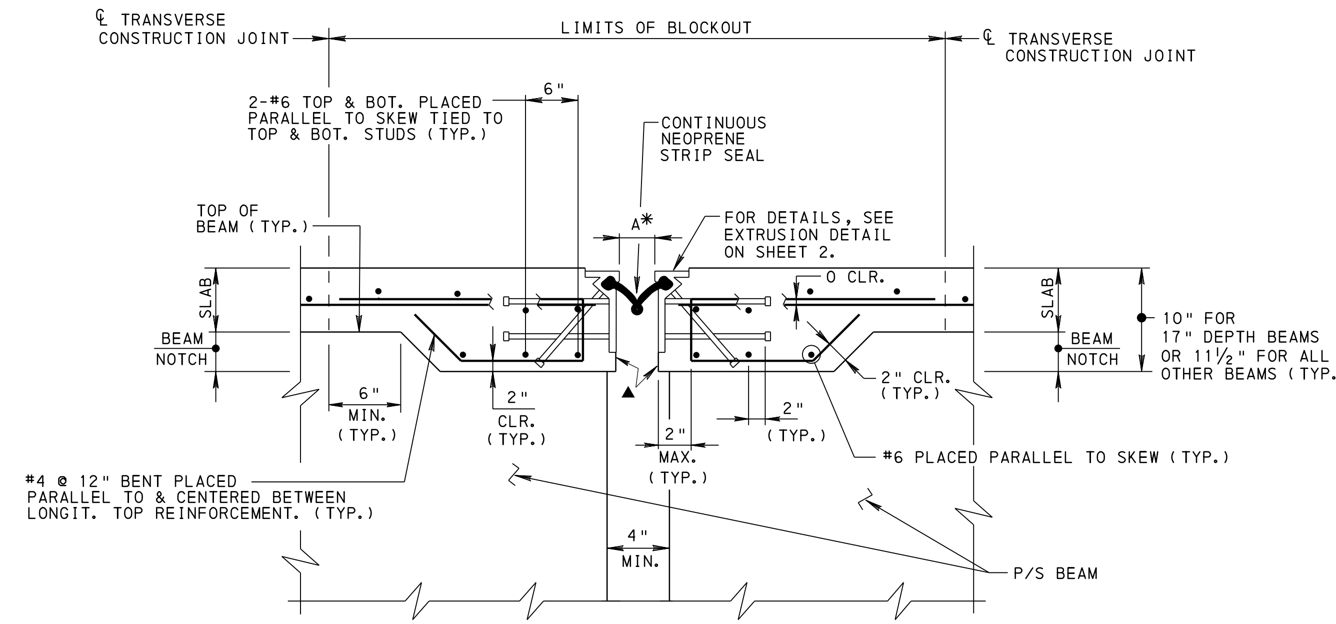
TYPICAL SECTION AT ABUTMENT

FIXED & EXPANSION

FOR P/S ADJACENT BEAMS

✳ - "A", IS INSTALLATION WIDTH AS PER DIMENSION "A" TABLE ON SHEET 2.

▲ - SEE NOTE 20 ON SHEET 1

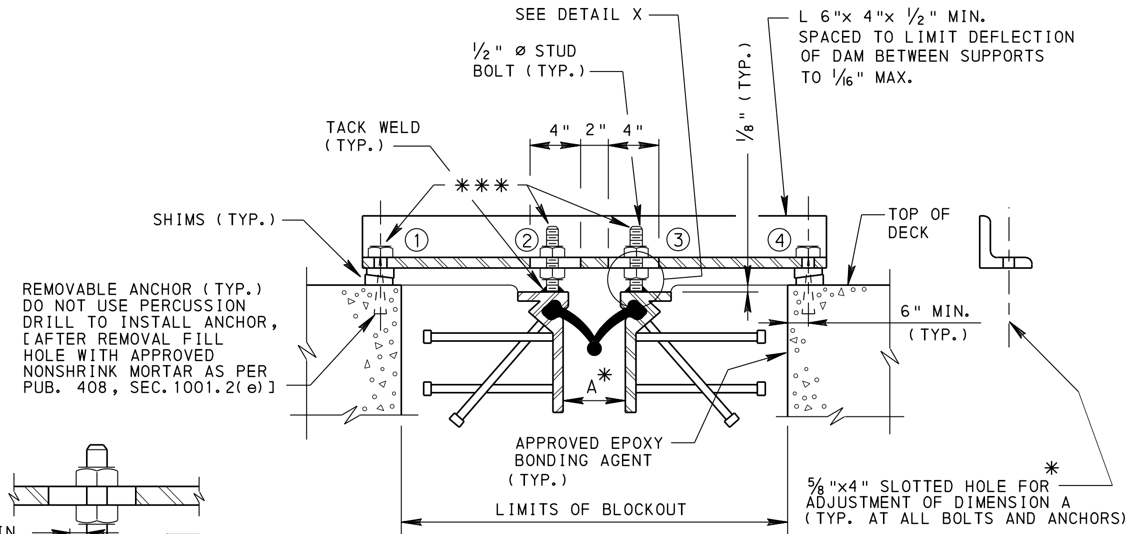


TYPICAL SECTION AT PIER

FIXED & EXPANSION

FOR P/S ADJACENT BEAMS

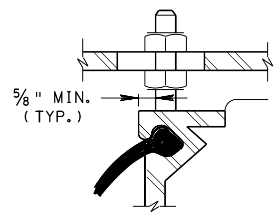
COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION BUREAU OF PROJECT DELIVERY		
STANDARD NEOPRENE STRIP SEAL DAM FOR PRESTRESSED CONCRETE & STEEL I-BEAM BRIDGES		
RECOMMENDED MAY 18, 2012 Thomas P. Macioce CHIEF BRIDGE ENGINEER	RECOMMENDED MAY 18, 2012 R. Wyze Willey ACTING DIR, BUR. OF PROJECT DIRECTOR	SHEET 3 OF 6 BC-767M



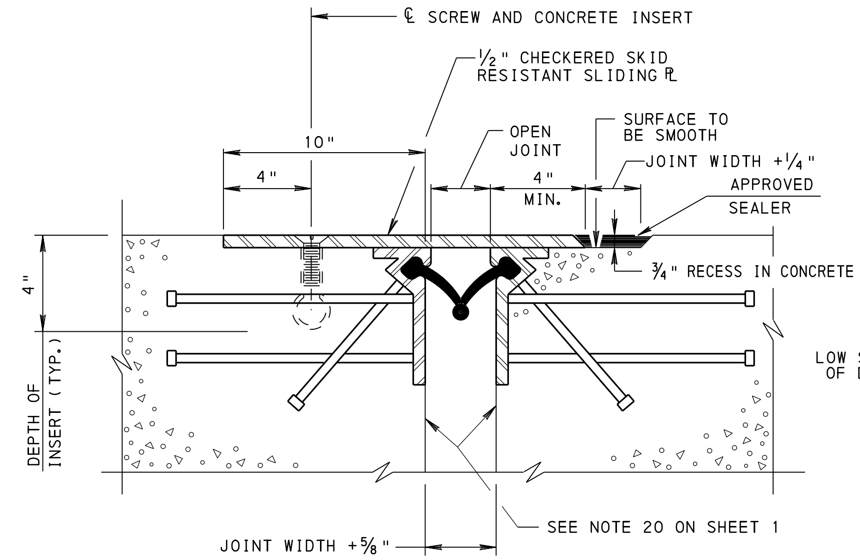
CONCEPTUAL SKETCH **

JOINT INSTALLATION SCHEME

(SEE NOTES BELOW)

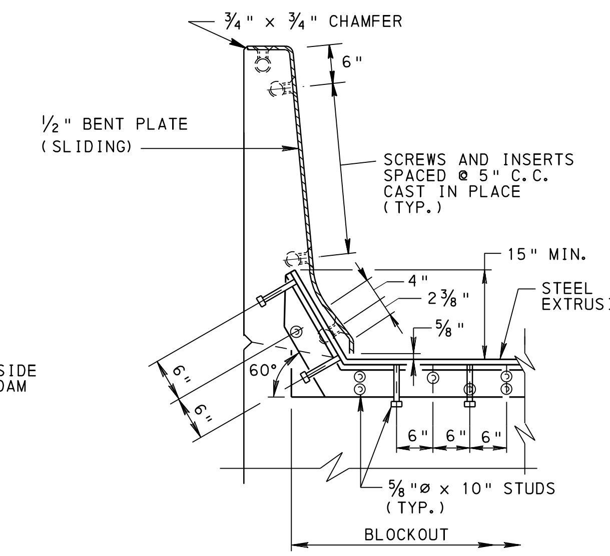


DETAIL X



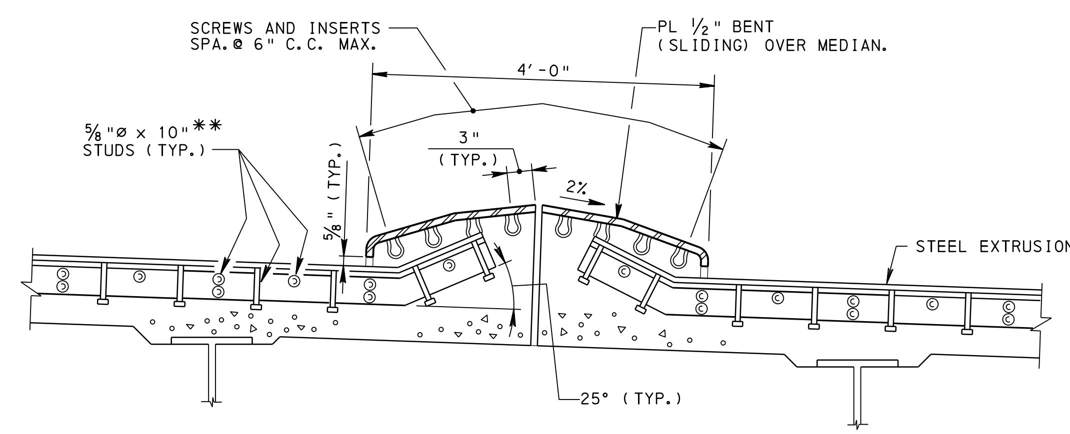
SECTION B-B

FOR LOCATION OF SECTION B-B SEE SHEET 4.



SECTION AT BARRIER

NOTE:
SPACING OF THE SCREWS IS THE SAME FOR THE ALTERNATE BARRIER. STEEL EXTRUSION IS SHOWN FOR 90° SKEW. DETAIL STEEL EXTRUSION AS REQUIRED FOR SKEWS LESS THAN 90°.



SECTION AT SPLIT CONCRETE DIVISOR

NOTE: FOR CONCRETE DIVISOR NOT SPLIT, USE ONE PIECE 1/2" BENT SLIDING PLATE.

JOINT INSTALLATION NOTES:

* TO BE ADJUSTED FOR INSTALLATION TEMPERATURE FOR SPECIFIC MOVEMENT CLASSIFICATION.

** CONTRACTOR MAY USE ALTERNATE SCHEMES ONLY WITH THE APPROVAL OF THE DISTRICT BRIDGE ENGINEER OR DISTRICT STRUCTURE CONTROL ENGINEER.

***
- DURING ASSEMBLY INSTALLATION TIGHTEN BOLT ① AND BOTH NUTS ON STUD BOLTS ② AND ③ MAKING SURE DIMENSION A* REFLECTS THE INSTALLATION TEMPERATURE.
- DO NOT TIGHTEN BOLT ④
- IMMEDIATELY AFTER BLOCKOUT IS CAST, LOOSEN BOTTOM NUT ON STUD BOLT ③ TO PERMIT TEMPERATURE MOVEMENT IN THE ASSEMBLY ON ONE SIDE OF JOINT.
- PROVIDE LOW FRICTION INTERFACE BETWEEN BOLT HEADS AND ANGLE AND TOP NUTS ON STUD BOLTS AND ANGLE.
- ALTERNATE THIS PATTERN BETWEEN NEAR SIDE AND FAR SIDE OF JOINT ON SUCCESSIVE ASSEMBLIES, I.E. TIGHTEN BOLT ④ AND BOTH NUTS ON STUD BOLTS ② AND ③ AFTER A* IS SET FOR INSTALLATION TEMPERATURE. DO NOT TIGHTEN BOLT ①. LOOSEN BOTTOM NUT ON STUD BOLT ② IMMEDIATELY AFTER BLOCKOUT IS CAST.

1. THE SURFACE OF THE BLOCKOUT MUST BE COMPLETELY CLEAN WHEN THE JOINT IS INSTALLED.
2. THE EXPANSION JOINT DEVICE MUST BE SUSPENDED IN THE BLOCKOUT TO THE PROPER LINE AND GRADE, WITH THE DISTANCE BETWEEN EXTRUSIONS SET WITH RESPECT TO THE TEMPERATURE AS SHOWN ON THE PLANS.
3. AFTER THE CONCRETE OF THE BLOCKOUT ACHIEVES PRESCRIBED STRENGTH IN ACCORDANCE WITH PUB. 408 SECTION 1001.3 (q) 1, REMOVE THE TEMPORARY SUPPORT ASSEMBLY AND GRIND OFF TACK WELD UNTIL SMOOTH.
4. APPLY TOUCH-UP PAINT.

STRIP SEAL INSTALLATION NOTES

1. THE FRAME RAILS SHALL BE CLEANED THOROUGHLY AND SEAL CHANNELS SHALL BE INSPECTED TO ASCERTAIN THE ABSENCE OF CONCRETE AND DEBRIS. THE SEAL CHANNEL SHALL ALSO BE INSPECTED AT ALL FIELD SPLICES, AND ALL WELD SPLATTER AND/OR SHARP EDGES SHALL BE REMOVED.
2. LIBERALLY COAT THE STRIP SEAL LUGS WITH LUBRICANT ADHESIVE. COAT ONLY 3'-0" TO 4'-0" PRECEDING THE INSTALLATION.
3. COLLAPSE THE STRIP SEAL INTO THE THE JOINT OPENING UNTIL THE LUG IS ALIGNED WITH THE FRAME RAIL CHANNEL. (SEE FIGURE 1)
4. PUSH THE LUG INTO THE CHANNEL AND THEN USE A BENT BAR TO FORCE THE LUG INTO THE CHANNEL (MAKE SURE THAT THE BAR IS DULL TO PREVENT PUNCTURING OF THE SEAL) (SEE FIGURE 2)
5. AFTER THE SEAL LOCKS INTO PLACE, PUSH THE TOP OF THE LUG AGAINST THE FRAME RAIL TO INSURE PROPER SEATING. (SEE FIGURE 3)
6. AS THE WORK PROGRESSES DOWN THE LENGTH OF THE JOINT, WORK BOTH SIDES OF THE STRIP SEAL INTO THE RAIL CHANNEL.

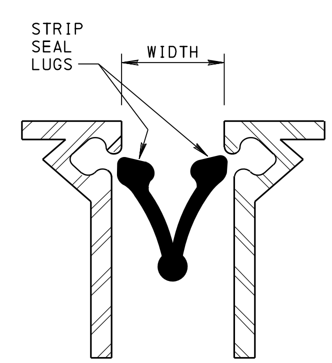


FIGURE 1

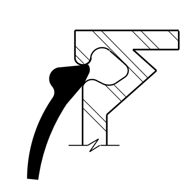


FIGURE 2

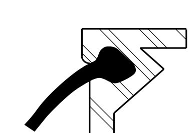


FIGURE 3

STRIP SEAL INSTALLATION PROCEDURE

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUREAU OF PROJECT DELIVERY

STANDARD
NEOPRENE STRIP SEAL DAM
FOR PRESTRESSED CONCRETE
& STEEL I-BEAM BRIDGES

RECOMMENDED MAY 18, 2012 Thomas P. Macioce CHIEF BRIDGE ENGINEER	RECOMMENDED MAY 18, 2012 R. Wyce Wiley ACTING DIR., BUR. OF PROJECT DIRECTOR	SHEET 5 OF 6 BC-767M

VHB Computations

Project: MAINEDOT ACEC BRIDGE
Project # N/A
Location: MAINEDOT
Sheet 1 of 1
Calculated by: S. HODGDON
Date: 6/2013
Checked by:
Date:
Title VT & MA BRIDGE JOINT TYPES + DETAILS

VTRANS — (STRIPSEAL OR GLAND SEAL IS NOT STANDARD!)

SKEW < 32, SKEW > 42:

ASPHALTIC PLUG JOINT - WITH TOTAL MOVEMENT ≤ 2" (1" ea. dir.)
"VERMONT JOINT" - WITH TOTAL MOVEMENT ≤ 3"
FINGER JOINT - WITH MOVEMENT > 3"
OTHER - PER MANUF RECC.

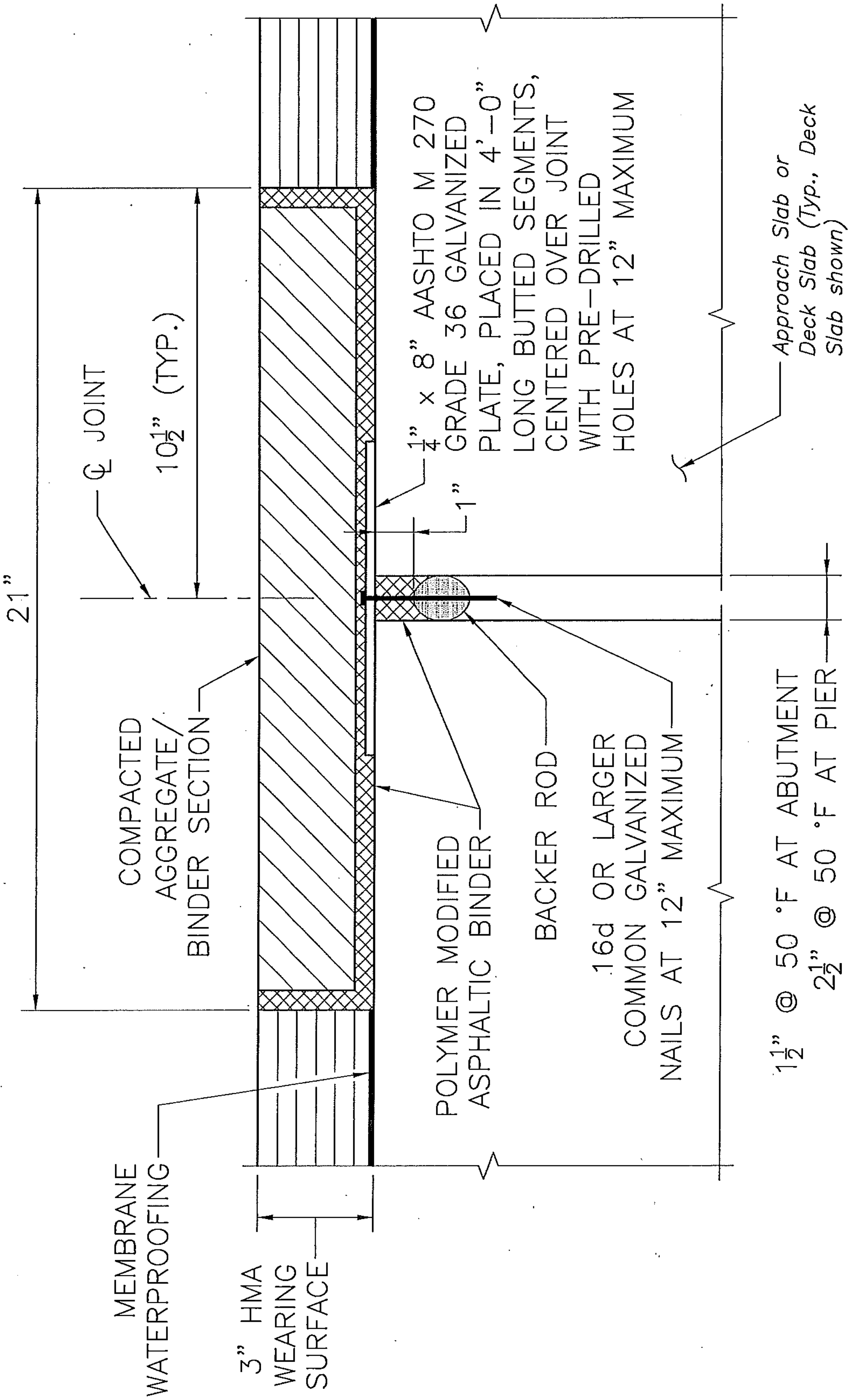
SKEW 32 - 42:

"WIDE" ASPHALTIC PLUG
VERMONT JOINT W/ FINGERS
FINGER JOINT

MASSDOT - LRFD MANUAL FOCUS ON ASPHALTIC PLUG OR GLAND/STRIP SEAL
ASSUME FINGER JOINT + MODULAR SIMILAR TO VT + NH

ASPHALTIC PLUG JOINT - 1" MAX ONE-WAY, SKEW ≤ 30°
STRIPSEAL
FINGER JOINT / OTHER WHEN STRIPSEAL MOVEMENTS ARE EXCEEDED.

NEW MANUAL COMING OUT NEXT MONTH ±
ABC TECHNIQUES PRIMARILY



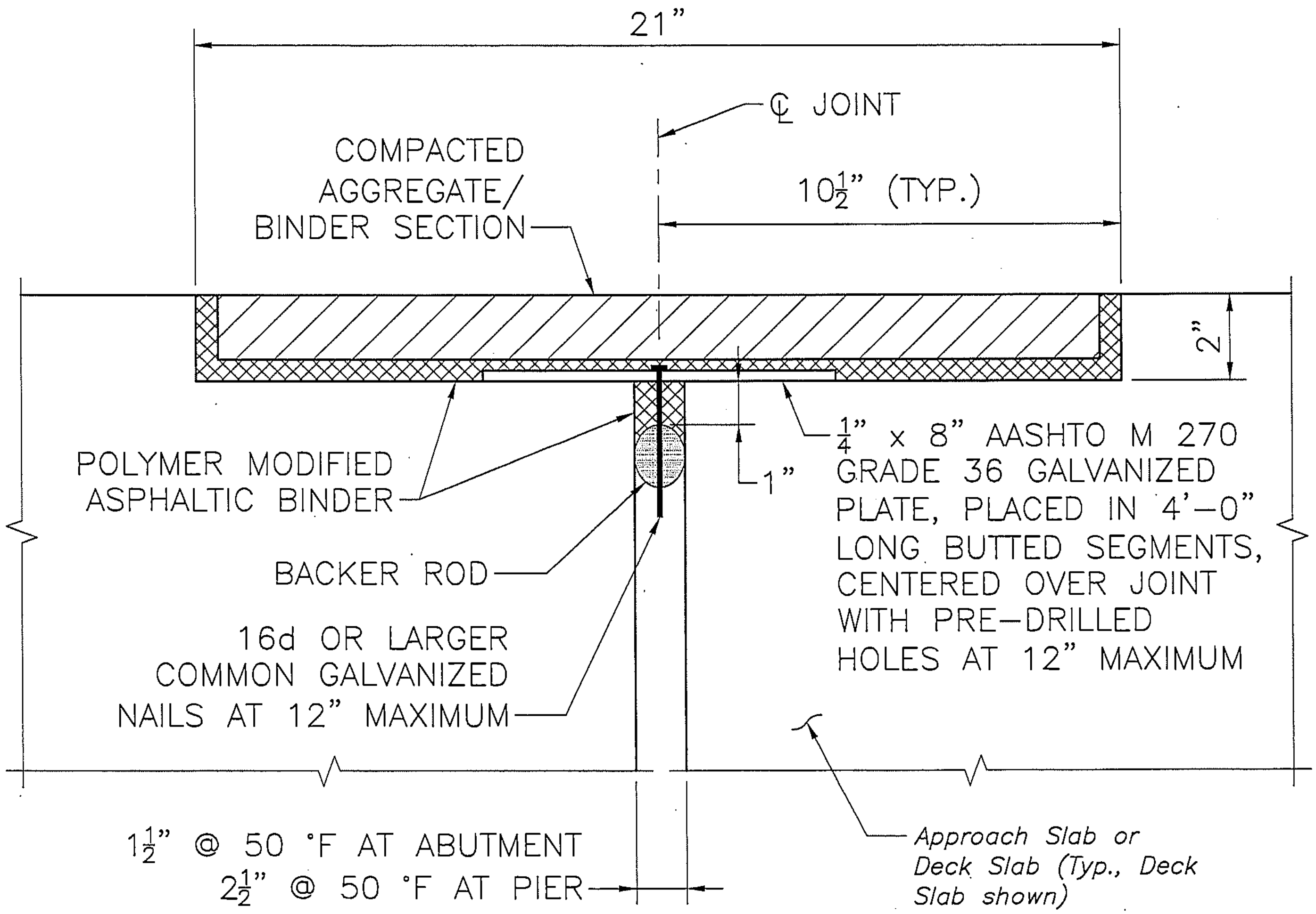
ASPHALTIC BRIDGE JOINT DETAIL

SCALE: 3" = 1'–0"

NOTES:

1. *Use of this joint is limited to a maximum of 1" of one way thermal movement or 30° maximum skew.*
2. *See Dwg. No. 10.1.3 for Construction Sequence Notes.*
3. *This detail must be used with deck drains. See Dwg. No. 7.3.1 for details.*

massDOT Highway — LRFD BRIDGE MANUAL	TYPICAL JOINT DETAIL HMA WEARING SURFACE ASPHALTIC BRIDGE JOINT	DATE OF ISSUE OCTOBER 2009
		DRAWING NUMBER **10.1.1**



ASPHALTIC BRIDGE JOINT DETAIL

SCALE: 3" = 1'-0"

NOTES:

1. *Use of this joint is limited to a maximum of 1" of one way thermal movement or 30° maximum skew.*
2. *See Dwg. No. 10.1.3 for Construction Sequence Notes.*

massDOT Highway

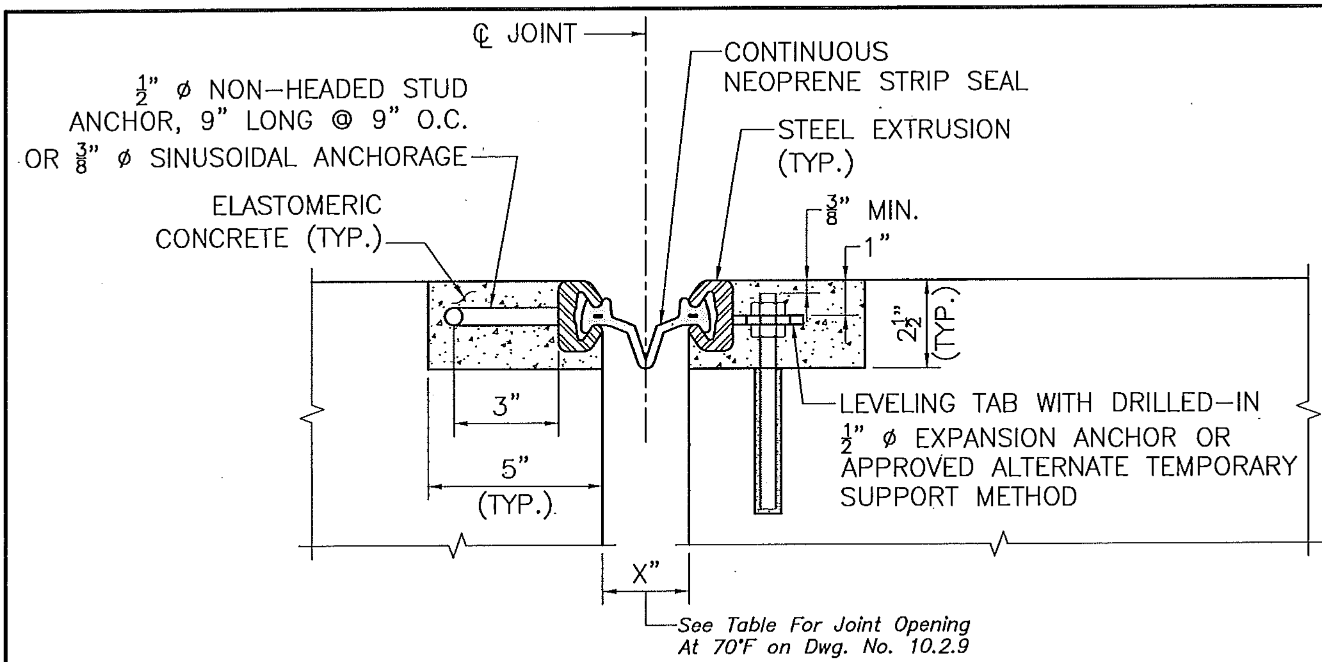
LRFD BRIDGE MANUAL

TYPICAL JOINT DETAIL EXPOSED CONCRETE DECKS

ASPHALTIC BRIDGE JOINT

DATE OF ISSUE
OCTOBER 2009

DRAWING NUMBER
10.1.2

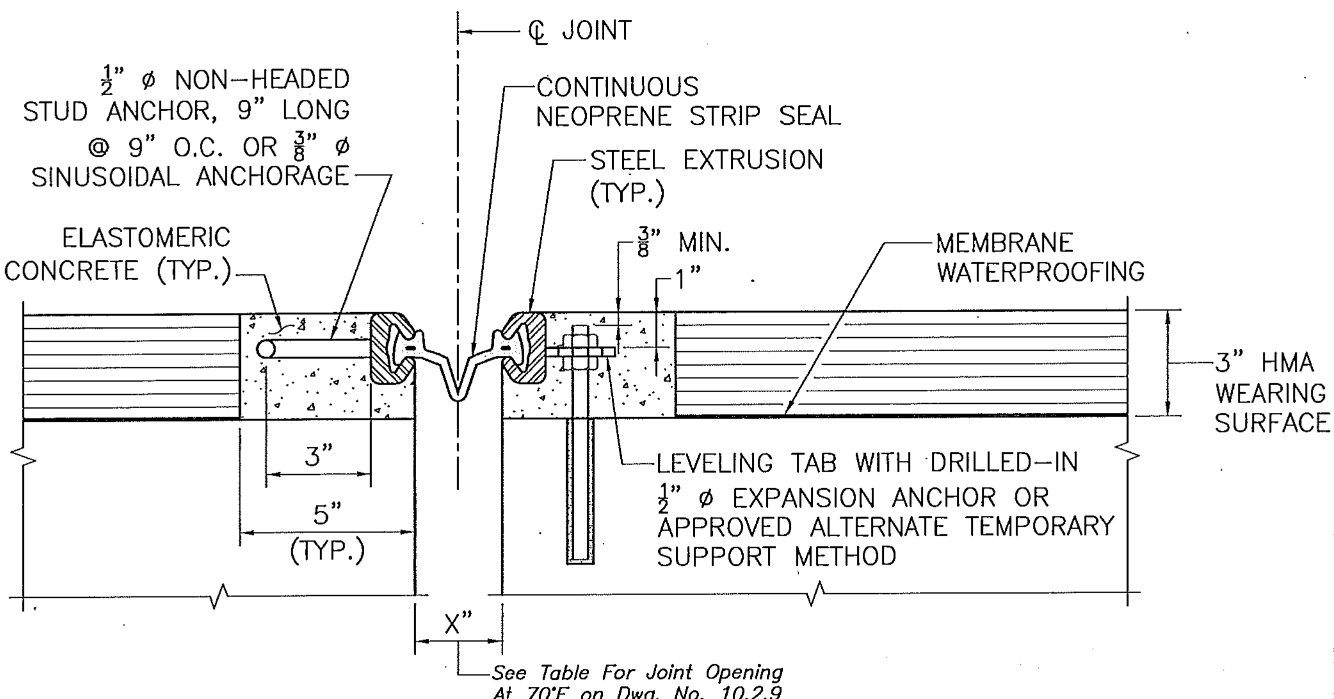


AT ANCHOR LOCATION — AT TEMPORARY SUPPORT LOCATION

SECTION 1

SCALE: 3" = 1'-0"

(EXPOSED CONCRETE DECKS)



NOTE:
This detail must be used with deck drains. See Dwg. No. 7.3.1 for details.

AT ANCHOR LOCATION — AT TEMPORARY SUPPORT LOCATION

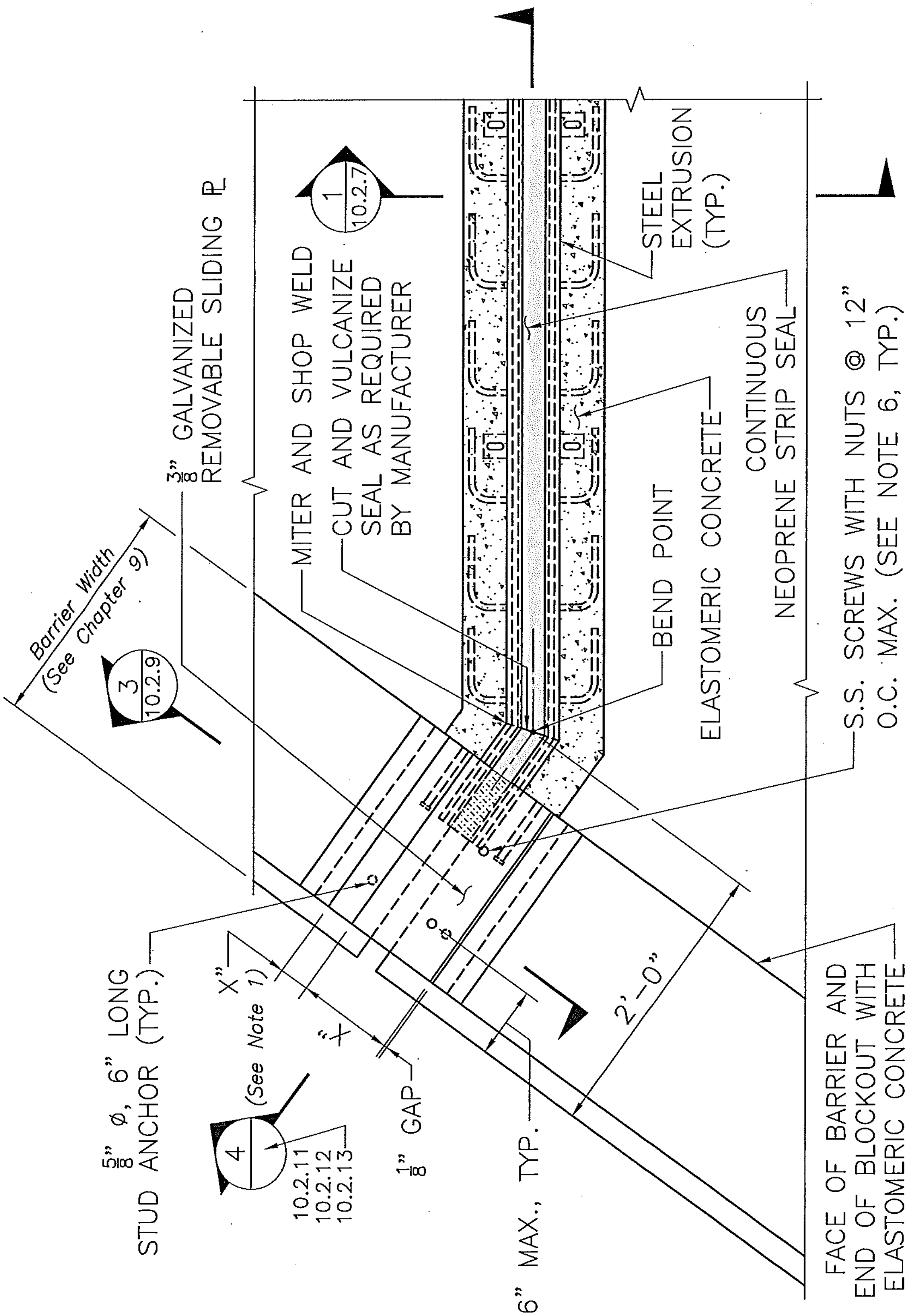
SECTION 1

SCALE: 3" = 1'-0"

(DECKS WITH HMA WEARING SURFACE)

NOTE:
See Dwg. No. 10.2.16 for Construction Notes to be placed on Construction Drawings.

massDOT Highway LRFD BRIDGE MANUAL	TRANSVERSE SECTION THRU ROADWAY STRIP SEAL JOINT DETAILS	DATE OF ISSUE OCTOBER 2009 DRAWING NUMBER **10.2.7**



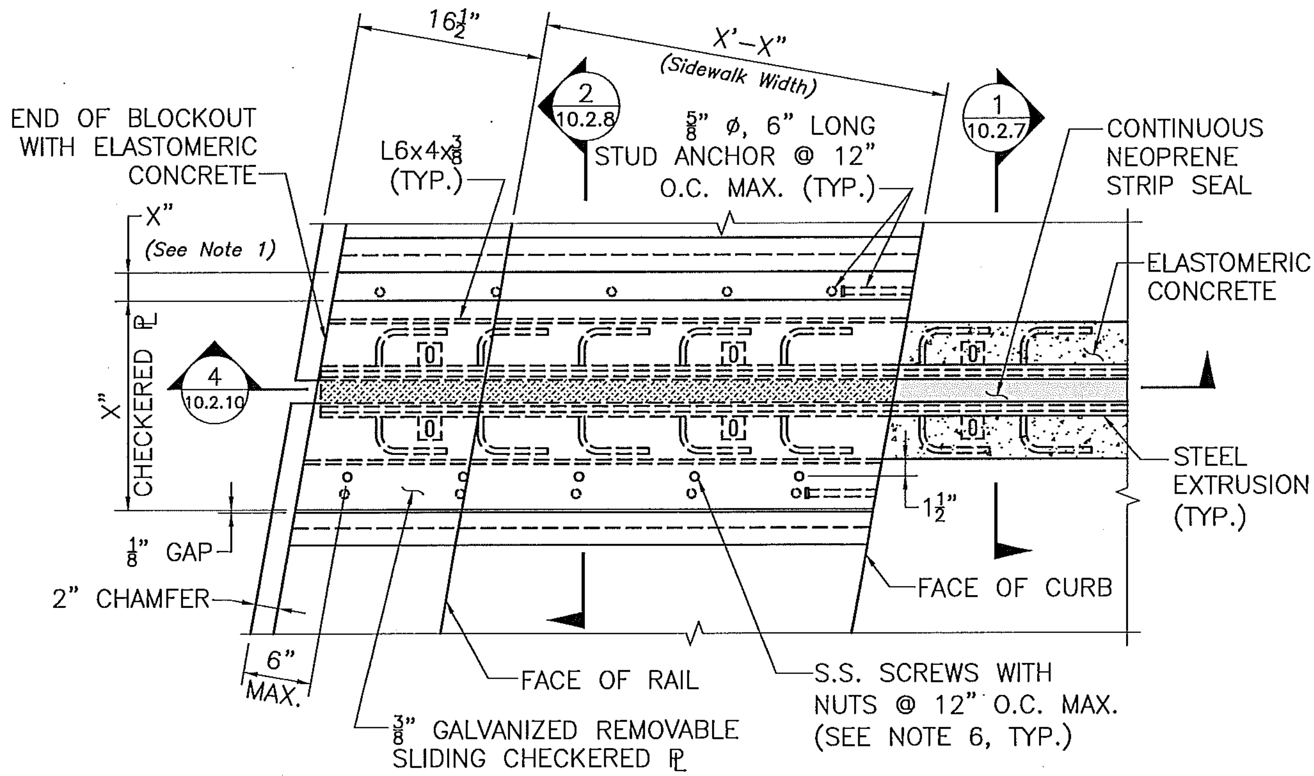
PLAN - STRIP SEAL JOINT AT SAFETY CURB

SCALE: 1" = 1'-0"

NOTES:

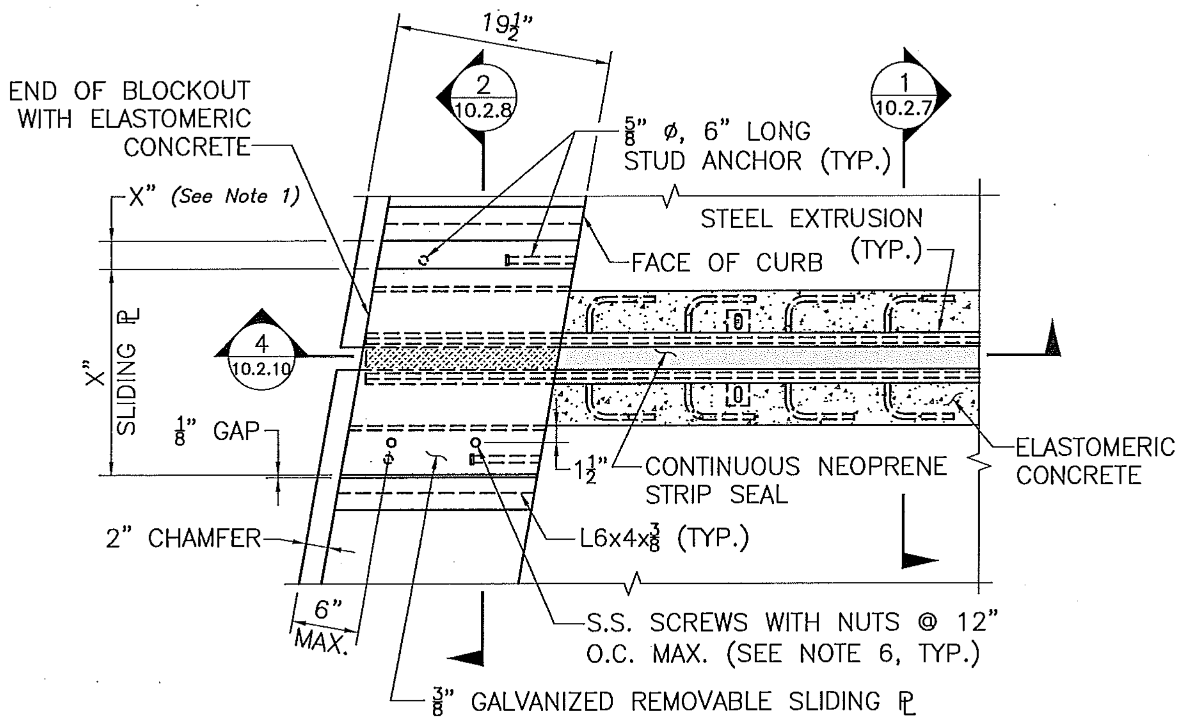
1. "X" = (Joint Width + 1/2")
2. See Dwg. No. 10.2.16 for Construction Notes to be placed on Construction Drawings.

massDOT Highway LRFD BRIDGE MANUAL	BARRIERS AT SAFETY CURB PLAN, SKEW > 35° STRIP SEAL JOINT DETAILS	DATE OF ISSUE: OCTOBER 2009 / DRAWING NUMBER: 10.2.6



PLAN – STRIP SEAL JOINT AT SIDEWALK

SCALE: 1" = 1'–0"



PLAN – STRIP SEAL JOINT AT SAFETY CURB

SCALE: 1" = 1'–0"

NOTES:

1. *X" = (Joint Width + ½")*
2. *See Dwg. No. 10.2.16 for Construction Notes to be placed on Construction Drawings.*

massDOT Highway LRFD BRIDGE MANUAL	S3–TL4 RAIL PLAN, SKEW ≤ 35° STRIP SEAL JOINT DETAILS	DATE OF ISSUE OCTOBER 2009 DRAWING NUMBER **10.2.1**

STRIP SEAL JOINT NOTES:

1. THE DETAILS SHOWN HERE ARE INTENDED AS A GENERAL GUIDE FOR A TYPICAL GLANDULAR TYPE STRIP SEAL JOINT SYSTEM. SHOP DRAWINGS WHICH INCLUDE DETAILS OF THE GLAND SHAPE, STEEL EXTRUSION SHAPE, WELDING PROCEDURE SPECIFICATIONS, ANCHOR ARRANGEMENT, TEMPERATURE CORRECTION REQUIREMENTS, AND TEMPORARY SUPPORT DETAILS SHALL BE SUBMITTED FOR APPROVAL OF THE ENGINEER ACCORDING TO THE STANDARD SPECIFICATIONS.

2. ALL STRUCTURAL STEEL COMPONENTS SHALL CONFORM TO AASHTO M270 GRADE 36. AFTER THE COMPLETION OF ALL WELDING OPERATIONS STEEL PLATE ASSEMBLIES SHALL BE HOT–DIP GALVANIZED.

3. ELASTOMERIC CONCRETE BLOCKOUT SHALL BE SANDBLASTED, CLEANED WITH COMPRESSED OIL LESS AIR, AND PRIMED WITH BONDING COMPOUND PRIOR TO CASTING ELASTOMERIC CONCRETE.

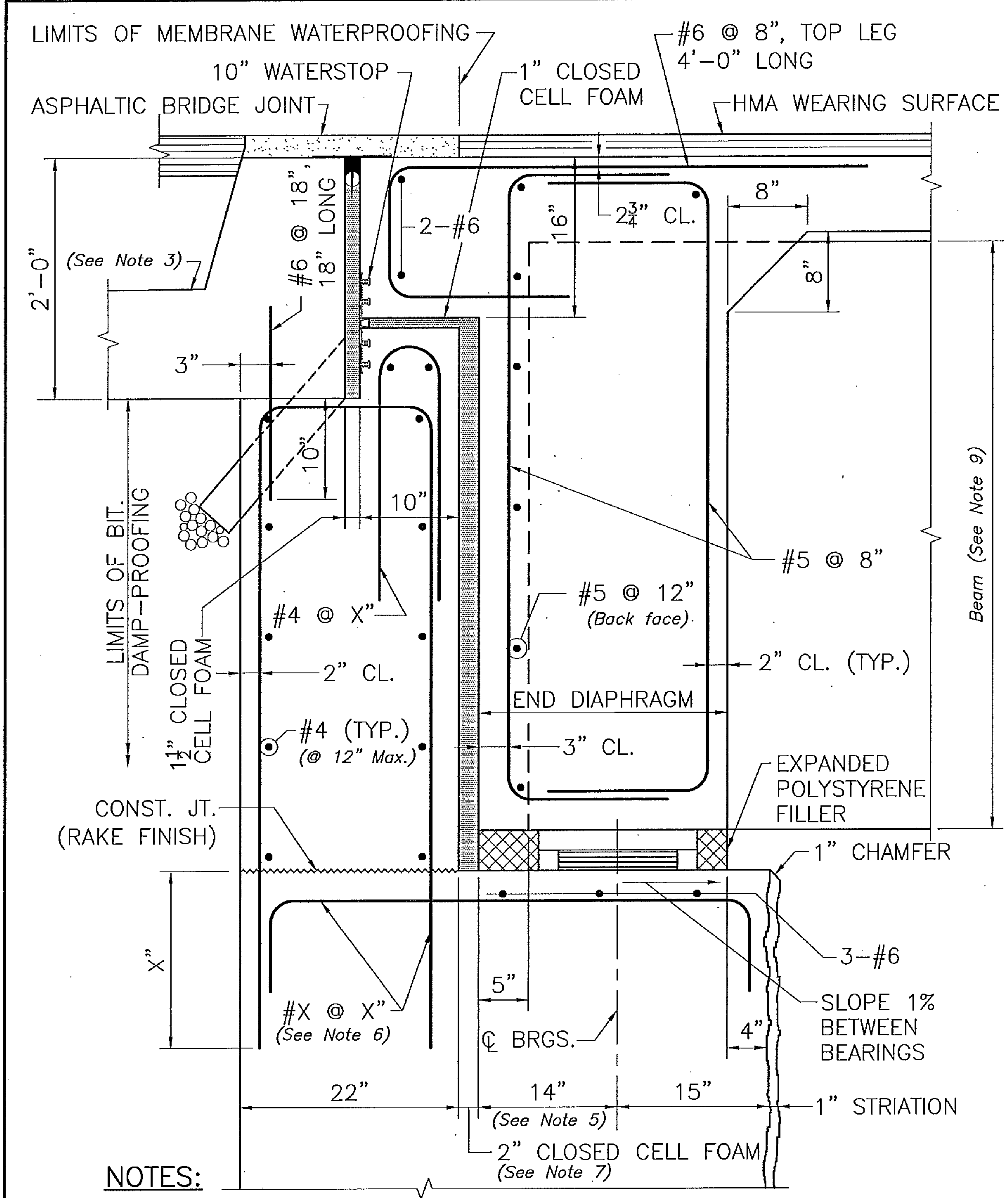
4. NEOPRENE STRIP SEAL SHALL BE BONDED TO STEEL EXTRUSION WITH APPROVED ADHESIVE.

5. INSTALL CONTINUOUS NEOPRENE STRIP SEAL IN THE FIELD. SPLICING OF SEAL IS NOT PERMITTED. TEMPORARY SEAL SHALL BE REQUIRED ON STAGE CONSTRUCTION PROJECTS.

6. $\frac{3}{4}$" ø STAINLESS STEEL FLAT HEAD MACHINE SCREWS STAINLESS STEEL NUTS. RECESS $\frac{1}{16}$" BELOW PLATE SURFACE. PRIOR TO PLACEMENT OF SIDEWALK/SAFETY CURB CONCRETE, LUBRICATE STAINLESS STEEL SCREWS WITH GRAPHITE AND SET SECURELY IN PLACE. MACHINE SCREWS TO BE TEMPORARILY REMOVED AFTER CONCRETE HAS ATTAINED FINAL SET.

7. NO WELDING OF PORTIONS OF STEEL EXTRUSIONS IN DIRECT CONTACT WITH NEOPRENE SEAL SHALL BE PERMITTED.

massDOT Highway LRFD BRIDGE MANUAL	STRIP SEAL JOINT CONSTRUCTION NOTES STRIP SEAL JOINT DETAILS	DATE OF ISSUE OCTOBER 2009 DRAWING NUMBER **10.2.16**



NOTES:

(See Dwg. No. 3.7.18 for Notes to be included on Construction Drawings)

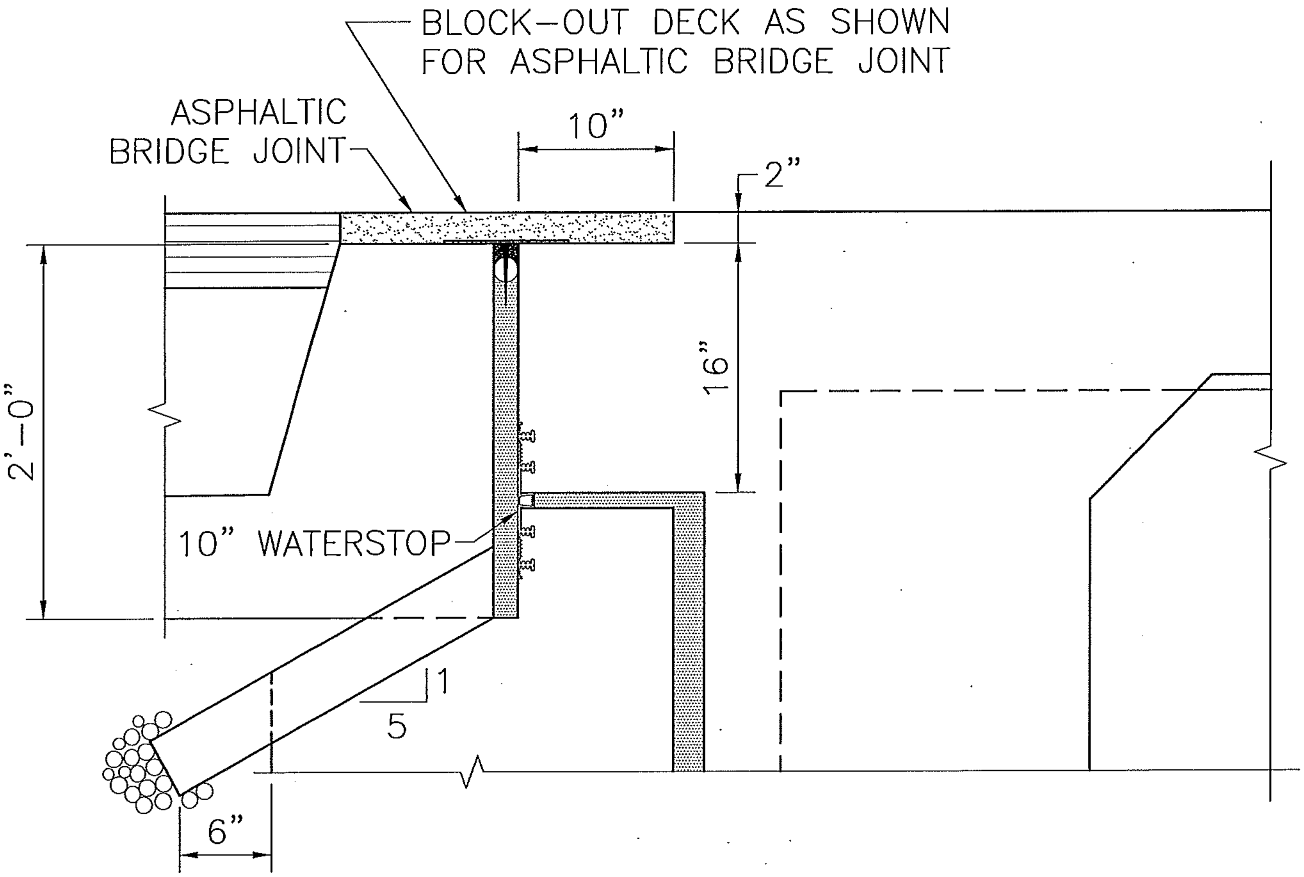
DETAILS AT ABUTMENT – ROADWAY SECTION

SCALE: 1" = 1'-0"

NOTES:

1. *This detail shall be used when one way thermal movement ≤ 1" and skew angle ≤ 30°.*
2. *See Dwg. No. 3.7.16 for Designer Notes.*

massDOT Highway LRFD BRIDGE MANUAL	ROADWAY SECTION WITH ASPHALTIC BRIDGE JOINT END OF DECK DETAILS	DATE OF ISSUE NOVEMBER 2010 DRAWING NUMBER **3.7.14**



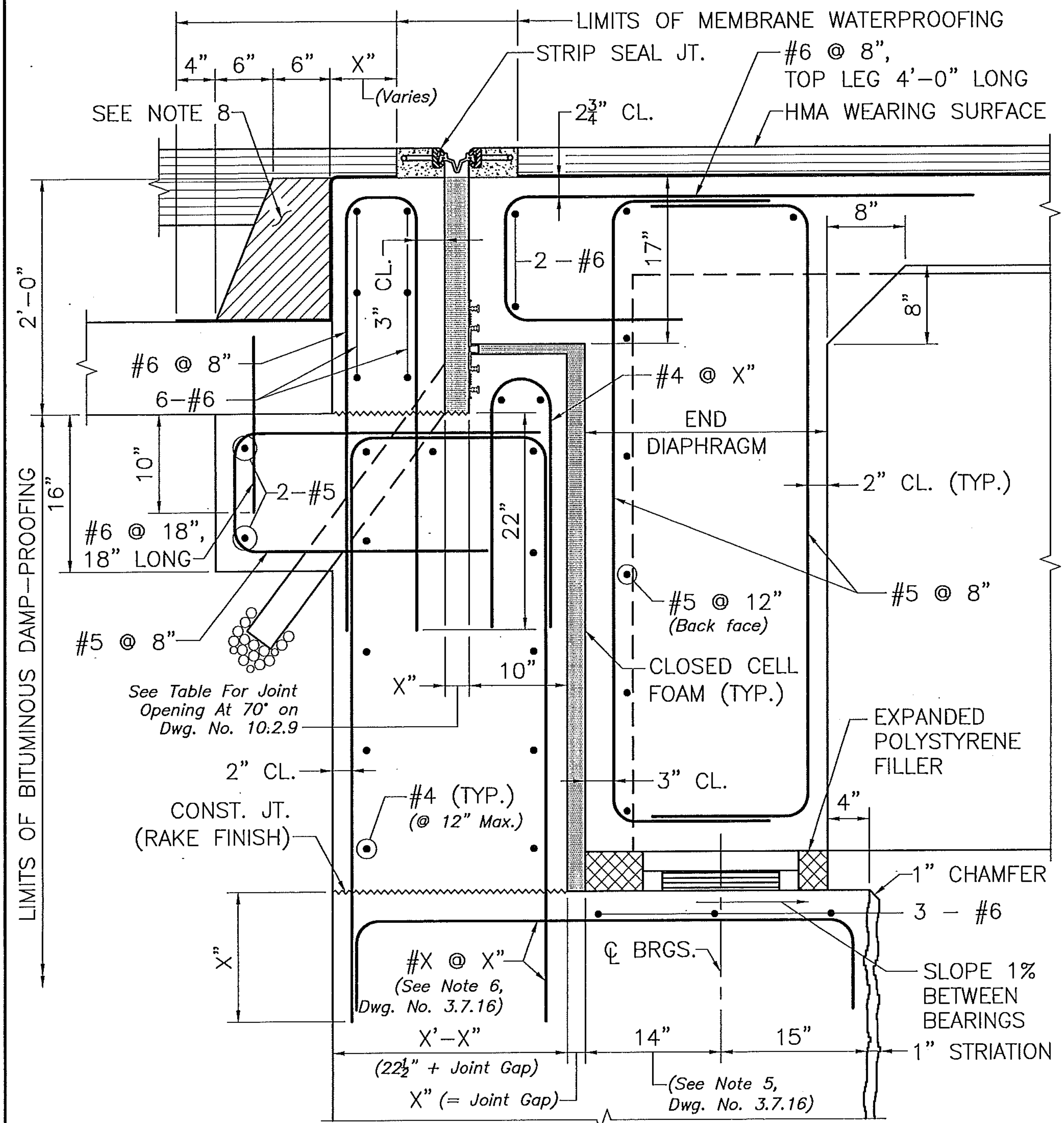
DETAILS AT ABUTMENT FOR EXPOSED CONCRETE DECKS

SCALE: 1" = 1'-0"

NOTES:

1. *Designer Notes listed here are for the details shown on Dwg. No's 3.7.14 and 3.7.15.*
2. *The Asphaltic Bridge Joint shall be used when the limits of the Pavement Sawcut details are exceeded. When the limits of the Asphaltic Bridge Joint as specified on Dwg. 3.7.14 are exceeded, use a Strip Seal Joint and modify this detail accordingly. If the thermal movement range of a strip seal is exceeded, consult with the Director of Bridges and Structures for an appropriate joint system.*
3. *This detail is to be used with Approach Slab Type III.*
4. *Bridges with HMA wearing surface require the use of deck drains.*
5. *If the bearing exceeds 16" in diameter, set this dimension equal to Bearing Dia./2 + 6". See Chapter 6 for additional modifications to this dimension required for the NEBT beams.*
6. *Design these bars for longitudinal seismic forces. Backwall reinforcement configuration shown is concptual. The Designer may modify the arrangement by adding additional hoops as required by the actual design.*
7. *This detail anticipates 1" of one-way thermal movement. The Designer may increase the closed cell foam thickness in ½" increments to accommodate larger thermal movements.*
8. *For bridges with exposed concrete decks, modify this detail as shown on Dwg. 3.7.16.*
9. *Modify the detail for the beam type used.*

massDOT Highway LRFD BRIDGE MANUAL	EXPOSED CONCRETE DECK DETAILS & DESIGNER NOTES END OF DECK DETAILS	DATE OF ISSUE NOVEMBER 2010 DRAWING NUMBER **3.7.16**



(See Dwg. No. 3.7.22 for Notes to be included on Construction Drawings)

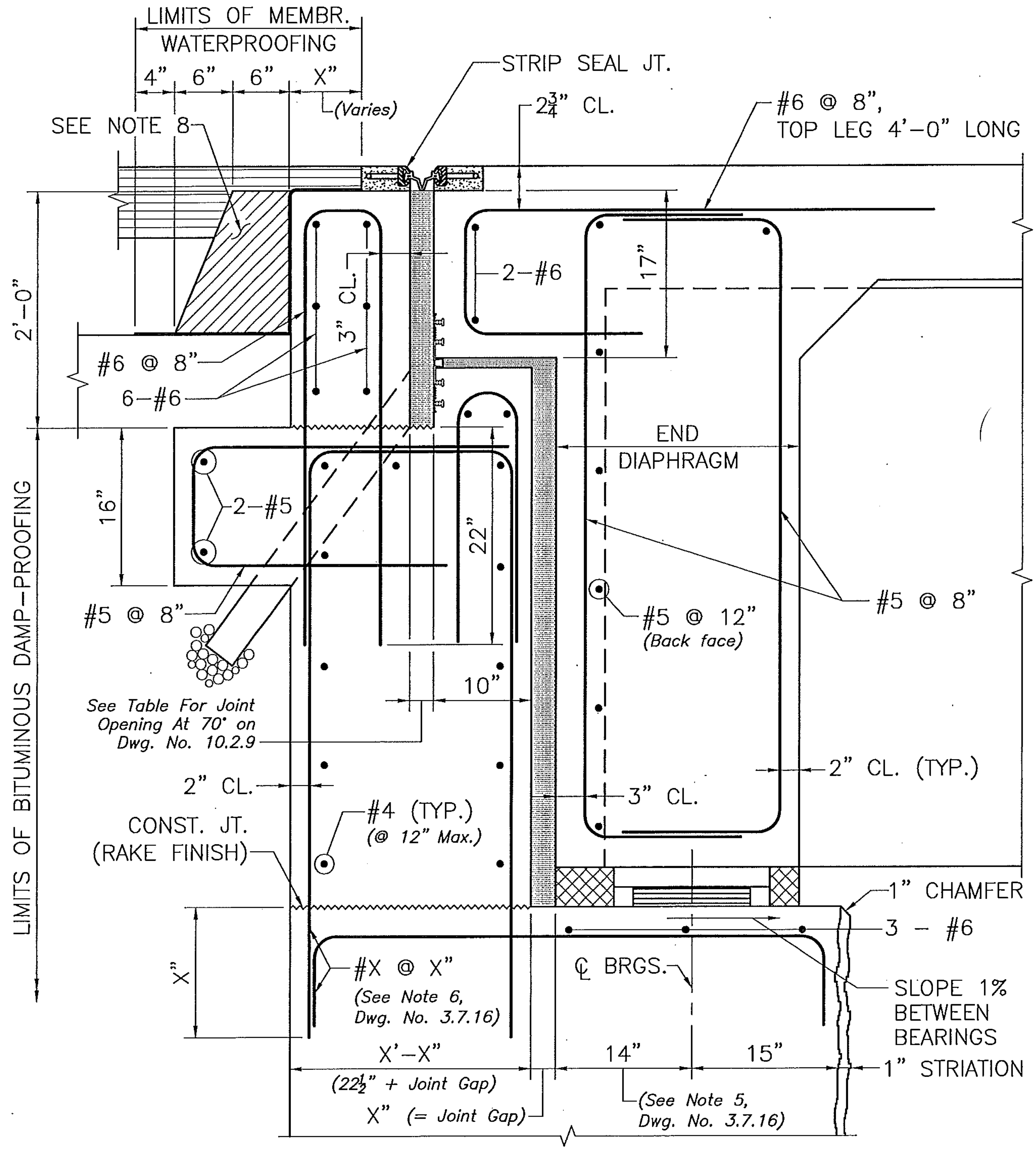
DETAILS AT ABUTMENT – ROADWAY SECTION

SCALE: 1" = 1'-0"

NOTES:

1. *This detail is to be used with approach slab Type I, modified as shown.*
2. *Bridges with HMA wearing surface require the use of deck drains.*
3. *For bridges with exposed concrete decks, modify this detail as shown on Dwg. No. 3.7.21.*

massDOT Highway LRFD BRIDGE MANUAL	ROADWAY SECTION WITH STRIP SEAL JOINT END OF DECK DETAILS	DATE OF ISSUE NOVEMBER 2010 DRAWING NUMBER **3.7.19**



NOTES:

1. *See Dwg. No. 3.7.22 for Notes to be included on Construction Drawings.*
2. *Refer to Dwg. No. 3.7.19 for dimensions and information not shown here.*
3. *This detail shall be used with Approach Slab Type I, modified as shown.*

DETAILS AT ABUTMENT – EXPOSED CONCRETE DECK

SCALE: 1" = 1'-0"

massDOT Highway LRFD BRIDGE MANUAL	EXP. DECK RDWY. SECTION WITH STRIP SEAL JOINT END OF DECK DETAILS	DATE OF ISSUE NOVEMBER 2010 DRAWING NUMBER **3.7.21**

ROADWAY/SIDEWALK SECTION NOTES:

(Modify the Construction Notes on Dwg. No. 3.7.18 as shown below for strip seal joints)

1. *(No modifications)*

2. *(No modifications)*

3. *(Substitute the following)* BACKWALL BELOW CONSTRUCTION JOINT, KEEPER BLOCK AND CURTAIN WALL CONCRETE MUST BE PLACED AND SUFFICIENTLY CURED PRIOR TO PLACING THE END DIAPHRAGM CONCRETE.

4. *(No modifications)*

5. *(No modifications)*

6. *(Substitute the following)* AFTER THE END DIAPHRAGM CONCRETE HAS CURED SUFFICIENTLY, PLACE THE APPROACH SLAB CONCRETE AND REMAINDER OF BACKWALL CONCRETE. THE BACKWALL TROUGH WILL BE FORMED WITH CLOSED CELL FOAM AND CARE SHALL BE TAKEN TO INSURE THAT CONCRETE DOES NOT ENTER THE TROUGH SUMP.

7. *(Substitute the following)* COVER THE BACKWALL TROUGH OPENING SECURELY TO KEEP DEBRIS OUT UNTIL READY TO INSTALL THE STRIP SEAL JOINT.

8. *(Add the following note)* PROTECTIVE COURSE TO BE HOT MIX ASPHALT DENSE BINDER COURSE FOR BRIDGES, PLACED IN 2" LAYERS AND COMPACTED WITH A MECHANICAL HAND–GUIDED TAMPER WITHIN 12 HOURS AFTER PLACING MEMBRANE WATERPROOFING.

VTRANS

SECTION 14: JOINTS AND BEARING

14.1 *GENERAL DESIGN*

Refer to AASHTO LRFD Section 14 for more design information not found in this section.

The influence of dynamic load allowance shall be included for all joints and bearings.

The joints and bearings should allow movement due to temperature changes, creep and shrinkage, elastic shortening due to prestressing, traffic loading, construction tolerances, camber release, substructure deflections and other effects.

Table 14.1.1 Joint Type Movement Table

Joint Type	Longitudinal Movement (in)	Transverse Movement (in)
Plug	2	1
Vermont	3	3
Finger	4	1/4 †
Other	Consult design or manufacturer's specifications	

† Finger configuration can be designed to accommodate slightly more movement.

If movements exceed those listed above, either:

- Choose a different joint type, or
- Document the costs of accepting a potential bearing or joint failure at the site. A risk assessment should include consideration of ADT, operational classification, detour length, economical impacts and any other relevant factors. Verify that a bearing or joint failure will not damage other structural components at the service limit state.

14.2 *JOINTS*

14.2.1 Joint Types

14.2.1.1 Modular Expansion Joint

These joint systems are proprietary products used for allowing large movements exceeding 4 inches longitudinally and accommodating some transverse movement. The intent of these systems is to seal the joint throughout the expansion and contraction extremes, while maintaining a smooth driving surface. Consider using this joint when skews and/or lateral movement exceed the capacity of the Vermont Joint using fingerplates.

14.2.1.2 Vermont Joint

The Vermont Joint has a long history in the state of Vermont. VTrans has used this joint for most long span bridges. The joint consists of steel plates that hold down a reinforced fabric trough used to collect water and channel it off the bridge deck. Depending on the width of the expected expansion gap, the designer will choose either the square steel plate or the steel fingerplate. Refer to Structures Detail SD-516.11 series drawings. These provide details and a "Joint Gap Dimension Table" based on temperature and expansion length.

14.2.1.2.1 Square Plate Vermont Joint

Use the square plate Vermont joint when end of bridge expansion movement is less then 3 inches.

14.2.1.2.2 Finger Plate Vermont Joint

Use the fingerplate Vermont joint when end of bridge expansion movement exceeds 3 inches.

14.2.1.3 Asphaltic Plug Joint

The joint is the thickness of the bituminous concrete pavement and is essentially joint sealer hot poured with binder aggregate in sealer over a steel plate to support vehicles. This joint can accommodate movement up to 1 inch. Refer Structures Detail SD-516.10 Series.

14.2.1.4 Pavement Saw Cut Joint

Install a pavement saw cut joint as a controlled crack in the pavement over concrete joints or where concrete slabs terminate, or other locations where network cracking may be expected. This joint does not allow for significant expansion. See Figure 14.2.1.4 -1 and Figure 14.2.1.4 -2.

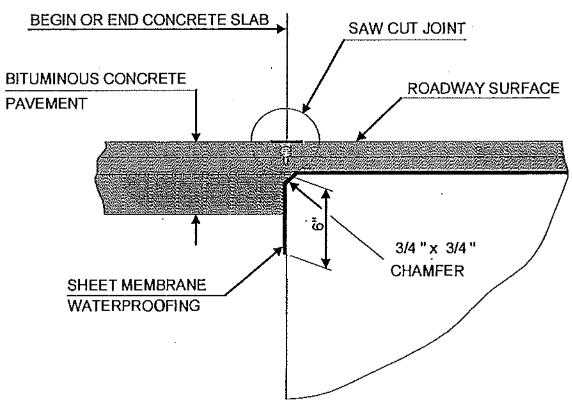


Figure 14.2.1.4 -1 Saw Cut Joint Detail

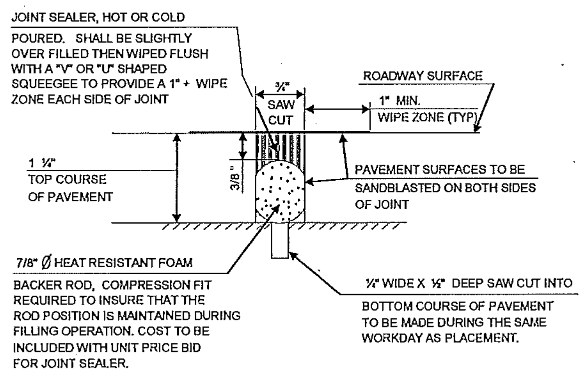


Figure 14.2.1.4 -2 Saw Cut Joint Detail Close Up

14.2.1.4.1 Saw Cut Joint Note

The following note shall be included with the plans if using saw cut joints.

The Joint is to be located accurately by string lining, or other means, prior to paving, so that the saw cuts will be made directly over the end of concrete deck. Cut the joint dry in a single pass and seal within a 24 hours period or prior to exposing to traffic. Clean the joint prior to applying the joint sealer. Refer to specification 524 and the special provisions.

2.3.2 Skew and Askew

2.3.2.1 Skew

Skew (Θ) is the angle between the centerline of a support and a line normal to the bridge chord. See Figure 2.3.2-1. For curved beam bridges, measure the skew from the radial line crossing the intersection of the bridge chord and centerline of substructure, to the centerline of substructure.

2.3.2.2 Askew

Askew is the compliment angle of the skew. See Figure 2.3.2-1.

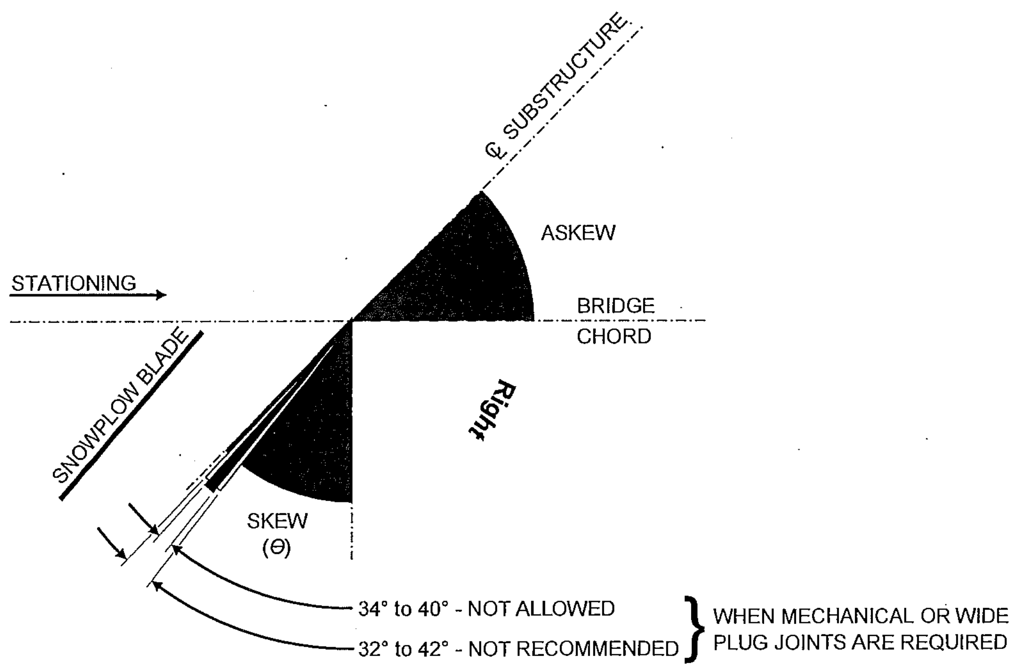


Figure 2.3.2-1 Skew and Askew Definition

2.3.2.3 Bridge Joint Skew Restrictions[3]

The VTrans Operations Division currently uses snowplows that have a horizontal blade angle of 36.5° to 37.5° right, measured from a perpendicular to the long axis of the plow vehicle. In situations where the angles of the snowplow blade and bridge joint are nearly the same, the blade will likely damage the bridge joint. The blade catches on the mechanical parts of the joint such as angles or plates as well as gouging out the joint material of the wide pavement joints. This situation can also result in significant damage to the plow and/or truck and may cause harm to the snowplow operator.

The designer must also consider other factors regarding the alignment of the snowplow blade with the bridge joint. Such factors include the width of the bridge joint; the plow truck path may not necessarily align with the bridge centerline when it passes over the joint or snowplow blades may be slightly misaligned.

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[3] Policy as stated in Structures Engineering Instructions 08-003 (3/31/08)

In consideration of these variables, the following skew restrictions apply on new bridges when mechanical or wide plug joints are required: (See Figure 2.3.2-1)

- Skews (Θ) not allowed: 34° to 40° to the right
- Skews (Θ) to avoid: 32° to 34° and 40° to 42° to the right

Because Local municipalities utilize equipment that is similar to that used by the VTrans Operations Division, these restrictions apply to all bridges designed for all of the bridge programs. The Structures Section extends these restrictions to left skews for bridges on the Interstate System, or other divided two-lane highways, which requires maintenance using left angled plows.

The Structures Section does not restrict the skew when using narrow saw cut pavement joints for bridge projects. The skew (Θ) restrictions do not apply for rehabilitation bridge projects.

Bridges that have skew angles within the restricted range, either a bridge rehabilitation project or a new bridge design which have a skew restriction exemption, the bridge joint shall be marked with delineators designed in consultation with the Operations Division. In these special cases, the designer should consider design features that minimize possible damage to the joint and maintenance equipment.

2.3.3 Deck on Beam Structures

For bridges with beams or girders, lay out the abutments from the centerline of bearings. A working point shall be located at the intersection of the roadway centerline and the bearing centerline. Identify an additional working point where the centerline of bearing intersects the exposed face of each wing wall. Dimension the wing wall lengths from these right and left working points, to the end of the wing walls. See Figure 2.3.1-1.

2.3.4 Concrete Structures

Cast-in-place concrete slab structures, precast concrete slab structures, large concrete boxes and concrete rigid frames shall be laid out from the abutments or outside walls from the begin and end bridge points extended along the back face. Working points shall be located at the bridge begin and end points along the centerline of the roadway. Additional working points shall be located where the back of the abutments and the inside of the wingwalls meet at the top of footing for either side of the abutment. Dimension the wing wall lengths from these right and left working points to the end of the wing walls. See Figure 2.3.1-2.

2.3.5 Pipes, Small Boxes and Small Frames

For corrugated plate arches, pipes, or pipe arches; small concrete boxes or small concrete frames, lay out the structure from the intersection of the roadway centerline and the centerline of structure. A working point shall be located at this intersection. The centerline of the structure should closely approximate the thalweg of the river or the approximate centerline of the stream. Show the dimensions left and right from this working point to the ends of the structure. Dimension the ends of the wing walls from the edge of the structure. See Figure 2.3.1-2 and Figure 2.3.1-3.

2.4 *BRIDGE TYPES*

2.4.1 Integral Abutment

Integral Abutment bridges encapsulate all other bridge types. Substructures and the superstructure of an integral abutment bridge are monolithic, thereby eliminating joints and bearings. The Agency considers the integral abutment as the primary choice for bridges in the state. If site conditions do not permit an integral abutment to be constructed, consider other bridge types.

2.4.2 Concrete Slab Bridge

A cast-in-place concrete or butted prestressed concrete beam deck. Spans are typically short.

2.4.3 Covered Bridge

Historically, an all timber structure comprised of side trusses; a deck built up with floor beams topped with runners; and a roof system. Typically, timber sheathing covers the trusses; however, some covered bridges have exposed trusses. Over time, the Agency has renovated several covered bridges. Some of these bridges have received a steel girder/timber deck system leaving the timber trusses and roof structure self-supported.

2.4.4 Steel Truss

Steel trusses are comprised of two similar truss structures connected by floor beams and a system of overhead sway bracing. In the past, the Agency used steel truss structures in locations where site conditions required long spans and maximized clear depths.

2.4.5 Straight Beams and Girders

This is a system of steel or prestress beams topped by a concrete deck. This bridge configuration makes up the majority of the federal and state system. Typically, if a simple concrete slab will not be sufficient as the superstructure for the bridge; straight beam framing will be the next alternative to explore.

2.4.6 Curved Beams and Girders

Beams configured similar to Section 2.4.5 , however curved with the roadway alignment. Use curved beams only where straight beams are impractical or produce an unacceptable overhang. Ideally, the substructures are radial however, some have skewed substructure.

2.4.7 3-Span Continuous Cantilever Bridges

A 3-Span continuous cantilever bridge has modified abutments attached to and supported by the superstructure. All abutment dead loads, superstructure dead loads, and live loads are then supported by two piers. This type of design allows a maximizing of the center span over the stream combined with some of the economics of a continuous design. The ideal span ratio is around 1 – 5 – 1.

2.5 *BRIDGE END DETAIL SCHEMATICS*

Integral abutment construction shall be considered as the first alternative for all concrete slab and concrete deck on steel beam or prestressed concrete beam bridges during the Project Definition Stage for Structure Section projects. Project Managers shall document the reasons for not selecting the integral abutment bridge type in a Scoping Report or in a memo from the Project Manager to the Structures Program Manager.

Avoid using expansion joints, if possible. If the design requires the use of expansion joints, the selection of the joint type is dependent on the length of span and total movement required.

2.5.1 Location of Expansion Joint

See Section 4.4 for a discussion of location of fixed and expansion joints.

Avoid open expansion joints at piers.

2.5.2 Selection of Bridge End Detail

Refer to Figure 2.5.2-1 to assist in selecting the appropriate bridge end detail for superstructures constructed from cast-in-place concrete slabs, prestressed concrete butted or spread beams, prestressed NEXT beams or steel beams. For timber, superstructures refer to Section 8 for bridge end details. Sections 2.5.2.1 to 2.5.2.9 guide the designer in selecting the proper end of bridge details and expansion joints. The details in this section show the bridge end details with exposed concrete decks. For paved deck or exposed concrete deck options, refer to Section 2.7. The designer shall refer to Section 5 and Section 6 for detailed information regarding the various decking options.

2.5.2.1 Type A

Use the Type A bridge end detail for Integral Abutment bridges with approach slabs. For short spans, use the Type C bridge end detail as an option. See Figure 2.5.2.1 -1.

2.5.2.2 Type B

A Type B bridge end detail is similar to Type A (See Section 2.5.2.1) for an integral abutment end detail however without approach slabs. See Figure 2.5.2.2 -1.

2.5.2.3 Type C

Use the Type C bridge end detail for fixed and expansion ends for short spans with approach slabs, with cast in place concrete or precast voided slab decks. Use this bridge end detail for short span integral abutment bridges as well. See Figure 2.5.2.3 -1.

2.5.2.4 Type D

Use the Type D bridge end detail for fixed and expansion ends for short spans without approach slabs for cast in place concrete slab, precast voided slab and box beam decks. Use this bridge end detail for short span integral abutment bridges as well. See Figure 2.5.2.4 -1.

2.5.2.5 Type E

A Type E bridge end detail applies to both fixed and expansion ends for intermediate spans using spread beams without approach slab. See Figure 2.5.2.5 -1

2.5.2.6 Type F

A Type F bridge end detail applies to fix and expansion ends of intermediate spans using spread beams with approach slab. See Figure 2.5.2.6 -1.

2.5.2.7 Type G

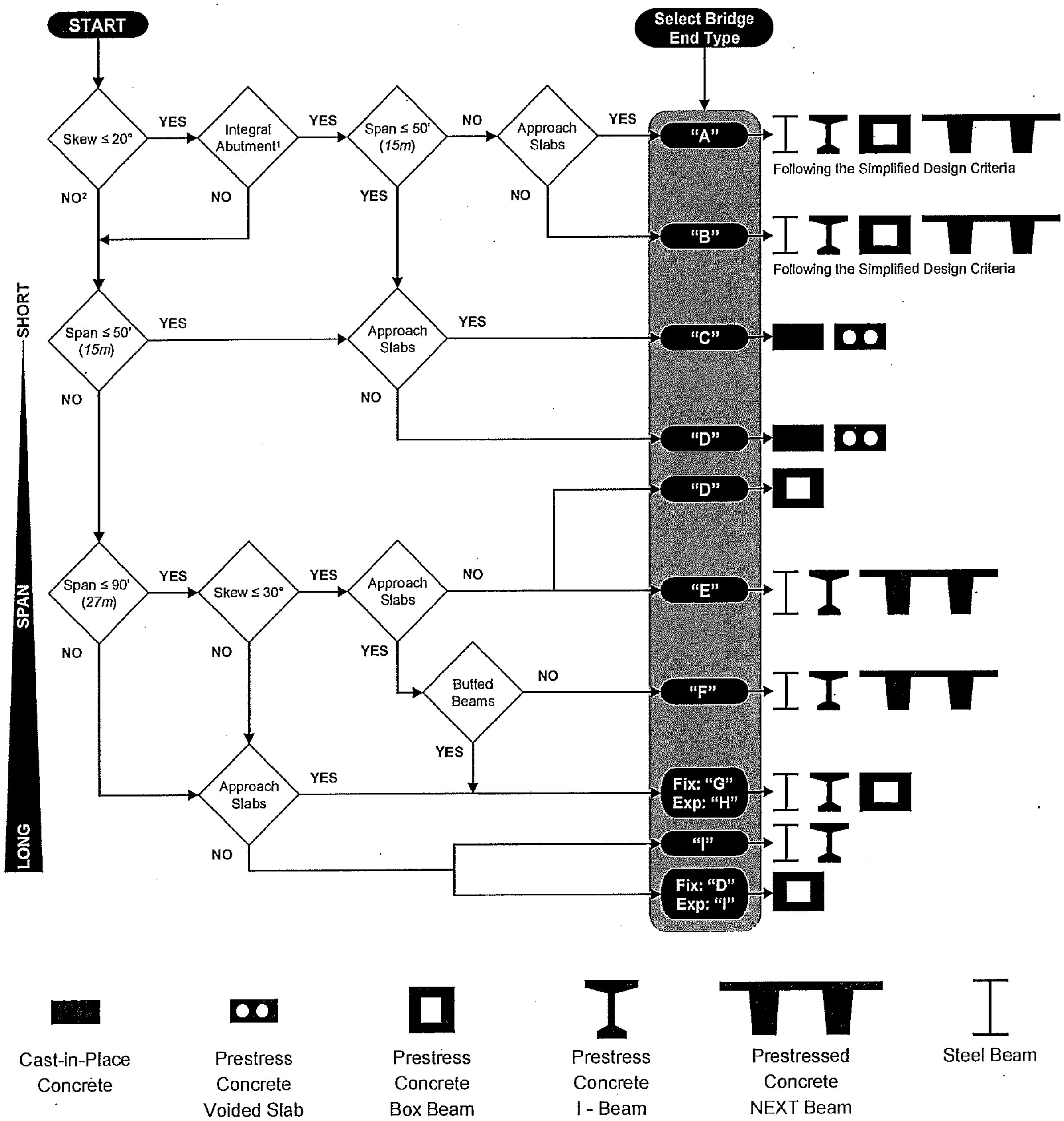
Use a Type G bridge end detail for the fixed end of spread beam decking on long spans with approach slabs. For butted box beam decks, use this bridge end detail for the fixed end, when skews are greater than 30°. See Figure 2.5.2.7 -1.

2.5.2.8 Type H

Use a Type H bridge end detail for the expansion end of spread beam decking on long spans with approach slabs. For butted box beam decks, use this bridge end detail for the expansion end, when skews are greater then 30°. See Figure 2.5.2.8 -1.

2.5.2.9 Type I

Use a Type I bridge end detail for spread beam decking of long spans without approach slabs. For butted box beam decks, use this bridge end detail for the expansion end, when skews are greater than 30°. Specify this bridge end detail for both fixed and expansion ends on gravel roadways. Use this detail for the fixed end and the Type H detail for the expansion end on paved highways. See Figure 2.5.2.9 -1.



1. Integral Abutments shall be the first choice when selecting a bridge type. This flow chart only addressed the simplified design method as presented in the VTrans Structures' Integral Abutment Design Guide. For bridges that do not comply with the criteria for the Simplified Design Method, use additional considerations to design them with Integral Abutment.

2. Though the skew exceeds 20°, using Integral Abutments is possible using additional design considerations

Figure 2.5.2-1 Flowchart Used for Selecting End of Bridge Details

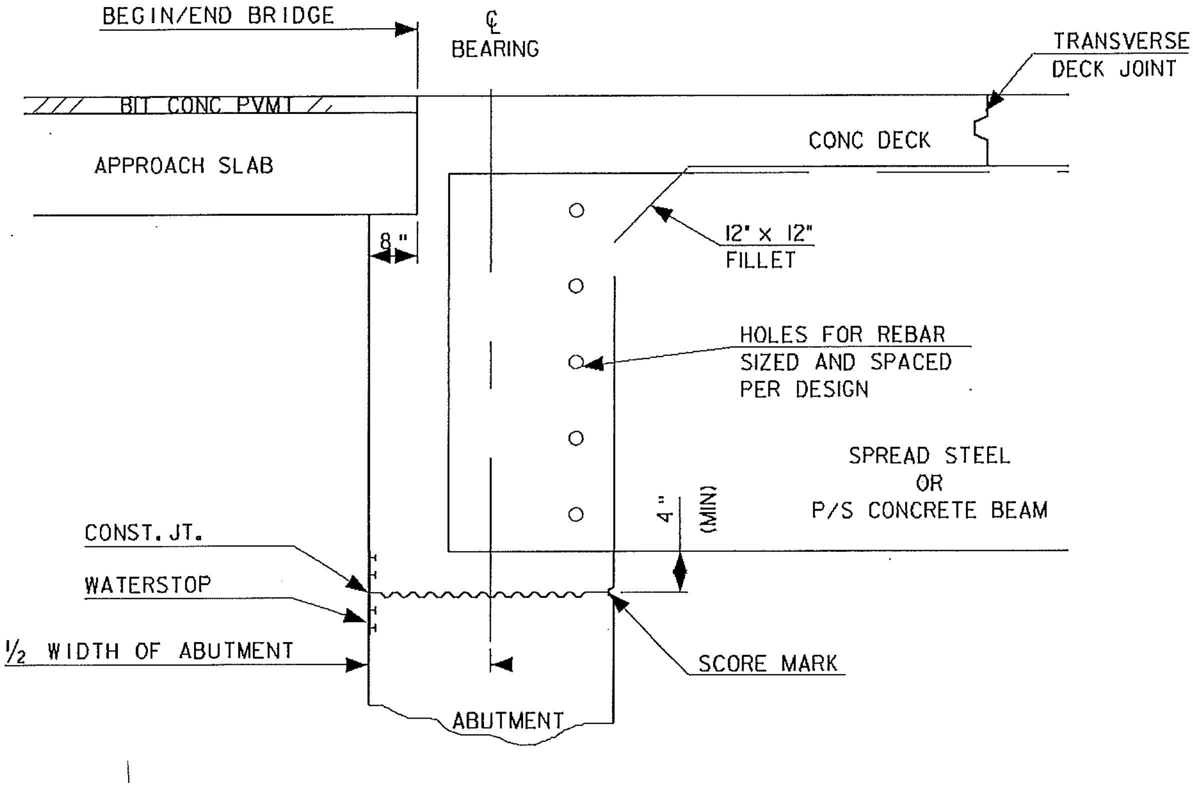


Figure 2.5.2.1 -1 Type A – Bridge Ends for Integral Abutment Bridges with Approach Slabs.

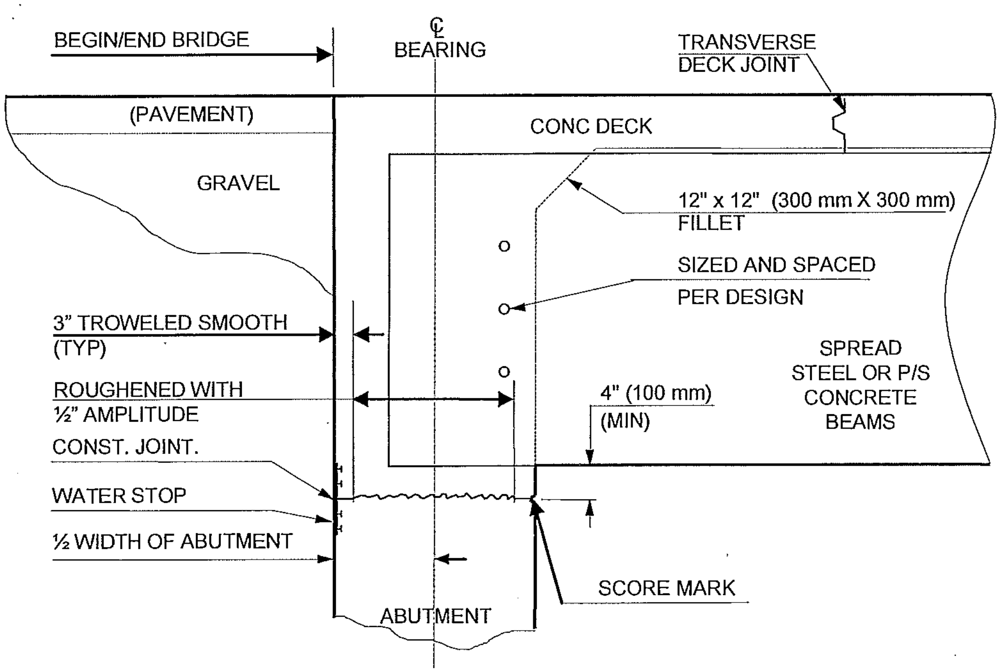


Figure 2.5.2.2 -1 Type B - Bridge Ends for Integral Abutment Bridges without Approach Slabs.

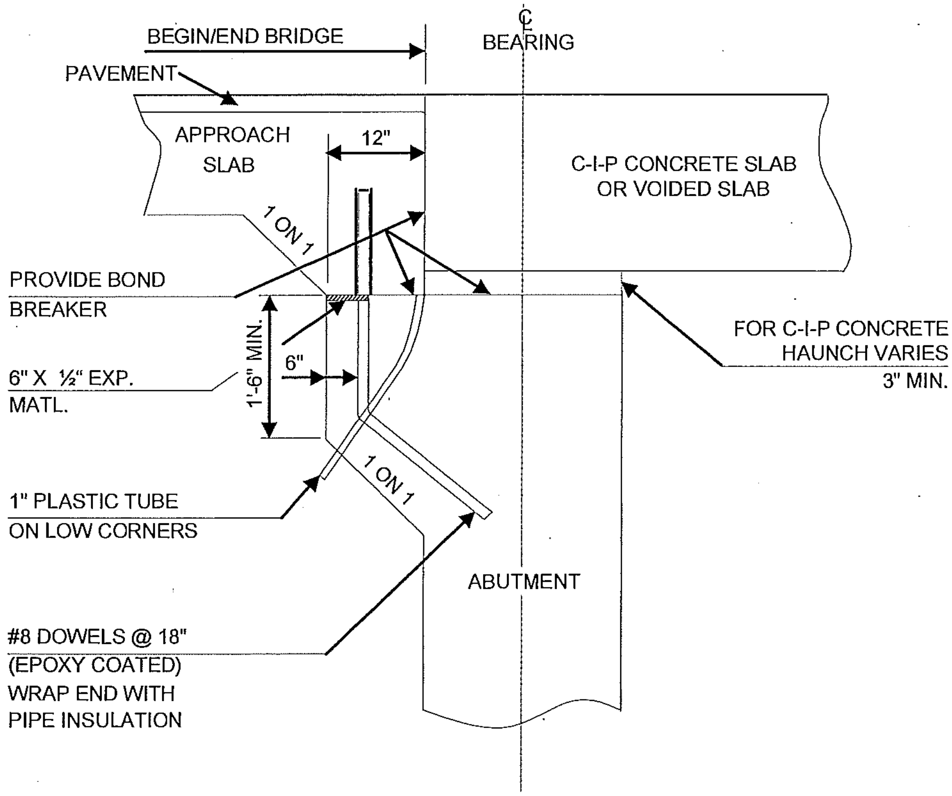


Figure 2.5.2.3 -1 Type C – Bridge Ends (both abutments) for short spans with Approach Slabs.

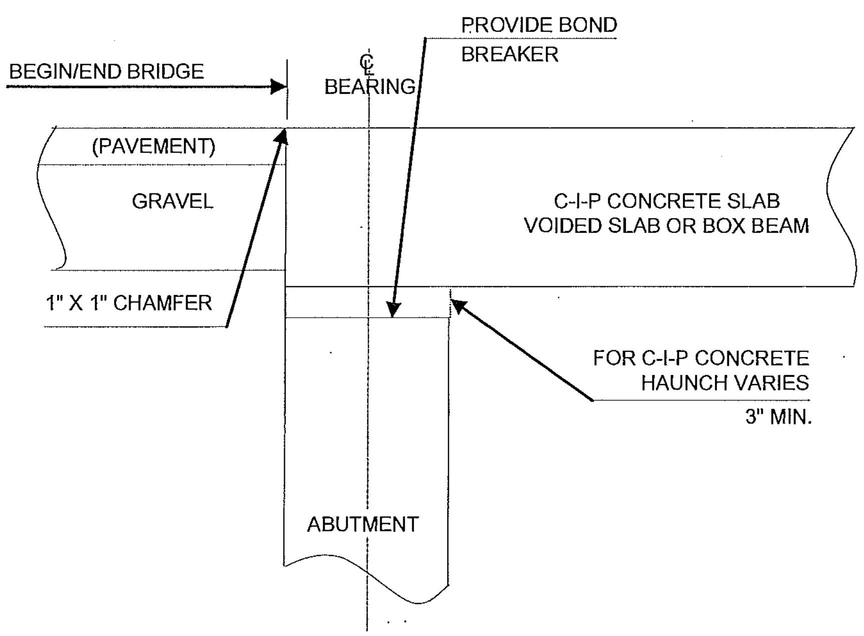


Figure 2.5.2.4 -1 Type D - Bridge Ends for short spans without Approach Slabs.

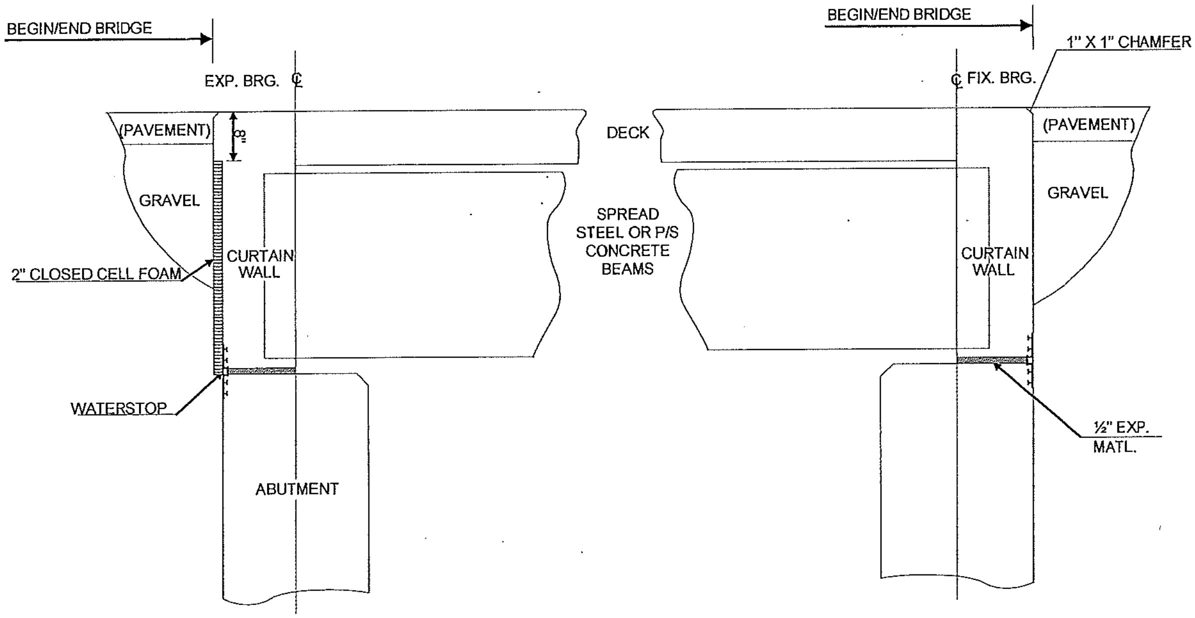


Figure 2.5.2.5 -1 Type E – Bridge Ends for intermediate spans without Approach Slabs.

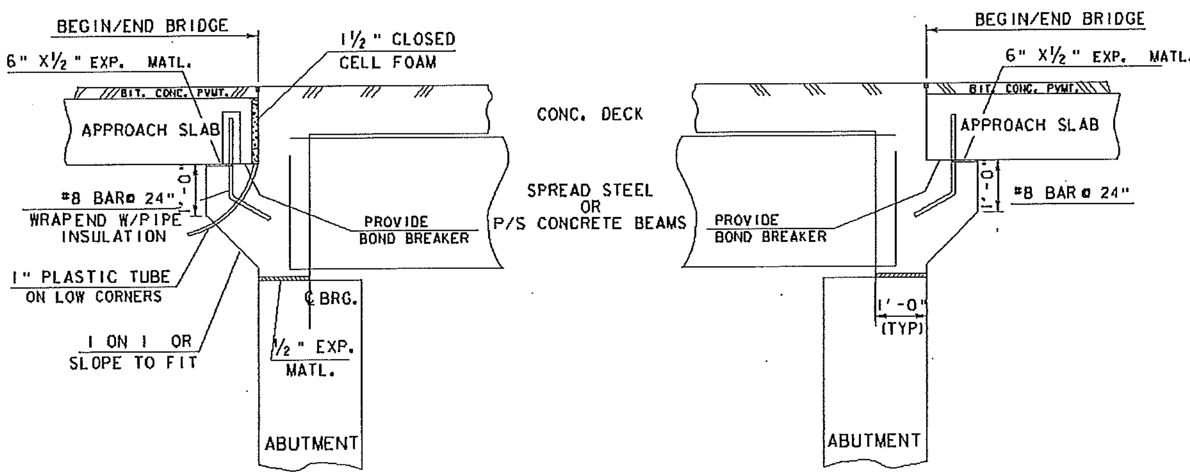


Figure 2.5.2.6 -1 Type F – Bridge Ends for intermediate spans with Approach Slabs.

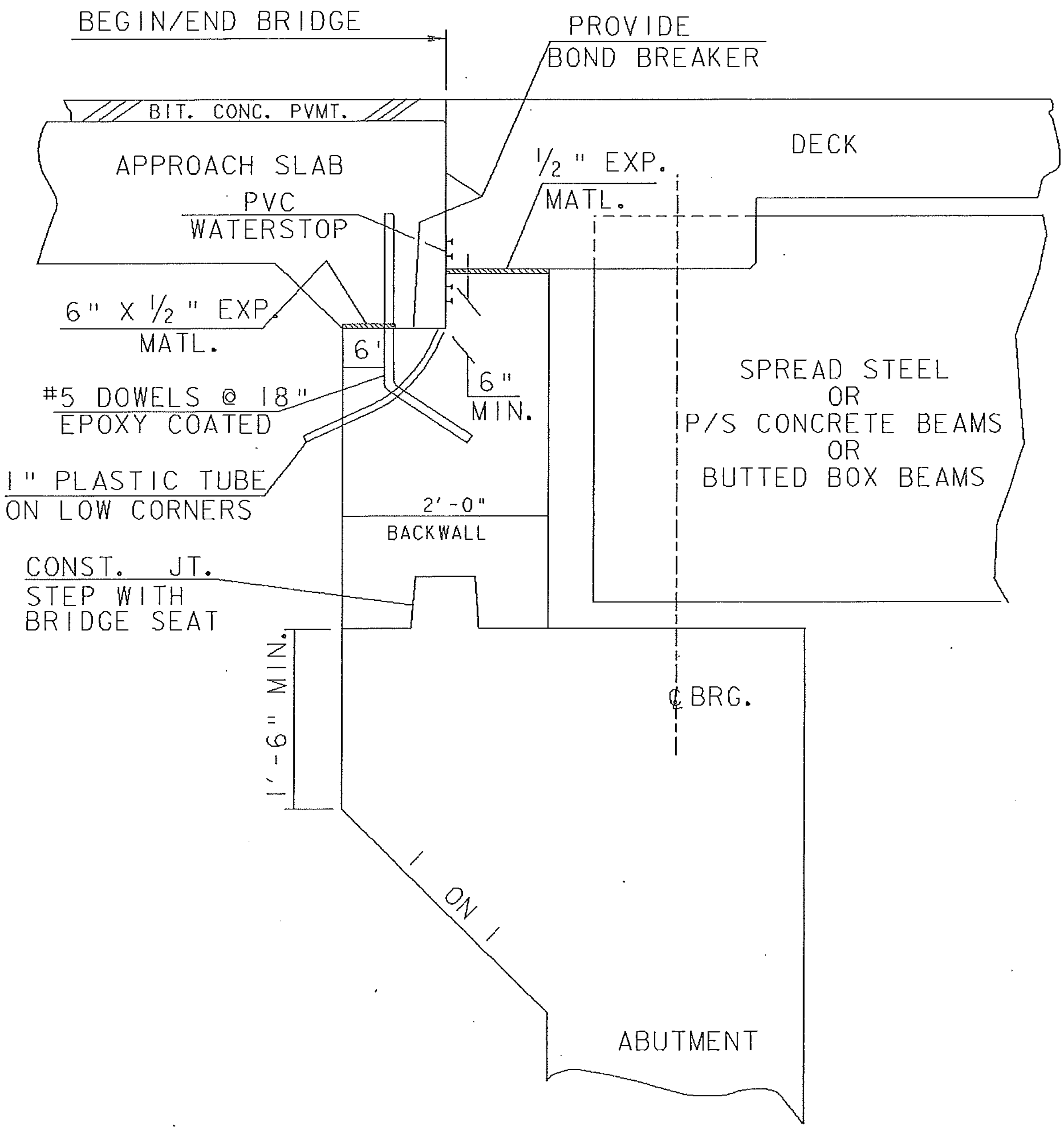


Figure 2.5.2.7 -1 Type G – Bridge End for Long Spans with Spread Beam Decking or Intermediate Spans with Butted Box Beams decking, both with Approach Slabs.

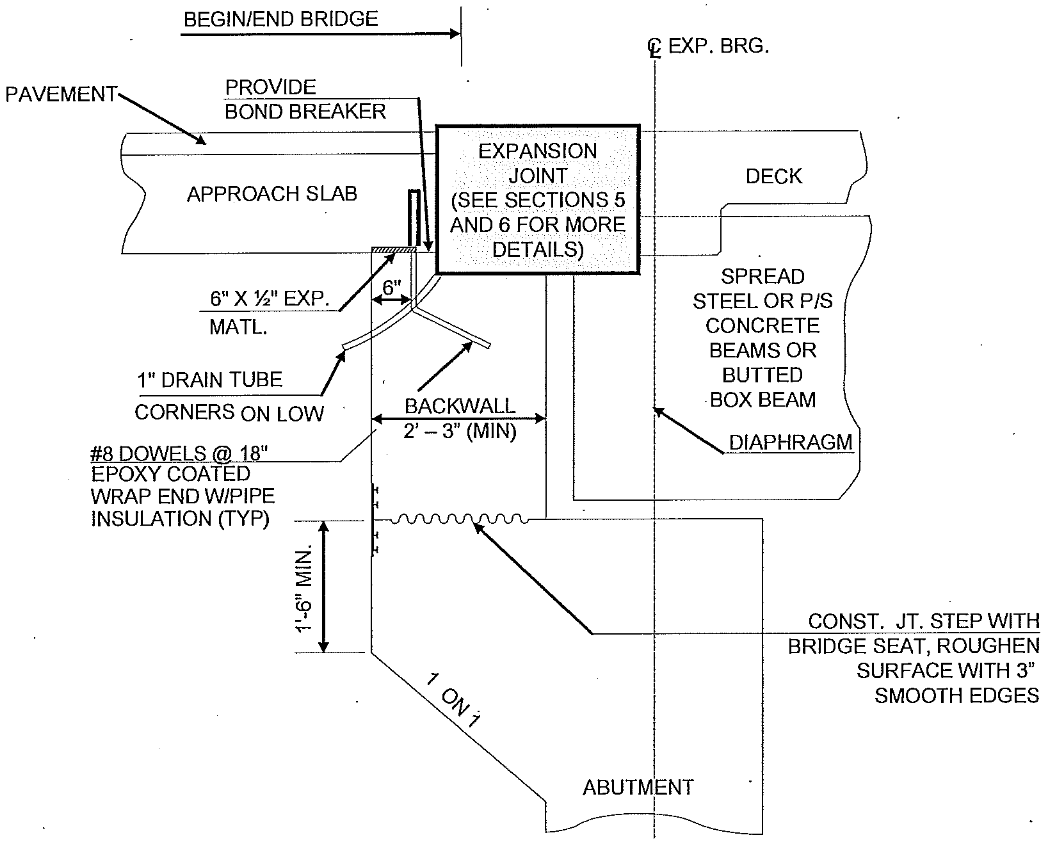


Figure 2.5.2.8 -1 Type H – Bridge End for Long Spans with Spread Beam Decking or Intermediate Spans with Butted Box Beams decking, both with Approach Slabs.

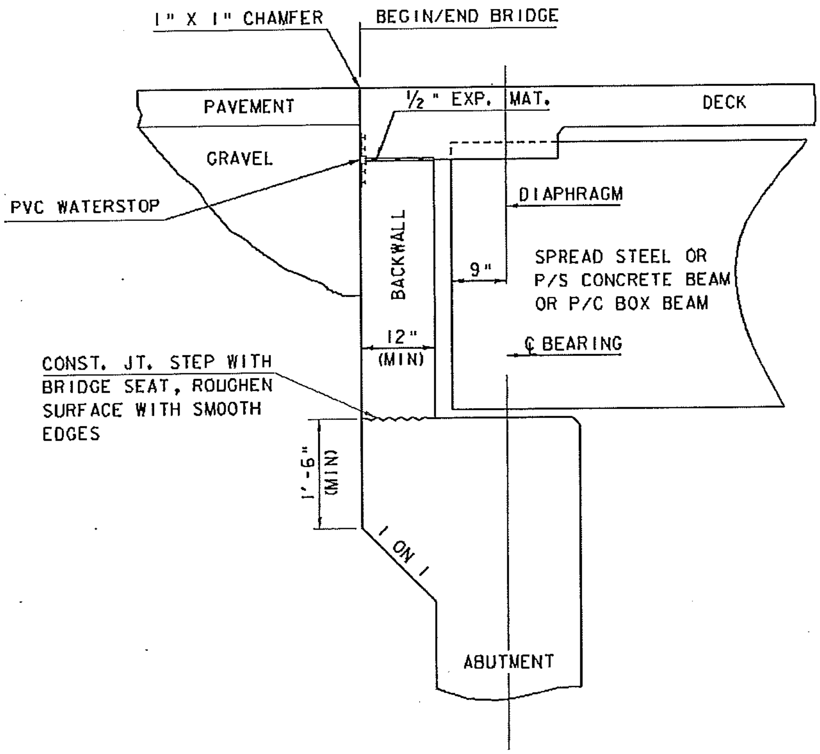


Figure 2.5.2.9 -1 Type I – Expansion and Fixed Bridge Ends for Long Span Spread Beam Decking without Approach Slabs of any skew or for the Expansion End of Butted Box Beam Decks with skews greater then 30°.

2.5.3 Bare and Paved Concrete Deck Details

The designer shall consider a bare deck initially. When specifying a paved deck in the plans, the bridge end details will require additional pavement details.

2.5.3.1 Bare Concrete Deck Details

For deck thicknesses refer to Section 5.2.1.1.1 . The concrete surface will require special treatment to ensure there will be adequate traction. This treatment will include applying a texture during the screeding of the deck, and may include grooving the deck once the concrete cures. Use the details above as well as those in Sections 5 and 6 as presented.

Grooving of the deck is used to provide appropriate friction for dry and wet pavement while still keeping a low-noise surface. A proper combination of macrotexture and microtexture (wavelengths of 0.5mm to 50mm and 1µm to 0.5mm, respectively) while limiting megatexture (wavelengths of 50mm to 500mm) can provide the texture needed for both adequate wet pavement friction and low noise. All bare concrete decks shall, as a minimum, have the surface textured by means of a broom finish, burlap drag, or artificial turf drag. Bridges with design speeds greater than 45 miles per hour or with a radius of curvatures less than 1640 feet shall also be tined or grooved. Other situations may warrant tining or grooving the bridge deck.[4]

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[4] Surface Texture for Asphalt and Concrete Pavements: http://www.fhwa.dot.gov/pavement/t504036.cfm
Surface Finishing of PPC Pavements: http://www.fhwa.dot.gov/legsregs/directives/policy/sa_96_06.htm

5.7 *CONCRETE BRIDGE END DETAILS*

5.7.1 Concrete Bridge End Details - Type A

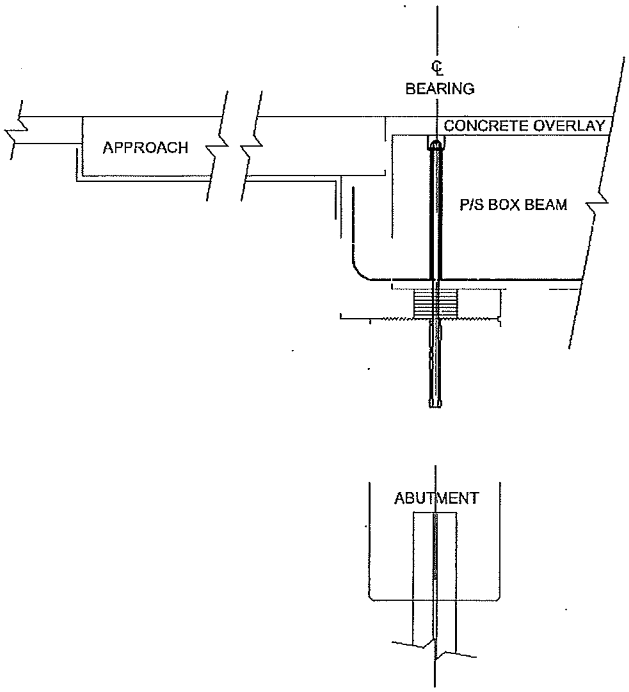


Figure 5.7.1 -1 Box Beam Type A Bridge End Detail

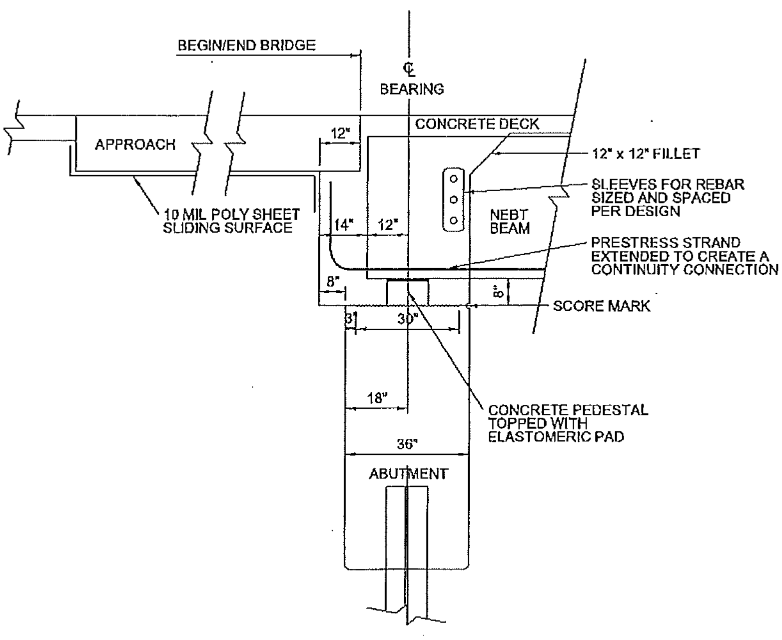


Figure 5.7.1 -2 North East Bulb Tee (NEBT) Type A Bridge End Detail

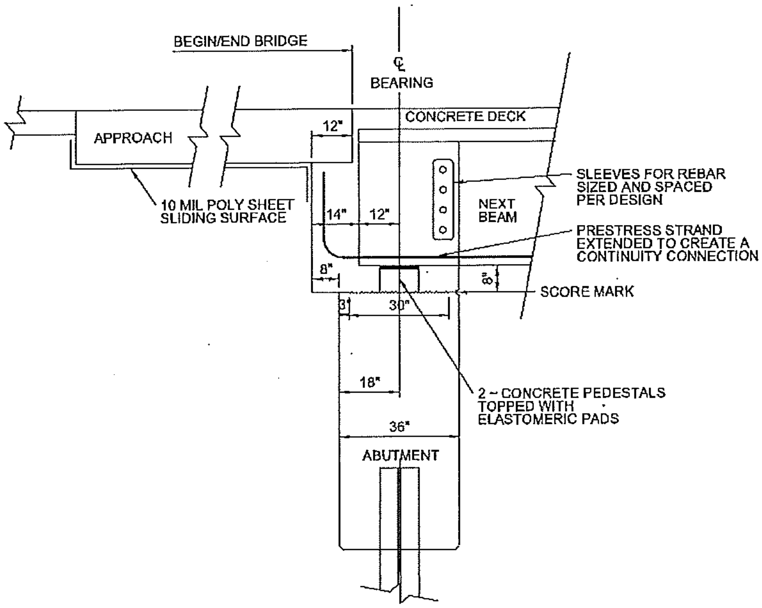


Figure 5.7.1 -3 North East Extreme Tee (NEXT) Type A Bridge End Detail

5.7.2 Concrete Bridge End Details - Type B

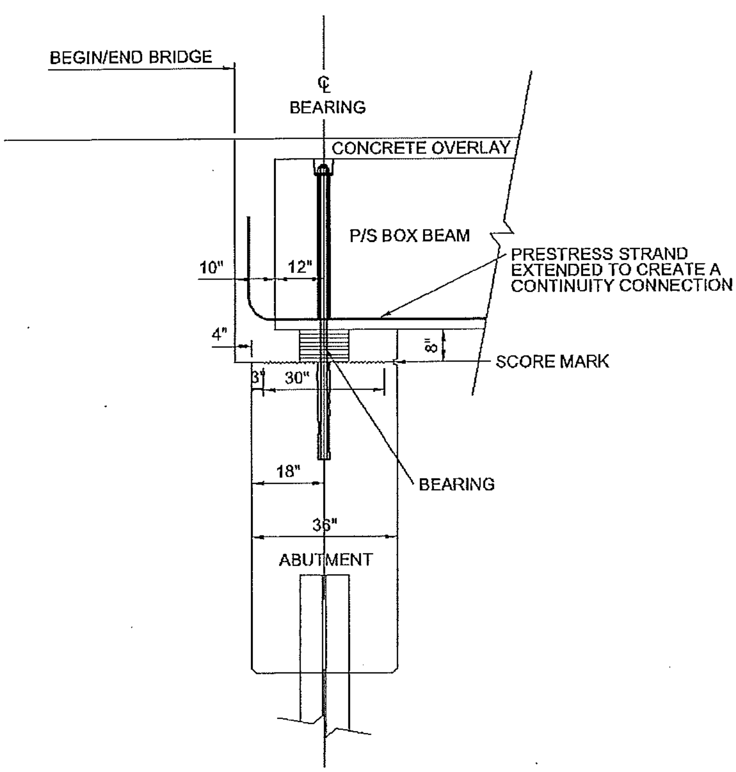


Figure 5.7.2 -1 Box Beam Type B Bridge End Detail

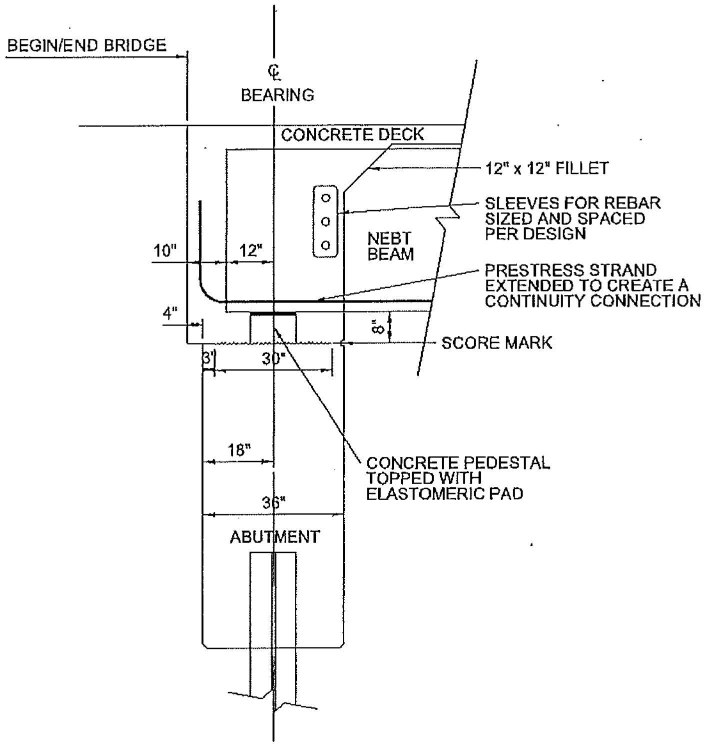


Figure 5.7.2 -2 North East Bulb Tee (NEBT) Type B Bridge End Detail

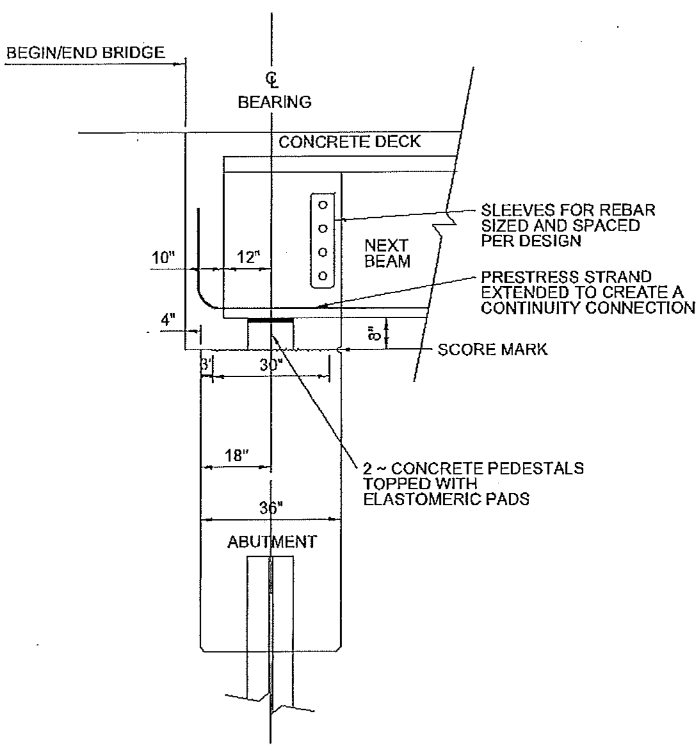


Figure 5.7.2 -3 North East Extreme Tee (NEXT) Type B Bridge End Detail

5.7.3 Concrete Bridge End Details - Type C

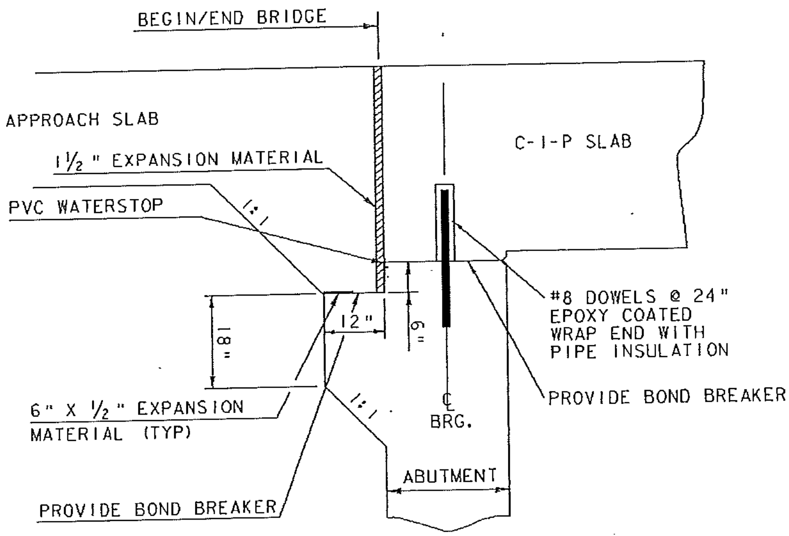


Figure 5.7.3 -1 Cast-in-Place Concrete Slab Type C Bridge End Detail

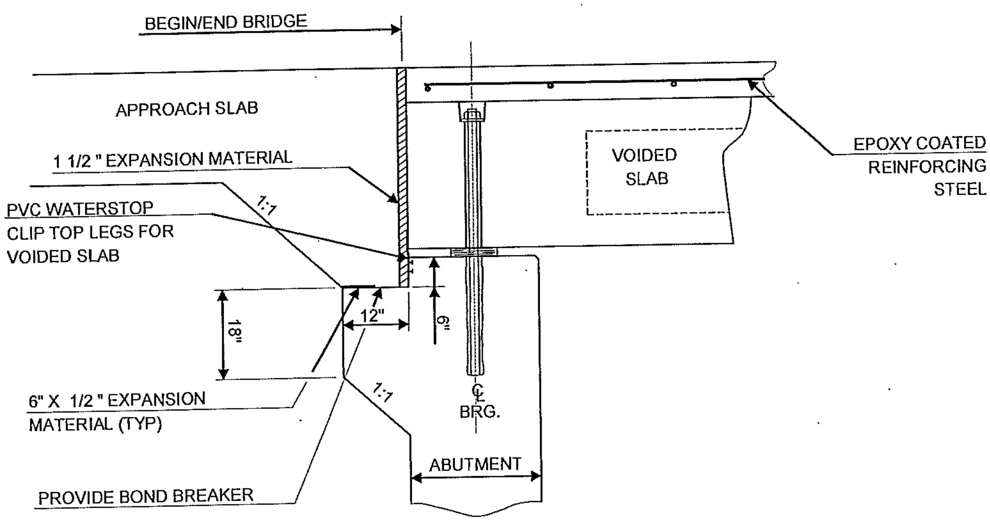


Figure 5.7.3 -2 Voided Slab Type C Bridge End Detail

5.7.4 Concrete Bridge End Details - Type D

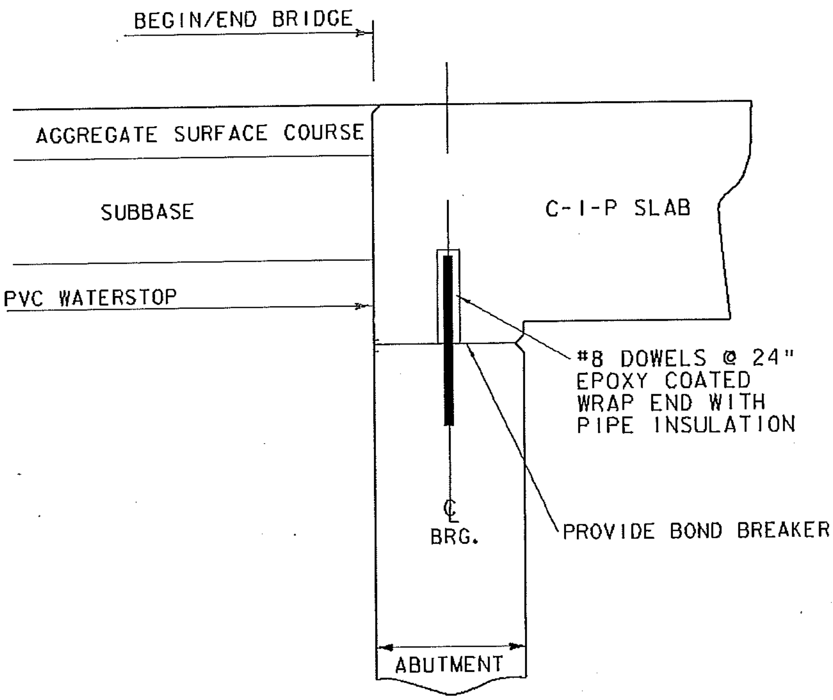


Figure 5.7.4 -1 Cast-in-Place Concrete Slab Type D Bridge End Detail

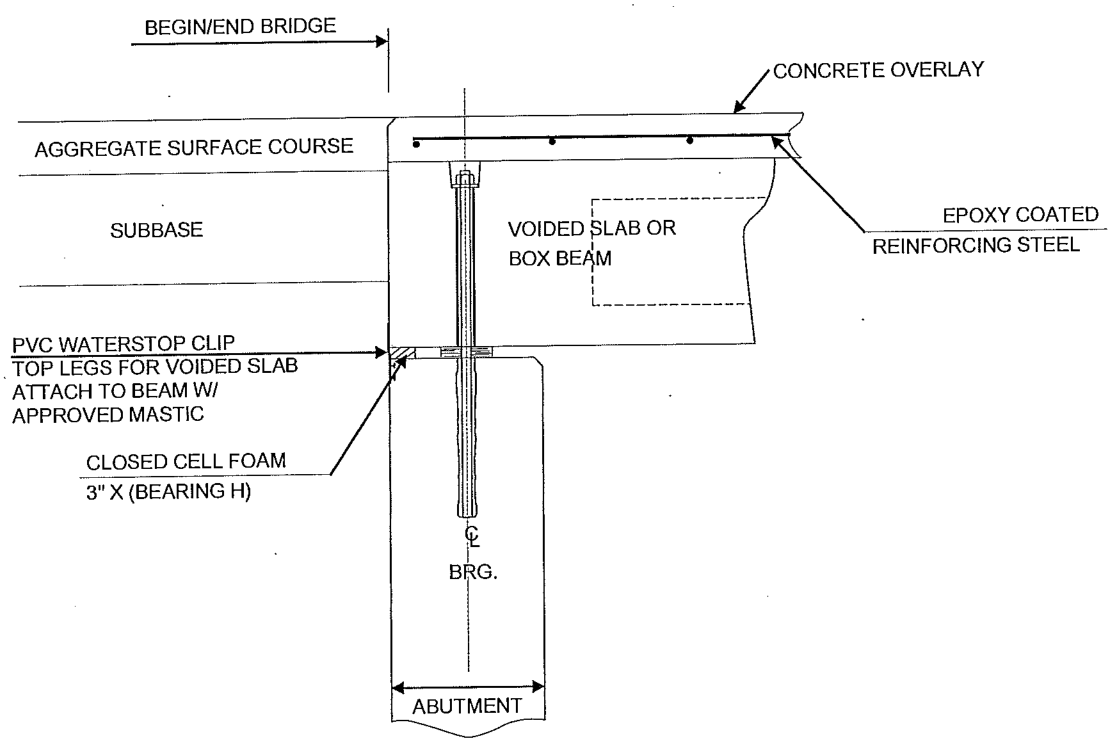


Figure 5.7.4 -2 Voided Slab and Box Beam Type D Bridge End Detail

5.7.5 Concrete Bridge End Details - Type E

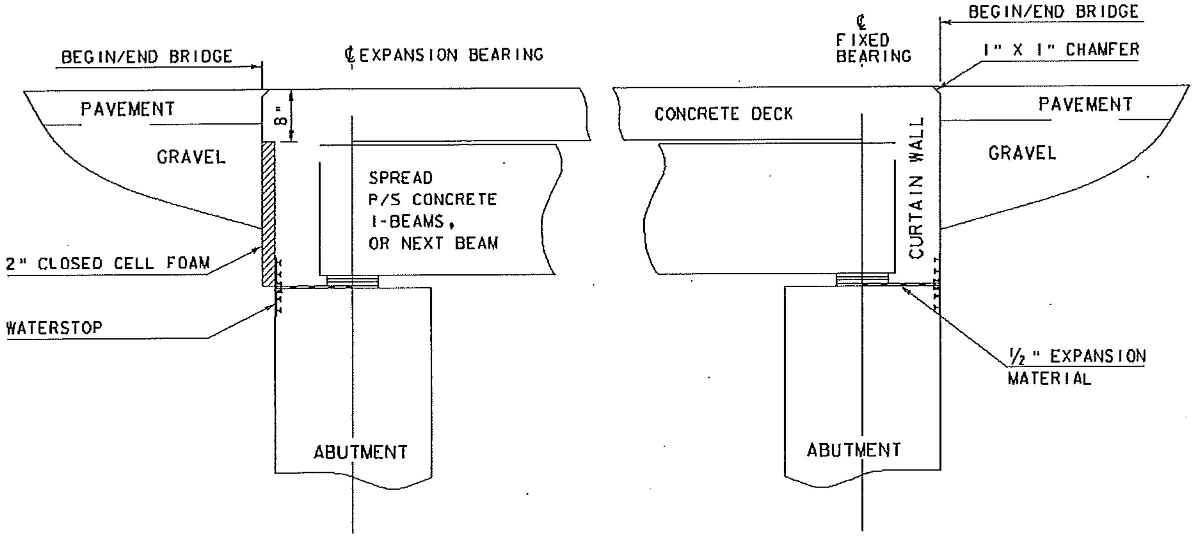


Figure 5.7.5 -1 North East Bulb Tee (NEBT) Type E Bridge End Detail

5.7.6 Concrete Bridge End Details - Type F

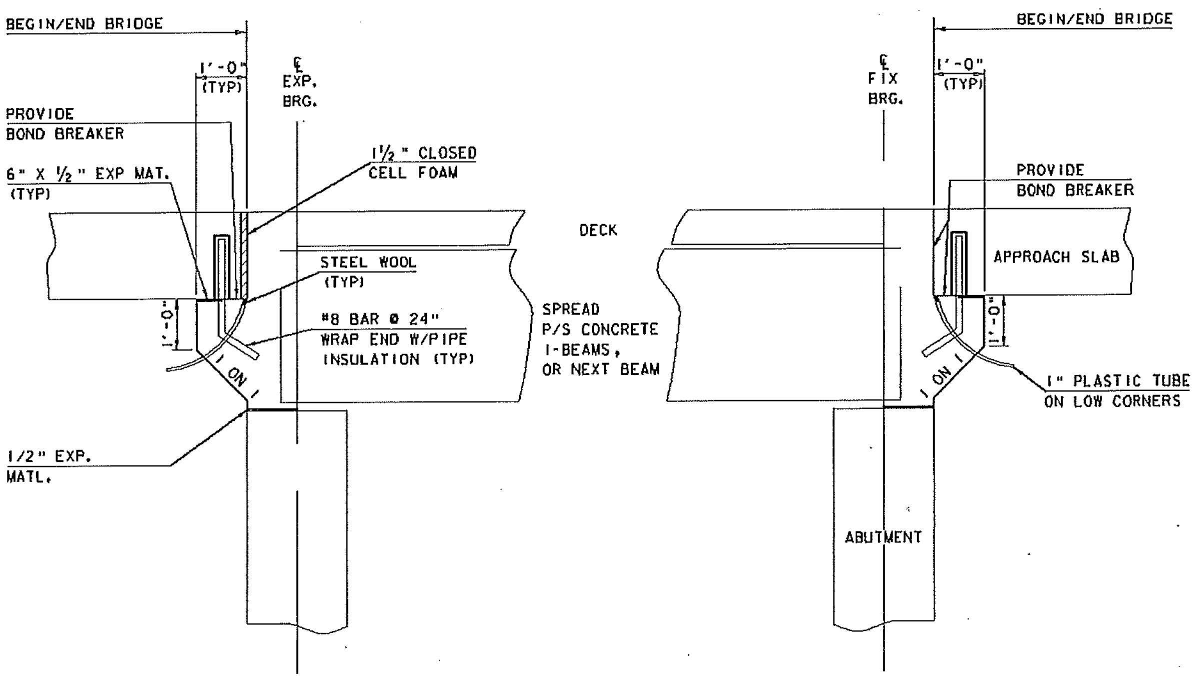


Figure 5.7.6 -1 North East Bulb Tee (NEBT) Type F Bridge End Detail

5.7.7 Concrete Bridge End Details - Type G

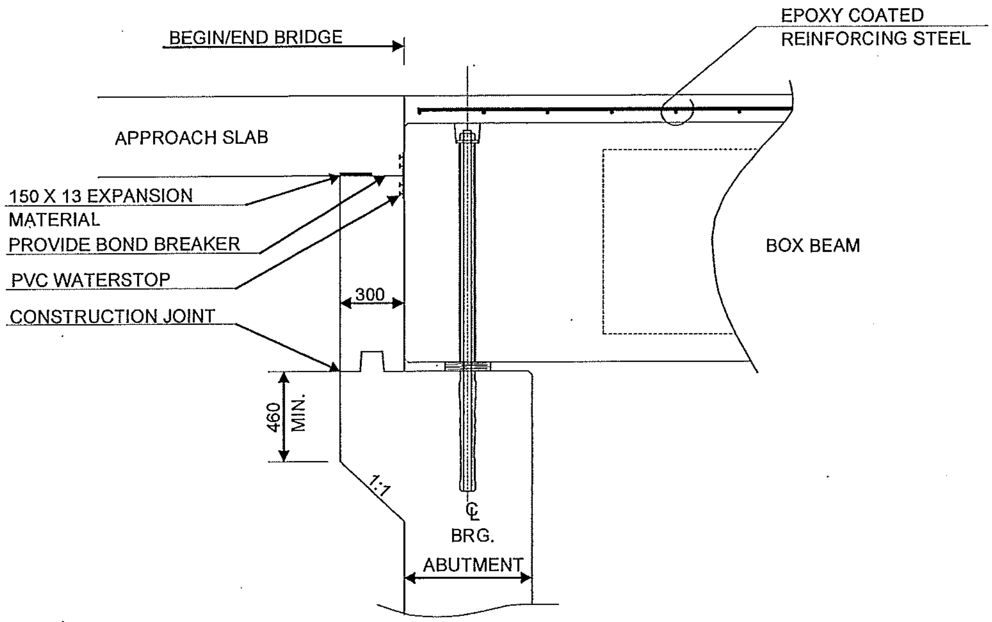


Figure 5.7.7-1 Box Beam Type G Bridge End Detail

5.7.8 Concrete Bridge End Details - Type H

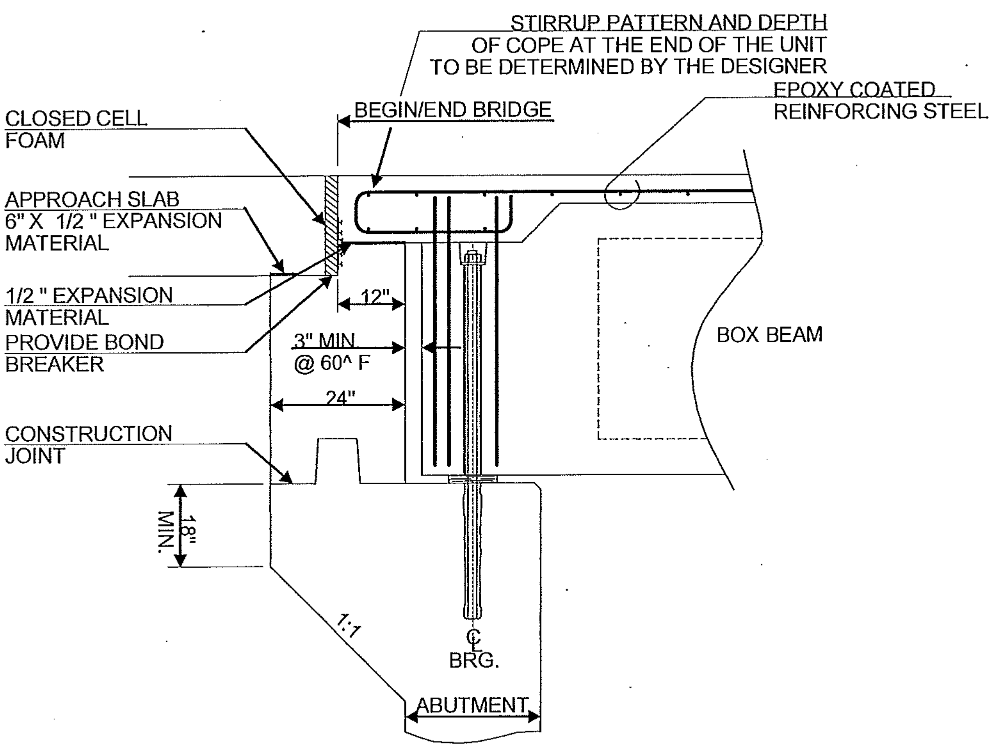


Figure 5.7.8 -1 Box Beam Type H Bridge End Detail

5.7.9 Concrete Bridge End Details - Type I

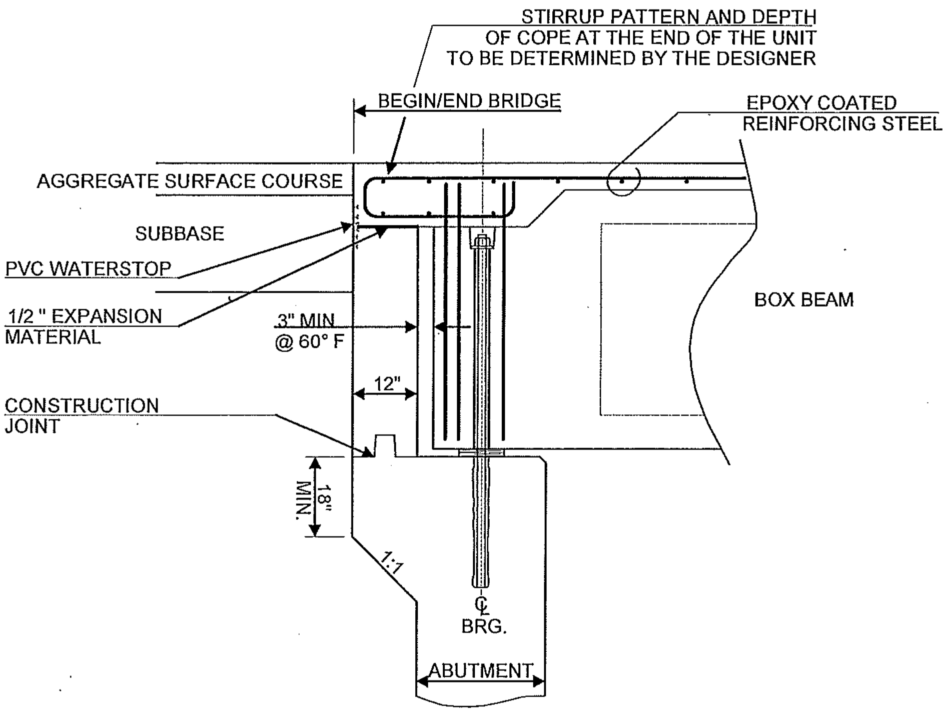
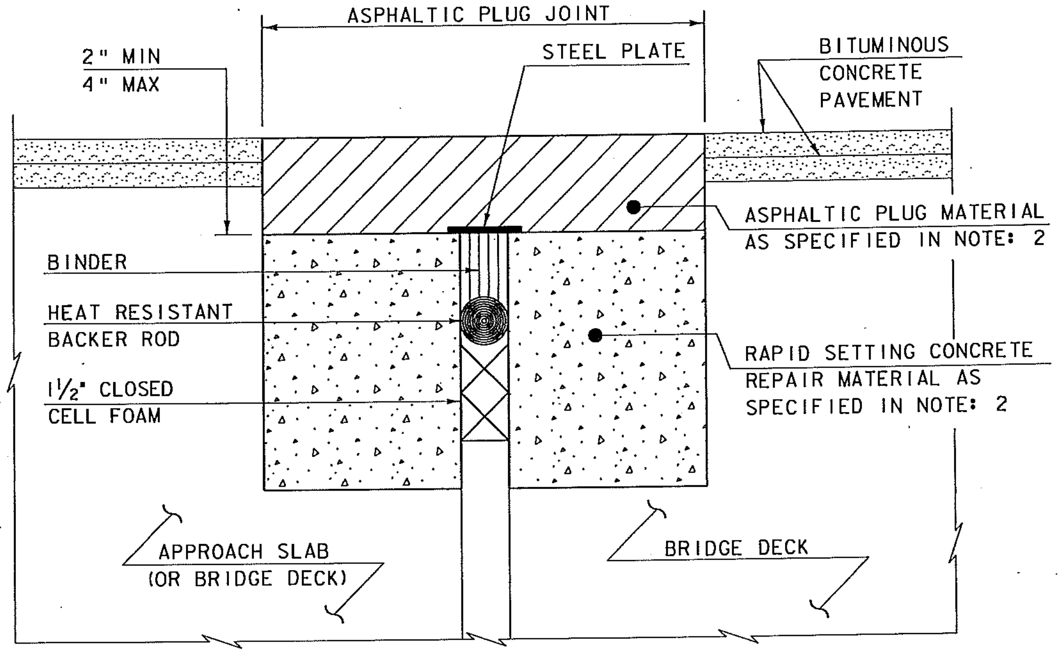
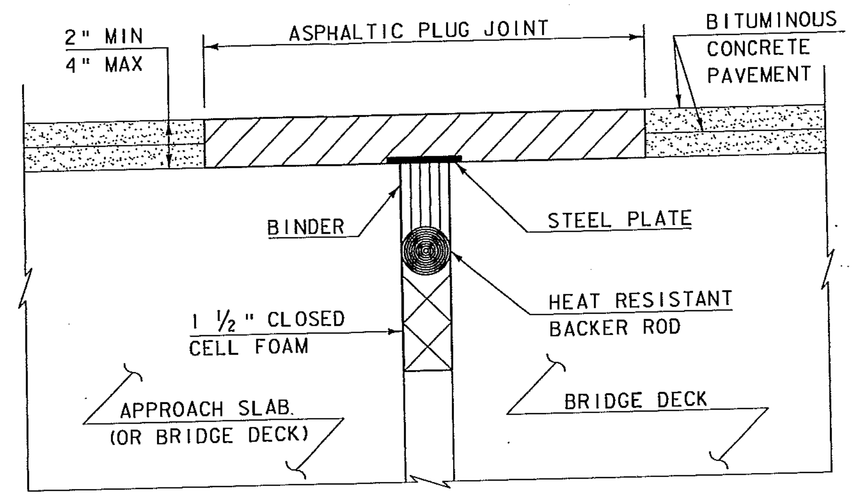


Figure 5.7.9 -1 Box Beam Type I Bridge End Detail



ASPHALTIC PLUG-TYPE JOINT DETAIL - REHAB

(NOT TO SCALE)



ASPHALTIC PLUG-TYPE JOINT DETAIL - NEW

(NOT TO SCALE)

NOTES:

1. THE CONTRACTOR SHALL REMOVE ALL ASPHALTIC PLUG JOINT MATERIAL AND DETERIORATED CONCRETE AS DIRECTED BY THE ENGINEER. REMOVAL OF THE FIRST 4 INCHES OF MATERIAL SHALL BE INCLUDED IN THE BID PRICE FOR ITEM 516.10 BRIDGE EXPANSION JOINT, ASPHALTIC PLUG. ANY REMOVAL OF MATERIAL GREATER THAN 4 INCHES SHALL BE INCLUDED IN THE BID PRICE OF ITEM 580.20 RAPID SETTING CONCRETE REPAIR MATERIAL WITH COURSE AGGREGATE.

2. THE CONTRACTOR SHALL REPLACE REMOVED MATERIAL THAT IS LESS THAN 4" FROM FINISHED GRADE WITH ASPHALTIC PLUG JOINT MATERIAL MEETING THE REQUIREMENTS OF SUBSECTION 707.15. ALL REMOVED MATERIAL THAT IS GREATER THAN 4 INCHES FROM FINISHED GRADE SHALL BE REPLACED WITH RAPID SETTING CONCRETE REPAIR MATERIAL WITH COARSE AGGREGATE MEETING THE REQUIREMENTS OF SUBSECTION 780.04.

3. REINFORCING STEEL NOT SHOWN FOR CLARITY.

ASPHALTIC PLUG JOINT NOTES

INSTALLATION:

1. LOCATE THE JOINT CENTRALLY OVER THE DECK OVERLAY EXPANSION GAP OR FIXED JOINT, MARKED OUT TO THE MANUFACTURER'S RECOMMENDED WIDTH.
2. REMOVE THE BITUMINOUS CONCRETE PAVEMENT FULL DEPTH AS SHOWN ON THE PLANS. THE PAVEMENT SHALL BE DRY AND SAW CUT TO THE LIMITS REQUIRED TO PLACE THE JOINT. A PNEUMATIC HAMMER AND CHISEL MAY BE USED ADJACENT TO THE CURB ONLY WHEN SAW CUTTING IS NOT POSSIBLE.
3. BLAST CLEAN THE JOINT AREA OF DEBRIS, ASPHALT AND SHEET MEMBRANE. THOROUGHLY DRY THE JOINT AREA WITH COMPRESSED AIR PRIOR TO APPLYING BINDER MATERIAL.
4. REPAIR MATERIAL GREATER THAN 4 INCHES FROM FINISHED GRADE WITH RAPID SETTING CONCRETE REPAIR MATERIAL WITH COARSE AGGREGATE MEETING THE REQUIREMENTS OF SUBSECTION 780.04.
5. PLACE PROPERLY SIZED HEAT RESISTANT BACKER ROD IN THE MOVEMENT GAP ALLOWING FOR 1" +/- OF BINDER ABOVE THE ROD.
6. HEAT AND PLACE THE BINDER MATERIAL AS RECOMMENDED BY THE MANUFACTURER.
7. PLACE 1/4" THICK BY 8" WIDE SECTIONS OF STEEL PLATE OVER THE CENTER OF THE MOVEMENT GAP. SECURE THE PLATES FROM MOVING BY INSERTING LOCATING PINS THROUGH THE PRE-STAMPED HOLES INTO BACKER ROD AND COVER WITH HOT BINDER. THE STEEL PLATES MAY BE OMITTED WHERE THE ENGINEER DETERMINES THAT THE APPROACH SLAB OR BRIDGE DECK WILL PROVIDE INADEQUATE SUPPORT AND WHERE VERTICAL MOVEMENT OF THE PLATES MIGHT OCCUR.
8. HEAT AND MIX THE BINDER MATERIAL AND AGGREGATE AS RECOMMENDED BY THE MANUFACTURER.
9. INSTALLATION OF MATERIAL, COMPACTION, AND TOP COATING SHALL BE AS RECOMMENDED BY THE MANUFACTURER.
10. IMMEDIATELY AFTER TOP COATING, CAST AN ANTI-SKID MATERIAL OVER THE JOINT TO REDUCE THE RISK OF TRACKING.
11. ONCE THE JOINT REACHES 82 DEG C (180 DEG F) +/-, WATER MAY BE USED TO EXPEDITE THE COOLING PROCESS.
12. PROTECT JOINT FROM TRAFFIC UNTIL THE MATERIAL HAS COOLED TO 51 DEG C (125 DEG F) +/-.

WEATHER LIMITATIONS

APPLY BINDER MATERIAL ONLY WHEN THE FOLLOWING CONDITIONS PREVAIL OR AS RECOMMENDED BY THE MANUFACTURER:

1. THE AMBIENT AIR TEMPERATURE IS AT LEAST 10 DEG C (50 DEG F) AND RISING.
2. THE ROAD SURFACE IS DRY.
3. WEATHER CONDITIONS OR OTHER CONDITIONS ARE FAVORABLE AND ARE EXPECTED TO REMAIN SO FOR THE PERFORMANCE OF SATISFACTORY WORK.

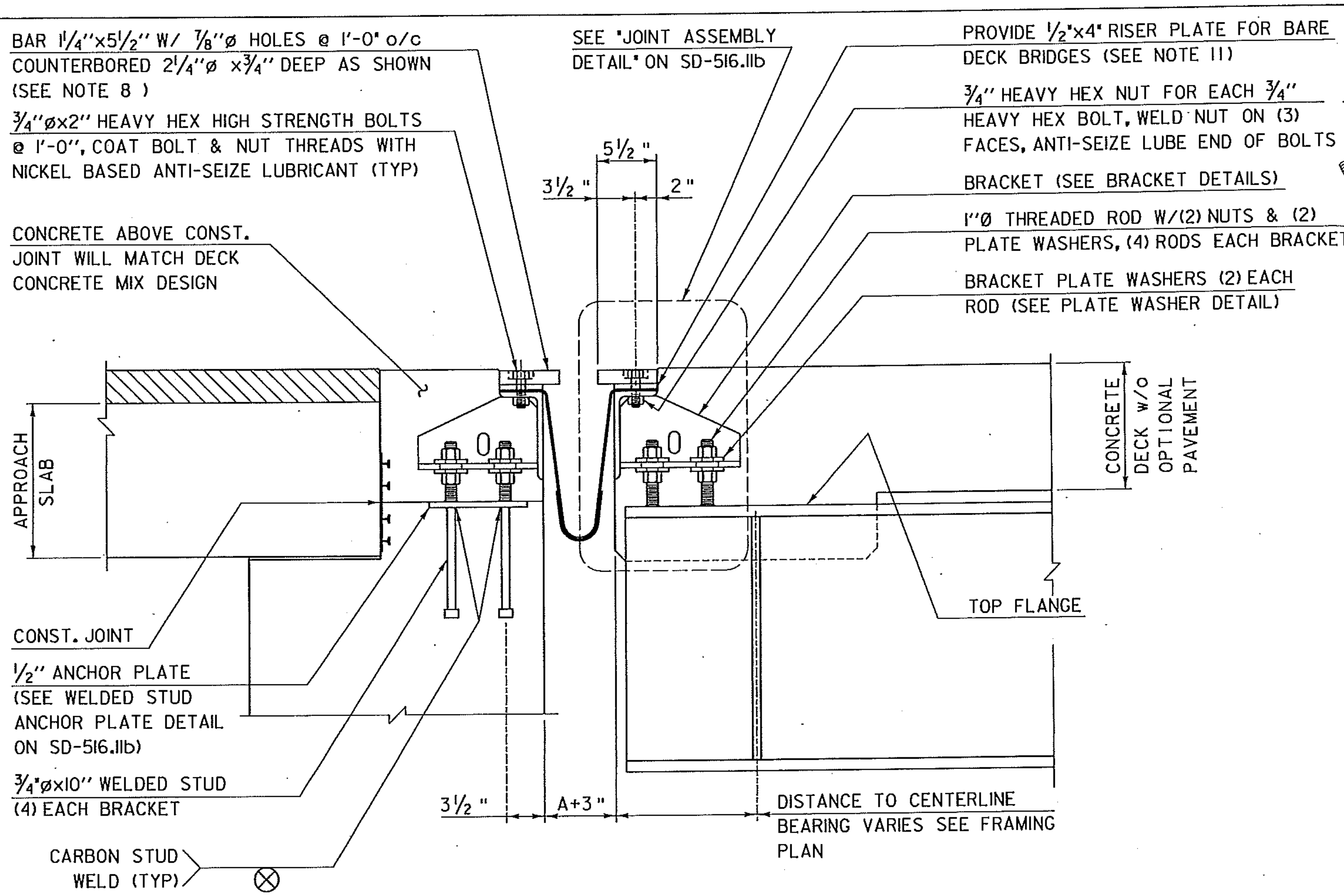
REVISIONS	
MAY 7, 2010	APPROVED FOR USE BY VAOT STRUCTURES SECTION

BRIDGE JOINT ASPHALTIC PLUG

VERMONT AGENCY OF TRANSPORTATION · STRUCTURES · DIVISION

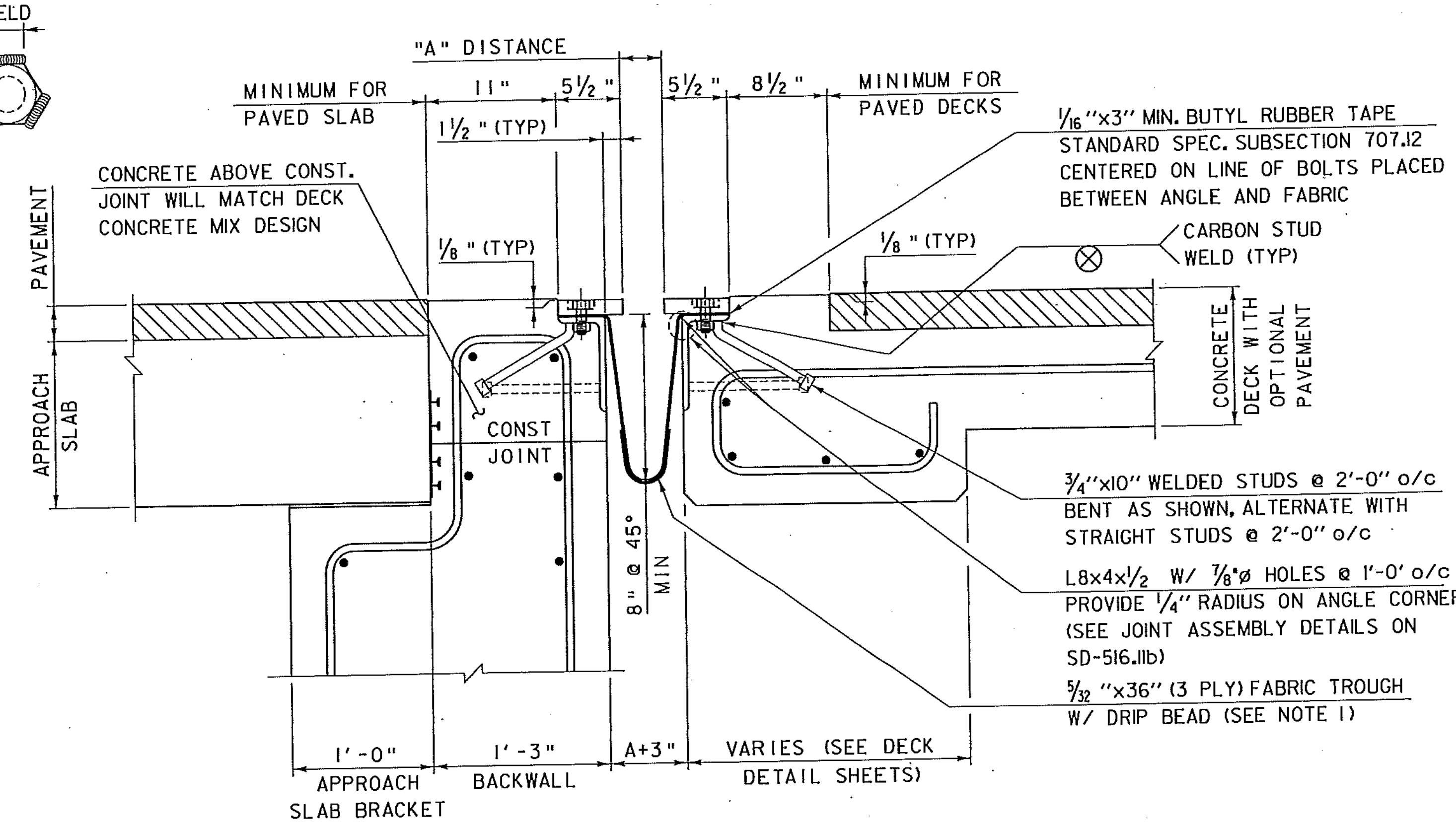
STRUCTURES DETAIL

SD-516.10



TYPICAL SECTION AT GIRDERS

SCALE 1½" = 1'-0"

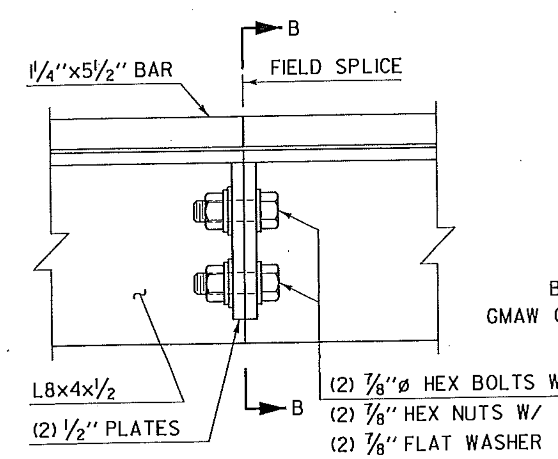


TYPICAL SECTION BETWEEN GIRDERS

SCALE 1½" = 1'-0"

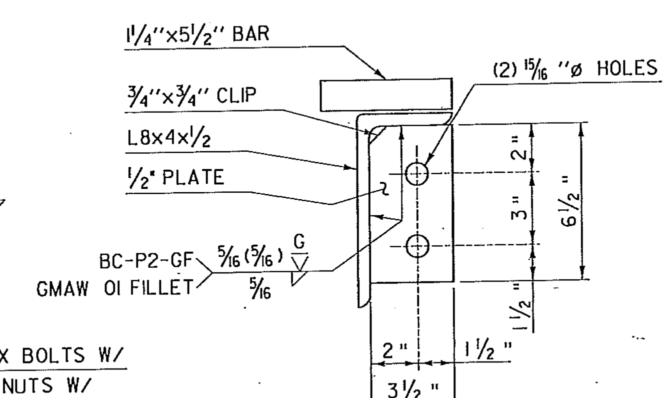
NOTES FOR ITEM 516.11 "BRIDGE EXPANSION JOINT, VERMONT"

1. FABRIC TROUGH SHALL BE THOROUGHLY CLEANED AND FLUSHED AFTER PAVING OPERATION. A DRIP BEAD OF 1/4"x7" STRIP OF PREFORMED FABRIC MATERIAL SHALL BE CEMENTED TO THE BOTTOM OF THE FABRIC TROUGH USING AN ADHESIVE APPROVED BY THE MANUFACTURER. THE DRIP BEAD SHALL BE APPLIED 1" FROM THE DOWNSPOUT END OF THE TROUGH. PREFORMED FABRIC MATERIAL SHALL BE CONTINUOUS FOR THE FULL LENGTH OF THE JOINT.
2. THE EXPANSION DEVICE SHALL BE COVERED TO PROTECT THE FINISH DURING PLACING OF BRIDGE DECK CONCRETE.
3. SEE "JOINT GAP DIMENSION TABLE" FOR DISTANCE "A" VALUES IN TEMPERATURE RANGE PROVIDED.
4. JOINT BRACKET LENGTH "X" VARIES DEPENDENT ON THE BRIDGE SKEW ANGLE. THE BRACKET MUST BE LOCATED SUCH THAT THE THREADED RODS ARE NOT LESS THAN 1½" FROM GIRDERS END OR FLANGE SIDES.
5. ALL STEEL COMPONENTS SHALL BE GALVANIZED OR METALIZED AND MEET THE REQUIREMENTS OF SUBSECTION 516.02. PRIOR TO GALVANIZING OR METALIZING, ALL CORNERS AND EDGES OF STEEL PLATES, SHAPES, ETC., SHALL BE GROUND TO A 1/16" INCH RADIUS. THREADED RODS SHALL CONFORM TO THE REQUIREMENTS OF 714.04. THE "WELDED STUD ANCHOR PLATE" AND WELDED STUDS MAY BE SUPPLIED WITHOUT GALVANIZING OR METALIZING.
6. THE 4"x8"x1/2" ANGLES MAY BE FURNISHED AS ONE CONTINUOUS PIECE OR SPLICED AS SHOWN IN THE FIELD SPLICE DETAIL WHEN SPECIFIED. THE 1¼"x5 ½" BARS EACH SIDE OF THE JOINT SHALL BE PROVIDED IN TWO EQUAL LENGTHS.
7. PROJECTING THREADS OF THE 3/4" Ø BOLTS IN THE JOINT SHALL BE GREASED BY THE CONTRACTOR PRIOR TO PLACING ADJACENT CONCRETE. THIS WILL FACILITATE BOLT REMOVAL IF REQUIRED IN THE FUTURE.
8. FILL COUNTERBORED HOLES WITH HOT POURED JOINT SEALER (STD. SPEC. 707.04) AFTER BOLT INSTALLATION. PAYMENT FOR THE WORK SHALL BE INCIDENTAL TO ITEM 516.11 "BRIDGE EXPANSION JOINT, VERMONT".
9. THE EXPANSION JOINT, INCLUDING THE FABRIC TROUGH, SHALL BE SHOP ASSEMBLED AND SHIPPED AS ONE UNIT. IF THE EXPANSION JOINT HAS A FIELD SPLICE SPECIFIED, THE FABRIC TROUGH SHALL BE SHIPPED WITH ONE UNIT AND ASSEMBLED WITH THE SECOND UNIT PRIOR TO CONCRETE PLACEMENT.
10. TEMPORARY SHIPPING ATTACHMENTS SHALL BE ATTACHED BY BOLTING; WELDING WILL NOT BE PERMITTED.
11. BARE DECK "RISER PLATE" AS SHOWN IN "TYPICAL SECTION AT GIRDERS" DRAWING SHALL BE INCLUDED ON BRIDGES WITH BARE CONCRETE DECK SPECIFIED. RISER PLATES SHALL BE INCLUDED FOR BOTH SIDES AND MATCH THE LENGTHS OF THE 1¼"x5½" BARS. THE RISER PLATE CAN BE REMOVED IF THE DECK IS MILLED IN THE FUTURE.



FIELD SPLICE DETAIL

SPLICE ONLY WHEN SPECIFIED ON PLANS.



SECTION "B-B"

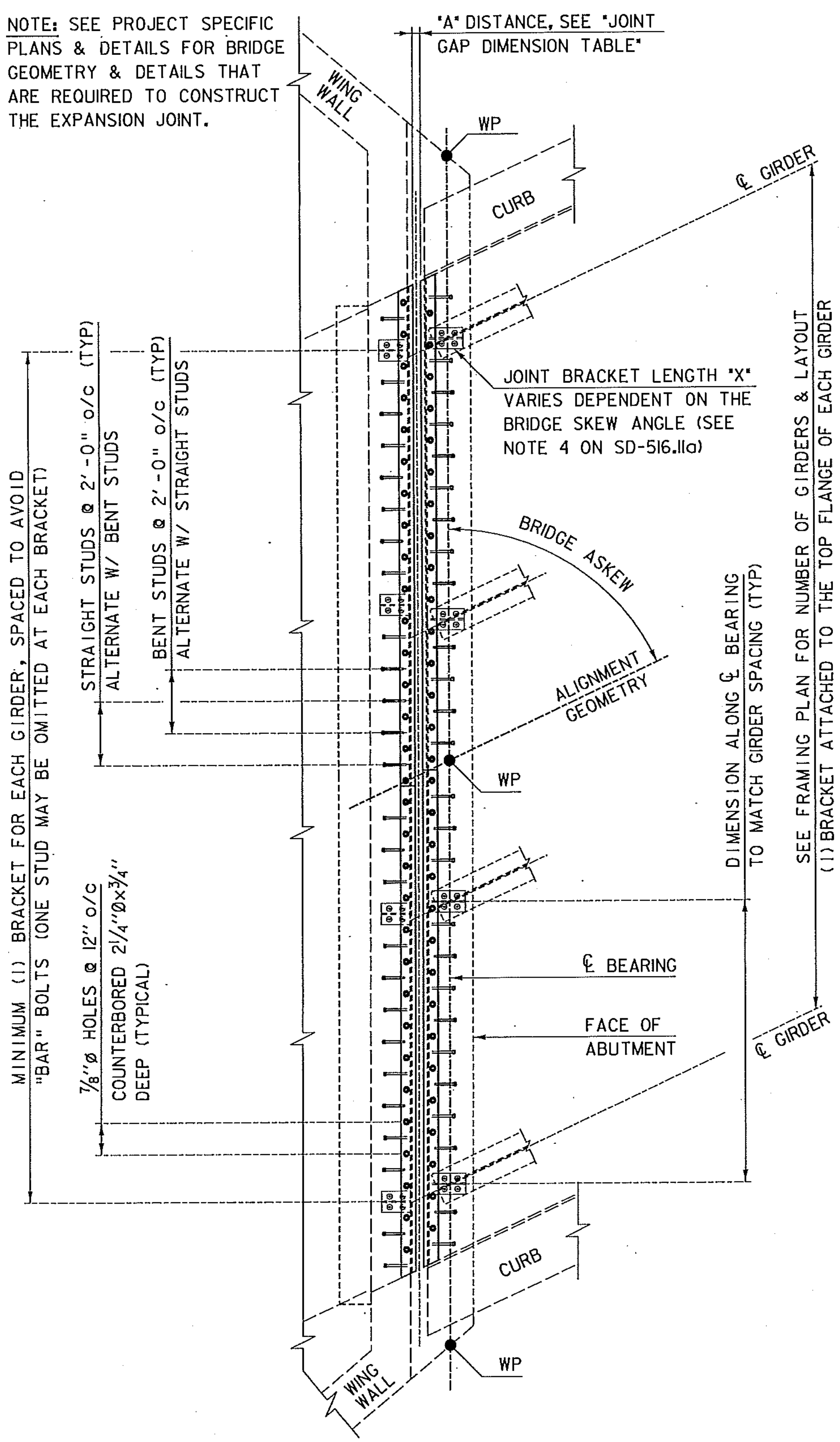
REVISIONS	
FEBRUARY 24, 2011	APPROVED FOR USE BY VAOT STRUCTURES SECTION

BRIDGE EXPANSION JOINT, VERMONT

VERMONT AGENCY OF TRANSPORTATION · STRUCTURES · SECTION

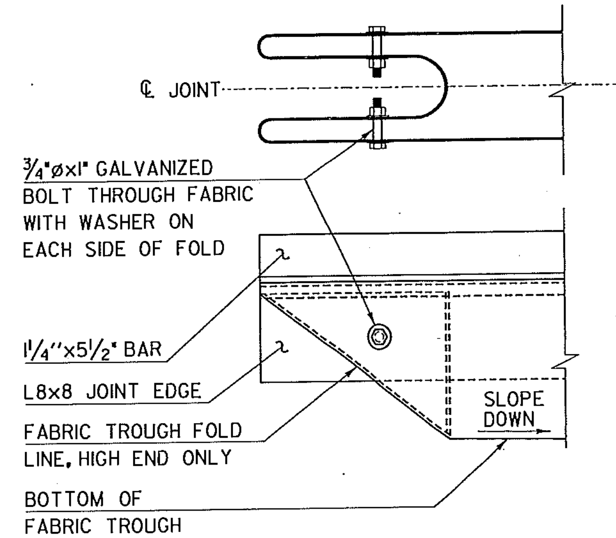
STRUCTURES DETAIL

SD-516.11a



EXPANSION JOINT PLAN

SCALE 3/8" = 1'-0"



FOLDED TROUGH END DETAIL

SCALE 1 1/2" = 1'-0"

1. TROUGH SHALL BE FOLDED AT HIGH ENDS. TROUGH SHALL SLOPE AT MIN 2% DOWN TOWARD THE NEAREST DRAINAGE SPOUT HOPPER LOCATION.
2. BOLTS, NUTS AND WASHERS FOR FOLD SHALL MEET REQUIREMENTS OF SUBSECTION 714.04 AND SHALL BE GALVANIZED.

JOINT GAP DIMENSION TABLE					
"A" Distance (in)					
Temp (°F)	Expansion Length (ft)				
	100 - 120	>120 - 140	>140 - 160	>160 - 180	>180 - 200
0	1 5/8	1 13/16	1 7/8	1 15/16	2 1/8
15	1 1/2	1 5/8	1 11/16	1 3/4	1 7/8
30	1 5/16	1 1/2	1 1/2	1 1/2	1 5/8
45	1 3/16	1 5/16	1 5/16	1 5/16	1 7/16
60	1 1/16	1 1/8	1 1/8	1 1/16	1 3/16
75	15/16	1	15/16	7/8	15/16
90	3/4	13/16	3/4	11/16	11/16
105	5/8	11/16	9/16	7/16	1/2

1) Expansion Length: Length of span, from Expansion Joint to nearest Fixed Bearing.
2) "A" Distance: measured distance during joint placement.
3) Temp: Approximate temperature of steel during joint placement.

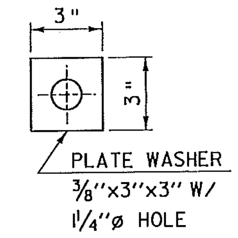
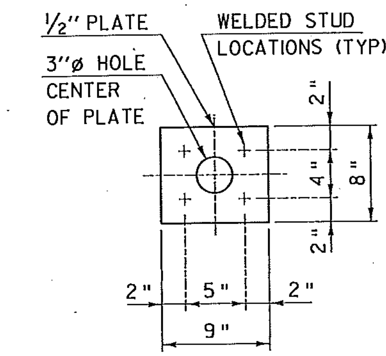


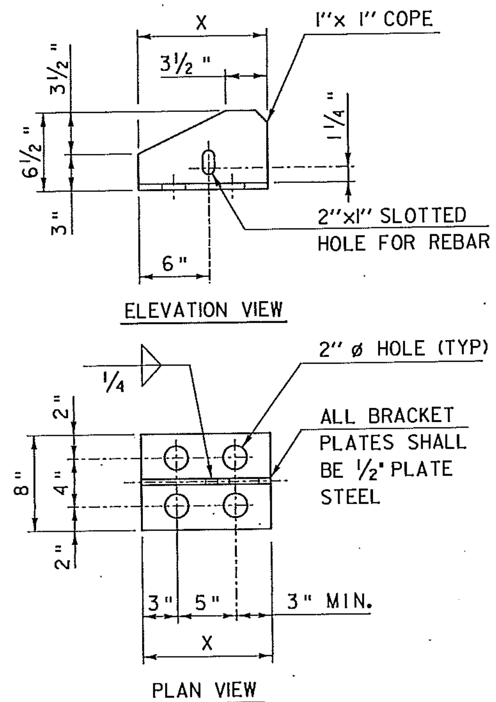
PLATE WASHER DETAIL

SCALE 3" = 1'-0"



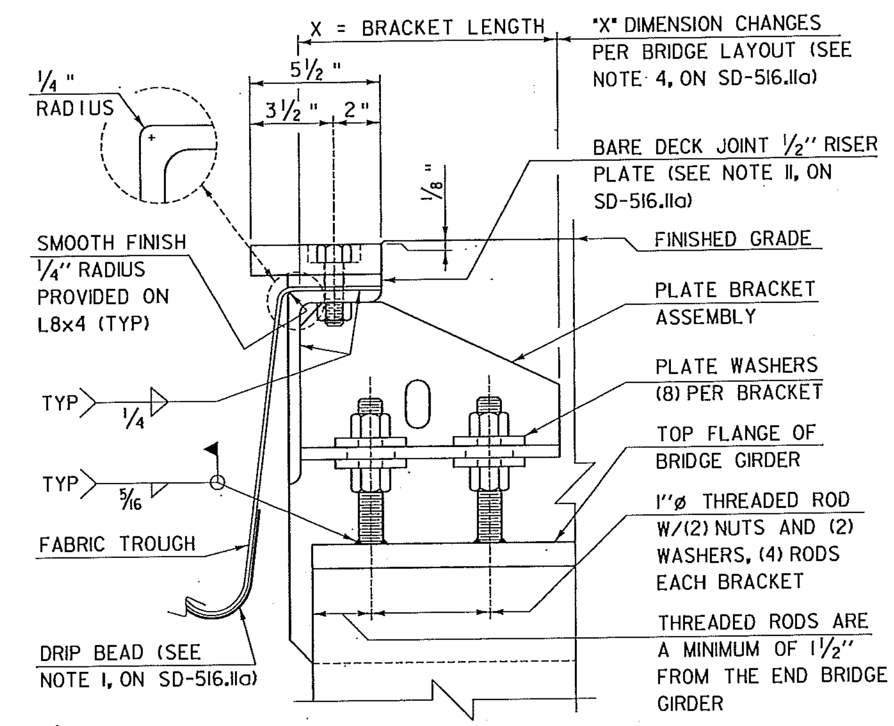
WELDED STUD ANCHOR PLATE DETAIL

SCALE 1 1/2" = 1'-0"



BRACKET DETAILS

SCALE 1 1/2" = 1'-0"



JOINT ASSEMBLY DETAIL

SCALE 3" = 1'-0"

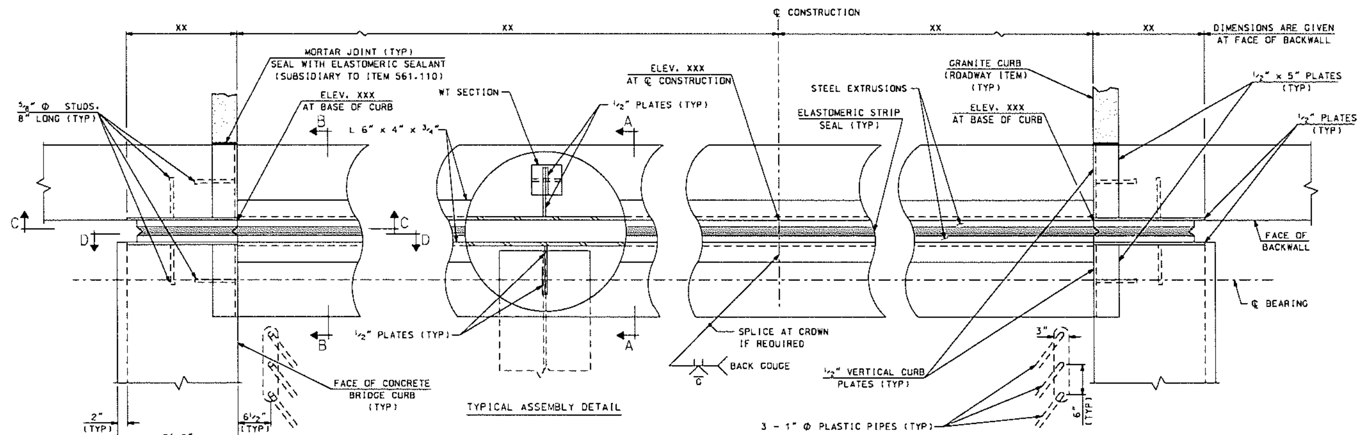
REVISIONS	
FEBRUARY 24, 2011	APPROVED FOR USE BY VAOT STRUCTURES SECTION

BRIDGE EXPANSION JOINT, VERMONT

VERMONT AGENCY OF TRANSPORTATION · STRUCTURES · SECTION

STRUCTURES DETAIL

SD-516.11b



PLAN VIEW
SCALE: 1" = 1'-0"

EXPANSION JOINT NOTES

(1) EXPANSION JOINT STEEL SHALL BE AASHTO M270 GRADE 50W (ASTM A709 GRADE 50W), EXCEPT AS OTHERWISE ALLOWED. THE ENTIRE ASSEMBLY, INCLUDING ELASTOMERIC SEAL, SHALL BE PAID FOR AS ITEM 561.110, PREFABRICATED EXPANSION JOINT, TYPE A (F).

(2) SPLICES FOR EXPANSION JOINT STEEL SHALL DEVELOP FULL STRENGTH.

(3) THE EXPANSION JOINT SHALL BE PRESET TO THE TEMPERATURE ANTICIPATED AT THE TIME OF INSTALLATION. FINAL SETTING IN THE FIELD SHALL BE DETERMINED BY THE CONTRACT ADMINISTRATOR (SEE TEMPERATURE ADJUSTMENT TABLE).

(4) ELASTOMERIC STRIP SEAL SHALL BE FURNISHED IN ONE CONTINUOUS LENGTH. NO SPLICES WILL BE ALLOWED.

(5) JOINT SUPPORT PLATES SHALL BE SHOP WELDED TO THE EXPANSION JOINT STEEL AND SHALL BE VERTICAL AFTER THE JOINT ASSEMBLY HAS BEEN ADJUSTED FOR ROADWAY CROSS-SLOPE AND GRADE.

(6) THE EXPANSION JOINT ASSEMBLY SHALL BE INSTALLED ONLY AFTER BOTH ABUTMENTS HAVE BEEN BACKFILLED TO WITHIN 3'-0" OF FINISHED GRADE.

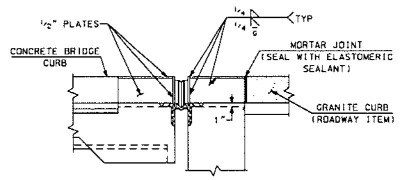
(7) IMMEDIATELY AFTER THE JOINT HAS BEEN SECURED TO THE STRUCTURAL STEEL AND BACKWALL, REMOVE SHIPPING DEVICES AND GRIND SMOOTH ANY WELDS ON EXPOSED SURFACES. REPAIR ANY DAMAGE TO EXPOSED PAINTED SURFACES WITH ZINC-RICH PRIMER, N.H. 1.60.

(8) PROTECT TOP OF EXPANSION JOINT DURING PLACEMENT OF CONCRETE AND BITUMINOUS PAVEMENT.

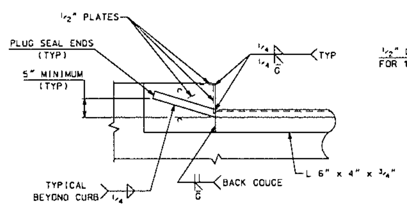
(9) THE ELASTOMERIC STRIP SEAL SHALL HAVE A MINIMUM RANGE OF MOVEMENT OF XX INCHES.

(10) NO "LOW PROFILE" STEEL EXTRUSIONS SHALL BE ALLOWED.

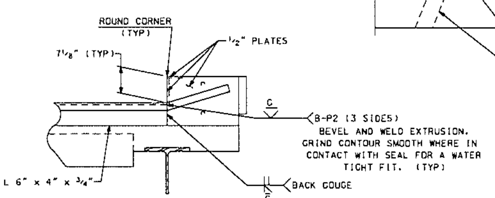
(11) ELEVATIONS SHOWN AT TOP OF ANGLES ARE $^1/_8$" LOWER THAN PROPOSED FINISHED ROADWAY GRADE.



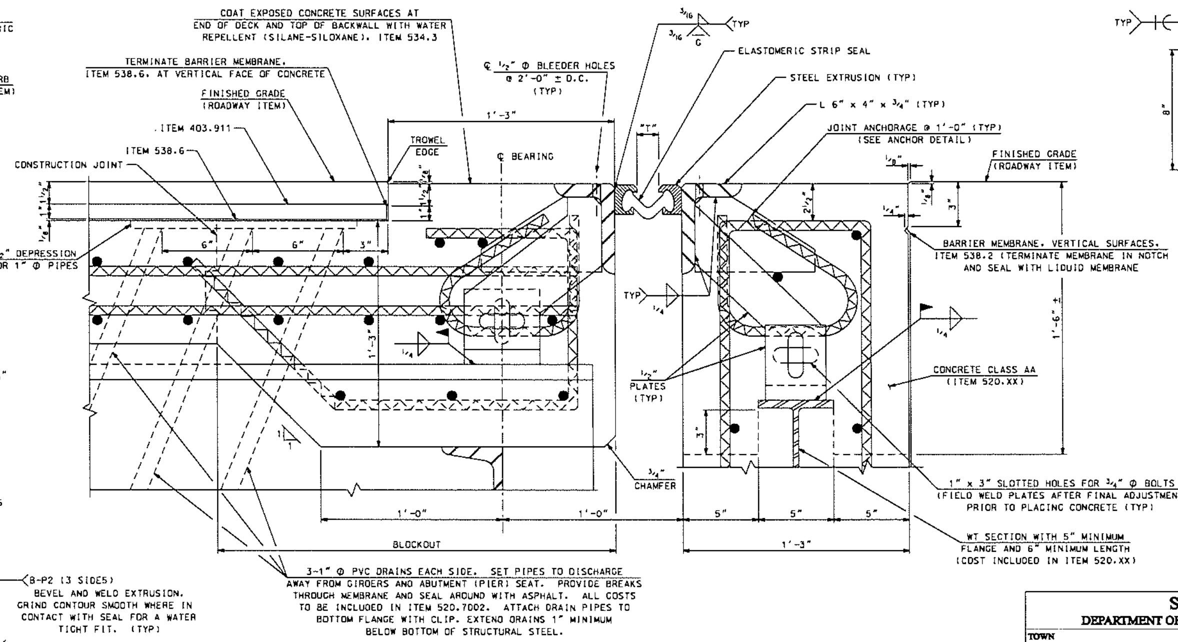
SECTION B-B
SCALE: $^3/_4$" = 1'-0"



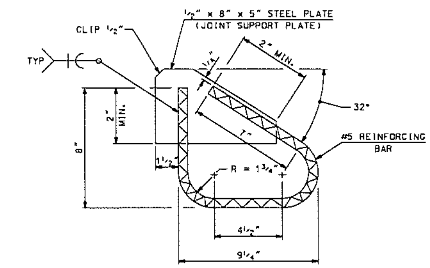
SECTION C-C
SCALE: $^3/_4$" = 1'-0"



SECTION D-D
SCALE: $^3/_4$" = 1'-0"



SECTION A-A
SCALE: 3" = 1'-0"



ANCHOR DETAIL
SCALE: 3" = 1'-0"

TEMPERATURE ADJUSTMENT TABLE

TEMPERATURE	"T"
15°F	X"
30°F	X"
45°F	X"
60°F	X"
75°F	X"
90°F	X"

"T" DIMENSIONS ARE PERPENDICULAR TO FACE OF BACKWALL

SUBDIRECTORY	DGN LOCATOR	SHEET SCALE
English/EXP-JTS	TYPE A-90	AS NOTED

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION * BUREAU OF BRIDGE DESIGN

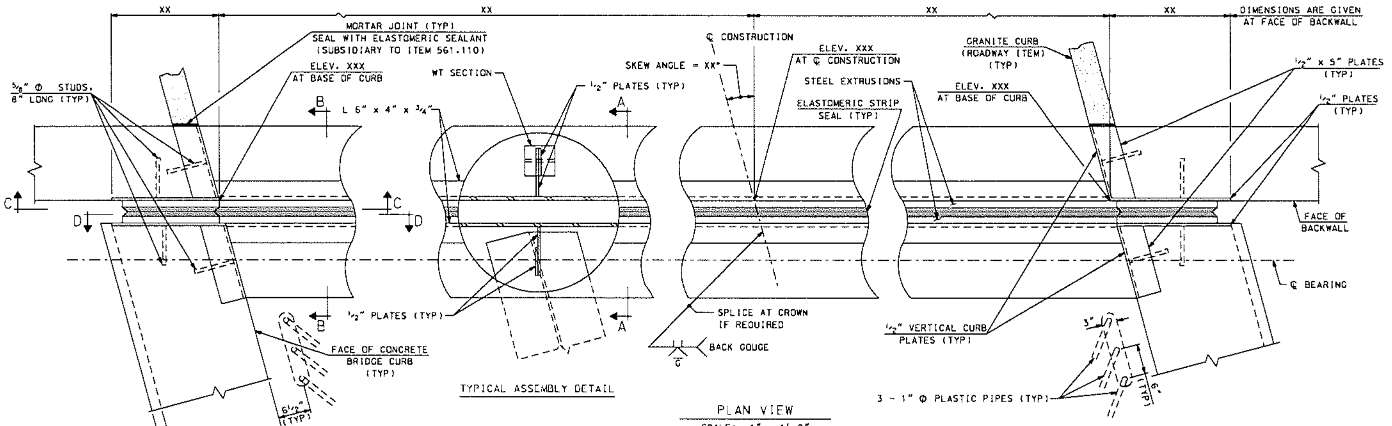
TOWN | BRIDGE NO. | STATE PROJECT
LOCATION

STRIP SEAL EXPANSION JOINT (NORMAL CROSSING)

REVISIONS AFTER PROPOSAL

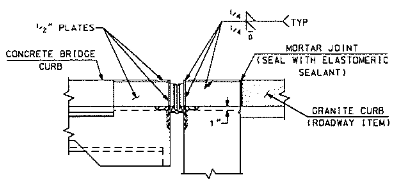
	BY	DATE		BY	DATE
DESIGNED	NHDOT		CHECKED	NHDOT	6/92
DRAWN	PJP	7/07	CHECKED	ACJ	7/07
QUANTITIES			CHECKED		
ISSUE DATE			FEDERAL PROJECT NO.	SHEET NO.	
REV. DATE					

BRIDGE SHEET OF
FILE NUMBER
TOTAL SHEETS



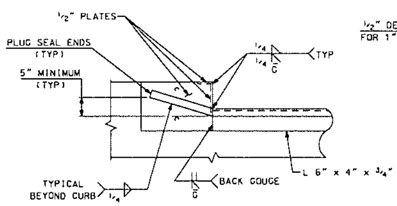
PLAN VIEW

SCALE: 1" = 1'-0"



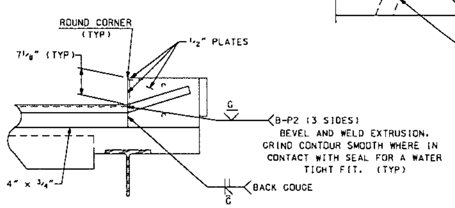
SECTION B-B

SCALE: $^{3}/_{4}$" = 1'-0"



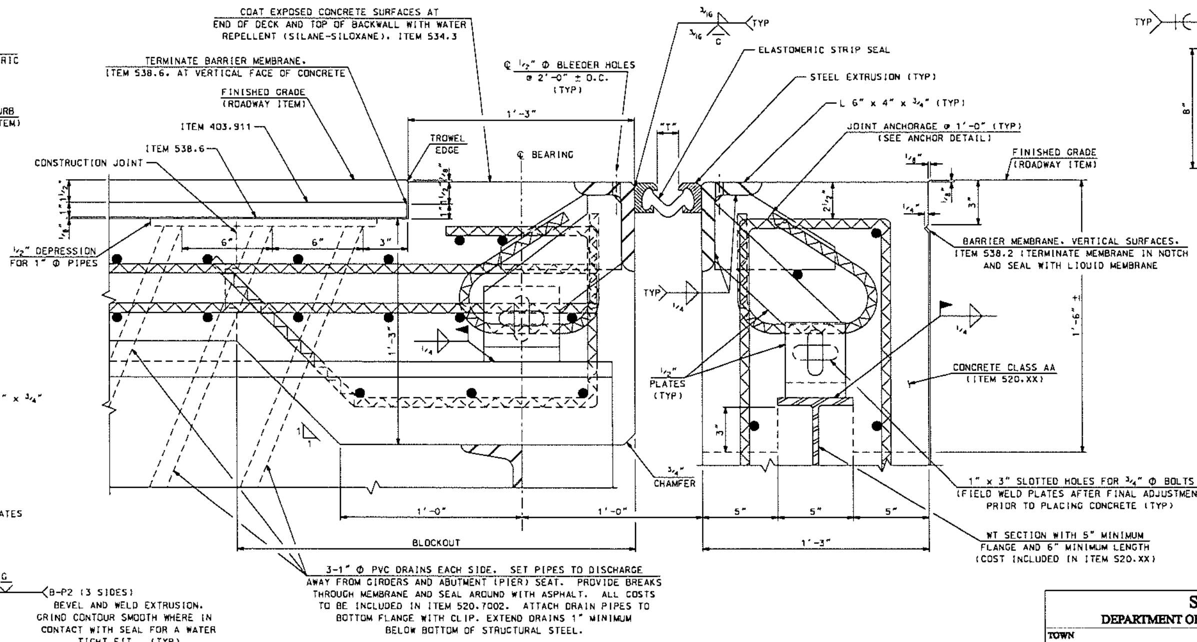
SECTION C-C

SCALE: $^{3}/_{4}$" = 1'-0"



SECTION D-D

SCALE: $^{3}/_{4}$" = 1'-0"



SECTION A-A

SCALE: 3" = 1'-0"

EXPANSION JOINT NOTES

(1) EXPANSION JOINT STEEL SHALL BE AASHTO M270 GRADE 50W (ASTM A709 GRADE 50W), EXCEPT AS OTHERWISE ALLOWED. THE ENTIRE ASSEMBLY, INCLUDING ELASTOMERIC SEAL, SHALL BE PAID FOR AS ITEM 561.110, PREFABRICATED EXPANSION JOINT, TYPE A (F).

(2) SPLICES FOR EXPANSION JOINT STEEL SHALL DEVELOP FULL STRENGTH.

(3) THE EXPANSION JOINT SHALL BE PRESET TO THE TEMPERATURE ANTICIPATED AT THE TIME OF INSTALLATION. FINAL SETTING IN THE FIELD SHALL BE DETERMINED BY THE CONTRACT ADMINISTRATOR (SEE TEMPERATURE ADJUSTMENT TABLE).

(4) ELASTOMERIC STRIP SEAL SHALL BE FURNISHED IN ONE CONTINUOUS LENGTH. NO SPLICES WILL BE ALLOWED.

(5) JOINT SUPPORT PLATES SHALL BE SHOP WELDED TO THE EXPANSION JOINT STEEL AND SHALL BE VERTICAL AFTER THE JOINT ASSEMBLY HAS BEEN ADJUSTED FOR ROADWAY CROSS-SLOPE AND GRADE.

(6) THE EXPANSION JOINT ASSEMBLY SHALL BE INSTALLED ONLY AFTER BOTH ABUTMENTS HAVE BEEN BACKFILLED TO WITHIN 3'-0" OF FINISHED GRADE.

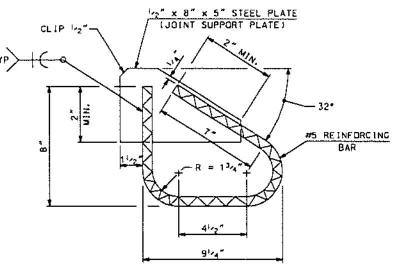
(7) IMMEDIATELY AFTER THE JOINT HAS BEEN SECURED TO THE STRUCTURAL STEEL AND BACKWALL, REMOVE SHIPPING DEVICES AND GRIND SMOOTH ANY WELDS ON EXPOSED SURFACES. REPAIR ANY DAMAGE TO EXPOSED PAINTED SURFACES WITH ZINC-RICH PRIMER, N.H. 1.60.

(8) PROTECT TOP OF EXPANSION JOINT DURING PLACEMENT OF CONCRETE AND BITUMINOUS PAVEMENT.

(9) THE ELASTOMERIC STRIP SEAL SHALL HAVE A MINIMUM RANGE OF MOVEMENT OF XX INCHES.

(10) NO "LOW PROFILE" STEEL EXTRUSIONS SHALL BE ALLOWED.

(11) ELEVATIONS SHOWN AT TOP OF ANGLES ARE $^{1}/_{8}$" LOWER THAN PROPOSED FINISHED ROADWAY GRADE.



ANCHOR DETAIL

SCALE: 3" = 1'-0"

TEMPERATURE ADJUSTMENT TABLE	
TEMPERATURE	"T"
15°F	X"
30°F	X"
45°F	X"
60°F	X"
75°F	X"
90°F	X"

"T" DIMENSIONS ARE PERPENDICULAR TO FACE OF BACKWALL

STATE OF NEW HAMPSHIRE

DEPARTMENT OF TRANSPORTATION • BUREAU OF BRIDGE DESIGN

TOWN | BRIDGE NO. | STATE PROJECT

LOCATION

STRIP SEAL EXPANSION JOINT (SKEWED LEFT)

REVISIONS AFTER PROPOSAL		BY	DATE		BY	DATE
	DESIGNED	NHDOT		CHECKED	NHDOT	6/92
	DRAWN	PJP	7/07	CHECKED	ACJ	7/07
	QUANTITIES			CHECKED		
	ISSUE DATE					
	REV. DATE					

BRIDGE SHEET OF | FILE NUMBER | FEDERAL PROJECT NO. | SHEET NO. | TOTAL SHEETS

SUBDIRECTORY	.DGN LOCATOR	SHEET SCALE
English/EXP-JTS	TYPE A-LT	AS NOTED

EXPANSION JOINT NOTES

(1) EXPANSION JOINT STEEL SHALL BE AASHTO M270 GRADE 50W (ASTM A709 GRADE 50W), EXCEPT AS OTHERWISE ALLOWED. THE ENTIRE ASSEMBLY, INCLUDING ELASTOMERIC SEAL, SHALL BE PAID FOR AS ITEM 561.110, PREFABRICATED EXPANSION JOINT, TYPE A (F).

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(6) THE EXPANSION JOINT ASSEMBLY SHALL BE INSTALLED ONLY AFTER BOTH ABUTMENTS HAVE BEEN BACKFILLED TO WITHIN 3'-0" OF FINISHED GRADE.

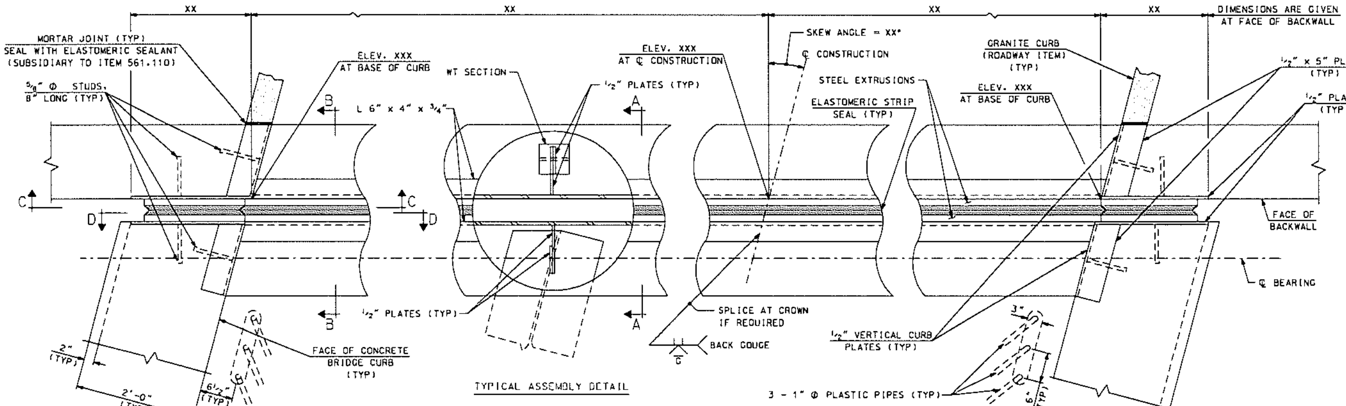
(7) IMMEDIATELY AFTER THE JOINT HAS BEEN SECURED TO THE STRUCTURAL STEEL AND BACKWALL, REMOVE SHIPPING DEVICES AND GRIND SMOOTH ANY WELDS ON EXPOSED SURFACES. REPAIR ANY DAMAGE TO EXPOSED PAINTED SURFACES WITH ZINC-RICH PRIMER, N.H. 1.60.

(8) PROTECT TOP OF EXPANSION JOINT DURING PLACEMENT OF CONCRETE AND BITUMINOUS PAVEMENT.

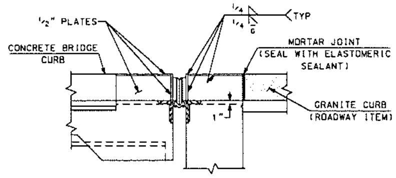
(9) THE ELASTOMERIC STRIP SEAL SHALL HAVE A MINIMUM RANGE OF MOVEMENT OF XX INCHES.

(10) NO "LOW PROFILE" STEEL EXTRUSIONS SHALL BE ALLOWED.

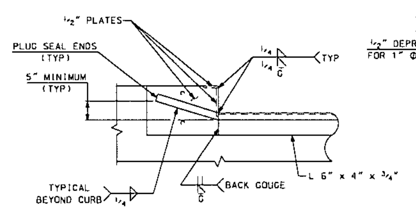
(11) ELEVATIONS SHOWN AT TOP OF ANGLES ARE 1/8" LOWER THAN PROPOSED FINISHED ROADWAY GRADE.



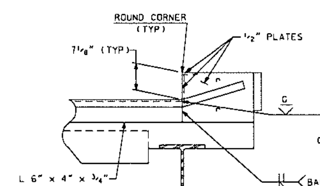
PLAN VIEW
SCALE: 1" = 1'-0"



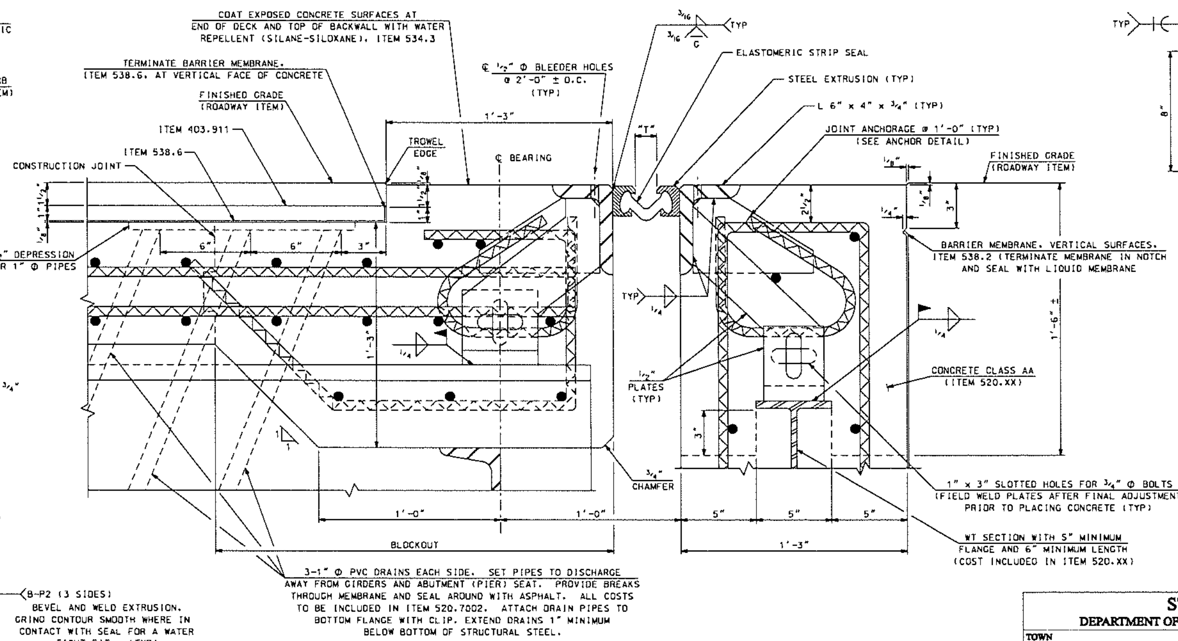
SECTION B-B
SCALE: 3/4" = 1'-0"



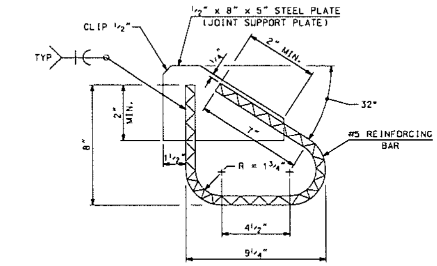
SECTION C-C
SCALE: 3/4" = 1'-0"



SECTION D-D
SCALE: 3/4" = 1'-0"



SECTION A-A
SCALE: 3" = 1'-0"



ANCHOR DETAIL
SCALE: 3" = 1'-0"

TEMPERATURE ADJUSTMENT TABLE

TEMPERATURE	"T"
15°F	X"
30°F	X"
45°F	X"
60°F	X"
75°F	X"
90°F	X"

"T" DIMENSIONS ARE PERPENDICULAR TO FACE OF BACKWALL

SUBDIRECTORY	.DGN LOCATOR	SHEET SCALE
English/EXP-JTS	TYPE A-RT	AS NOTED

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION • BUREAU OF BRIDGE DESIGN

TOWN | BRIDGE NO. | STATE PROJECT
LOCATION

STRIP SEAL EXPANSION JOINT (SKEWED RIGHT)

REVISIONS AFTER PROPOSAL		BY	DATE		BY	DATE
	DESIGNED	NHDOT		CHECKED	NHDOT	6/92
	DRAWN	PJP	7/07	CHECKED	ACJ	7/07
	QUANTITIES			CHECKED		
	ISSUE DATE					
	REV. DATE					

BRIDGE SHEET OF | FILE NUMBER | FEDERAL PROJECT NO. | SHEET NO. | TOTAL SHEETS

641 Expansion Joints

641.1 General

The use of expansion joints should be avoided if possible. Plow plates will not be allowed.

641.2 Typical Sections

641.2.1 Elastomeric Plug Joint

The elastomeric plug joint system should be the preferred joint when joints are required on a bridge. See Plate 641.2a (641.2b) for the limitations on using the plug joint system.

641.2.2 Strip Seal

The strip seal joint system is less expensive than the finger joint and allows movements up to 75 mm (3 in.). The strip seal has limitations concerning snow removal operations. Plow plates will not be allowed on the strip seal joint system. See Plate 641.2a (641.2b) for the limitations on using the strip seal joint system.

641.2.3 Finger Joint

The finger joint-elastomeric trough system should be considered as an alternative to the strip seal where large movements are involved.

The finger joint-elastomeric trough system should be used when there are large movements (greater than 75 mm (3 in.)) and the skew angle is 25° or greater, in order to prevent the snowplows from catching the expansion joint. See Plate 641.2a (641.2b) for the limitations on using the finger joint-elastomeric trough system. Minimum finger overlap should be 50 mm (2 in.). The minimum joint opening (maximum design temperature) in the longitudinal direction should be 25 mm (1 in.). Bicycle safety needs to be considered when using this joint.

641.2.4 Modular Joint

The modular joint system is an alternative to the finger joint which accommodates movements greater than 75 mm (3 in.). The modular joint system has limitations concerning snow removal operations. Plow plates will not be allowed on the modular joint system. See Plate 641.2a (641.2b) for the limitations on using the modular joint system.

641.3 Materials

641.3.1 Steel

Typical designs should be based on a Fy of 250 MPa (36,000 psi) with the use of AASHTO M 270M Grade 250 (M 270 Grade 36).

641.3.2 Coating

All expansion joints, except for elastomeric plug joints, should be required to be painted with one coat of approved zinc-rich primer (all strip seal and modular assemblies) or galvanized (finger joint assemblies).

641.3.3 Anchorage

Anchorages to the backwall and deck (between curbs) should be made using rebar and should be spaced at 300 mm (1'-0") maximum. Brush curb and sidewalk anchorages should be made of stud anchors and should be spaced at 450 mm (1'-6") maximum. The anchorage reinforcement should extend into the backwall or curb reinforcement cage for proper anchorage.

641.4 Guidelines for Design

Expansion joints should be eliminated if possible with the use of integral or semi-integral abutment design. See 613.5 for more information.

The guidelines on Plate 641.2a (641.2b) are working guidelines and meant to be flexible. Adjustments to these guidelines are to be made as experience is gained and new technology becomes available.

641.4.1 Temperature Range

Expansion joints should be designed to accommodate a temperature range from -35°C to +50°C (-30°F to +120°F) in steel girder bridges and -18°C to +27°C (0°F to +80°F) in concrete girder bridges.

641.4.2 Mid-Point

Set expansion joints at the mid-point of the temperature range at 8°C (45°F).

For strip seals, check the manufacturer's minimum installation width against the set temperature range; an adjustment of the mid-point may be required.

641.4.3 Abutment Tip

In addition to the amount of movement required for temperature, some provision should be made for possible abutment tip. For each 3 m (10 ft.) of height allow 6 mm (1/4 in.) for rotation, or more for unusual conditions (for example lateral squeeze). Provisions for abutment tip do not need to be included in bridge rehabilitation projects.

641.4.4 Joint Location

Bridges should be designed to avoid placement of expansion joints over piers whenever possible. If an expansion joint is required at a pier, the finger joint-elastomeric trough system should be used.

On continuous spans, the pier can be fixed to allow the use of elastomeric joints at the abutments.

641.4.5 Located on the High End

The expansion joint should typically be located on the high end of the bridge.

On a one-way bridge, the expansion joint should be located on the departure end.

Provide PVC drains at all expansion joints, including plug joints when the joint is located at the low end.

641.4.6 Concrete Apron

The top of expansion joints should be set flush with a concrete apron on each side of the joint. The top surface of the joint and concrete apron should be set 3 mm (1/8 in.) below finished grade. For joints where the asphalt-wearing course comes in contact with the steel edge beam (usually a channel or angle), the edge of the top flange of the beam will be chamfered to provide an inclined surface to guide snowplows up and across the joint (See standard detail sheet for more information.).

641.4.7 Trough Slope

Finger joint troughs should have a minimum slope of 3 mm per 100 mm (3/8 in. per ft.).

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION - BUREAU OF BRIDGE DESIGN

DESCRIPTION:	DATE ISSUED: 10-1-00	REVISED:
Expansion Joint Guidelines (Metric)	PLATE: 641.2a	

EXPANSION JOINT GUIDELINES

Length of bridge element contributing to movement		**Skew**	**Expansion joint required**
Steel	Concrete		
< 25 m	< 42 m	all	none [2]
25 - 42 m	42-55 m	0 - 25°	elastomeric plug joint
25 - 42 m	42-55 m	>25° right ahead [3]	strip seal, finger joint
		>25° left ahead	finger joint
> 42 m	> 55 m	0-25° >25° right ahead [3]	strip seal, modular or finger joint
> 42 m	>55 m	>25° left ahead	finger joint

1. Avoid any joint if at all possible.
2. Cracks in the bituminous pavement at ends of the bridge should be checked every year and sealed as required.
3. Applies only if the road is for two-way traffic.
4. Skew limitations for strip seals and modular joints are established so as to avoid conflict with the angle of snowplow blades.
5. Skew limitations for plug joints are a function of material performance.

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION - BUREAU OF BRIDGE DESIGN

DESCRIPTION:	DATE ISSUED: 10-1-00	REVISED:
Expansion Joint Guidelines (English)	PLATE: 641.2b	

EXPANSION JOINT GUIDELINES

Length of bridge element contributing to movement		Skew	Expansion joint required
Steel	Concrete		
< 80 feet	< 140 feet	all	none [2]
80 - 140 feet	140-180 feet	0 - 25°	elastomeric plug joint
80 - 140 feet	140-180 feet	>25° right ahead [3]	strip seal, finger joint
		>25° left ahead	finger joint
> 140 feet	> 180 feet	0-25° >25° right ahead [3]	strip seal, modular or finger joint
> 140 feet	>180 feet	>25° left ahead	finger joint

1. Avoid any joint if at all possible.
2. Cracks in the bituminous pavement at ends of the bridge should be checked every year and sealed as required.
3. Applies only if the road is for two-way traffic.
4. Skew limitations for strip seals and modular joints are established so as to avoid conflict with the angle of snowplow blades.
5. Skew limitations for plug joints are a function of material performance.