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Synthesis of Bridge Approach Panels Best Practices

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April 2013

Research Project
Final Report 2013-09

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An increasing number of integral and semi-integral abutment bridges are being built in Minnesota. A standard E8 expansion joint consisting of a 4.5 in (114 mm) piece of foam filler placed in a 4 in (102 mm) wide opening is typically provided at the joint between the approach panel and pavement. This joint has not performed well often failing within a year of service. This research project was primarily a synthesis study of other states' practices for the expansion joint.

A detailed study of the following agencies' practices was conducted: Wisconsin, South Dakota, Iowa, Michigan, Ohio, Kansas, and Ontario, Canada. There were substantial differences between all of the practices and none easily adaptable to Minnesota. For instance, Minnesota, unlike the other states studied, does not permit deck drains on its bridges for environmental reasons. Most of the agencies seemed satisfied with their current practices. Four out of the seven agencies used strip seals in one form or another. Only one (Iowa) still uses the same foam filler as Minnesota, although others had in the past. The Iowa detail involves doweled bars across the joint and a different approach slab detail.

In order to measure the actual movement at the joints, sensors were installed on several bridges and recorded displacement and temperature for a period of one to two years.

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Minnesota State University Mankato undergraduate students Michael Burdorf, Nripendra Bastola, and Ebrima Jaiteh participated in downloading data and taking readings at the bridge sites often in extremely cold weather.

Members of the Technical Advisory Panel:

- Paul Rowekamp, MnDOT Bridge Office, technical liaison
- Mark Spafford, MnDOT Bridge Office
- Thomas Villar, MnDOT
- Ronald Mulvaney, MnDOT
- Scott Morgan, MnDOT District 7
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Executive Summary

An increasing number of integral and semi-integral abutment bridges are being built in Minnesota. A standard E8 expansion joint consisting of a 4.5 in (114 mm) piece of Evazote foam filler placed in a 4 in (102 mm) wide opening is typically provided at the joint between the approach panel and pavement. This joint has not performed well often failing within a year of service. This research project was primarily a synthesis study of other states' practices for the expansion joint.

A detailed study of the following agencies' practices was conducted: Wisconsin, South Dakota, Iowa, Michigan, Ohio, Kansas, and Ontario, Canada. There were substantial differences between all of the practices and none easily adaptable to Minnesota. For instance, Minnesota, unlike the other states studied, does not permit deck drains on its bridges for environmental reasons. This can complicate the design of the E8 joint since in many cases rainwater and snow melt from the bridge surface must be carried off either end of the bridge, over the E8 joint. Thus, the requirement to carry water over the joint at the gutter line renders some of the designs and details used by other agencies impractical or unusable. Most of the agencies seemed satisfied with their current practices. Four out of the seven agencies used strip seals in one form or another. Only one (Iowa) still uses Evazote, although others had in the past. The Iowa detail involves doweled bars across the joint and a different approach slab detail.

To measure the actual movements at the joint, four different sensors were installed on bridges. Two of the bridges were single span with one free end and one fixed. The remaining two sensors were used on either end of a two-span bridge. On average, the joint movements were 21% higher than theoretical (assuming coefficient of thermal expansion = 6.5×10^{-6} /°F (11.7×10^{-6} /°C)) for the two-span bridge and 16% lower for the single span bridges. In addition to the large seasonal temperature variation (around 127ºF (71 °C)), substantial daily cycles (around 46ºF (26 °C) maximum and 21ºF (12 °C) average) were seen. There was no significant friction effect from the approach slabs.

The overall recommendation from this project is to consider the use of strip seals for new construction even though this would require construction of an additional 20 ft (6 m) or more of barrier on both ends (4 corners). This type of expansion joint has performed relatively well in Minnesota for parapet-type abutments. For maintenance of existing bridges, a compression seal or Sealtite/Polytite filler may be considered; however, it is recommended to calculate expected movement and follow manufacturer's recommendations when sizing the joint and selecting the size. It might also be worthwhile to build a test installation similar to that proposed by Iowa DOT, including the use of a doweled expansion joint with Evazote.

Chapter 1. Introduction

1.1 Problem Statement

Making a smooth transition from a pavement to a bridge deck has traditionally been somewhat of a challenge because the pavement side is relatively susceptible to settlement while the bridge deck is not. Commonly, a concrete slab known as an approach panel is provided between the pavement and bridge deck. In order to account for movement of the bridge, primarily due to temperature fluctuations, an expansion joint is provided. In the case of integral and semi-integral abutment bridges, this joint is provided between the approach panel and pavement. Minnesota has been using an "E8" Expansion Joint detail at this location; however, there have been numerous reports of poor performance of this detail and premature failure. The main objective of this study was to look at a few neighboring states and/or states with similar climactic conditions and to try to identify any best practices for the expansion joint detail.

1.2 Various Types of Abutments

Minnesota's traditional type of abutment is the parapet-type abutment (Fig. 1). Here the beams rest on bearings sitting on the abutment. There is no rigid connection between the approach panel and the abutment. Older designs had a tie between the approach panel and sleeper slab; however there were some instances when the back wall of the abutment cracked and subsequently the rigid tie was abandoned. The major movements occur between the deck and the abutment end block and a strip seal (a v-shaped rubber gland) is provided here. Relatively little movement is expected between the approach panel and the abutment end block or between the approach panel and the pavement and an E8 expansion joint is used at this location. Overall, the performance of both the strip seal and E8 joint has been relatively good for these types of bridges. A drawback of this type of abutment is a maintenance issue when moisture leaks through the joint to the bearings.

A newer type of abutment is the integral abutment (Fig. 2). An advantage of this design is that there are no bearings and no joints at the abutment location. The approach panel is tied into the abutment. The abutment is supported by a single row of piles oriented such that longitudinal movements of the bridge will be accommodated by the piles bending about their weak axis. Note that the effective length for thermal movement is increased by the length of the approach panels (typically 20 ft (6 m)) at both ends. The integral abutment bridge may not be practical for long spans or high skew situations.

Another type of abutment is the semi-integral abutment (Fig. 3). In this design, only the back wall portion of the substructure is directly connected with the superstructure. The beams still rest on bearings (similar to parapet-type); however, there is no joint over the abutment (similar to integral). Once again, the effective length for thermal movement is increased by the length of the approach panels. This design could accommodate larger spans and higher skews than the integral abutment.

MnDOT prefers integral and/or semi-integral bridges over the parapet type for spans that are less than 300 ft (91 m). The current E8 expansion joint detail between the approach panel and pavement has not performed well for the integral and semi-integral bridges.

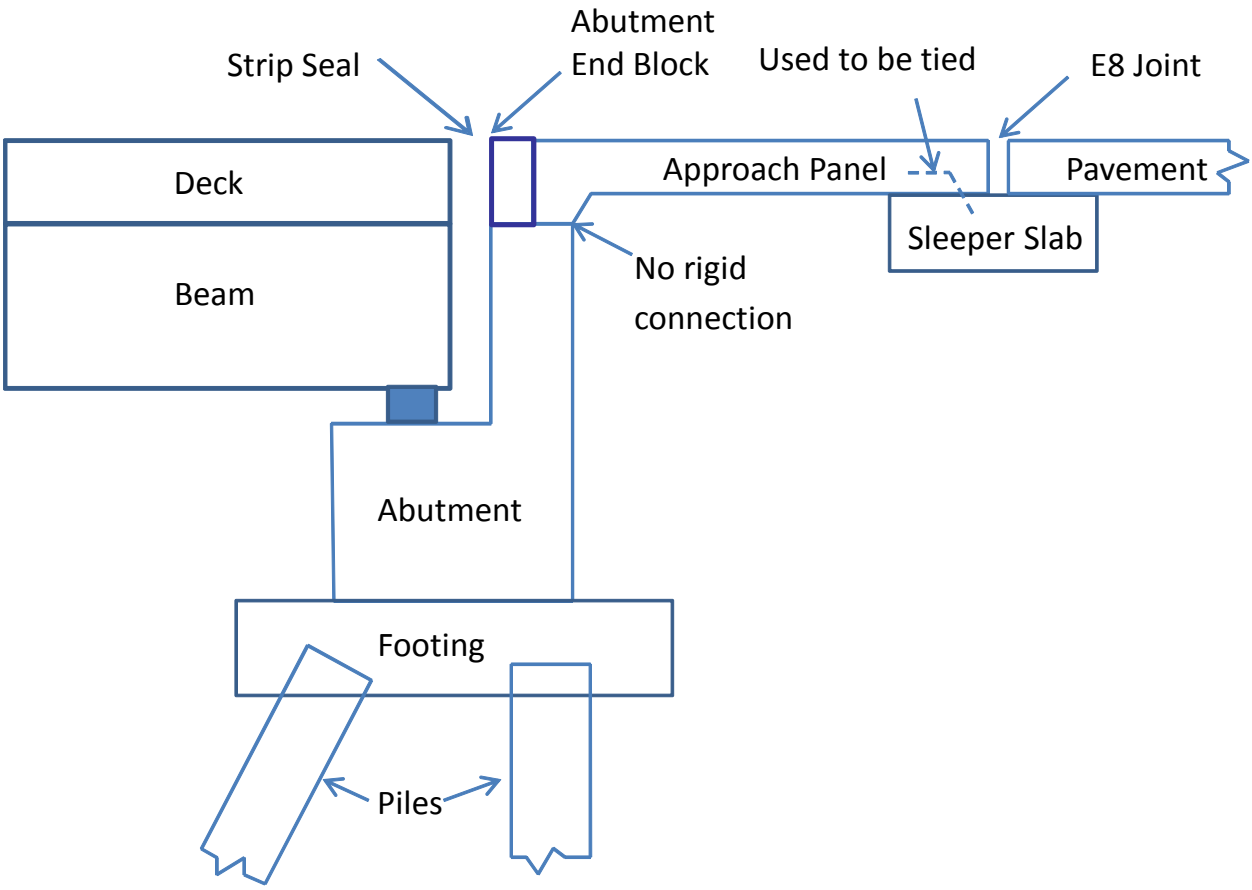


Figure 1: Schematic details of a parapet-type abutment.

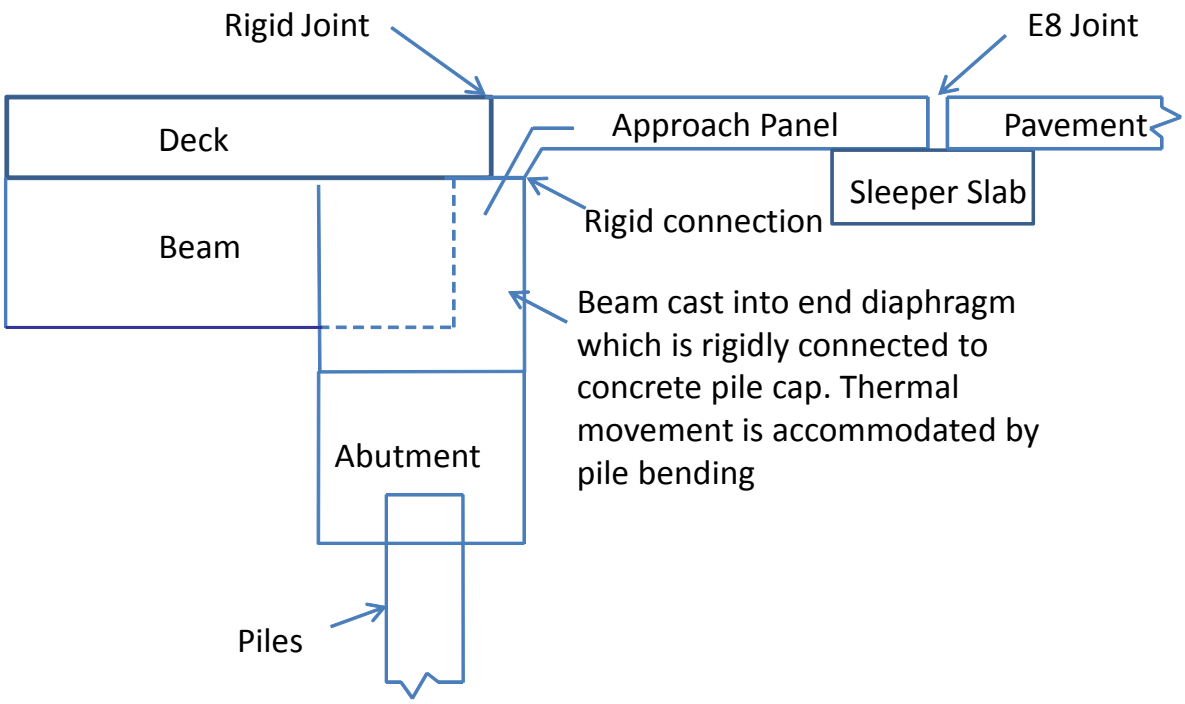


Figure 2: Schematic details of an integral abutment.

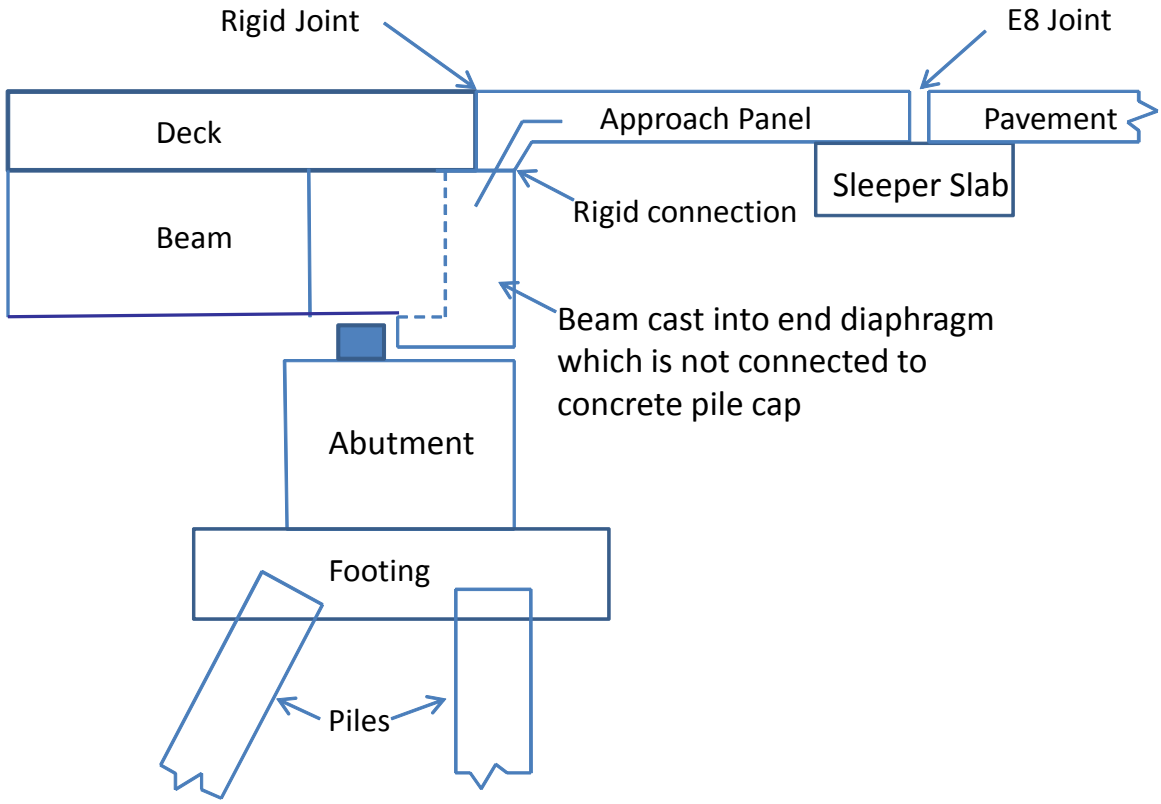


Figure 3: Schematic details of a semi-integral abutment.

1.3 Minnesota Approach Panel and E8 Expansion Joint

The standard MnDOT approach panel is a 20 ft (6 m) long 12 in (305 mm) thick concrete slab (Fig. 4). It is tied to the abutment with rebar for jointless (integral & semi-integral abutment) bridges and sits on a bond breaker for 2 ft (0.6 m) on a concrete sill at the other end.

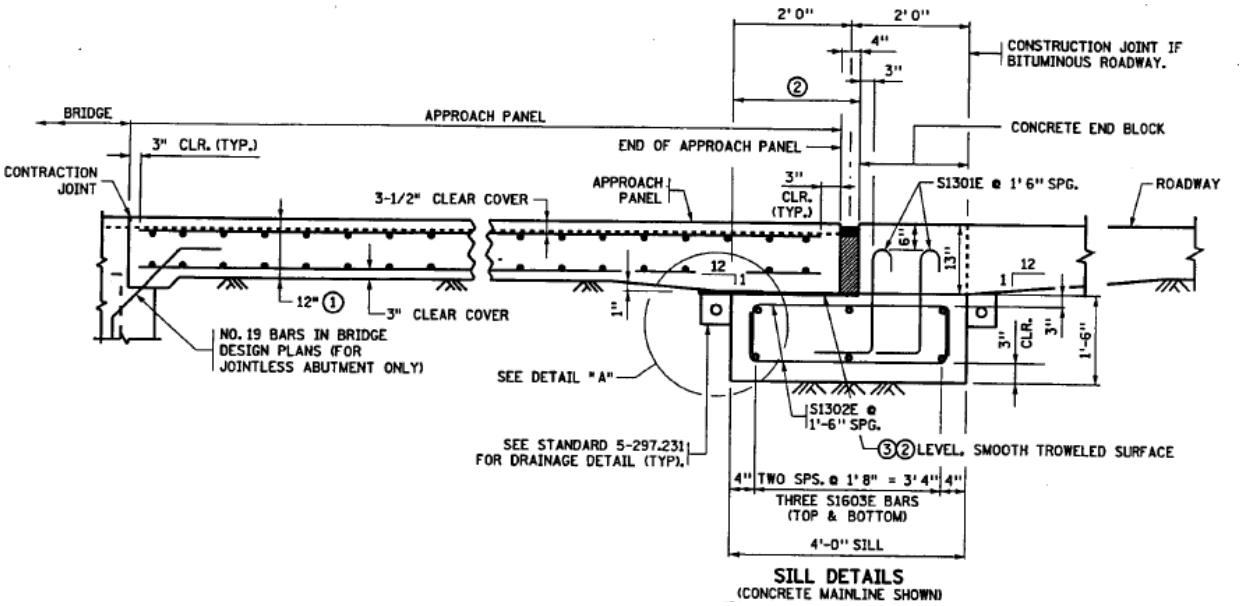


Figure 4: MnDOT approach panel details.

The pavement is tied to the other side of the concrete sill away from the bridge. The details of this connection are shown in Fig. 5 for both concrete and asphalt roadways. Minnesota uses an E8 expansion joint at this location. Temperature movements for the bridge length plus the approach slab length must be accommodated at this expansion joint. The E8 joints are sawed or formed 4 in (102 mm) wide by the full depth of the panel. The joint filler material consists of a high density foam product (Evazote) which is 4.5 in (114 mm) wide by 8 in (203 mm) deep. For installation, the inside walls of the joint are painted with lubricant adhesive, the bottom of the filler material is pinched together and walked down into the joint using a sledgehammer and a 2 x 4 to a depth of 7/8 in (22 mm) below the concrete surface. A ½ in (13 mm) depth of hot pour sealant is then placed to seal the joint.

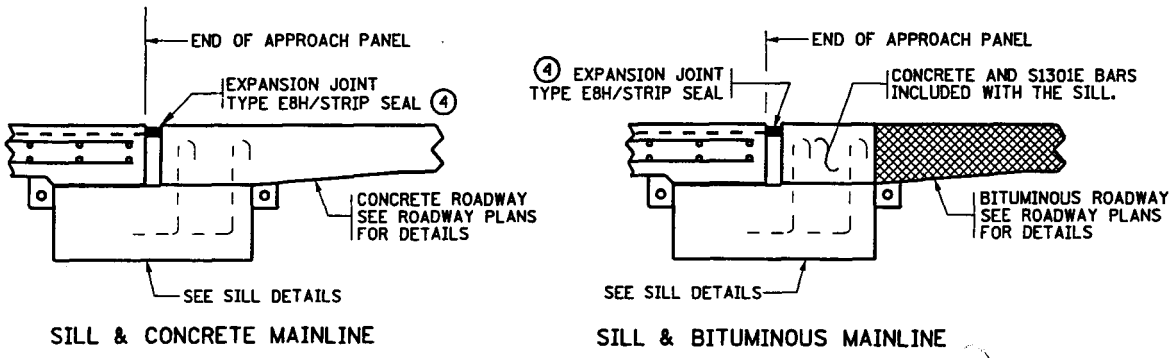


Figure 5: Approach slab to roadway connection details.

MnDOT has been observing premature failure at these expansion joints leading to costly maintenance. In the winter time, as the bridge contracts and moves away from the pavement, the thin asphalt joint seal may break and the adhesive holding the foam filler may fail. Typical failures of E8 expansion joints are shown in Fig. 6.

Figure 6: Failures of E8 expansion joints.

Chapter 2. Review of Literature

2.1 NCHRP Synthesis 319

NCHRP Synthesis 319 Bridge Deck Joint Performance report [1] was published in 2003. It surveyed all the states in the U.S. and Canadian provinces. There was no perfect solution identified. Every joint type had at least some states that had negative experience with it. The joints had service lives of 0-5 years and in some instances 5-10 years. Almost all agencies preferred closed type of joints over open. The authors discussed poured silicone, asphalt plug, open and closed cell compression seal, strip seal, inflatable neoprene (Jeene), cushion seal, and modular joints. The most popular was the strip seal, followed by the compression seal. Most agencies turned the seal up at the ends, some shaped them up the curb, and a few extended the seal at the same slope as the roadway. Some of the recommendations that came out of the report were:

1. Preventive maintenance. Although only 10 states had a joint maintenance program, most felt that it would be cost effective. Among the tasks would be to wash the deck, remove debris from the joints, and to make small repairs.
2. Use a concrete blockout for example as shown in Fig. 7. Sawing is better than forming for these. It is easier to control the joint width and shape when the blockout is cast after the deck is cast. More expensive materials e.g. polymer concrete could be used in the blockout.
3. Bond the joint to sound concrete. Clean the walls, remove salt and old concrete. Any armor should be completely supported.
4. Position the seal to match ambient temperature. If you put the seal at midrange on a very hot day, it may not be capable of expanding on a cold day.
5. Construct the proper joint size opening. The joint should be the right size for the deck temperature at which it is measured. Some states allow compression only in their seals for example from 20 to 60%
6. Install joint after placing overlay. Place the overlay across the joint opening, then cut out the blockout.
7. Protect against unusual movement, e.g. embankment pressure, earthquake, and settlement.
8. Follow manufacturer’s recommendations.
9. Avoid splices in premolded expansion seals.
10. Protect against snow plow damage. For example, provided recessed metal plates.

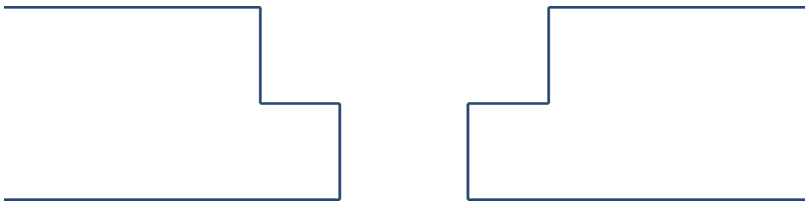


Figure 7: Example of a concrete blockout shape.

2.2 Wisconsin Survey

CTC & Associates, *Concrete Bridge Approach Pavements: A Survey of State Practices*, Wisconsin Department of Transportation, 2010. [2].

A brief survey of state DOTs was conducted consisting of the following questions:

1. What problems has your state experienced with cracking of concrete approach slabs adjacent to skewed bridge decks?
2. Have you had instances of expansion joint failure at concrete approach slabs, and if so, to what extent?
3. Could you please attach or provide a link to your agency's designs or specifications on concrete bridge approach pavements?
4. What is the name, phone number and e-mail address of the appropriate person in your agency to talk to about this topic?

Eighteen state DOTs responded to the survey. Key findings were:

- Of 18 respondents, 17 use concrete approach slabs and one (Maryland) does not.
- Of those agencies using approach slabs, 14 (82 percent) reported problems with cracking, two (12 percent) had no problems, and one (6 percent) could not say because of difficulties with inspection.
- Of 14 agencies reporting cracking, eight (57 percent) reported problems in the acute corners of skewed approach slabs, and six (43 percent) said the cracking problem was the same for skewed and nonskewed bridges. Three of 14 agencies (21 percent) said that cracking was a minor problem, and five (36 percent) reported settling or erosion of underlying subgrade soils beneath slabs as a possible cause of cracking.
- Of 17 agencies using approach slabs, 13 (76 percent) use expansion joints. For those agencies using expansion joints, 12 (92 percent) had a problem with joint failure and one (8 percent) did not. For the12 agencies with expansion joint problems, three (25 percent) reported this failure as uncommon and two (17 percent) as not attributable to approach slabs specifically.

Chapter 3. Synthesis of Other States' Practices

During the initial startup meeting for the project it was decided that rather than do a blanket survey of all states, it would be more useful to do a targeted survey of a few states. A list of agencies was developed based on proximity to Minnesota and/or TAP members' knowledge of the agency. The list included: Wisconsin, South Dakota, Iowa, Kansas, Michigan, Ohio, and Ontario, Canada.

This chapter documents the results of the phone conversations and follow-up emails made with the responsible persons from each agency. Most agencies have differing procedures. Four out of the seven agencies use strip seals in one way or another, two use asphalt concrete joints with a pressure relief joint further away, and only one (Iowa) still uses Evazote although they employ a dowel bar arrangement.

3.1 Wisconsin

For parapet abutments, Wisconsin uses strip seals similar to MnDOT. Typical strip seal joint details at a sidewalk are shown in Fig. 8. For semi-integral abutment bridges Wisconsin has not been attaching the approach panel to the back of the bridge abutment. However, they plan to change their details to require a rigid connection between the approach panel and the bridge abutment (similar to MnDOT) in the near future. For semi-integral abutment bridges, in lieu of an E8 joint Wisconsin has been using a series of three 1.5 in wide doweled expansion joints. Drawing S.D.D. 13 B 2-6 in Appendix B provides additional information. One potential disadvantage of this detail is the movement at each joint may vary, and it adds additional joints that must be maintained. However, it does eliminate the need for a single E8 type joint.

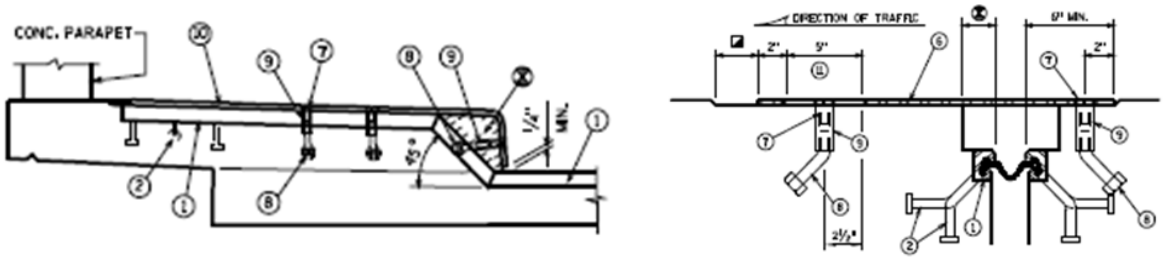


Figure 8: Wisconsin details.

Wisconsin has not done much with compression seals for the last 10 years or with Evazote. It was pointed out that if temperatures have to go down to -30ºF (-34 °C), it is hard to put so much initial compression on the Evazote so that it stays in compression. For the case of compression seals, it was suggested that they could possibly cut from the bottom up to make it less stiff and then work it up into the parapet.

3.2 South Dakota

South Dakota has built integral abutment bridges for many years. They stopped using Evazote a long time ago. They have a 20 ft (6 m) approach slab. On the sleeper slab, they have a hat in the middle (stub of concrete). They use strip seal on the approach panel side. On the other side, if it is asphalt, they run right up against the hat (see Drawing Approach Slab_Asph Pavement in Appendix C). If it is concrete, they have a D.S. Brown compression seal (see Drawing Approach Slab_Conc Pavement). They previously used asphalt plugs but it was a maintenance issue. They use concrete anchors for the strip seal and also armor the edges on both sides. It was indicated that they usually don't have curbs that far out, so it is a flat slab at the joint; however it was noted that D.S. Brown would have a detail for cutting (softening) the seals at the end so that they could be bent. Since they do not need to carry water runoff from the bridge over the joint, they do not need to have the strip seal "kick-up" at the gutter line. Adding a kick-up to their details (without a curb) is likely not possible, and hence problematic for use in Minnesota.

Temperature related bridge movement is taken into account to size the strip seal. The other side (compression seal) is just standard. That accounts for roadway creep. Joints are formed not sawed. Figure 9 shows examples of the sleeper slab, compression seal and strip seal.

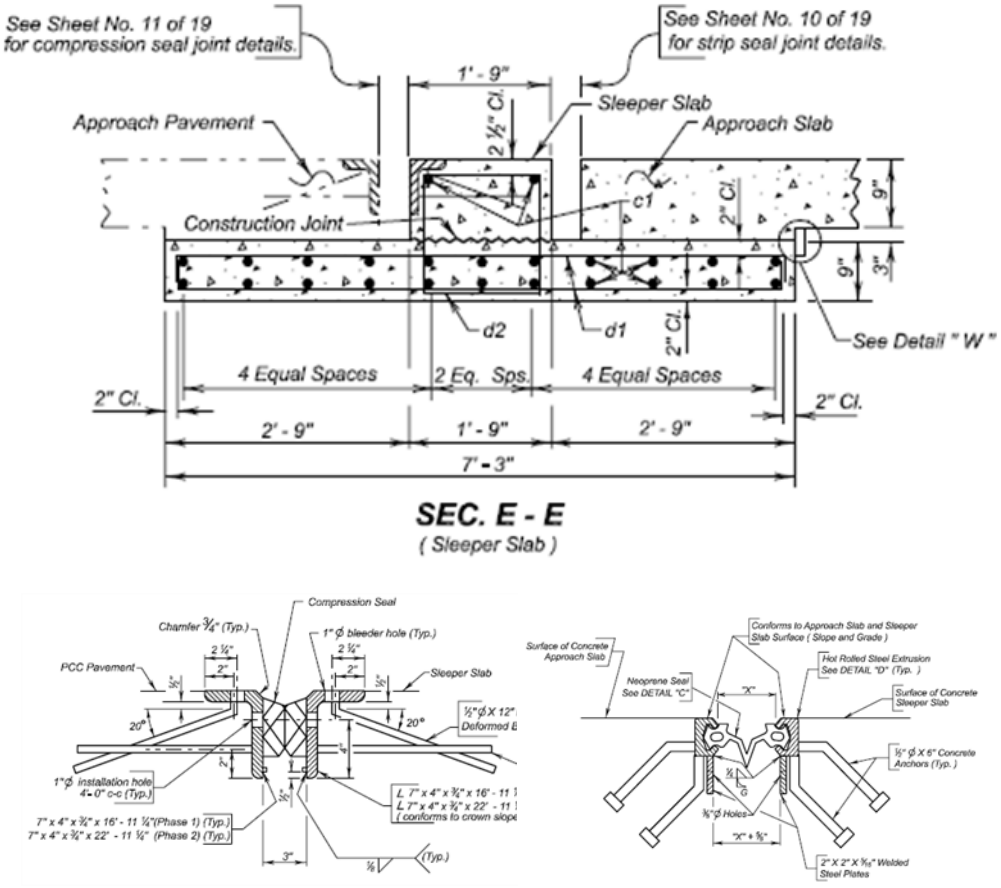


Figure 9: South Dakota details.

3.3 Iowa

Iowa uses doweled expansion joints (Detail EF on Sheet 3 of PV-1 in Appendix D). The filler consists of Evazote sandwiched by ¼ in (6 mm) plywood and with a ½ in (13 mm) joint sealant on top (Detail G on Sheet 3). The standard opening is about 4 in (102 mm). They previously used 2 in (51 mm) spacing but this tended to close up. Dowel bars are bonded on one side and run in a sleeve on the other side alternating by bar (Sheet 4 of PV-1). There is no sleeper beam in this construction (see drawing RK-19B). A 20 ft reinforced concrete section attached to the abutment is followed by two 20 ft (6 m) non-reinforced sections. The expansion joint is at the end of these sections. For the case of HMA pavement it is allowed to run right up against the concrete panels (see drawing RK-19G).

Note also that the curb ends long before the expansion joint location in this design. Iowa has indicated that they are overall happy with the performance. They have tried compression seal before but indicated that they can't keep them in compression and tend to fall out. Figure 10 shows examples of the three 20 ft (6 m) concrete panels and doweled expansion joint.

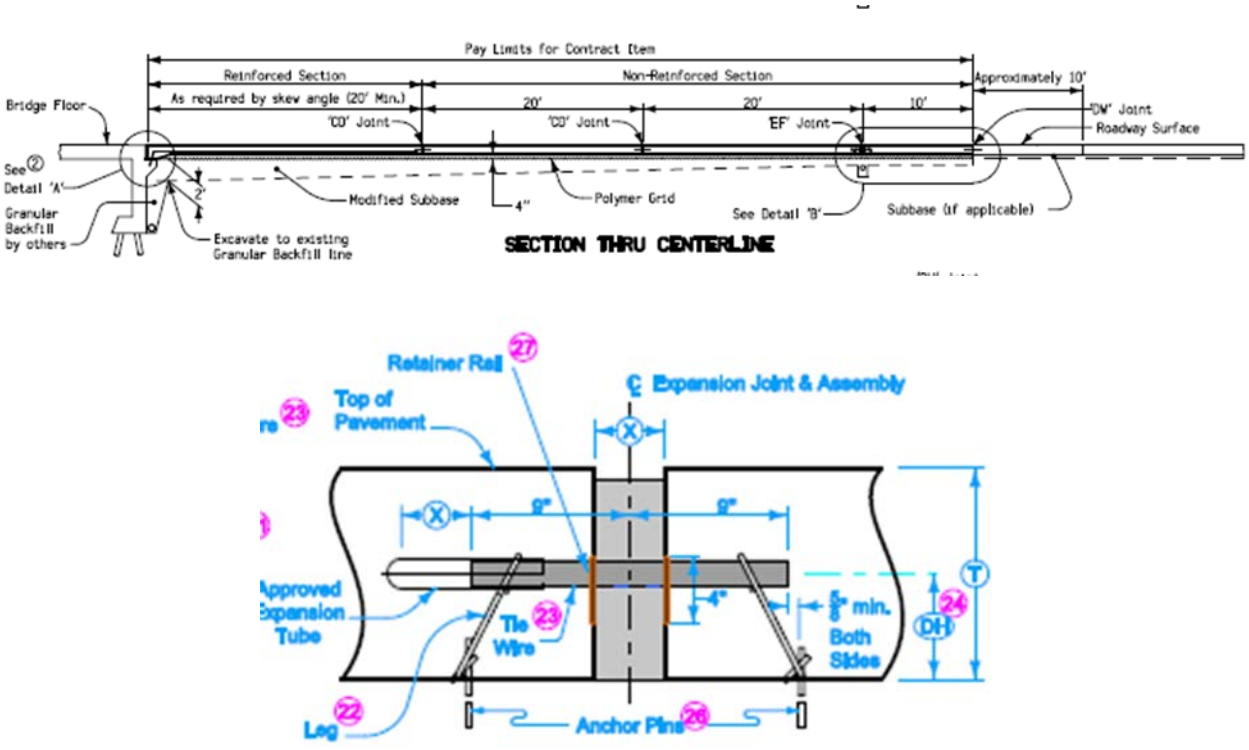


Figure 10: Iowa details.

3.4 Michigan

Michigan uses strip seals for the expansion joints. Drawing 62004 in Appendix E shows the integral abutment details. Drawing 62004B shows the approach slab details. Note that the sleeper beam is "L" shaped for HMA pavement, and "inverted T" shaped for concrete pavement with a bond breaker on the pavement side. Drawing 62004C shows details of the sleeper slab. A strip

seal is used on the approach side and an E3 joint is used on the pavement side (for concrete only).

Drawing EJ3Y shows EJ3 type strip seal with bend details for various end conditions. Drawing EJ4L shows another type of strip seal. In this detail a blockout is made which is filled with elastomeric concrete. Drawing 62905 shows slope details for an EJ3 for parapet, sidewalk, or brush block. Drawing R-39-H (sheet 2 of 4) shows the E3 joint (on the pavement side). It is a 1 in joint consisting of fiber filler, and a polyethylene foam rod, covered by a rubber-asphalt sealant. Michigan indicated that they have not had good luck using compression seals. Figure 11 shows examples of the approach panel and sleeper slab, steel railing bend up into a barrier, and strip seal. Based on their standard drawings, they require that a barrier or sidewalk extend beyond the end of the approach panel to allow the strip seal to kick up.

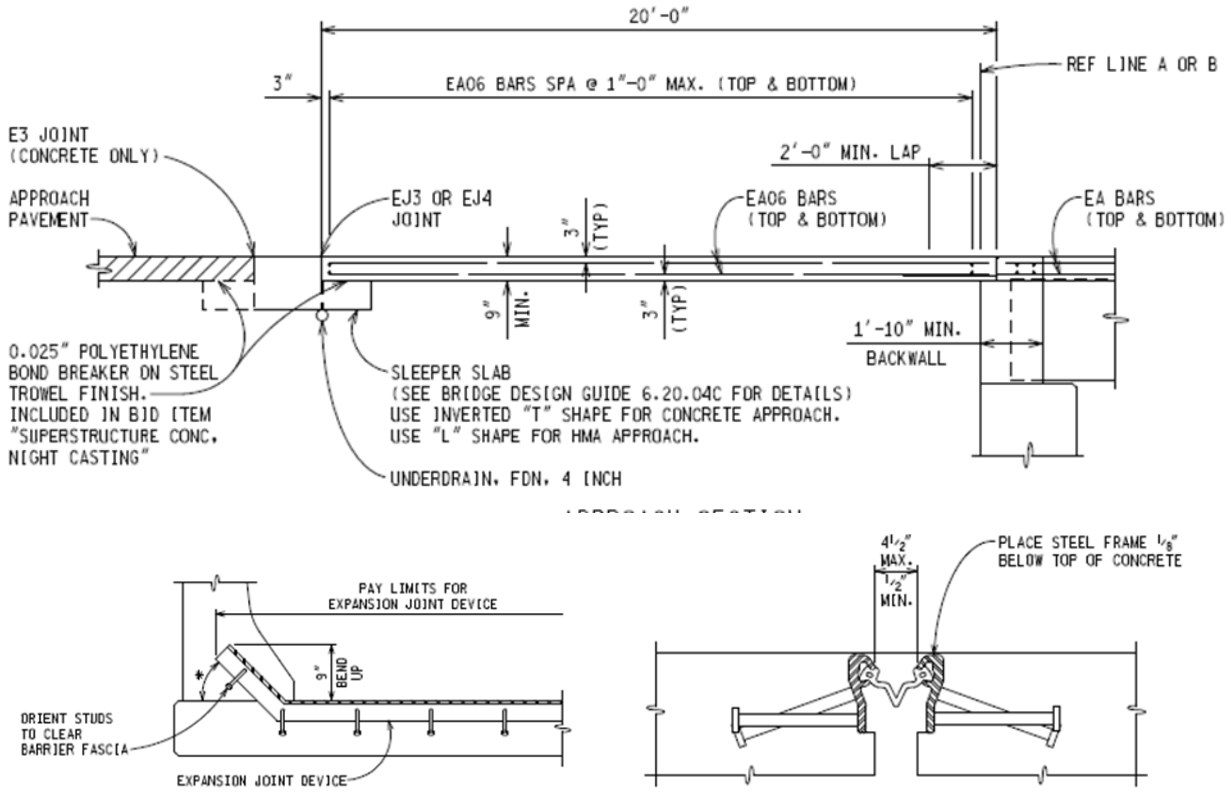


Figure 11: Michigan details.

3.5 Ohio

Drawing AS181 in Appendix F shows the approach slab details. Ohio uses a “pressure-relief” joint rather than expansion joint. The detail involves an 8 ft (2.4 m) sleeper slab. The approach panel sits 2 ft (0.6 m) in on a bond breaker on one side, while the concrete pavement sits in 2 ft (0.6 m) on the other side. The middle 4 ft (1.2 m) gap is filled with asphalt concrete (see Drawing BP2.3). Ohio indicated that there were some ride quality issues with this detail, where a “hump” of asphalt was being formed. They have a research project in progress with Iowa State University titled “Identification and Evaluation of Pavement Bridge Interface Ride Quality

Improvement". One of the early recommendations from that report was the Colorado DOT detail which had an inverted T sleeper slab with modular expansion joint between approach and sleeper beam. Figure 12 shows an example of the asphalt pressure relief joint.

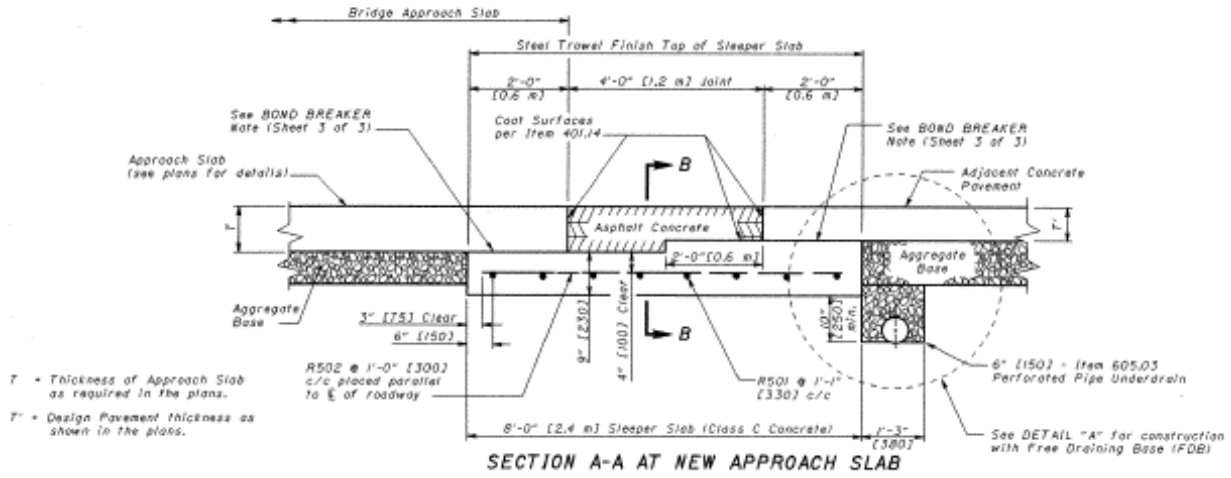


Figure 12: Ohio details.

3.6 Kansas

The Kansas detail consists of two sleeper slabs (see Drawing KA16201 in Appendix G). The 13 ft (4 m) approach slab ties into the abutment and rests on 1 ft (0.3 m) of the first sleeper slab. There is 6 ft (1.8 m) of asphalt and then a second concrete slab. The second slab is 14 ft (4.3 m) long and rests on a second sleeper slab. In between the second slab and the concrete pavement is a pressure relief/expansion joint. Details are shown in drawing RD712. The membrane sealant must be contoured to the curb edge. The details of the edge curb are shown in Drawing RD711.

Kansas indicated that the best performing product they have used as the membrane sealant is "polytite". A copy of a powerpoint file provided in Appendix G shows some installation photos of the product, and there is also some installation instructions for polytite. The material is squeezed and held by adhesive on one side. It expands to fill the joint. Regarding the ride quality of the asphalt portion, Kansas indicated that they could "mill it" or "fill it" as required. Also included in the Appendix is a copy of the Kansas specifications.

Kansas noted that they have tried almost everything. They do not recommend strip seals. There have been instances of the sleeper slab tipping slightly and snowplows taking out the strip seals. Compression seals (including Jeene) can pull concrete apart. They do not perform well in up and down motion. Figure 13 shows the approach panel and sleeper slab details.

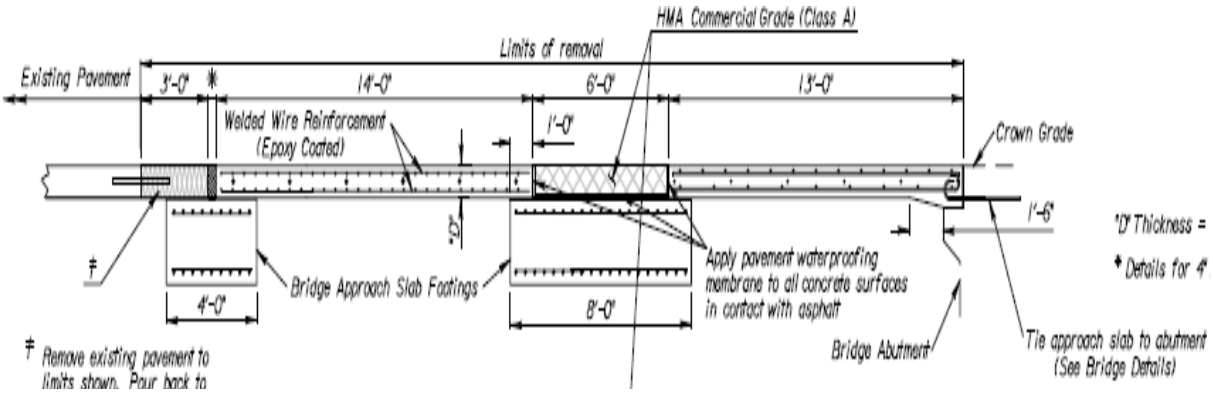


Figure 13: Kansas details.

3.7 Ontario, Canada

The current guidelines for expansion joints used in Ontario are summarized concisely in the Memorandum which is provided in Appendix H. The thinking is that the specified treatment will vary depending on the magnitude of the expected bridge movement.

For small movements less than 1 in (25 mm) an asphalt impregnated fiber board is used, and sealed by rubber asphalt. For intermediate movements between 1 in and 2 in (20 – 50 mm), an L-shaped sleeper slab is used. Between the approach slab and the hat of the sleeper slab, the expansion joint consists of a closed cell neoprene seal. For large movements greater than 2 in (50 mm) a strip seal expansion joint is used.

It was noted that if roads need to be closed for maintenance, costs become astronomical; therefore added upfront costs for strips seal joints are justified. Figure 14 shows the L-shaped sleeper slab, examples of compression seals, and a detail showing a closed end (side wall) on the sleeper slab.

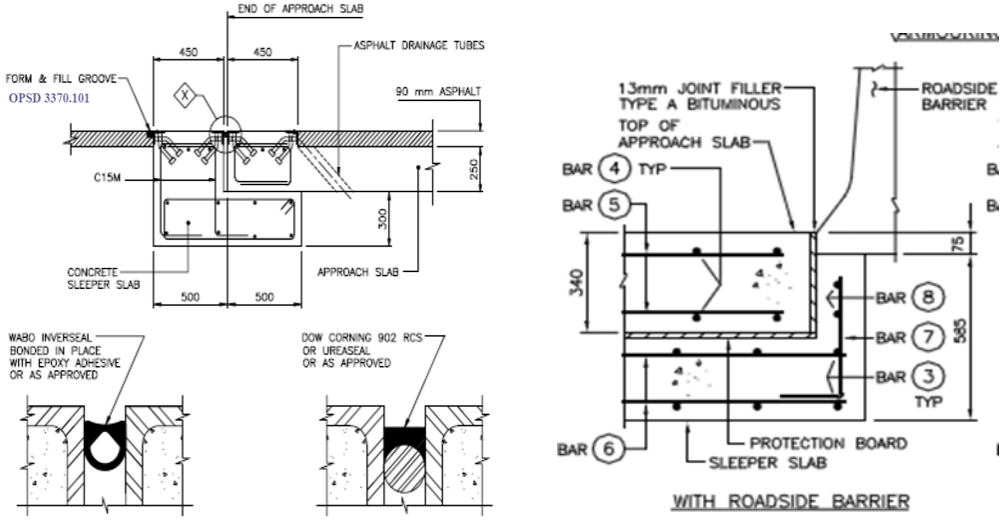


Figure 14: Ontario details.

Chapter 4. Monitoring the Movement of Bridges

4.1 Setup

In order to design an expansion joint correctly it would be necessary to establish exactly how much movement would be expected at that joint. The idea in this task was to monitor movement in several bridges and compare with theoretical calculations. A total of four Geokon VW 4420 crackmeters with a total stroke of 4 in (102 mm) were installed on three different bridges.

Bridge 81007 carries CR 27 over US 14 near Waseca. It is a two-span (equal length) bridge with free bearings at both ends. It is a semi-integral abutment bridge. The total theoretical length for expansion at each end including approach panels is 129.83 ft (40 m). Instruments were set up on both the northwest and southwest sides. A few relevant drawings from the bridge plan for 81007 are given in Appendix I.

The next two bridges 81013 and 81014 are sister (parallel) bridges carrying US 14 Westbound and Eastbound respectively over MN 13 in Waseca. They are semi-integral abutment bridges. These are two-span bridges with fixed bearings at one end and free bearings at the other. Instruments were set up at the free bearing ends as theoretically all the movement should take place there. The total theoretical length for expansion including approach panels is 172.67 ft (52.6 m). A few relevant drawings from the bridge plan for 81013 are given in Appendix J.

Temperature and displacement readings were recorded every hour on the hour. Data collection on Bridge 81007 began on 11/7/2010 and ended on 11/2/2012 resulting in two years' worth of data. Data collection on Bridges 81013 and 81014 ran from 9/27/2011 to 11/3/2012 resulting in a little over one year's worth of data. In order to protect the instruments from snow plows, it was not possible to place the sensors directly over the joints. Instead the equipment was placed on the back side of the barriers. They read the relative displacement between two perpendicular surfaces – (i) the barrier which is rigidly attached to the deck and hence expected to move along with it, and (ii) the wingwall which is assumed to remain stationary. The set up can be seen in Fig. 15. It was therefore expected that the movements should be the same as directly across the joint.

For comparison readings, measurements were taken with a tape measure directly across the joints. Initial efforts attempted to measure the actual joint; however this proved to be difficult. Later, three red lines were drawn at 10 in (254 mm) apart on either side of the joint. These reference lines were measured every time we went to download data.

Temperature data were available from onboard thermistors both at the data logger box and on the crackmeter itself. For all the data analysis, the temperature of the crackmeter was used. Whenever these numbers were compared to ambient weather station temperatures they were relatively close except for extremely warm days (around 100ºF (37 °C)) where the crackmeter temperature was usually higher sometimes reaching around 125ºF (52 °C). AASHTO design temperatures for Minnesota are usually from -30ºF (-34 °C) to 120ºF (49 °C).

Figure 15: Sensors measuring relative displacements between barrier and wingwall.

4.2 Results

The magnitude of gage readings for every measurement station was always less than the magnitude of reference line readings. Any possible error in data collection or data reduction was investigated thoroughly. The Excel files were also provided to Geokon technical consultants. They were also not able to find any errors.

This leads to the conclusion that movements at the joints are higher than between the wingwall and barrier. Possible reasons may be (i) some relative movement of the wingwall even though it is supposed to be stationary and/or (ii) some movement on the pavement side even though it is rigidly attached to a sleeper slab.

Because the actual movement at the joint was of interest, it was decided to adjust the gage readings by an adjustment factor. This was obtained by making a plot of reference reading minus gage reading versus temperature. This plot was found to be fairly linear in all cases. A linear curve fit was performed to find an adjustment equation. An example for Bridge 81007 NW is shown in Fig. 16. For all subsequent analysis, the adjusted displacements are utilized.

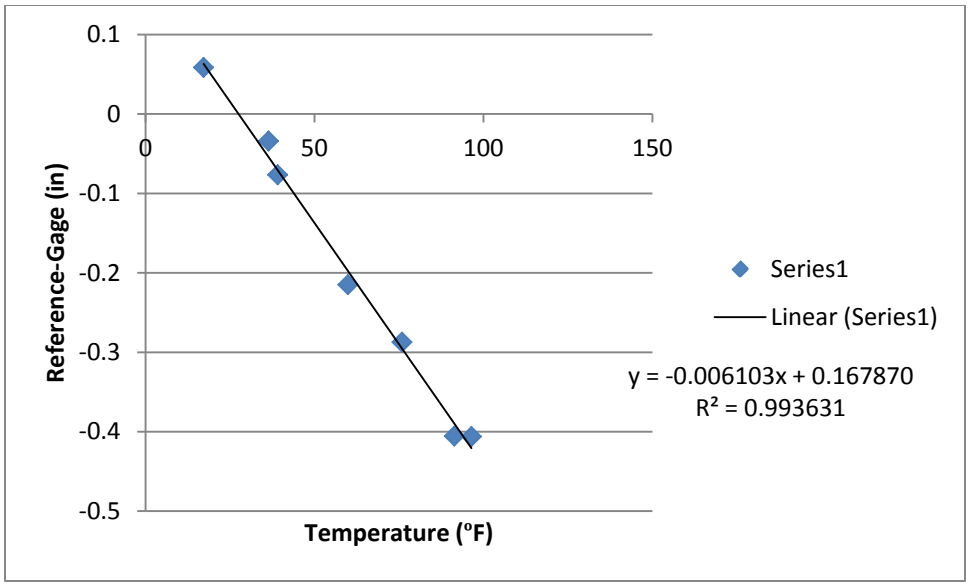


Figure 16: Adjustment factor to reconcile reference readings with gage readings for Bridge 81007NW.

The plots of joint movement and temperature versus time for all four bridges are given in Figs 17-20. For Bridge 81013 there was a period of lost data due to low battery. This is easily observable in Fig. 19. As expected in Minnesota large temperature differentials (around 127ºF (71 °C)) occur between winter and summer. There are also significant daily temperature variations (around 46ºF (26 °C) maximum and 21ºF (12 °C) average).

The plots of displacement versus temperature are given in Figs. 21-24. An effective coefficient of thermal expansion can be found by applying a linear curve fit to these plots then dividing the slope by the total length. A theoretical coefficient of thermal expansion was taken as 6.5×10^{-6} /°F (11.7x10-6 /°C). It could be noted that according to FHWA the coefficient of thermal expansion of concrete could vary between $(4.1\text{-}7.3) \times 10^{-6}$ °/F primarily influenced by the aggregate used.

A plot of both theoretical displacement and measured displacement versus time for example for Bridge 81007NW can be seen in Fig. 25. There is no significant lag between the two curves indicating that friction between approach slab and backfill is relatively insignificant.

A summary of key data points is presented in Table 1. Interestingly it can be observed that for the bridge with two moveable joints, the effective coefficient of thermal expansion is larger than 6.5×10^{-6}. So on average, the joint movements are about 21% higher than theoretical. On the other hand, for bridges with one moveable joint, the effective coefficient of thermal expansion was less than 6.5×10^{-6}. So on average, the joint movements are about 84% of the theoretical. This raises an interesting question of whether there is truly no movement at the other end i.e. the fixed end. What is also interesting is that on one of these supposedly “non-working” joints, MnDOT inspectors found a cracked compression seal before the bridge was even open to traffic.

4.3 Discussion

Some states use between 1.25 to 1.5 times the theoretical temperature movement to size the joints. When considering the maximum joint opening, the 1.5 factor seems appropriate because of creep and shrinkage. The observed results for the bridges with two moveable joints seem to be in line with this practice. The results for the bridges with a single moving joint show displacements less than theoretical. It would be interesting to conduct future measurements on both ends of these types of bridges. Future measurements are recommended using embedded crackmeters installed directly across the joint. These could be installed using a blockout which is subsequently filled with concrete.

Table 1: Summary of key results.

	81007NW	81007SW	81013	81014
Coldest Temp (^{o}F)	-8.5	-10.12	2.84	-2.56
Date	1/21/2011	1/21/2011	2/11/2012	1/19/2012
Warmest Temp (^{o}F)	118.76	118.94	102.74	121.82
Date	7/7/2011	7/7/2011	7/7/2012	7/8/2012
Temperature Difference (^{o}F)	127.26	129.06	99.90	124.38
Joint Movement (in)	1.3027	1.4001	0.7951	1.3958
Theoretical Movement (in)	1.2887	1.3070	1.3455	1.6759
Max – Min gage reading (in)	1.3340	1.4068	0.9591	1.4137
Effective Coefficient of Thermal Expansion	8.0528×10^{-6}	7.7743×10^{-6}	5.0594×10^{-6}	5.8045×10^{-6}
Multiplier = Effective Coefficient / 6.5×10^{-6}	1.2389	1.1960	0.7784	0.8930
Max Daily Temperature Swing (^{o}F)	46.89	42.48	44.10	48.96
Max Daily Joint Movement (in)	0.4287	0.4641	0.2389	0.5106
Average Daily Temperature Swing (^{o}F)	21.21	19.77	17.50	21.78
Average Daily Joint Movement (in)	0.1855	0.2103	0.1113	0.2386

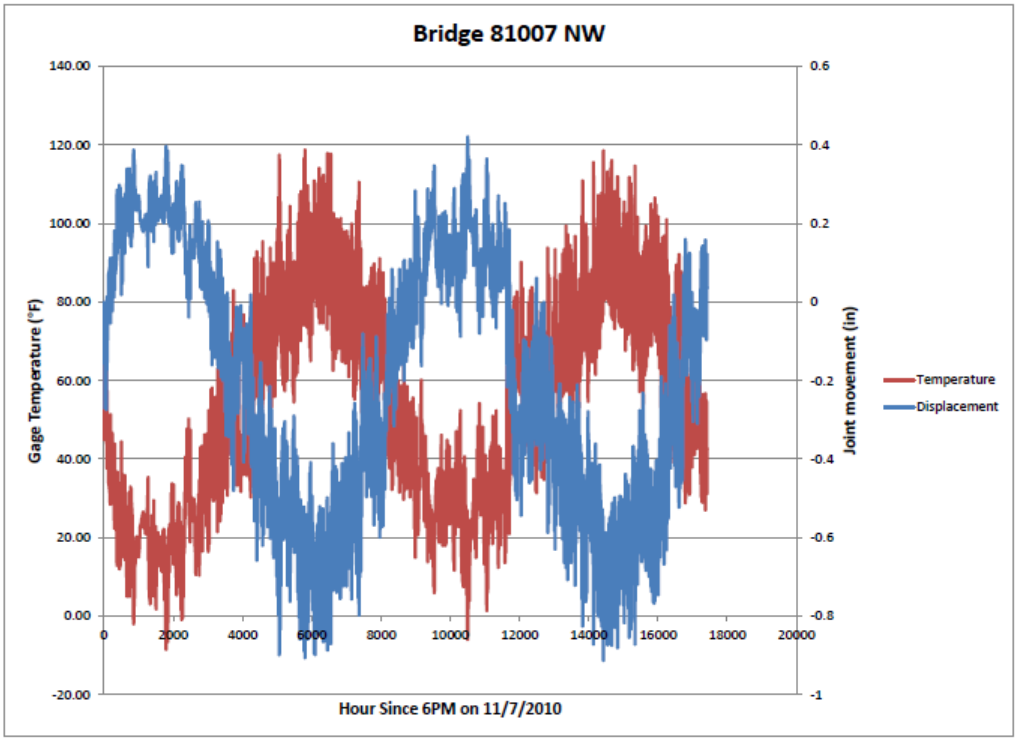


Figure 17: Bridge 81007NW displacement and temperature versus time.

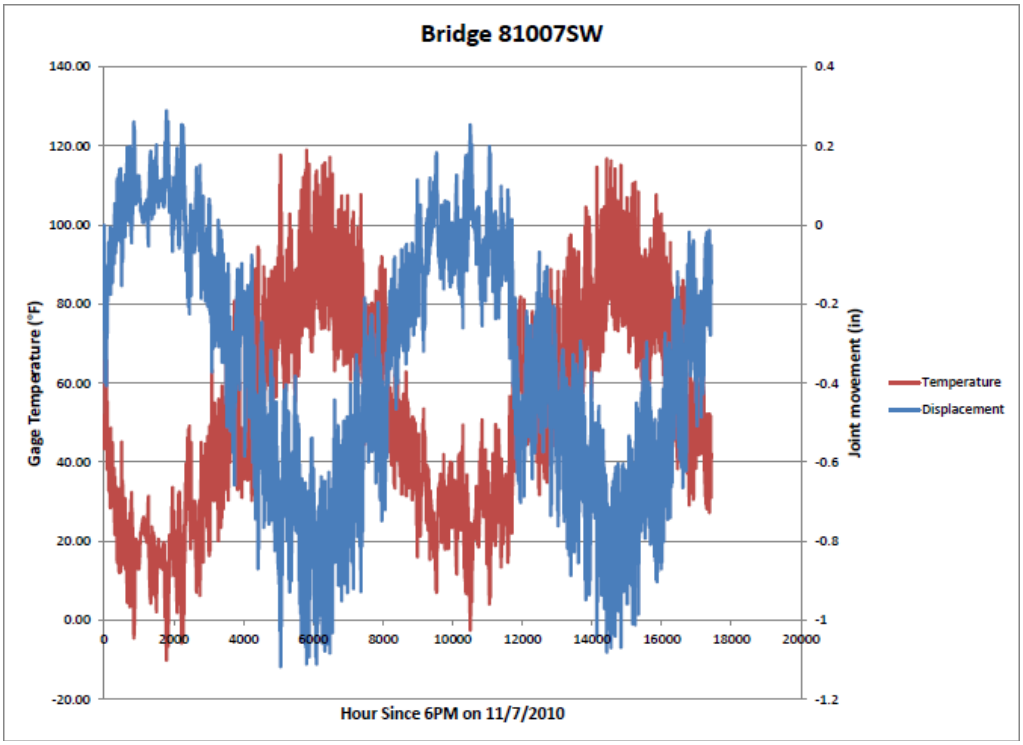


Figure 18: Bridge 81007SW displacement and temperature versus time.

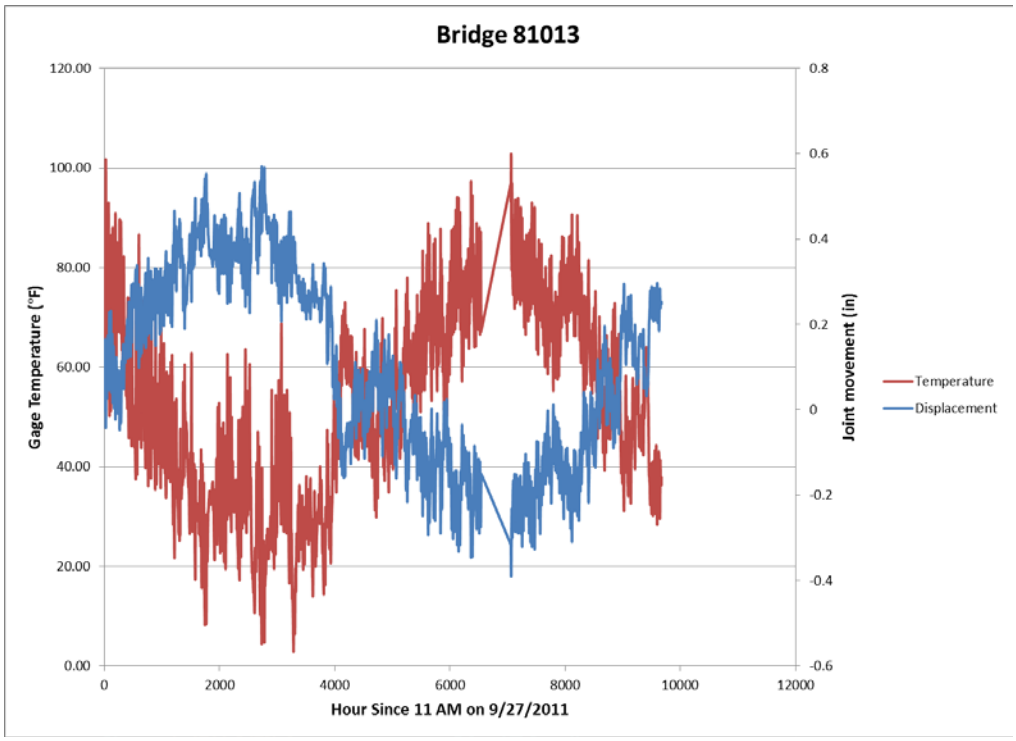


Figure 19: Bridge 81013 displacement and temperature versus time.

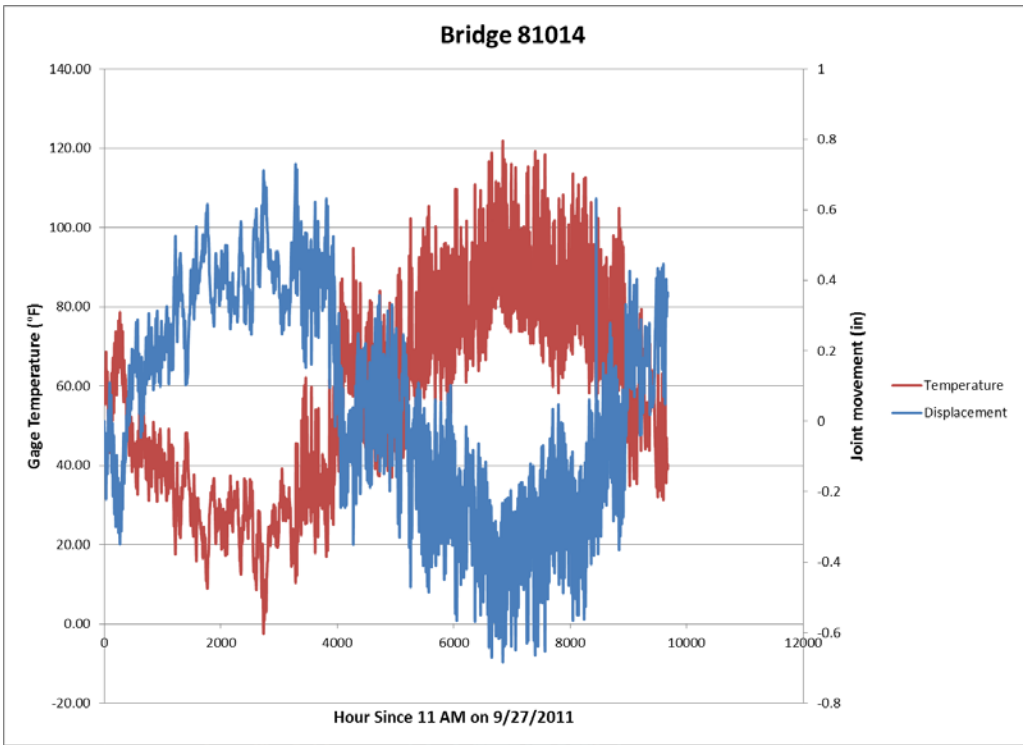


Figure 20: Bridge 81014 displacement and temperature versus time.

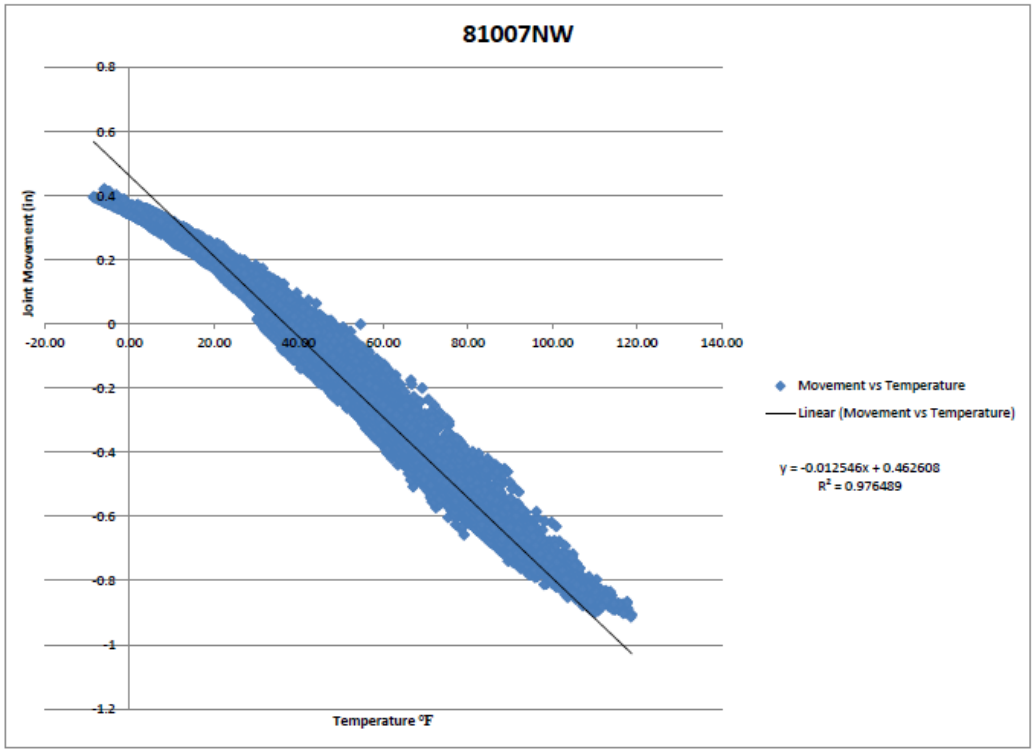


Figure 21: Bridge 81007NW movement versus temperature.

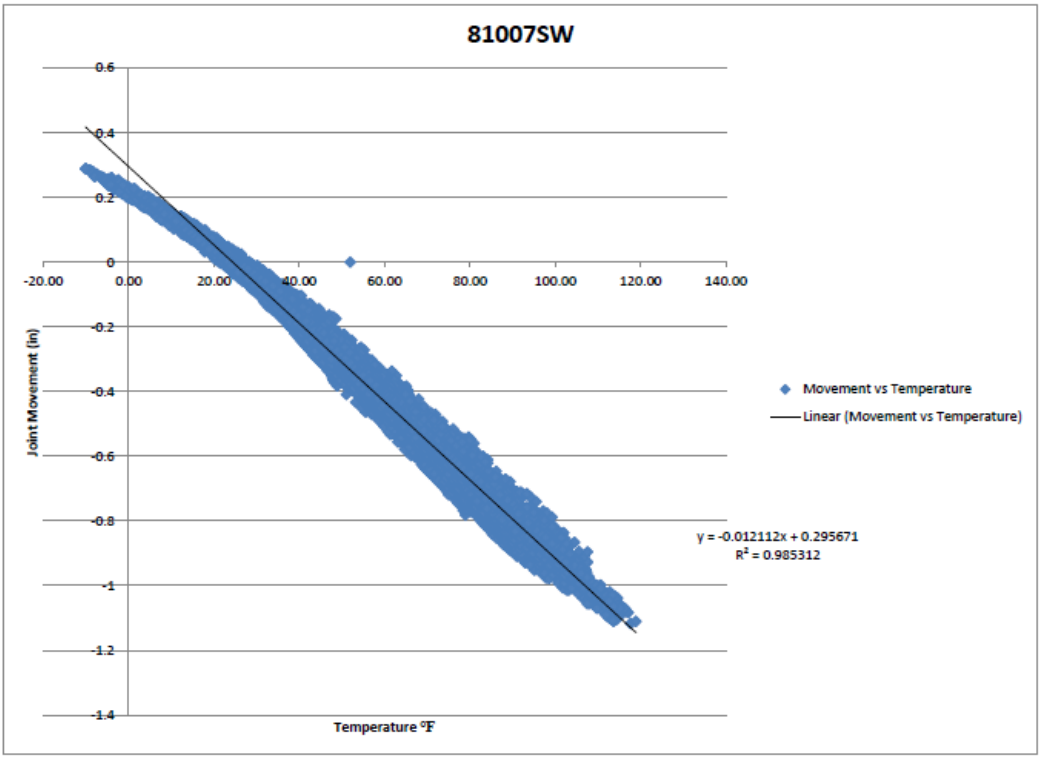


Figure 22: Bridge 81007SW movement versus temperature.

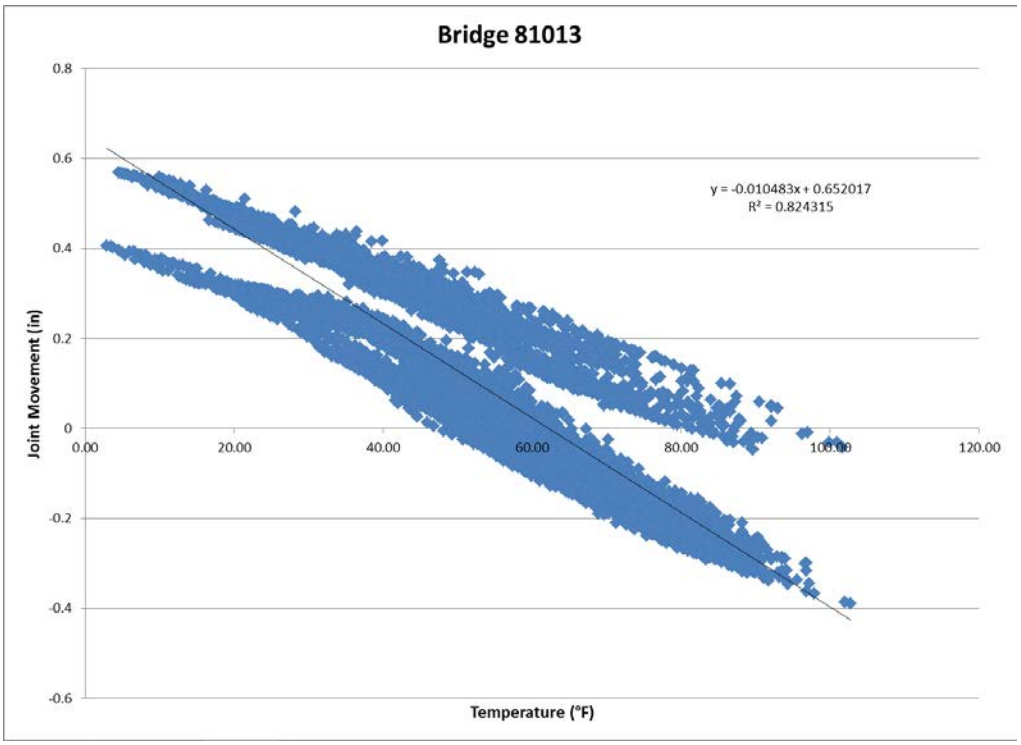


Figure 23: Bridge 81013 movement versus temperature.

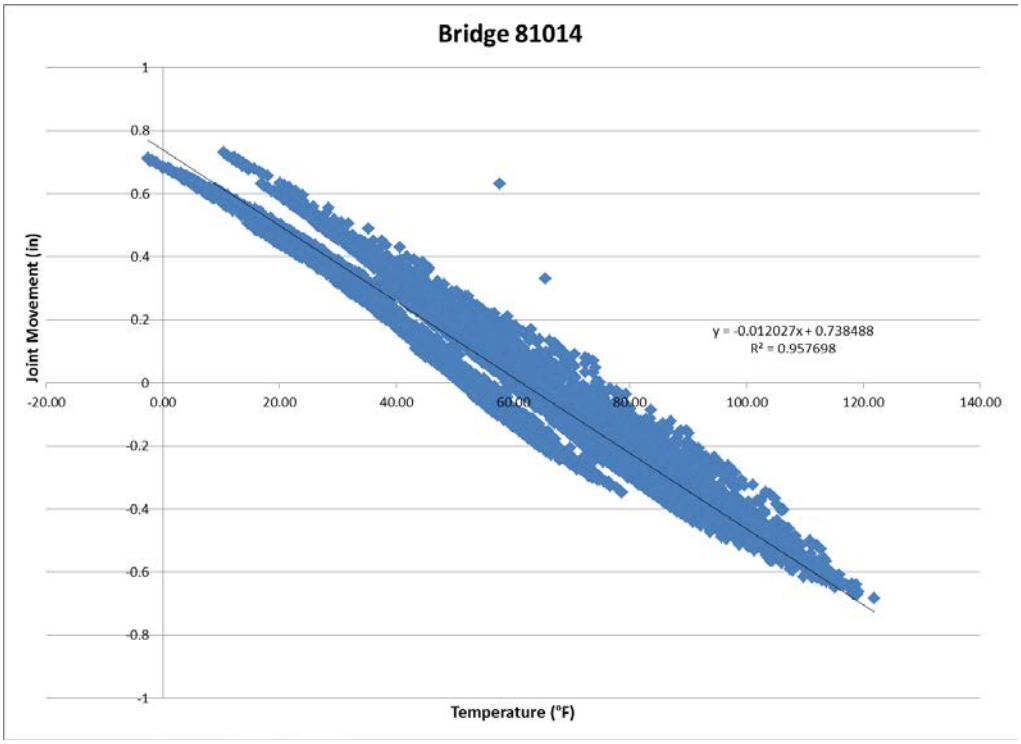


Figure 24: Bridge 81014 movement versus temperature.

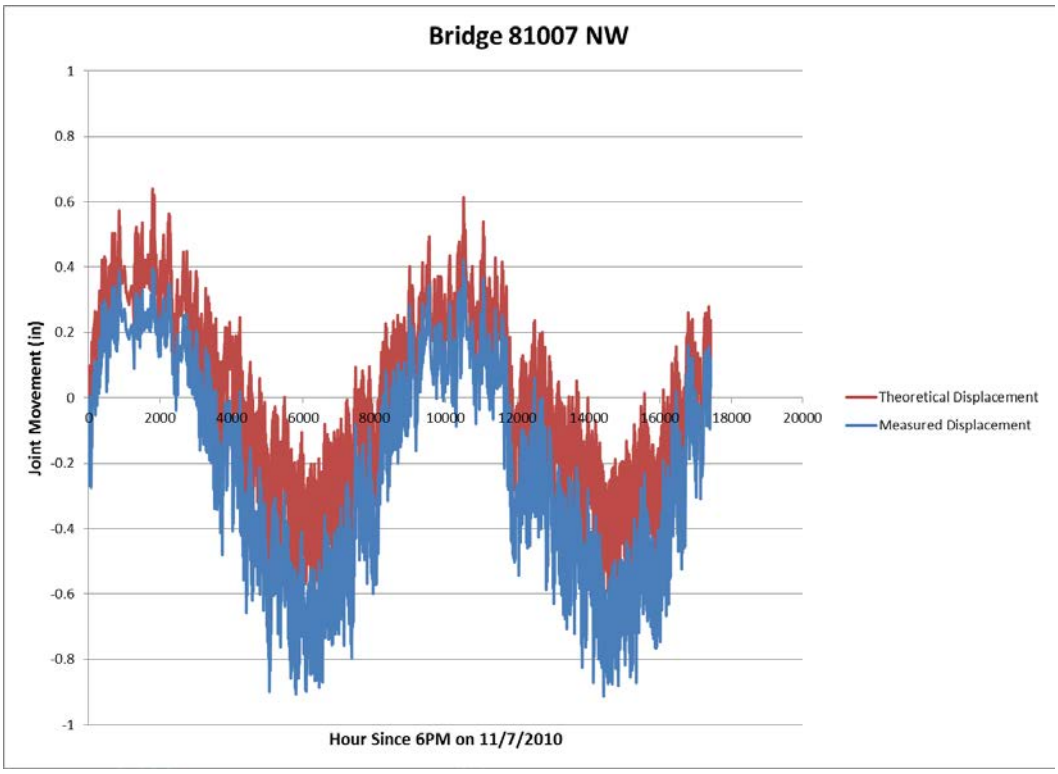


Figure 25: Theoretical and measured displacement versus time.

Chapter 5. Alternative Expansion Joint Details

This chapter discusses some alternatives to the E8 joint being explored by MnDOT.

5.1 D.S. Brown Compression Seal

D.S. Brown Company produces a series of webbed neoprene compression seals that are attached by a high-strength, two-part epoxy-based adhesive. The J-series and the JP-series are shown in Fig. 26. The JP series provides a smooth surface suitable for pedestrians.

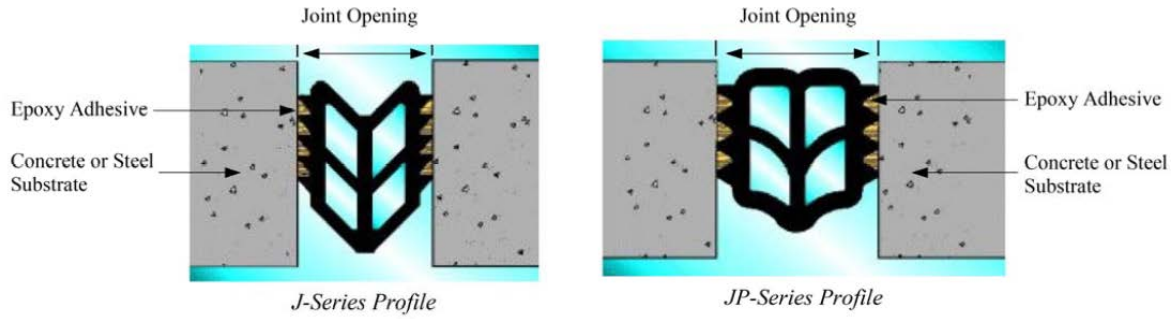


Figure 26: D.S. Brown J and JP series compression seals.

MnDOT recently began experimenting with using these compression seals. In a recent project, the US 14 construction near Waseca, Minnesota, the compression seals were used on nine different bridges. All of the bridges received JP-400 seals except for Bridge 81006 which has the JP-500. In an email on August 29, 2012 MnDOT inspectors found brittle failure of the neoprene material on five out of the eighteen installations with effective service life of 1 to 2 years. The failed glands were Bridges 81006 North approach (JP-500), 81013 East approach, 81014 West approach (at a fixed bearing), and 81011 East and West approach. An example of the brittle failure of the compression seal is shown in Fig. 27.

Figure 27: Failed JP-series compression gland.

The installation of the compression seals is relatively easy. Some photos of installation from the US 14 project at Waseca are shown in Fig. 28. The basic procedures include saw-cutting the concrete walls and removing dirt with compressed air, applying conditioning agent to the sidewalls of the seal, sandblasting or wire-brushing the seal, applying rubbing alcohol, drying with clean cloth, mixing the adhesive, applying the adhesive to the joint interfaces and sidewalls of the seal, then installing the gland.

Figure 28: Installation of D.S. Brown JP series compression seal.

One of the problems with the seal was the issue of the curb kick-up, that is, the upturn at the end of the seal to prevent water runoff. Early attempts included using a vertical piece of Evazote at the ends. On subsequent installations, the manufacturer suggested a procedure that can be seen in Fig. 29. It involves pinching the material and drilling a stress relief hole, slitting from the bottom up to the hole, removing the material from the bottom at the very end of the seal and then turning the flap over and securing with screws.

Figure 29: A curb kick-up procedure for the JP compression seal.

5.2 Sealtite/Polytite

Schul International is selling a product under the names of Sealtite 50N and Polytite. It is a precompressed joint sealant of high density polyurethane foam. This product has been used by Kansas in their expansion joints. It is available either in sticks or in rolls. Some pictures of the product are shown in Fig. 30. MnDOT is planning to do some trial installations of the product.

Figure 30: Sealtite/Polytite.

5.3 MnDOT Proposed Trials

In an effort led by Sarah Sondag of MnDOT Bridge Operations Support an experimental project to try different expansion joint options in a relatively small area was proposed. The proposed test section is located on I-35 near Faribault, Minnesota. Bridges included in the test section are as follows:

1. Br 66815 (1973) - 35 SB @ CoRd 11
2. Br 66816 (1973) - 35 NB @ CoRd 11
3. Br 66813 (1973) - 35 SB @ Cannon R.
4. Br 66814 (1973) - 35 NB @ Cannon R.
5. Br 66811 (1973) - 35 SB @ CoRd 11
6. Br 66812 (1973) - 35 NB @ CoRd 11

This allows for 12 different joint configurations. These bridges had new E-8 joints installed in 2009 and roughly two-thirds have failed. The 12 proposed joint trials are as follows:

1. Standard E8 joint (as control)
2. Standard E8 joint (with drain tile)

3. Filter sand (with drain tile) – cover sand with something
4. Sand (without drain tile) – add riprap at end to drain
5. Sealtite 50N precompressed joint (without drain tile)
6. Sealtite (with drain tile)
7. Bituminous
8. Crafco asphaltic plug (just use 501 in E8 joint opening)
9. Emseal bridge expansion joint system (with drain tile)
10. D.S. Brown JP-400 or J-400 compression seal (with drain tile)
11. Watson Bowman Jeene FW or Jeene W (with drain tile)
12. Drain tile, styrene, bituminous felt, bituminous topping

Chapter 6. Conclusions

This research project attempted to find possible solutions for a longer-lasting expansion joint. The study of other agencies' policies showed widely varying practices none probably exactly adaptable to Minnesota. Some trials of the D.S. Brown JP and J series compression seal have been conducted by MnDOT, and while there are signs of good performance so far in most cases, there have been instances with premature failure. Additionally, the curb kick-up can be challenging with this material. The Sealtite/Polytite seal is another promising material but had not been evaluated by MnDOT as of the time of writing this report. As mentioned in Chapter 5, MnDOT is also interested in experimenting with some other materials and/or methods.

The author recommends that MnDOT consider the use of strip seals at the expansion joint for new semi-integral and integral abutment bridges. This recommendation is based on the following reasons:

1. MnDOT uses strip seals on parapet-type abutments and they perform satisfactorily.
2. Strip seals were the most popular choice for the agencies surveyed. Strip seals are the most popular joint overall according to NCHRP 319.
3. As seen in this research, in Minnesota, there are large seasonal temperature variations and even sizeable daily temperature variations. This will cause cyclic stress changes in any adhesive/filler type joints (such as compression seal, Sealtite, Evazote, etc.) These stresses can change from compression to tension. There is no mention about this aspect from the manufacturers and no research to evaluate the performance of adhesive/filler under cyclic load. In the case of strip seal, the movements are accommodated by opening and closing of the V-shape, thus not inducing any stress on the gland or its connection.

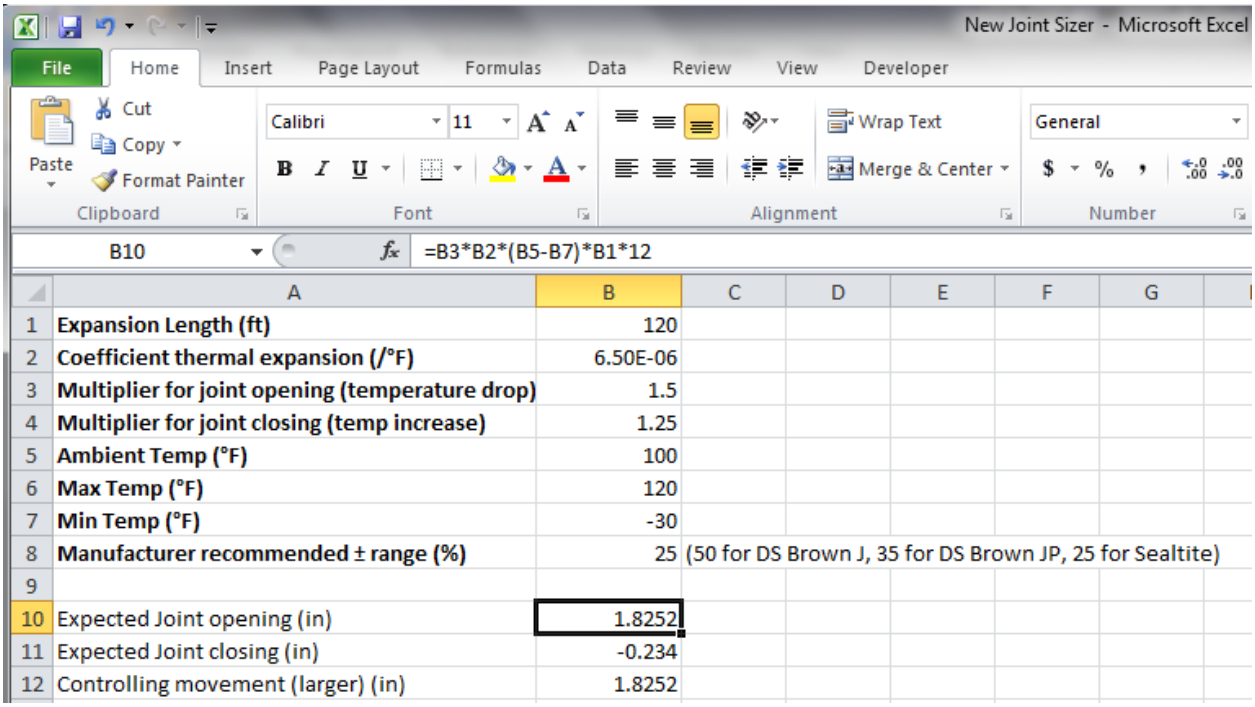
If the strip seal were to be utilized, it has been determined that the curb dimensions would be too small to adequately support the railing for the curb kick-up of the strip seal. Therefore, it would be necessary to run the concrete barrier the full length of the approach panel, then there would be about another 7 ft (1.5 m) of barrier on the pavement side before the curb transition begins. In effect, compared to current designs, an additional 20 ft (6 m) minimum (more if there is a skew) would need to be provided on each end of the bridge. This would also require a significant revision to the existing MnDOT approach panel standards, perhaps including extending the length, as currently barriers do not extend beyond the E8 joint. Any barrier that extends beyond the E8 joint would need to meet the same crash test standards as barriers mounted on an approach panel (minimum 7 ft length). Also, slabs that have barriers attached need significant reinforcement within the slab, which may require that the same reinforcement used in the approach panel would need to be continued at least 7 ft beyond the E8 joint, which would likely add significant cost and construction effort. Assuming a 2013 estimate (provide by MnDOT Bridge Office) of $60 per lineal foot ($138 per m) for a 32 in (0.8 m) Type F concrete barrier, if 20 ft (6 m) were added at both ends and both sides (that is, 4 corners), it would be about a $4800 dollar increase. This idea had been discussed at a TAP meeting and some felt it would be cost effective, but needs further evaluation based on the concerns mentioned above.

For maintenance of existing bridges, D.S. Brown J or JP series or Sealtite/Polytite could be considered. It is recommended to make temperature calculations to calculate maximum

anticipated joint opening or closing, and then use this number versus manufacturer recommendations to choose the appropriate width of the joint and seal type/size. The movement calculation is according to the equation

$$Movement = Multiplier \times \alpha \times \Delta T \times L$$

For the multiplier, it is recommended to use 1.5 for joint closing (that is temperature drops) because this also corresponds to creep and shrinkage effects and 1.25 for joint opening based on the results of the bridge monitoring. When estimating the expansion length it should be remembered to include the 20 ft (6 m) approach panel length. The calculations can easily be set up on a spreadsheet for example as shown in Fig. 31.



	A	B	C	D	E	F	G
1	**Expansion Length (ft)**	120					
2	**Coefficient thermal expansion (/°F)**	6.50E-06					
3	**Multiplier for joint opening (temperature drop)**	1.5					
4	**Multiplier for joint closing (temp increase)**	1.25					
5	**Ambient Temp (°F)**	100					
6	**Max Temp (°F)**	120					
7	**Min Temp (°F)**	-30					
8	**Manufacturer recommended ± range (%)**	25	(50 for DS Brown J, 35 for DS Brown JP, 25 for Sealtite)				
9							
10	Expected Joint opening (in)	1.8252					
11	Expected Joint closing (in)	-0.234					
12	Controlling movement (larger) (in)	1.8252					

Figure 31: Example of spreadsheet to calculate joint movement.

For the case of Sealtite, the sticks are available for joint sizes from 1-5/8 in (41 mm) to 5 in (127 mm). The Kansas specification which matches manufacturer's recommendations is that the joint movement range should be limited to ± 25% of the joint opening dimension. The precompressed dimension should not exceed 75% of the joint opening width. Once the controlling movement has been obtained from calculation it could be divided by 0.25 to obtain the size of the joint width and seal size that would work (if any).

For the case of D.S. Brown J or JP series compression seals, the manufacturer supplied information is shown in Fig. 32. Once the controlling movement has been obtained from calculation, it can be added or subtracted to the mid-range values in Fig. 32 to determine which (if any) seal would work. The corresponding joint width (seal width) can also be seen from the figure.

Product Name	Seal Width in (mm)	Seal Height in (mm)	Min. Width in (mm) -50%	Mid-Range @ 70°F in (mm)	Max.Width in (mm) +50%	Total Movement in (mm)
J-100	1.00 (25.4)	1.19 (30.2)	0.50 (12.7)	1.00 (25.4)	1.50 (38.1)	1.00 (25.4)
J-150	1.50 (38.1)	1.88 (47.8)	0.75 (19.1)	1.57 (39.9)	2.38 (60.3)	1.63 (41.3)
J-200	2.00 (50.8)	2.44 (62.0)	1.00 (25.4)	2.00 (50.8)	3.00 (76.2)	2.00 (50.8)
J-250	2.44 (62.0)	2.94 (74.7)	1.25 (31.8)	2.57 (65.3)	3.88 (98.4)	2.50 (63.5)
J-300	3.25 (82.6)	3.94 (100.1)	1.50 (38.1)	3.00 (76.2)	4.50 (114.3)	3.00 (76.2)
J-400	4.00 (101.6)	4.50 (114.3)	2.00 (50.8)	3.94 (100.1)	5.88 (149.3)	3.88 (98.4)
J-500	5.00 (127.0)	6.50 (165.1)	2.50 (63.5)	4.88 (123.9)	7.26 (184.4)	4.74 (120.9)

Product Name	Seal Width in (mm)	Seal Height in (mm)	Min. Width in (mm) -35%	Mid-Range @ 70°F in (mm)	Max.Width in (mm) +35%	Total Movement in (mm)
JP-100	1.00 (25.4)	1.19 (30.2)	0.65 (16.5)	1.00 (25.4)	1.35 (34.3)	0.70 (17.8)
JP-150	1.50 (38.1)	1.88 (47.8)	0.98 (24.9)	1.50 (38.1)	2.02 (51.3)	1.05 (26.7)
JP-200	2.00 (50.8)	2.44 (62.0)	1.30 (33.0)	2.00 (50.8)	2.70 (68.6)	1.40 (35.6)
JP-250	2.44 (62.0)	2.94 (74.7)	1.63 (41.4)	2.50 (63.5)	3.38 (85.9)	1.75 (44.5)
JP-300	3.25 (82.6)	3.94 (100.1)	1.95 (49.5)	3.00 (76.2)	4.02 (102.1)	2.10 (53.3)
JP-400	4.00 (101.6)	4.50 (114.3)	2.60 (66.0)	4.00 (101.6)	5.40 (137.2)	2.80 (71.1)
JP-500	5.00 (127.0)	6.00 (152.4)	3.25 (82.6)	5.00 (127.0)	6.75 (171.5)	3.50 (88.9)

Figure 32: D.S. Brown J and JP series sizing guide.

References

1. Purvis, Ronaldo L. *Bridge Deck Joint Performance*, National Cooperative Highway Research Program Synthesis 319 Report, Transportation Research Board, Washington DC, 2003.

2. CTC & Associates, *Concrete Bridge Approach Pavements: A Survey of State Practices*, Wisconsin Department of Transportation, Madison, WI, 2010.

Appendix A: Information for Person(s) Contacted for Synthesis Study

Agency: Wisconsin DOT
Contact: Dave Kiekbusch, Wisconsin DOT, Structural Development Engineer
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Agency: Ohio DOT
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Agency: Kansas DOT
Contact: Don Whisler, Kansas DOT, Bridge Management Engineer
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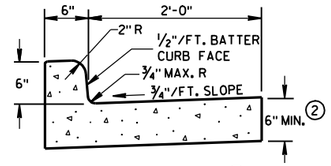
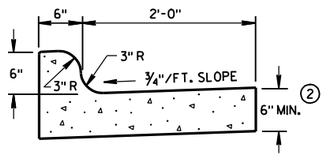
Agency: Ministry of Transportation, Ontario
Contact: Nicolas Theodor, MTO, Head Standards Engineer
Phone: 905-704-2381
Email: Nicolas.Theodor@ontario.ca

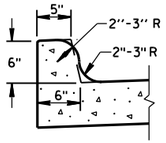
Appendix B: Wisconsin Drawings



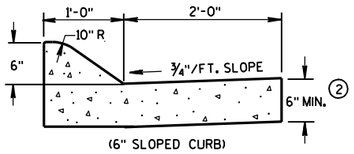
TYPES A & D ①



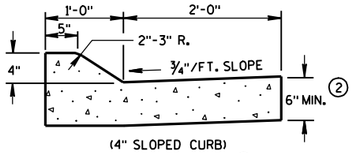
TYPES K & L ①



OPTIONAL CURB SHAPE FOR TYPES K & L ①

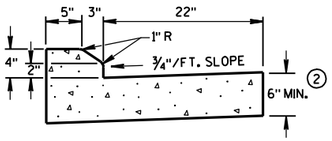


(6" SLOPED CURB)

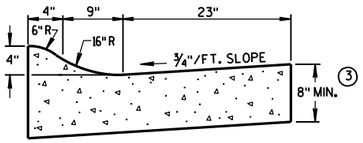


(4" SLOPED CURB)

TYPES A & D ①



6" SLOPED CURB TYPES G & J ①



4" SLOPED CURB TYPES R & T ①④

4" SLOPED CURB TYPES G & J ①

CONCRETE CURB & GUTTER 30"

CONCRETE CURB & GUTTER 36"

GENERAL NOTES

DETAILS OF CONSTRUCTION, MATERIALS AND WORKMANSHIP NOT SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE CONTRACT.

PAVEMENT TIES AND TIE BARS SHALL BE EPOXY COATED IN CONFORMANCE WITH SUBSECTION 505.2.6.2 OF THE STANDARD SPECIFICATIONS.

INTEGRAL CURB & GUTTER SHALL CONFORM TO THE DETAILS SHOWN FOR CONCRETE CURB & GUTTER INCLUDING THE TRANSVERSE GUTTER SLOPE. A LONGITUDINAL CONSTRUCTION JOINT IS NOT REQUIRED WITH INTEGRAL CURB AND GUTTER.

WHERE THE TRANSVERSE JOINTS IN THE PAVEMENT ARE REQUIRED TO BE SEALED, THE JOINTS IN THE INTEGRAL CURB AND GUTTER SHALL BE SEALED TO THE FACE OF CURB WITH THE SAME TYPE OF SEALANT. THE COST OF FURNISHING AND INSTALLING THIS SEALANT SHALL BE INCIDENTAL TO THE ITEM CONCRETE CURB AND GUTTER.

UNLESS OTHERWISE SHOWN ON THE TYPICAL CROSS SECTIONS, THE BASE AGGREGATE AND COMMON EXCAVATION LIMITS ARE 2'-0" BEHIND THE BACK OF CURBS.

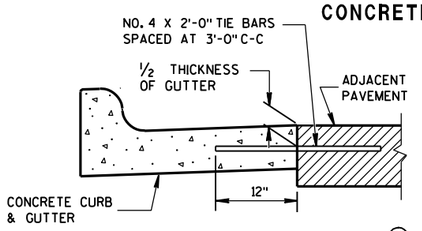
① TIE BARS ARE REQUIRED FOR CURB AND GUTTER TYPES A, G, K AND R.

② THE BOTTOM OF CURB AND GUTTER MAY BE CONSTRUCTED EITHER LEVEL OR PARALLEL TO THE SLOPE OF THE SUBGRADE OR BASE AGGREGATE PROVIDED A 6" MINIMUM GUTTER THICKNESS IS MAINTAINED.

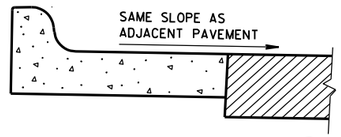
③ THE BOTTOM OF CURB AND GUTTER MAY BE CONSTRUCTED EITHER LEVEL OR PARALLEL TO THE SLOPE OF THE SUBGRADE OR BASE AGGREGATE PROVIDED A 8" MINIMUM GUTTER THICKNESS IS MAINTAINED.

④ THE FACE OF CURB IS 6" FROM THE BACK OF CURB.

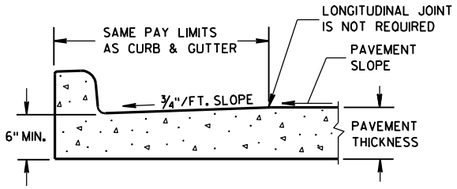
⑤ WHEN REVERSE SLOPE GUTTER IS REQUIRED, THE LOCATION(S) WILL BE SHOWN ELSEWHERE IN THE PLAN.



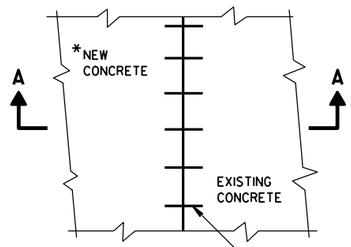
TYPICAL TIE BAR LOCATION ①



REVERSE SLOPE GUTTER ⑤
(TYPICAL FOR ALL CURB & GUTTER TYPES)

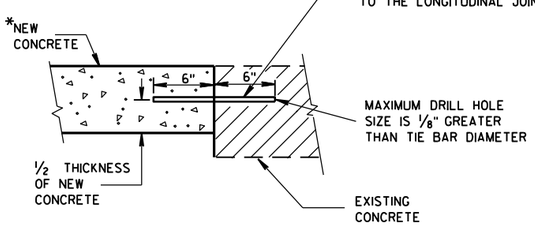


PARTIAL SECTION OF PAVEMENT WITH INTEGRAL CURB & GUTTER



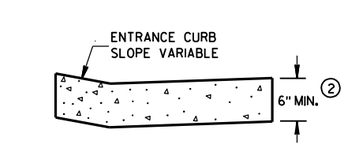
PLAN VIEW

*NEW CURB & GUTTER, SURFACE DRAINS, CONCRETE PAVEMENT OR OTHER NEW CONCRETE.

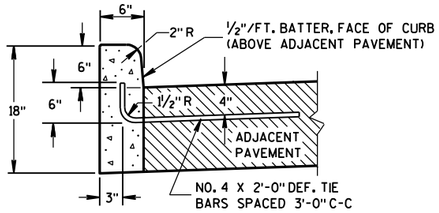


SECTION A-A

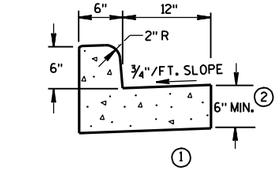
TIE BARS DRILLED INTO EXISTING PAVEMENT



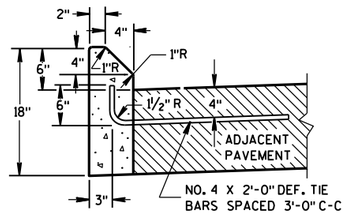
DRIVEWAY ENTRANCE CURB
(WHEN DIRECTED BY THE ENGINEER)



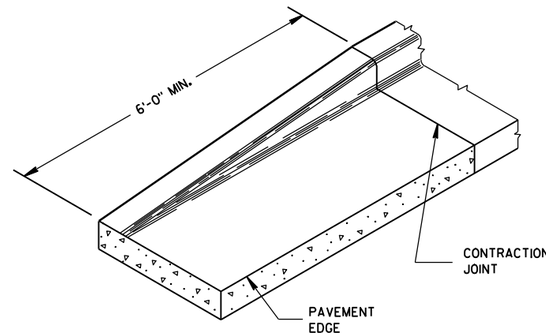
① TYPES A & D



① TYPES A & D
CONCRETE CURB & GUTTER 18"



① TYPES G & J



END SECTION CURB & GUTTER

CONCRETE CURB

CONCRETE CURB, CONCRETE CURB & GUTTER AND TIES

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

APPROVED
9/4/08 DATE
FHWA
/S/ Jerry H. Zogg
ROADWAY STANDARDS DEVELOPMENT ENGINEER

6

S.D.D. 8 D 1-17

References: FDM Procedure 11-20-1

Bid items associated with this drawing:

Item #	Title
416.0610	Drilled Ties Bars (Each)
601.0105	Concrete Curb Type A (LF)
601.0110	Concrete Curb Type D (LF)
601.0115	Concrete Curb Type G (LF)
601.0120	Concrete Curb Type J (LF)
601.0150	Concrete Curb Integral Type D (LF)
601.0155	Concrete Curb Integral Type J (LF)
601.0405	Concrete Curb & Gutter 18-Inch Type A (LF)
601.0407	Concrete Curb & Gutter 18-Inch Type D (LF)
601.0409	Concrete Curb & Gutter 30-Inch Type A (LF)
601.0411	Concrete Curb & Gutter 30-Inch Type D (LF)
601.0413	Concrete Curb & Gutter 6-Inch Sloped 30-Inch Type G (LF)
601.0415	Concrete Curb & Gutter 6-Inch Sloped 30-Inch Type J (LF)
601.0417	Concrete Curb & Gutter 30-Inch Type K (LF)
601.0419	Concrete Curb & Gutter 30-Inch Type L (LF)
601.0452	Concrete Curb & Gutter Integral 30-Inch Type D (LF)
601.0454	Concrete Curb & Gutter Integral 30-Iinch Type J (LF)
601.0456	Concrete Curb & Gutter Integral 30-Inch Type L (LF)
601.0501	Concrete Curb & Gutter Integral 4-Inch Sloped 36-Inch (LF)
601.0511	Concrete Curb & Gutter Integral 6-Inch Sloped 36-Inch (LF)
601.0551	Concrete Curb & Gutter 4-Inch Sloped 36-Inch Type A (LF)
601.0553	Concrete Curb & Gutter 4-Inch Sloped 36-Inch Type D (LF)
601.0555	Concrete Curb & Gutter 6-Inch Sloped 36-Inch Type A (LF)
601.0557	Concrete Curb & Gutter 6-Inch Sloped 36-Inch Type D (LF)
601.0574	Concrete Curb & Gutter 4-Inch Sloped 30-Inch Type G
601.0576	Concrete Curb & Gutter 4-Inch Sloped 30-Inch Type J
601.0580	Concrete Curb & Gutter 4-Inch Sloped 36-Inch Type R
601.0582	Concrete Curb & Gutter 4-Inch Sloped 36-Inch Type T

Standardized Special Provisions associated with this drawing: None

Design Notes:

Any special curb or curb and gutter, different from those listed above, requires a SPV.0900 item number, special provision and special detail.

List in miscellaneous quantities all curb and curb and gutter types along with STA-STA limits LT and RT. Label typical finished sections with curb and curb and gutter types. Indicate on plan sheets where reverse slope gutter is required.

Any required modification to the standard ¾" gutter slope will need to be addressed in a plan general note or by including a special detail. When modifying the gutter cross slope, adjust that inlet spacing per FDM procedure 13-25-15.

The 4 inch curb & gutter Types R and T have been added for use between the circulatory roadway and the truck apron on roundabouts. The face of curb for the Type R and T is 6-inches from the back of curb.

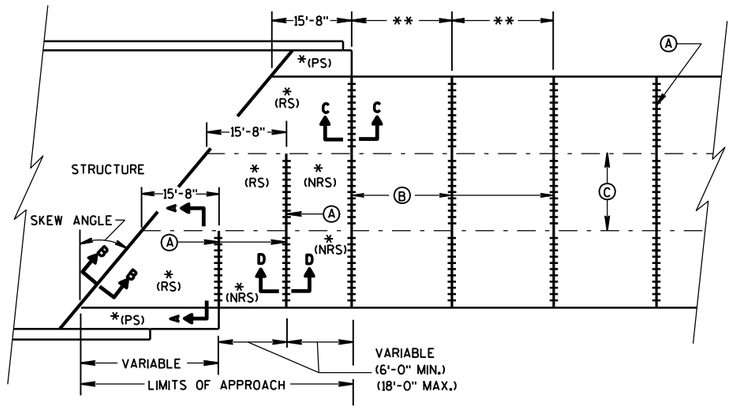
Use the end section curb & gutter at railroad crossings where curb & gutter is present and at driveways where the sidewalk is adjacent to the back of curb.

Note:

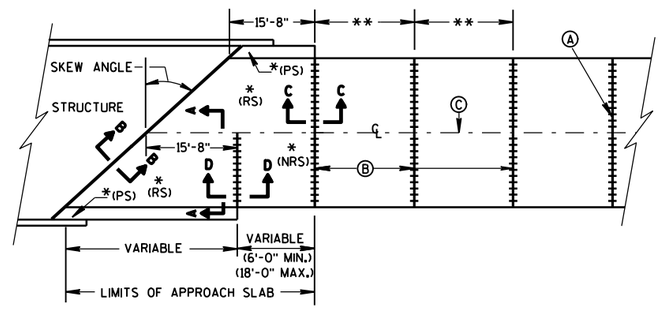
Do not use this SDD for Items 601.0199.s Concrete Curb Precast or 465.0310 Asphaltic Curb. Always include a special detail in the plan for these items. (See CADDS cell 9 or 10 in file CDCRBFTR.CEL and modify titles to match that of item 465.0310.)

Contact Person: Patrick Fleming (608) 266-8486

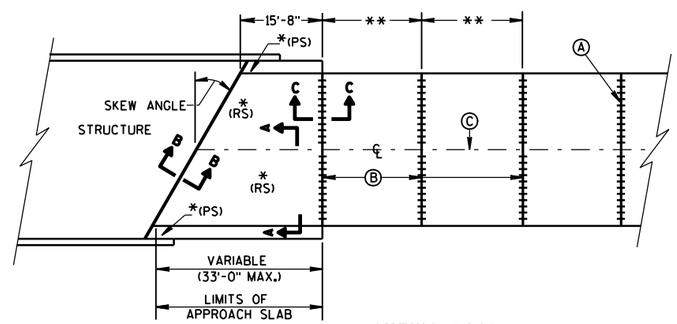
October 30, 2008



SKEWED APPROACH
(PAVEMENT MORE THAN 2 LANES)



SKEWS >30°
(PAVEMENT WIDTH ≤30')



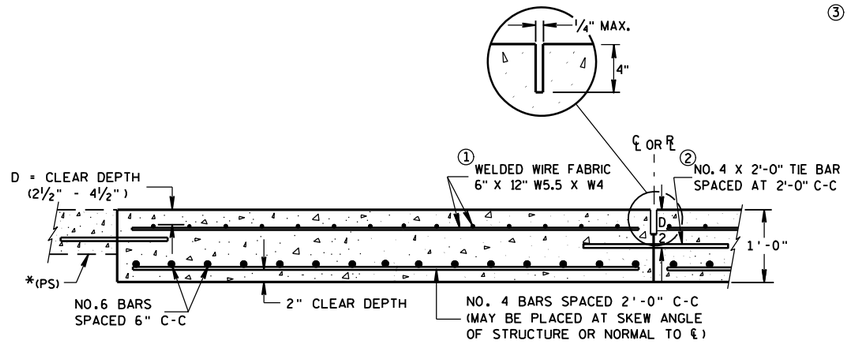
SKEWS ≤30°
(PAVEMENT WIDTH ≤30')

APPROACH SLAB AND ADJACENT PAVEMENT

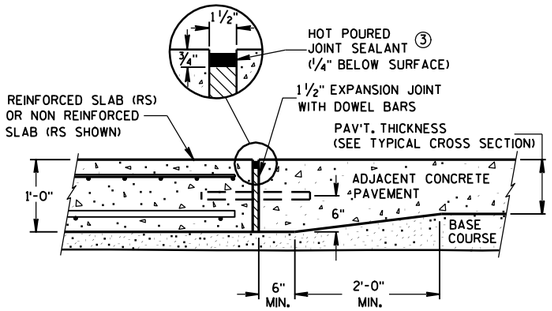
*(RS) = REINFORCED CONCRETE SLAB
*(PS) = PAVED CONCRETE SHOULDER: CONCRETE PAVEMENT, OR CONCRETE SURFACE DRAIN (SEE DETAILS ELSEWHERE IN THE PLAN)
*(NRS) = NON-REINFORCED CONCRETE SLAB

**STANDARD TRANSVERSE JOINT SPACING (SEE SDD 13C4, SDD 13C11, & SDD 13C13)

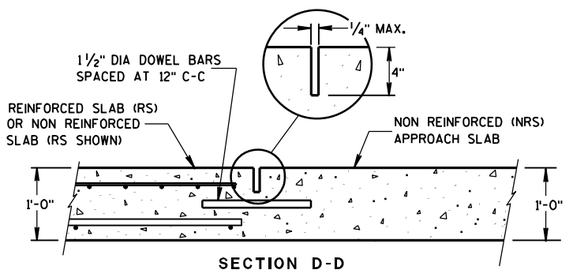
Ⓐ STANDARD CONTRACTION JOINT NORMAL TO ℄ OR ℄
Ⓑ 1½" EXPANSION JOINT WITH DOWEL BARS NORMAL TO ℄ OR ℄
Ⓒ STANDARD LONGITUDINAL JOINT AND TIE BARS.



SECTION A-A
REINFORCEMENT POSITIONING DETAIL



SECTION C-C
TRANSITION DETAIL
APPROACH SLAB TO ADJACENT PAVEMENT



SECTION D-D
CONTRACTION JOINT

GENERAL NOTES

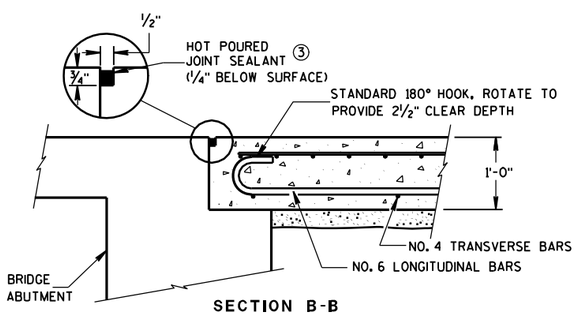
APPROACH SLABS ABUTTING AN HMA PAVEMENT OVER BASE COURSE DO NOT NEED TO BE DOWELED.

THE CONTRACTOR MAY SPLICE NO. 6 BARS IN THE APPROACH SLAB FOR SKEWED STRUCTURES ONLY. STAGGER SPLICES WITH A MAXIMUM OF ONE SPLICE PER BAR. THE LENGTH OF LAP IS 20 INCHES.

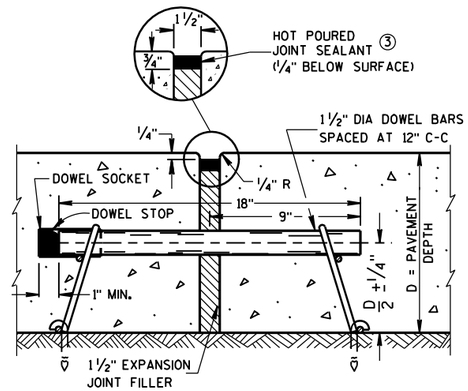
① THE CONTRACTOR MAY USE NO. 4 BARS SPACED AT 2'-0" C-C IN BOTH THE LONGITUDINAL AND TRANSVERSE DIRECTIONS FOR TOP REINFORCEMENT AS AN ALTERNATIVE TO THE WELDED WIRE FABRIC.

② THE CONTRACTOR MAY OMIT TIE BARS BETWEEN REINFORCED SLABS WHERE SLAB REINFORCEMENT BARS EXTEND ACROSS THE CENTERLINE OR REFERENCE LINE.

③ USE A JOINT SEALANT MEETING THE REQUIREMENTS OF ASTM D6690.



SECTION B-B
BEND DETAIL
BOTTOM REINFORCEMENT



EXPANSION JOINT

CONCRETE PAVEMENT APPROACH SLAB

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

APPROVED
12/11/2009 — DATE
/S/ Deb Bischoff — PAVEMENT POLICY & DESIGN ENGINEER
FHWA

6

S.D.D. 13 B 2-6

6

S.D.D. 13 B 2-6

Standard Detail Drawing 13B2-6

References:

FDM 14-10-15

Bid items associated with this drawing:

ITEM NUMBER	DESCRIPTION	UNIT
416.0050	Concrete Pavement Approach Slab	SY

Standardized Special Provisions associated with this drawing:

STSP NUMBER	TITLE
NONE	

Other SDDs associated with this drawing:

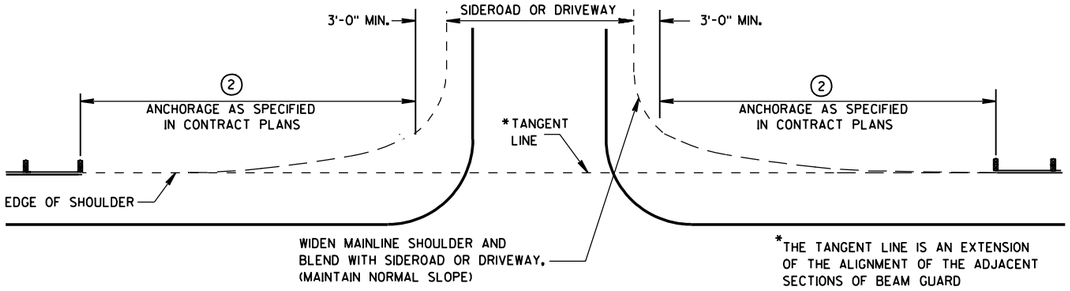
NONE

Design Notes:

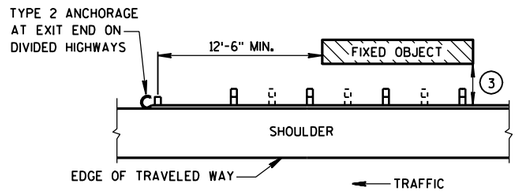
Procedure 14-10-15 provides guidance on bridge approach pavements. The bar steel reinforcement does not need to be epoxy coated due to the amount of concrete cover and because the welded wire fabric is not produced with epoxy coating. This SDD reflects AASHTO's recommendation of providing pavement expansion away from the bridge abutment.

Contact Person:

Deb Bischoff: (608) 246-7957



BEAM GUARD AT SIDEROADS OR DRIVEWAYS



BEAM GUARD AT OBSTACLES EXIT END - ONE WAY TRAFFIC

GENERAL NOTES

DETAILS OF CONSTRUCTION, MATERIALS AND WORKMANSHIP SHALL CONFORM TO THE PERTINENT STANDARD SPECIFICATIONS AND THE APPLICABLE SPECIAL PROVISIONS.

W6 X 9 OR W6 X 8.5 STEEL POSTS WITH NOTCHED PLASTIC BLOCKOUTS ARE ACCEPTABLE ALTERNATIVES FOR 6" X 8" WOOD POSTS WITH WOOD OR PLASTIC BLOCKOUTS. USE APPROVED NOTCHED PLASTIC BLOCKOUTS WITH STEEL POSTS.

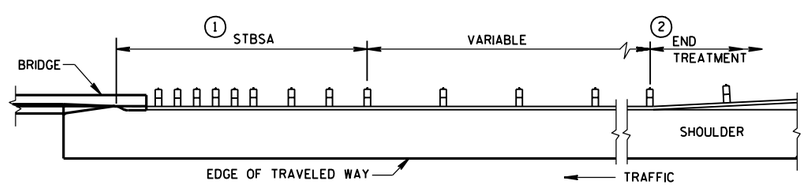
THE LOCATIONS AND LENGTHS OF BEAM GUARD ARE SHOWN ELSEWHERE IN THE PLAN.

(1) STEEL THRIE BEAM STRUCTURAL APPROACH (STBSA) - SEE CURRENT SDD 14B20.

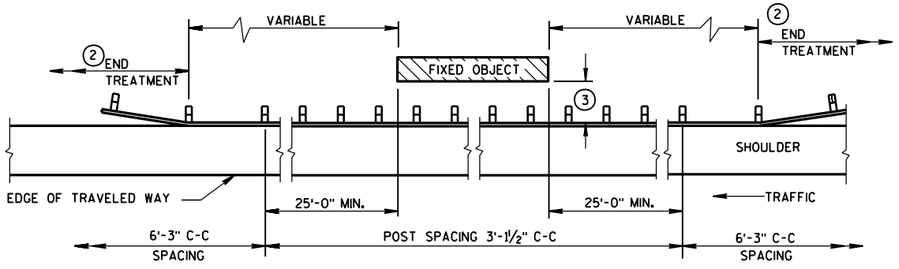
(2) USE AN APPROVED END TREATMENT FOR THE TRAFFIC APPROACH SIDE OF BRIDGE/OBSTACLES. USE TYPE 2 ANCHORAGE ONLY AT THE DOWNSTREAM ENDS OF BEAM GUARD LOCATED ALONG ROADWAYS WITH ONE WAY TRAFFIC.

(3)

MINIMUM LATERAL DISTANCE FROM FACE OF BEAM GUARD TO FIXED OBJECT	POST SPACING
3'-6"	3' - 1½"
4'-6"	6' - 3"

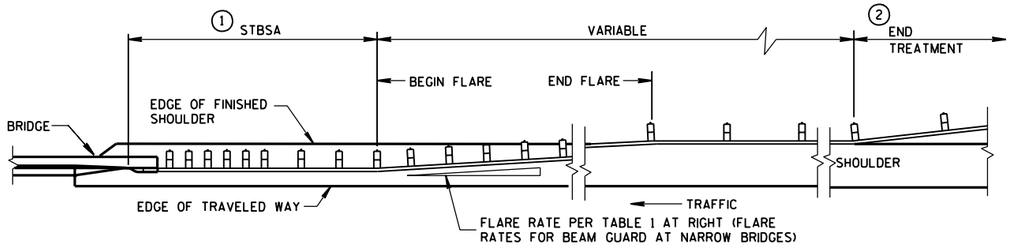


BEAM GUARD AT FULL WIDTH BRIDGES



BEAM GUARD AT OBSTACLES - TWO WAY TRAFFIC

(RAIL TO OBSTACLE CLEARANCE 3'-6" TO 4'-6")



BEAM GUARD AT NARROW BRIDGES

(FLARED TO SHOULDER EDGE, THEN PARALLEL TO ROADWAY)

TABLE 1
FLARE RATES FOR BEAM GUARD AT NARROW BRIDGES

POSTED SPEED (MPH)	FLARE RATE
25	13:1
30	15:1
35	16:1
40	18:1
45	21:1
50	24:1
55	26:1
65	30:1

STEEL PLATE BEAM GUARD, CLASS "A" (AT BRIDGES, OBSTACLES AND SIDEROADS/DRIVEWAYS)

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

APPROVED
8-21-07 — DATE
/S/ Jerry H. Zogg — ROADWAY STANDARDS DEVELOPMENT ENGINEER
FHWA

6

S.D.D. 14 B 18-6a

6

S.D.D. 14 B 18-6a

Standard Detail Drawing 14B18-6a

References: FDM Procedure 11-45-1
AASHTO Roadside Design Guide

Bid items associated with this drawing:

Item #	Title
614.0200	Steel Thrie Beam Structure Approach (LF)
614.0305	Steel Plate Beam Guard Class A (LF)
614.0370	Steel Plate Beam Guard Energy Absorbing Terminal (each)
205.9006.S	Grading, Shaping and Finishing for Barrier Terminals, Item 205.9006.S (each)

Standardized Special Provisions associated with this drawing:

STSP #	Title
205-008	Grading Shaping and Finishing for Barrier Terminals, Item 205.9006.S

Other SDD's associated with this drawing: 14B15, 14B18, and/or 14B24
Include this drawing, 14B18-a, whenever 14B15a or 14B16 are called for in the plans.

Design Notes: For Non-Grading Type Projects with Beam Guard - (Resurfacing plus Beam Guard or Separate Beam Guard Project)

Item #	Title
205.9006.S	Grading Shaping and Finishing for Barrier Terminals, Item 205.9006.S

List all items of work and round up the quantities for individual items and note them as "For Bid Information Only." Following is suggested table format for use on the Miscellaneous Quantities Sheet:

GRADING, SHAPING AND FINISHING FOR BARRIER TERMINALS, ITEM 205.9006.S

Station Location	* Comm. Exc.	* Fill	* Borrow Exc.	* Salv. Topsoil	* Fert. Type ---	* Seeding	* Mulching	Each
(Anchorage Post # 1)	C.Y.	C.Y.	C.Y.	S.Y.	CWT.	L.B.	S.Y.	
Sta.____								
Totals								

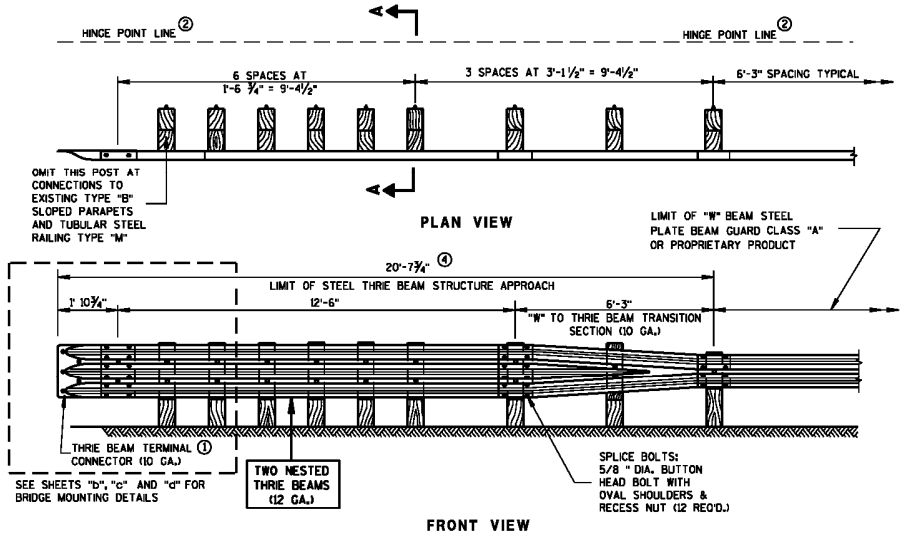
* Items & Quantities listed for Bid Information Only. For quantities shown be very clear how many units Each are included in the table.
Options to use in displaying quantities:

1. Show items and quantities for 1 Each, typical location.
2. List each anchor location separately with respective quantities.
3. Show items and quantities for all anchors inclusive, and indicate the quantity of anchors these totals are for.

The Energy Absorbing Terminal is recommended. The turn-down-end may be used on Non-NHS and Non-STH's if the roadway meets the criteria in Procedure 11-45-1.

Contact Person: Erik Emerson (608) 266-2842

September 7, 2007



GENERAL NOTES

DETAILS OF CONSTRUCTION, MATERIALS AND WORKMANSHIP NOT SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE STANDARD SPECIFICATIONS AND THE APPLICABLE SPECIAL PROVISIONS.

FURNISH AND CONSTRUCT THRIE BEAM STRUCTURAL APPROACH ACCORDING TO THE REQUIREMENTS OF SECTION 614 OF THE STANDARD SPECIFICATIONS. THRIE BEAM SECTIONS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO DESIGNATION M180, CLASS "A", TYPE 2.

BOLT THE THRIE BEAM TO ALL POSTS AND BLOCKOUTS. DRILL OR PUNCH BOLT HOLES IN THE BEAM IF THE POST SPACING IS LESS THAN 6'-3.

DO NOT USE STEEL POSTS AND NOTCHED PLASTIC BLOCKOUTS IN THE STEEL THRIE BEAM STRUCTURAL APPROACH AND THE TRANSITION SECTION OF STEEL PLATE BEAM GUARD, CLASS "A" INSTALLATIONS.

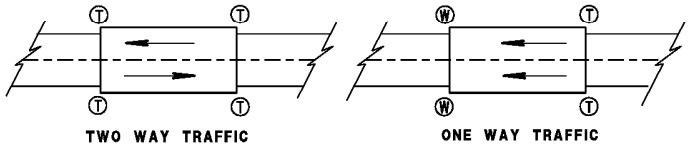
IF ROCK IS ENCOUNTERED DURING EXCAVATION, THE ENGINEER MAY APPROVE USING A 12 INCH DIAMETER POST HOLE EXTENDING 20 INCHES DEEP INTO THE ROCK. PLACE GRANULAR MATERIAL IN THE BOTTOM OF THE HOLE APPROXIMATELY 2½ INCHES DEEP. CUT THE POSTS TO LENGTH AND PLACE IN THE HOLE. BACKFILL WITH MATERIAL EXCAVATED FROM THE HOLE AND COMPACT ADEQUATELY. (SEE SDD 14 B 15-4a).

① BRIDGE RAILING TYPE "W" DOES NOT REQUIRE A TERMINAL CONNECTOR.

② MINIMUM EMBEDMENT SHALL BE 4'-0". WHERE EXISTING CONDITIONS DO NOT PERMIT THE APPROPRIATE EARTHWORK SHOWN ON THE PLAN TYPICAL SECTIONS OR DETAILS, THE ENGINEER MAY ALLOW THE REDUCTION OR ELIMINATION OF THE 2 FOOT DISTANCE TO THE HINGE POINT. OTHERWISE BUILD AS THE PLAN SHOWS OR AS THE ENGINEER DIRECTS. IF THE 2 FOOT DISTANCE TO THE HINGE POINT IS REDUCED OR ELIMINATED, INCREASE THE POST EMBEDMENT DEPTH TO 4'-6" OR MORE.

③ BOLTS SHALL CONFORM TO THE REQUIREMENTS OF ASTM F-1554, GRADE 55. NUTS SHALL CONFORM TO THE REQUIREMENTS OF ASTM A-563 DH.

④ ALL WOOD POSTS MUST BE 6" X 8" AND AT LEAST 7'-0" LONG.

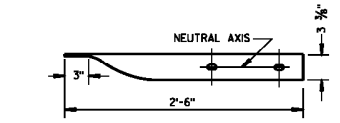


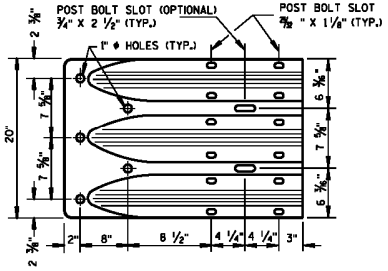
TWO WAY TRAFFIC — ONE WAY TRAFFIC

Ⓣ THRIE BEAM CONNECTION

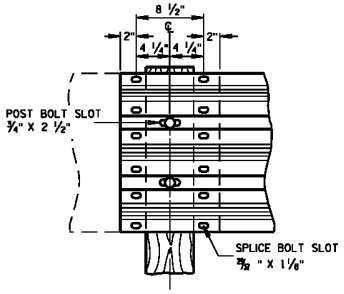
Ⓦ W-BEAM CONNECTION WHEN REQUIRED

TYPICAL LOCATIONS OF THRIE BEAM AND W-BEAM CONNECTIONS TO BRIDGE

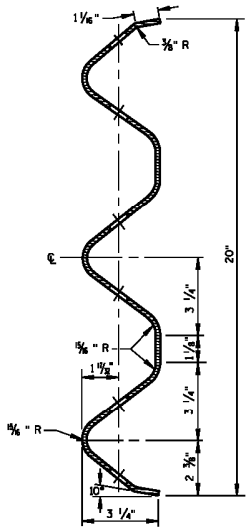




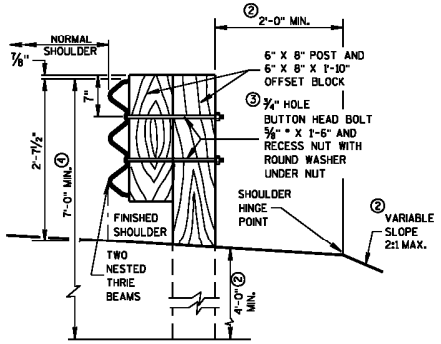
THRIE BEAM TERMINAL CONNECTOR



THRIE BEAM SPLICE



SECTION THRU THRIE BEAM RAIL ELEMENT



SECTION A-A

STEEL THRIE BEAM STRUCTURE APPROACH

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

APPROVED
6-3-2010 — DATE
/S/ Jerry M. Zogg — ROADWAY STANDARDS DEVELOPMENT ENGINEER
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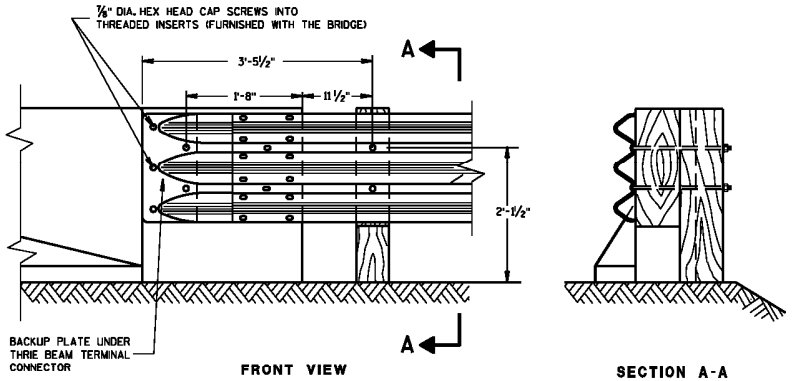
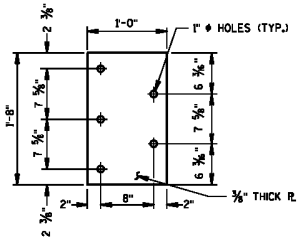


FRONT VIEW

SECTION A-A

THRIE BEAM CONNECTION TO BRIDGE PARAPET WITH SQUARE ENDS



② **BACKUP PLATE DETAIL**

(USE ONLY AT BRIDGE PARAPET CONNECTIONS)

GENERAL NOTES

THESE ARE TYPICAL CONNECTION DETAILS. ADJUST THE POSTION OF CONNECTIONS TO EXISTING BRIDGES TO FIT THE ACTUAL BRIDGE AND SITE DIMENSIONS.

BOLTS, PLATES, NUTS AND WASHERS SHALL CONFORM TO THE REQUIREMENTS OF ASTM SPECIFICATION A 325, AND BE GALVANIZED IN ACCORDANCE WITH ASTM A 153.

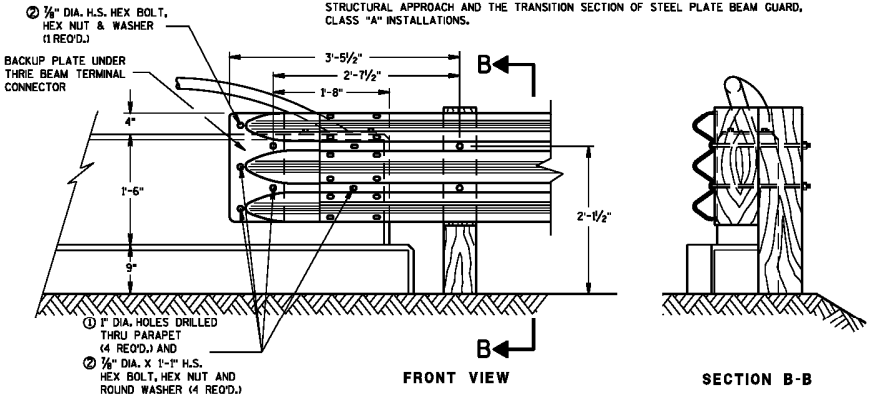
① INCLUDE THE PAYMENT FOR DRILLING BOLT HOLES THROUGH THE PARAPET, AND THE BACKUP PLATE AND ALL BOLTS, NUTS AND WASHERS IN THE ITEM "STEEL THRIE BEAM STRUCTURAL APPROACH".

② EACH BOLT AT THE BACK FACE OF THE PARAPET REQUIRES A HARDENED ROUND STEEL WASHER WITH A 2 ¼" O.D. X ⅝ " THICK.

③ THE RECESS FOR A W-BEAM CONNECTION, WHICH EXISTS ON SOME PARAPETS OF THIS TYPE, SHALL BE FILLED WITH A TREATED TIMBER BLOCKOUT. BLOCKOUT SIZE IS 1'-6" X 2'-0" X 3 ½".

④ W6 X 9 OR W6 X 8.5 STEEL POSTS AND NOTCHED PLASTIC BLOCKOUTS ARE ACCEPTABLE ALTERNATIVES FOR 6" X 8" WOOD POST WITH WOOD OR PLASTIC BLOCKOUTS. USE APPROVED NOTCHED PLASTIC BLOCKOUTS WITH STEEL POSTS.

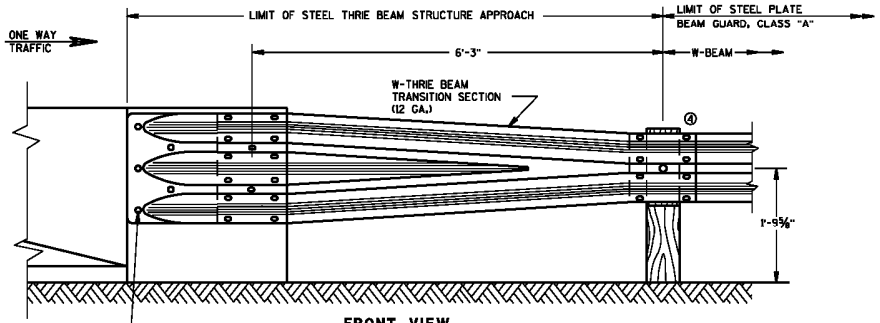
DO NOT USE STEEL POSTS AND NOTCHED PLASTIC BLOCKOUTS IN THE STEEL THRIE BEAM STRUCTURAL APPROACH AND THE TRANSITION SECTION OF STEEL PLATE BEAM GUARD, CLASS "A" INSTALLATIONS.



FRONT VIEW

SECTION B-B

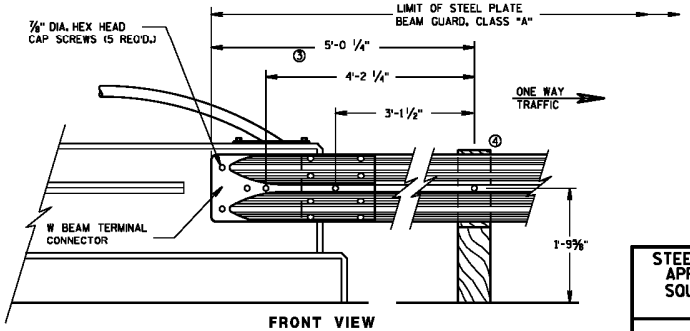
THRIE BEAM CONNECTION TO VERTICAL FACED PARAPETS



FRONT VIEW

W BEAM TRANSITION AND CONNECTION TO BRIDGE PARAPETS WITH SQUARE ENDS

(USE ONLY ON THE TRAFFIC EXIT END OF ONE WAY BRIDGES)



FRONT VIEW

W BEAM CONNECTION TO VERTICAL FACE PARAPET

(USE ONLY ON THE TRAFFIC EXIT END OF ONE WAY BRIDGES)

STEEL THRIE BEAM STRUCTURE APPROACH, CONNECTION TO SQUARE END AND VERTICAL FACED PARAPETS

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

APPROVED

6-3-2010 — DATE

/S/ Jerry M. Zogg — ROADWAY STANDARDS DEVELOPMENT ENGINEER

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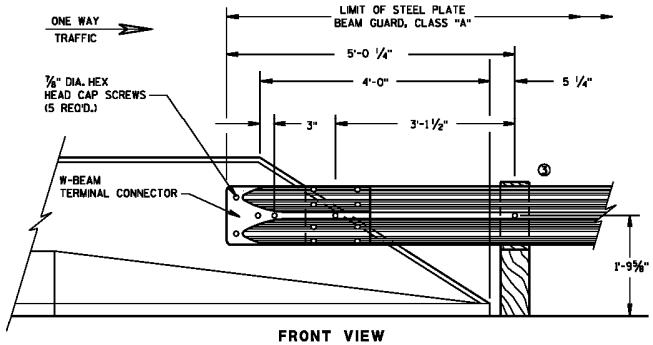


FRONT VIEW

W BEAM CONNECTION TO PARAPETS WITH SLOPED ENDS

(USE ONLY AT TRAFFIC EXIT END OF ONE WAY BRIDGE)

GENERAL NOTES

THESE ARE TYPICAL CONNECTION DETAILS. ADJUST THE POSTION OF CONNECTIONS TO EXISTING BRIDGES TO FIT THE ACTUAL BRIDGE AND SITE DIMENSIONS.

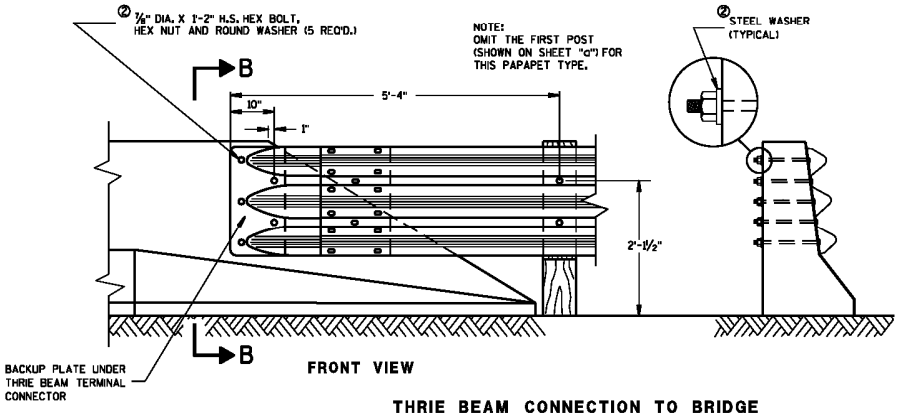
BOLTS, PLATES, NUTS AND WASHERS SHALL CONFORM TO THE REQUIREMENTS OF ASTM SPECIFICATION A 325, AND BE GALVANIZED IN ACCORDANCE WITH ASTM A 153.

① INCLUDE THE PAYMENT FOR DRILLING BOLT HOLES THROUGH THE PARAPET, AND THE BACKUP PLATE AND ALL BOLTS, NUTS AND WASHERS IN THE ITEM "STEEL THRIE BEAM STRUCTURAL APPROACH".

② EACH BOLT AT THE BACK FACE OF THE PARAPET REQUIRES A HARDENED ROUND STEEL WASHER WITH A 2 1/4" O.D. X 5/32 " THICK.

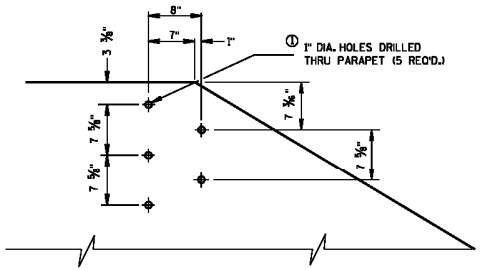
③ W6 X 9 OR W6 X 8.5 STEEL POSTS AND NOTCHED PLASTIC BLOCKOUTS ARE ACCEPTABLE ALTERNATIVES FOR 6" X 8" WOOD POST WITH WOOD OR PLASTIC BLOCKOUTS. USE APPROVED NOTCHED PLASTIC BLOCKOUTS WITH STEEL POSTS.

DO NOT USE STEEL POSTS AND NOTCHED PLASTIC BLOCKOUTS IN THE STEEL THRIE BEAM STRUCTURAL APPROACH AND THE TRANSITION SECTION OF STEEL PLATE BEAM GUARD, CLASS "A" INSTALLATIONS.



FRONT VIEW

THRIE BEAM CONNECTION TO BRIDGE PARAPETS WITH SLOPED ENDS



DRILL HOLE LOCATION AND PATTERN FOR THRIE BEAM CONNECTION

STEEL THRIE BEAM STRUCTURE APPROACH, CONNECTION TO SLOPED END PARAPETS	
STATE OF WISCONSIN DEPARTMENT OF TRANSPORTATION	
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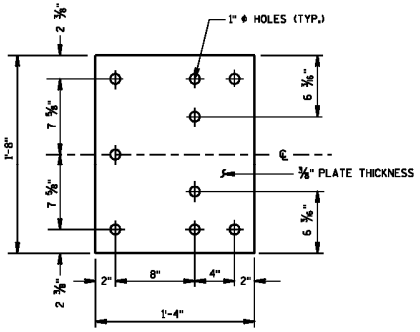
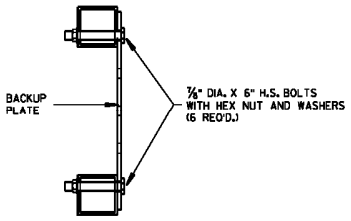


BACK-UP PLATE DETAIL



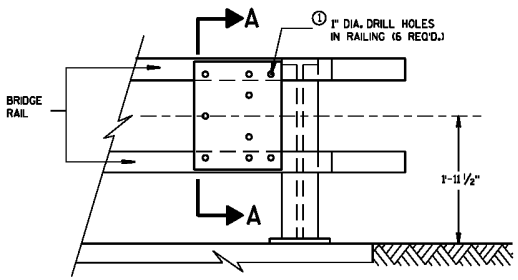
SECTION A-A

GENERAL NOTES

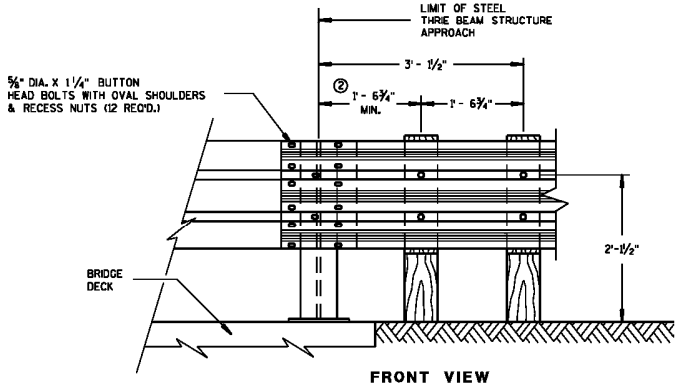
BOLTS, PLATES, NUTS AND WASHERS SHALL CONFORM TO THE REQUIREMENTS OF ASTM SPECIFICATION A 325 AND BE GALVANIZED IN ACCORDANCE WITH ASTM A 153.

① INCLUDE THE PAYMENT FOR DRILLING HOLES IN RAILING IN THE ITEM "STEEL THRIE BEAM STRUCTURE APPROACH".

② VARY THIS DIMENSION DEPENDING ON ABUTMENT TYPE, WINGWALL DETAILS, AND ANGLE OF SKEW. PLACE THE FIRST WOOD POST OFF THE BRIDGE SHALL AS CLOSE AS FEASIBLE TO THE STEEL END POST.

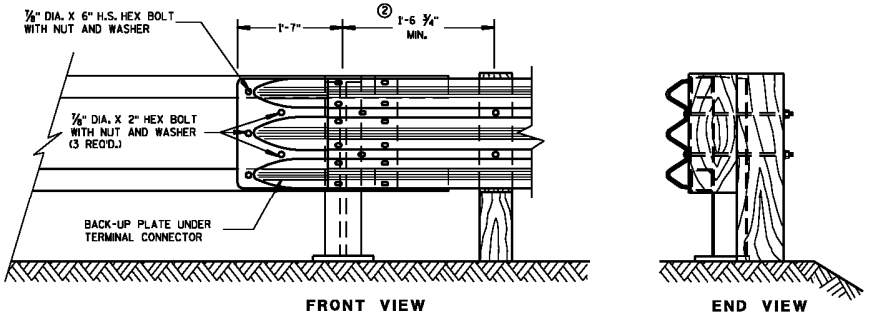


BACK-UP PLATE MOUNTING ONTO BRIDGE RAILING



FRONT VIEW

THRIE BEAM CONNECTION TO STEEL RAILING TYPE "W"



FRONT VIEW

END VIEW

THRIE BEAM CONNECTION TO TUBULAR RAILING TYPE "F"

STEEL THRIE BEAM STRUCTURE APPROACH, CONNECTION TO BRIDGE RAILING TYPES "F" AND "W"

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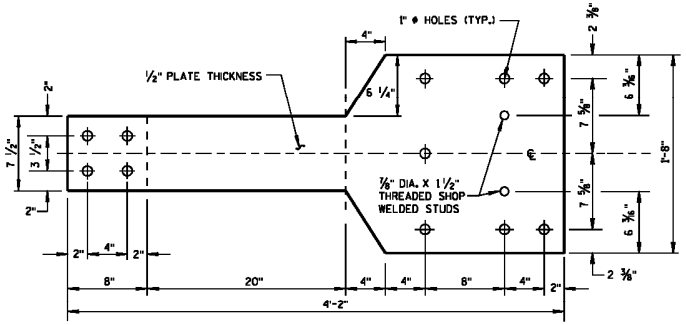
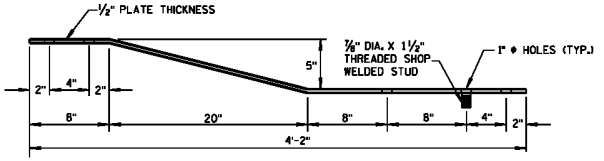
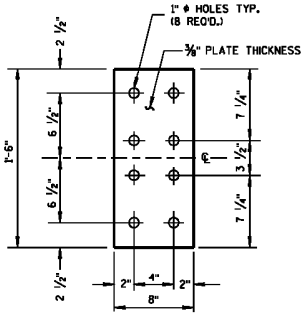
GENERAL NOTES

① VARY THIS DIMENSION DEPENDING ON ABUTMENT TYPE, WINGWALL DETAILS, AND ANGLE OF SKEW. PLACE THE FIRST WOOD POST OFF THE BRIDGE SHALL BE AS CLOSE AS FEASIBLE TO THE STEEL END POST.

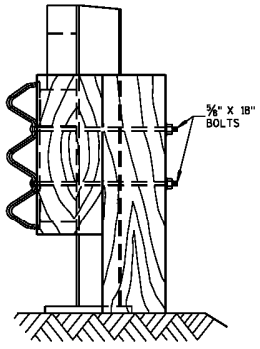


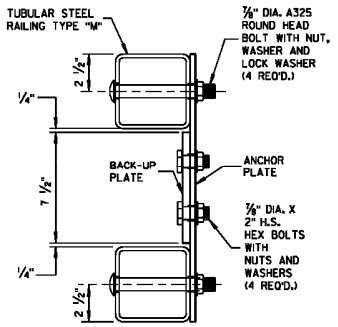


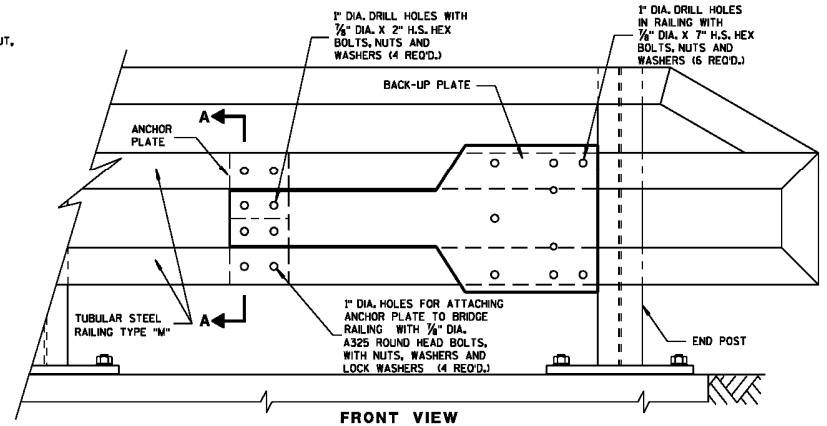
BACK-UP PLATE DETAIL, TYPE "M"



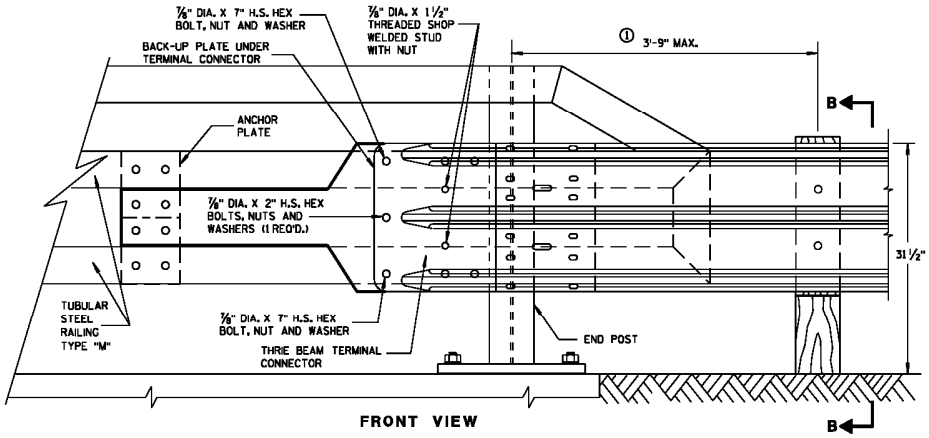
ANCHOR PLATE DETAIL, TYPE "M"

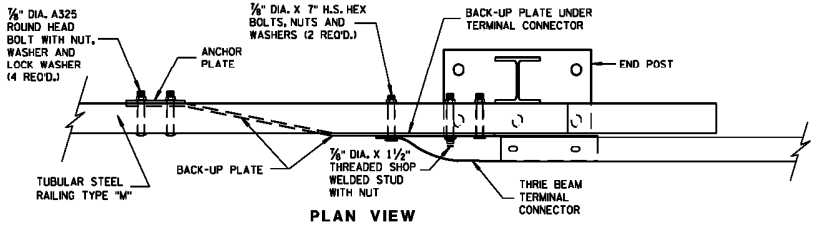






ANCHOR AND BACK-UP PLATE MOUNTING TO BRIDGE RAILING, TYPE "M"





THRIE BEAM CONNECTION TO TUBULAR RAILING, TYPE "M"

STEEL THRIE BEAM STRUCTURE APPROACH, CONNECTION TO BRIDGE RAILING TYPE "M"

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GENERAL NOTES

COVER PLATE PANELS ARE 3/16" THICK.

ALL STIFFENERS ARE 1/4" THICK.

CONNECTOR PLATE SHALL BE FABRICATED FROM ASTM GRADE A36 STEEL AND GALVANIZED.

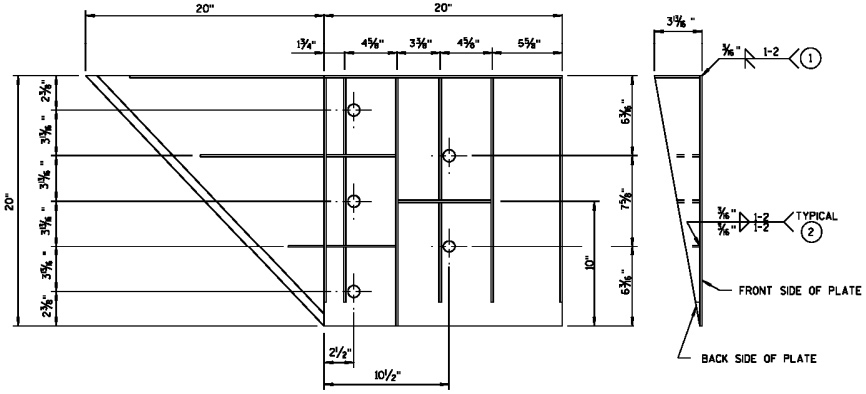
FOR GALVANIZED REQUIREMENTS, SEE SECTION 614 OF THE STANDARD SPECIFICATIONS.

ALL HOLE DIAMETERS SHALL BE 1".

FOR OPPOSITE SIDE INSTALLATION MIRROR DRAWINGS.

(1) STIFFENERS LOCATED AT THE OUTSIDE EDGES OF THE COVER PLATES SHALL BE WELDED AS FOLLOWS:
SINGLE BEVEL GROOVE WELD ON EXTERNAL SIDES AND 3/16" FILLET WELD BY 1" LONG SPACED AT 2" ON INTERNAL SIDES.

(2) STIFFENERS LOCATED ON THE INSIDE OF THE COVER PLATE SHALL BE WELDED AS FOLLOWS:
3/16" FILLET WELD BY 1" LONG SPACED AT 2".



WELDING INSTRUCTION

(VIEWED FROM BACK SIDE OF PLATE)

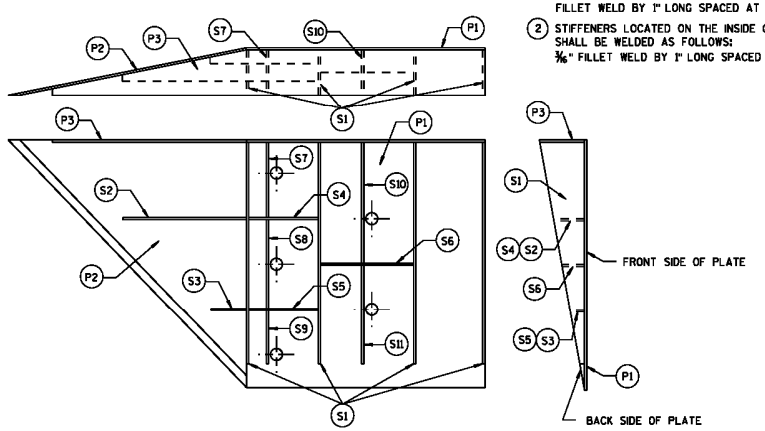


PLATE AND STIFFENER IDENTIFICATION

(VIEWED FROM BACK SIDE OF PLATE)

CONNECTOR PLATE DIMENSION (PER ASSEMBLY)

PLATE	QUANTITY	SHAPE	SIZE (A x B x C x D)	THICKNESS
P1	1		20" x 20"	3/16"
P2	1		20" x 20" x 28 5/16"	3/16"
P3	1		39" x 3 5/8" x 20" x 19 5/16"	3/16"
S1	4		18 1/16" x 3 5/8" x 18 3/4"	1/4"
S2	1		10 1/4" x 2 7/16" x 10 3/8" x 1/2"	1/4"
S3	1		3" x 1/16" x 3 1/8" x 1/2"	1/4"
S4	1		6 1/8" x 2 7/16"	1/4"
S5	1		6 1/8" x 1 1/16"	1/4"
S6	1		7 3/4" x 1 3/4"	1/4"
S7	1		2 9/16" x 6" x 3 5/8" x 5 7/8"	1/4"
S8	1		1 19/32" x 7 1/2" x 2 1/2" x 7 3/16"	1/4"
S9	1		6 1/16" x 6 3/16" x 1 3/32"	1/4"
S10	1		1 7/8" x 9 7/8" x 3 5/8" x 9 5/16"	1/4"
S11	1		8 1/2" x 8 3/4" x 1 5/16"	1/4"

STEEL THRIE BEAM STRUCTURE APPROACH

STEEL THRIE BEAM STRUCTURE APPROACH, CONNECTOR PLATE DETAIL

STATE OF WISCONSIN
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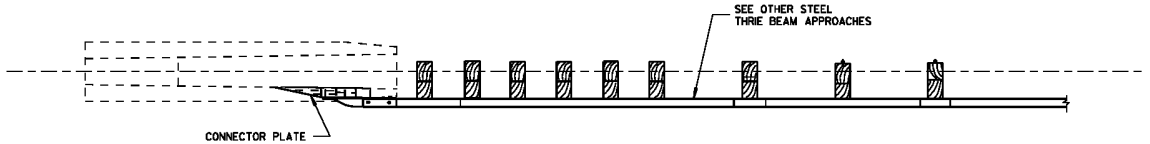
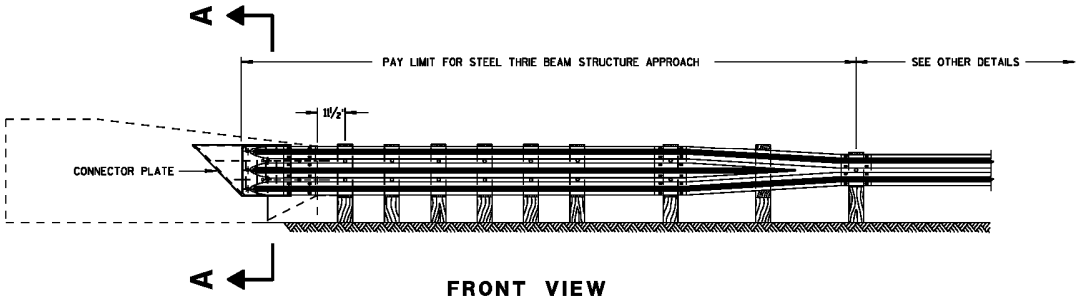
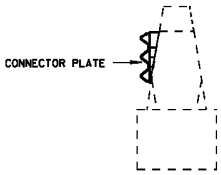


PLAN VIEW

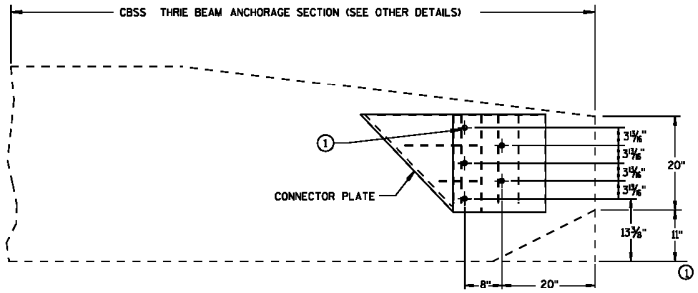


FRONT VIEW



SECTION A-A

SEE SDD 14B-20 FOR OTHER DETAILS.
CONSTRUCT PER STANDARD SPECIFICATION 614.
CONNECTOR PLATE INCIDENTAL TO STEEL THRIE BEAM STRUCTURE APPROACH.



① USE ⅞" DIAMETER A325 BOLT WITH HEX HEAD AND, NUT, AND WASHER.
EXTEND ⅞" DIAMETER BOLT COMPLETELY THROUGH BARRIER.
BACK FACE OF BARRIER REQUIRES A HARDENED ROUND STEEL WASHER WITH 2¼" OUTER DIAMETER.
GROUT ANY DAMAGED CONCRETE FROM BOLT INSTALLATION.

CONNECTOR PLATE LOCATION

STEEL THRIE BEAM STRUCTURE APPROACH

STEEL THRIE BEAM
STRUCTURE APPROACH,
SINGLE SLOPE ATTACHMENT

STATE OF WISCONSIN
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APPROVED
6-3-2010
DATE
/S/ Jerry H. Zogg
ROADWAY STANDARDS DEVELOPMENT ENGINEER
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Contact Person

Erik Emerson (608) 266-2842

References

Standard Spec 614
FDM 11-45-2
FDM 11-45-1
AASHTO Roadside Design Guide
NCHRP Report 350 Test 3-21 of the Thrie Beam Transition to Wisconsin Type “M” Tubular Steel Bridge Rail, January 2003
MwRSF report TRP-03-47-95

Design Notes:

Consider surface runoff from a structure when installing thrie beam structural approach. Excessive run-off will scour beam guard posts in the structural approach affecting the performance of the system. Include appropriate protection for these areas by providing concrete surface drains. Avoid removing of post to accommodate drainage structures.

It may be necessary to increase post length to accommodate steeper slopes.

Do not install curb and gutter in front of Steel Thrie Beam Structure Approach when installing concrete barrier single slope anchor.

Standardized Special Provisions associated with this drawing:

STSP NUMBER	TITLE
(none)	

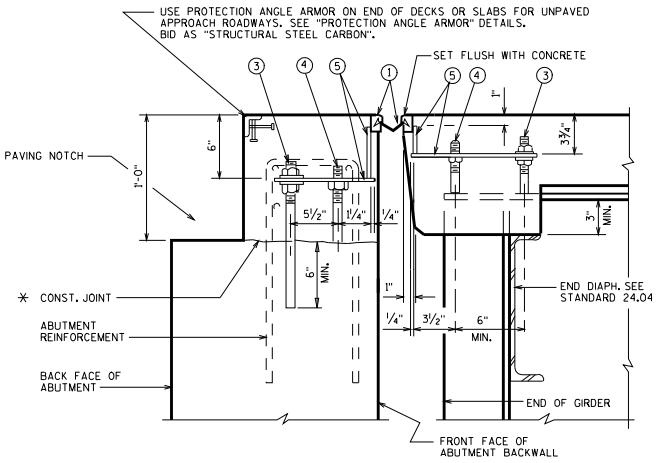
Other SDDs associated with this drawing:

SDD 14B11 Concrete Barrier (Double Faced)
SDD 14B15 Steel Plate Beam Guard, Class “A”, Installation & Elements, Mow Strip Detail
SDD 14B22 Concrete Barrier, Single-Faced (With Anchorage)
SDD 14B24 Steel Plate Beam Guard Energy Absorbing Terminal
SDD 14B32 Concrete Barrier Single Slope
SDD 14B33 Thrie Beam Anchorages
SDD 14B34 Short Concrete Barrier Sections (Use for runs of less than 40'
SDD 14B41 Roadside Retaining Wall Barrier

Bid items associated with this drawing:

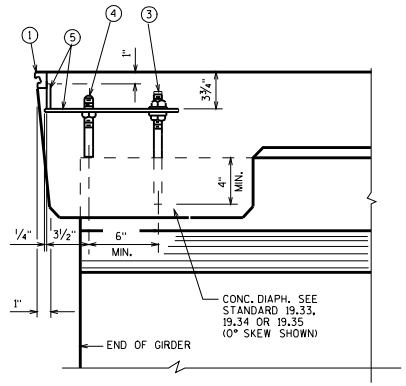
ITEM NUMBER	DESCRIPTION	UNIT
603.0105	Concrete Barrier Single-Faced 32-Inch	LF
603.0205	Concrete Barrier Double-Faced 32-Inch	LF
603.1000 - 1999	Concrete Barrier (type)	LF
614.0200	Steel Thrie Beam Structure Approach	LF
614.0230	Steel Thrie Beam	LF
614.0250	Steel Thrie Beam Structure Approach Temporary	LF
614.0300 - 0339	Steel Plate Beam Guard (class)	LF
614.0360	Steel Plate Beam Guard Temporary	LF
614.0370	Steel Plate Beam Guard Energy Absorbing Terminal	EACH
614.0380	Steel Plate Beam Guard Energy Absorbing Terminal Temporary	EACH
614.0390	Steel Plate Beam Guard Short Radius Terminal	EACH
614.0395 - 0399	Guardrail Mow Strip (material)	SY
614.0400	Adjusting Steel Plate Beam Guard	LF

614.0920	Salvaged Rail	LF
614.0925	Salvaged Guardrail End Treatments	EACH
614.0930 - 0939	Salvaged (component)	EACH
614.0950	Replacing Guardrail Posts and Blocks	EACH
614.0951	Replacing Guardrail Rail and Hardware	LF
690.0150	Sawing Asphalt	LF
690.0250	Sawing Concrete	LF



TYPICAL SECTION THRU JOINT AT STEEL GIRDER

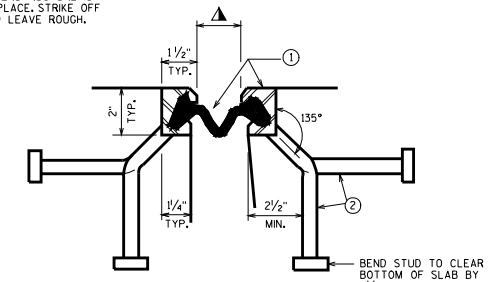
NORMAL TO ℄ SUBSTRUCTURE



PART SECTION THRU JOINT AT PRESTRESSED GIRDERS

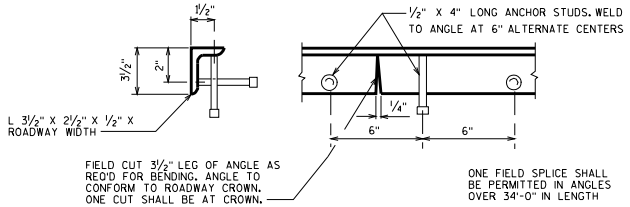
NORMAL TO ℄ SUBSTRUCTURE

✳ POUR CONC. ABOVE THIS JOINT AFTER SUPERSTRUCTURE IS IN PLACE. STRIKE OFF AND LEAVE ROUGH.

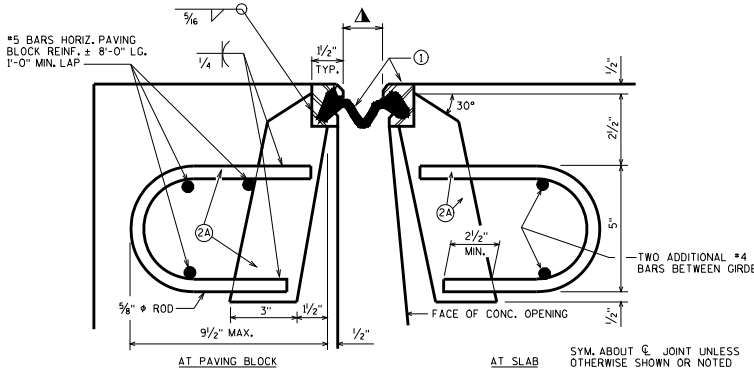


SECTION THRU JOINT

EXTERIOR GIRDER TO EDGE OF SLAB, AND AT PARAPETS, MEDIANS AND SIDEWALKS



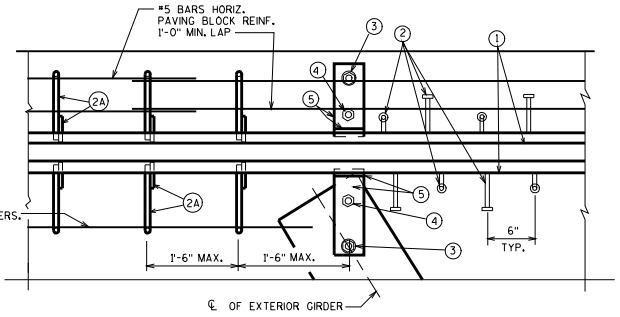
PROTECTION ANGLE ARMOR



SYM. ABOUT ℄ JOINT UNLESS OTHERWISE SHOWN OR NOTED

SECTION THRU JOINT

ROADWAY TRAFFIC AREA BETWEEN EXTERIOR GIRDERS.



PART PLAN

LEGEND

⚠ (1) NEOPRENE STRIP SEAL (.-INCH) AND STEEL EXTRUSIONS. SET JOINT OPENING AT 1¾" WHEN EXPANSION LENGTH ≤ 230'-0". WHEN EXPANSION LENGTH > 230'-0", PREPARE A TEMPERATURE TABLE SHOWING JOINT OPENINGS FROM 5°F TO 85°F IN 10°F INCREMENTS. ACCOUNT FOR PRESTRESSED GIRDER SHRINKAGE DUE TO CREEP WHEN DETERMINING THIS TABLE.

(2) STUDS ⅝" ø × 6⅜" LONG AT 6" ALTERNATE CENTERS. WELD TO EXTRUSIONS AND BEND AS SHOWN AFTER WELDING.

(2A) ½" THICK ANCHOR PLATE WITH ⅝" ø ROD (OR ALTERNATE STRIP SEAL ANCHOR). WELD ROD TO ANCHOR PLATE, WELD ANCHOR PLATE TO NO. 1 AT 1'-6" CENTERS BETWEEN GIRDERS.

(3) ¾" ø THREADED ROD WITH 2 NUTS AND PLATE WASHERS. FOR PRESTRESSED GIRDERS, GROUT THREADED ROD INTO FIELD DRILLED HOLES ON ℄ OF GIRDER. FOR STEEL GIRDERS, WELD THREADED ROD TO TOP FLANGE OR ATTACH BY BOLTING THRU FLANGE. ON ABUTMENT SIDE, GROUT THREADED ROD INTO FIELD DRILLED HOLES IN ABUTMENT BACKWALL AS SHOWN.

(4) ¾" ø THREADED ROD WITH NUT. TACK WELD NUT TO NO. 5.

(5) FABRICATE SUPPORT FROM 3" × ½" BAR AS SHOWN OR EQUIVALENT. ONE PER GIRDER PER SIDE. SHOP OR FIELD WELD TO NO. 1. IF FIELD WELDED, COVER WELDED AREAS WITH EPOXY-COATING MATERIAL. PROVIDE 1½" ø HOLE FOR NO. 3 AND 1" ø HOLE FOR NO. 4.

REFER TO STANDARD 28.02

(6) GALVANIZED PLATE ⅜" × 10½" × (2'-0" LONG FOR SKEWS TO 45° AND 3'-0" LONG FOR SKEWS > 45°) WITH HOLES FOR NO. 7. BEND AS SHOWN.

(7) ¾" ø × 1½" STAINLESS STEEL SOCKET FLAT HEAD SCREWS WITH ANTI-SEIZE LUBRICANT. PLACE IN COUNTERSUNK HOLE. RECESS 1/16" BELOW PLATE SURFACE.

(8) ¾" ø × 4" GALVANIZED HEX HEAD BOLT. BEND 45°.

(9) ¾" ø × 2¼" GALVANIZED THREADED COUPLING.

(10) SIDEWALK COVER PLATE ⅜" × (2'-0" WIDE FOR SKEWS TO 45° AND 3'-0" WIDE FOR SKEWS > 45°) × LIMITS SHOWN. BEND DOWN FACE OF SIDEWALK WITH HOLES FOR NO. 7. GALVANIZE PLATE AFTER SLIP-RESISTANT SURFACE IS APPLIED.

(11) 1" × 5" SLOTTED COUNTERSUNK HOLE FOR NO. 7. PLACE SLOT PARALLEL TO DIRECTION OF MOVEMENT.

GENERAL NOTES

ONE FIELD SPLICE PERMITTED IN STEEL EXTRUSIONS. IF USED, DETAILS SHALL BE SUBMITTED FOR APPROVAL. NO SPLICING PERMITTED IN NEOPRENE STRIP SEAL.

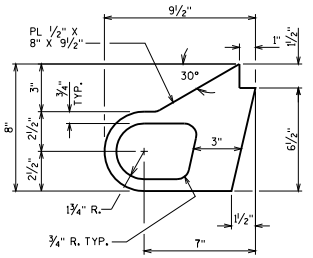
AFTER FABRICATION, BUT BEFORE SHIPMENT, STRAIGHTEN STEEL EXTRUSIONS SUCH THAT THEY SHALL BE FREE FROM WARP, TWIST & SWEEP.

FABRICATOR SHALL PROVIDE MEANS OF KEEPING GALVANIZED EXTRUSIONS CLEAN AND SMOOTH DURING SHIPMENT AND PRIOR TO APPLYING LUBRICANT ADHESIVE FOR NEOPRENE GLAND INSTALLATION.

SANDBLAST PLATES AND EXTRUSIONS AFTER FABRICATION IN ACCORDANCE WITH SSPC SP. #6 "COMMERCIAL BLAST CLEANING". AFTER BLAST CLEANING, THE PLATES AND EXTRUSIONS SHALL BE HOT DIPPED GALVANIZED. SLIP-RESISTANT SURFACE IS APPLIED TO SIDEWALK COVER PLATES BY THE MANUFACTURER AND THEN HOT DIPPED GALVANIZED TO THEIR RECOMMENDATIONS TO MAINTAIN THE INTEGRITY OF THIS SURFACE.

ANCHOR SYSTEM NO. 8 AND NO. 9 SHALL CONFORM TO ASTM A307 AND SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM A153 CLASS C AND D.

STRIP SEAL EXPANSION JOINT ASSEMBLY, INCLUDING ANCHOR STUDS AND HARDWARE WILL BE PAID FOR AT THE LUMP SUM PRICE BID FOR "EXPANSION DEVICE B-_-_".



ALTERNATE STRIP SEAL ANCHOR

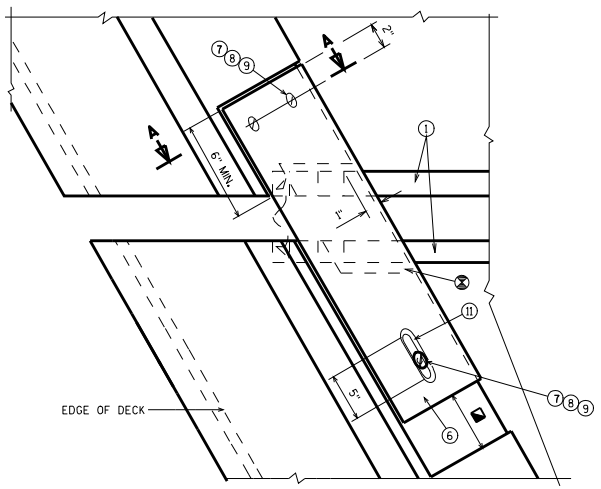
STRIP SEAL EXPANSION JOINT DETAILS

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION
STRUCTURES DEVELOPMENT SECTION

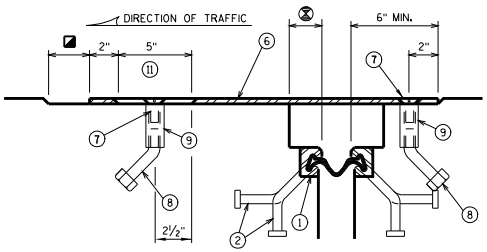
APPROVED: Scot Becker

DATE: 7-10

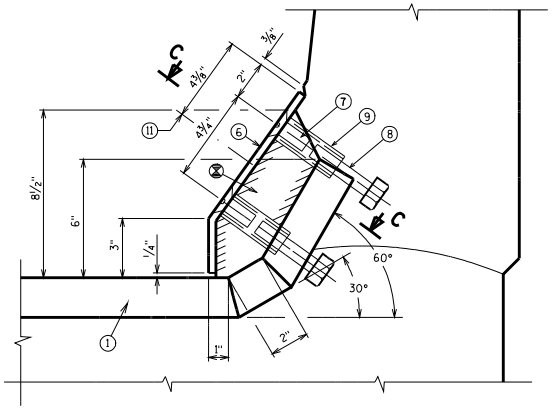
STANDARD 28.01



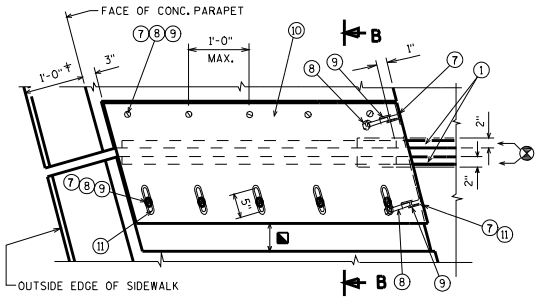
PLAN AT PARAPET



SECTION C-C

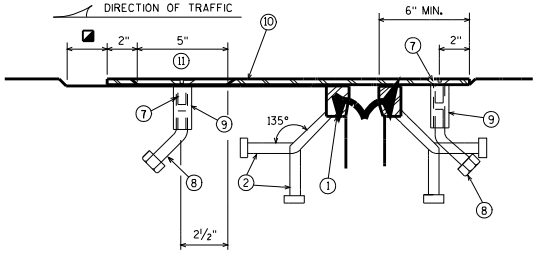


SECTION A-A

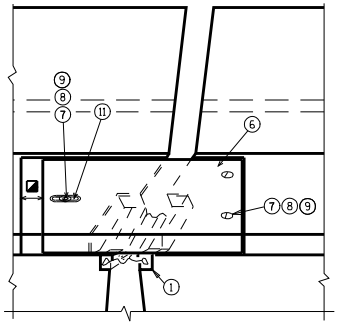


PLAN AT SIDEWALK

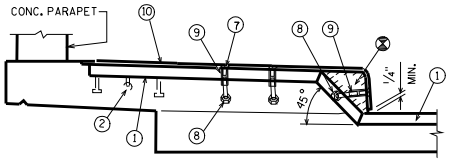
† 1'-2" WHEN "VERTICAL FACE PARAPET TYPE 'TX' IS USED



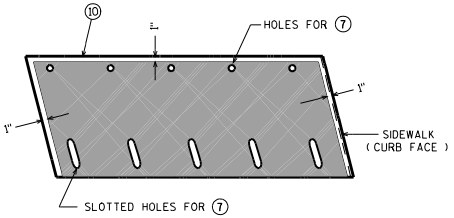
SECTION B-B



VIEW OF PARAPET PLATES FROM ROADWAY



SECTION AT SIDEWALK



PLAN OF SIDEWALK COVER PLATE WITH SLIP-RESISTANT SURFACE

PLACE SLIP-RESISTANT SURFACE ON TOP WALKING SURFACE IN SHADED AREA ONLY (NOT ON CURB FACE).

APPROVED SLIP-RESISTANT APPLIED SURFACES FOR STEEL PLATES		
PRODUCT	MANUFACTURER	CONTACT AT
SLIPNOT GRADE 2, STEEL	W. S. MOLNAR COMPANY	1-800-SLIPNOT
ALGRIP, STEEL	ROSS TECHNOLOGY CORP.	1-800-345-8170

⊠ BLOCK OUT CONCRETE 2" EACH SIDE OF JOINT OPENING

◪ JOINT OPENING DIM. ALONG SKEW PLUS ½"

STRIP SEAL COVER PLATE DETAILS

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION
STRUCTURES DEVELOPMENT SECTION

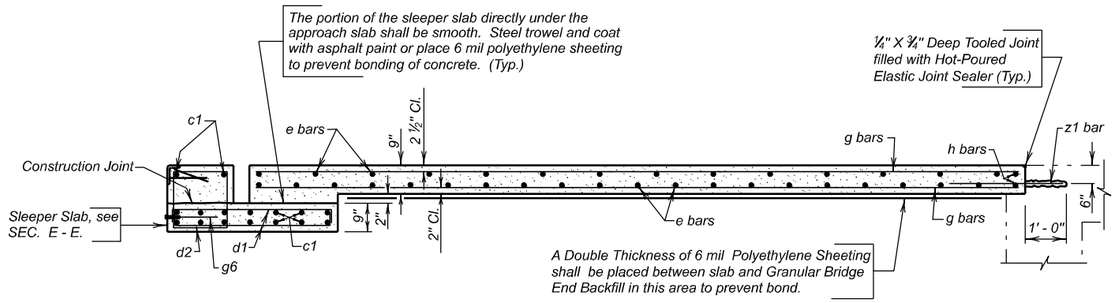
APPROVED: Scot Becker

DATE: 7-10

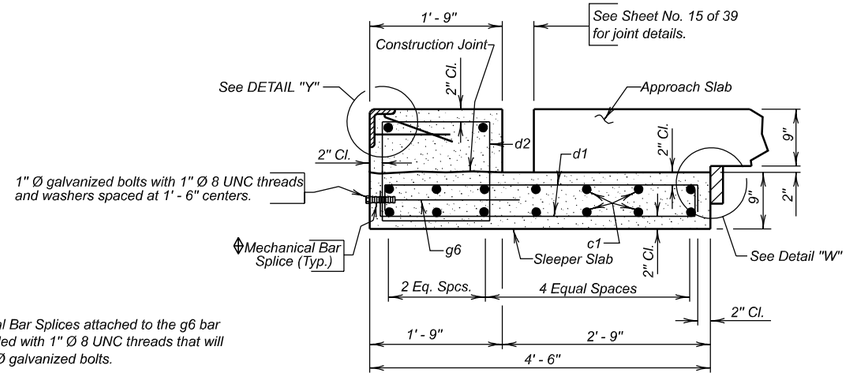
STANDARD 28.02

Appendix C: South Dakota Drawings

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	IM 0297(34)179	E16	E67

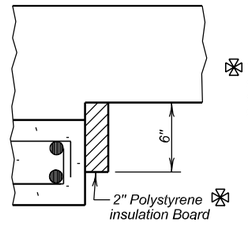


SEC. A - A



◈ The Mechanical Bar Splices attached to the g6 bar shall be threaded with 1" Ø 8 UNC threads that will accept the 1" Ø galvanized bolts.

SEC. E - E
(Sleeper Slab)

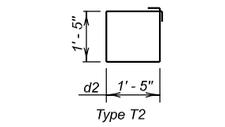


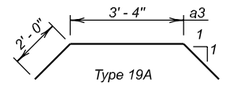
✠ The Polystyrene Insulation Board shall be firmly attached to the sleeper slab by a method to be approved by the Engineer.

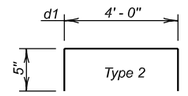
DETAIL "W"

REINFORCING SCHEDULE
(For Two Approach and Sleeper Slabs)

	Mk.	No.	Size	Length	Type	Bending Details
PHASE 1	a3	4	4	7' - 4"	19A	
	⍁ c1	32	5	18' - 9"	Str.	
	d1	76	4	4' - 10"	2	
	d2	38	4	6' - 5"	T2	
	⍁ e1	28	4	18' - 9"	Str.	
	⍁ e3	40	6	18' - 9"	Str.	
	g1	4	4	19' - 8"	Str.	
	g2	24	4	20' - 2"	Str.	
	g3	4	6	19' - 8"	Str.	
	g4	72	8	20' - 2"	Str.	
	g5	24	4	6' - 0"	Str.	
	⍁ g6	24	7	2' - 0"	Str.	
	⍁ h1	4	6	17' - 10"	Str.	
	△ z1	24	6	4' - 0"	Str.	
PHASE 2	a3	4	4	7' - 4"	19A	
	c1	32	5	22' - 9"	Str.	
	d1	92	4	4' - 10"	2	
	d2	46	4	6' - 5"	T2	
	⍁ e2	28	4	22' - 9"	Str.	
	⍁ e4	40	6	22' - 9"	Str.	
	g1	4	4	19' - 8"	Str.	
	g2	30	4	20' - 2"	Str.	
	g3	4	6	19' - 8"	Str.	
	g4	88	8	20' - 2"	Str.	
	g5	30	4	6' - 0"	Str.	
	⍁ g6	30	7	2' - 0"	Str.	
	⍁ h2	4	6	21' - 10"	Str.	
	△ z1	30	6	4' - 0"	Str.	







⍁ These bars shall be spliced with mechanical splice devices
Equivalent Splice Lengths
No. 4 - 2' - 0"
No. 5 - 2' - 6"
No. 6 - 3' - 0"

NOTES:
All Dimensions are out to out of bars.
All Bars to be Epoxy Coated.
△ Dowels

ESTIMATED QUANTITIES
(For Two Approach and Sleeper Slabs)

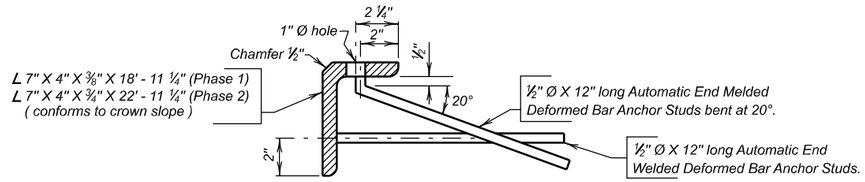
ITEM	UNIT	PHASE I QUANTITY	PHASE 2 QUANTITY
Concrete Approach Slab for Bridge	Sq. Yd.	86.2	104.4
Concrete Approach Sleeper Slab for Bridge	Sq. Yd.	19.0	23.0
Install Dowel In Concrete	Each	24	30
No. 4 Rebar Splice	Each	28	–
No. 5 Rebar Splice	Each	32	–
No. 6 Rebar Splice	Each	44	–

	PHASE I	PHASE 2
1. Concrete in Approach Slabs.	24.6 Cu. Yd.	29.8 Cu. Yd.
✠ 2. Epoxy Coated Re-Steel in Approach Slabs.	6071 Lb.	7377 Lb.
3. Concrete in Sleeper Slabs	7.0 Cu. Yd.	8.4 Cu. Yd.
4. Epoxy Coated Re-Steel in Sleeper Slabs.	1034 Lb.	1254 Lb.

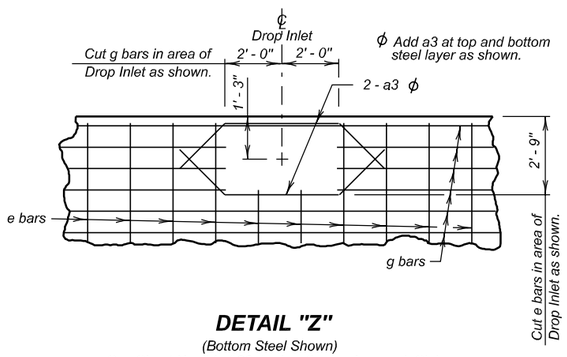
Items 1 thru 4 are approximate quantities contained in the above bid item and are for information only.

✠ Does not include the following quantities for z1 bars as these are paid for in the Bid Item "Install Dowel in Concrete".

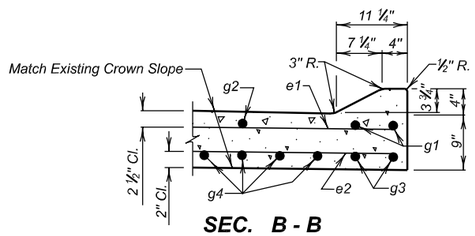
PHASE I	PHASE 2
243 Lb.	303 Lb.



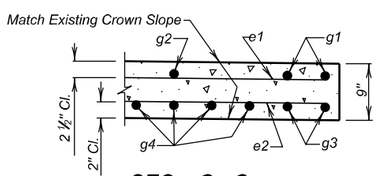
DETAIL "Y"
(See Notes Regarding Armor Angle Assembly.)



DETAIL "Z"
(Bottom Steel Shown)
See Sheet No. 14 of 36 for location on Approach Slab .



SEC. B - B



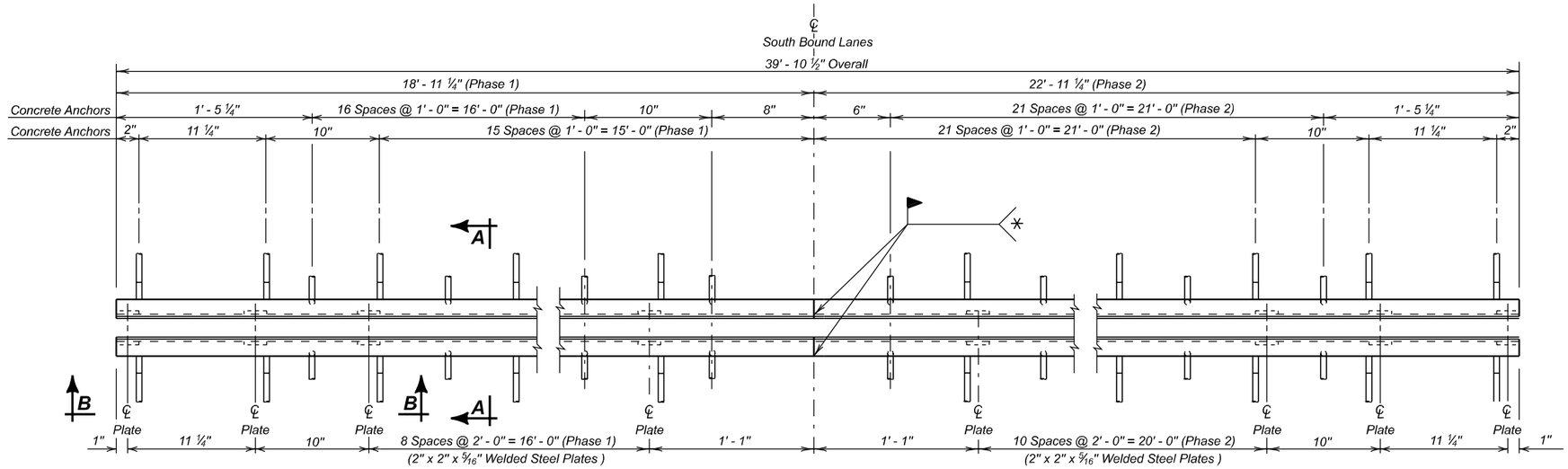
SEC. C - C

NOTE:
This sheet to be used in conjunction with Sheet Nos. 14 & 15 of 36.

(SOUTH BOUND LANES)
APPROACH SLAB DETAILS (CONT.)
FOR
454' - 0" CONTINUOUS CONCRETE BRIDGE
40' - 0" ROADWAY
OVER GREAT NORTHERN R. R.
AND CREEK
STR. NO. 15-215-078
0° SKEW
SEC. 10-T118N-R52W
IM 0297(34)179
CODINGTON COUNTY
S. D. DEPT. OF TRANSPORTATION
MAY 2009

DESIGNED BY	DRAWN BY	CHECKED BY	
EJA	JWL	DJS	Kevin N. Goeden
CODNOIQN	OIQNTBI4		BRIDGE ENGINEER

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	IM 0297(34)179	E17	E67



PLAN OF STRIP SEAL
(Neoprene Seal not shown)

JOINT INSTALLATION
(Abut. No. 1)

TEMP.	DIMENSION "X"
30°	2 1/16"
40°	2 ½"
50°	2 5/16"
60°	2 3/16"
70°	2"
80°	1 13/16"
90°	1 11/16"

JOINT INSTALLATION
(Abut. No. 12)

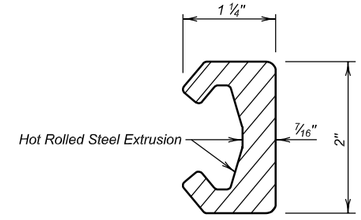
TEMP.	DIMENSION "X"
30°	2 ¾"
40°	2 9/16"
50°	2 ⅜"
60°	2 3/16"
70°	2"
80°	1 13/16"
90°	1 ⅝"

GENERAL NOTES:

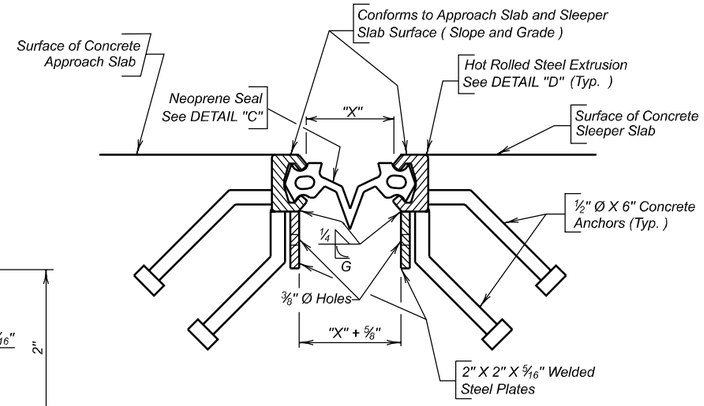
1. Materials for the Steel Extrusion shall conform to ASTM-A36, A242 or A588. Materials for the 2" x 2" x 5/16" welded steel plates shall conform to ASTM-A36. Material for the ½" diameter x 6" Concrete Anchors shall conform to Type A steel studs of Section 7 of the latest edition of the ANSI /AWS D1. 1 Structural Welding Code-Steel.
2. Material for the neoprene seal shall conform to ASTM D2628 modified to omit the recovery test. No splices will be permitted in the neoprene seal.
3. A Lubricant-Adhesive shall be used to install the noeprene seal.The Lubricant-Adhesive shall be as recommended by the neoprene-seal manufacturer.
4. The installation of the neoprene seal shall be as recommended by its Manufacturer and approved by the Engineer, but in general shall be as follows: The neoprene seal shall be installed and bonded to the steel extrusion with a high-solids lubricant adhesive. The neoprene surfaces shall be roughened with a wire brush before the application of the lubricant adhesive. The neoprene seal may be installed either prior to or after the time the steel extrusions are concreted in the approach slabs. The steel extrusion shall be dry, clean, free from dirt, grease and contaminates at the time the neoprene seal is installed.
5. Due to the length of the steel extrusions, splices are permitted. No welds shall be permitted in the internal section of the extrusion where the neoprene seal is located. Weld details shall be shown on the shop plans for approval by the Engineer. Welding shall be in accordance with latest edition of the ANSI/AWS D1.1 Structural Welding Code-Steel. Galvanize the steel extrusions and anything welded to them after all welding is completed. They shall be galvanized in accordance with AASHTO M111 (ASTM A123). If welded splices are used subsequent to galvanizing, the weld details and the procedures for preparing the surface for welding and repairing the galvanizing after welding shall be included with the shop plans. Repair of galvanizing shall be by the zinc-based solder method in accordance with ASTM A780.
6. The thickness and shape of the neoprene seal may vary from the sketch shown (Detail "C" on this sheet) according to the manufacturer's design; however, the wedge lugs must properly fit the groove in the steel extrusion. Before installation, the shop plans of the proposed neoprene seal showing the fixed dimensions, thickness of neoprene seal, and dimensions pertinent to the fit of the neoprene seal in the steel extrusion shall be submitted to and approved by the Engineer.
7. Since the configuration and dimensions of the steel extrusion may vary according to each manufacturer's design, they need not conform exactly to that shown in DETAIL "D", however, any deviations from the plan shown configuration or dimensions must be approved by the Office of Bridge Design.
8. The Strip Seal Expansion Joint supplier shall submit a detailed gland installation procedure with the shop plans for approval. Installation one half bridge width at a time will not be allowed unless approved in writing by the Bridge Construction Engineer prior to installation.
9. The cost of welding shall be incidental to the contract cost per foot for Strip Seal Expansion Joint.
10. The neoprene seal shall be of sufficient length such that a minimum length of 6" shall extend beyond each end of the steel extrusions.
11. The Strip Seal Expansion Joint will be measured in feet to the nearest one-tenth foot, complete in place. Measurement will be made of the overall horizontal length. The Strip Seal Expansion Joint will be paid for at the contract unit price per foot complete in place. Payment for this item shall be full compensation for furnishing all the required materials in place, inclusive of labor, equipment and incidentals necessary to complete the work in accordance with plans and the foregoing specifications.

✳ 12. Due to phased construction, the steel extrusion shall be spliced in the Field at the location shown above. The Weld Details and the procedures for preparing the surface for welding and repairing the galvanizing after welding shall be included with the shop plans.

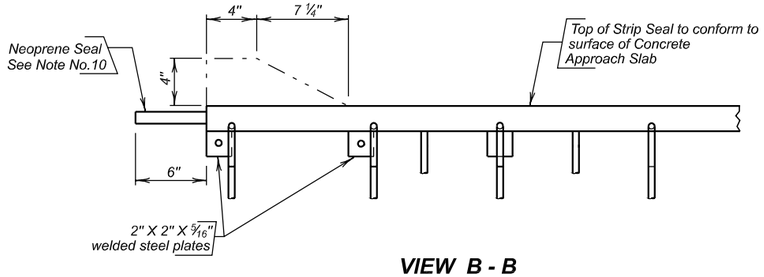
DETAIL "C"
Neoprene Seal shall have a 3" movement capability.



DETAIL "D"



SEC. A - A



VIEW B - B

ESTIMATED QUANTITIES
(For Two Approach Slabs)

ITEM	UNIT	PHASE 1 QUANTITY	PHASE 2 QUANTITY
Strip Seal Expansion Joint	Ft	37.9	45.9

(SOUTH BOUND LANES)
STRIP SEAL JOINT DETAILS
FOR
454' - 0" CONTINUOUS CONCRETE BRIDGE

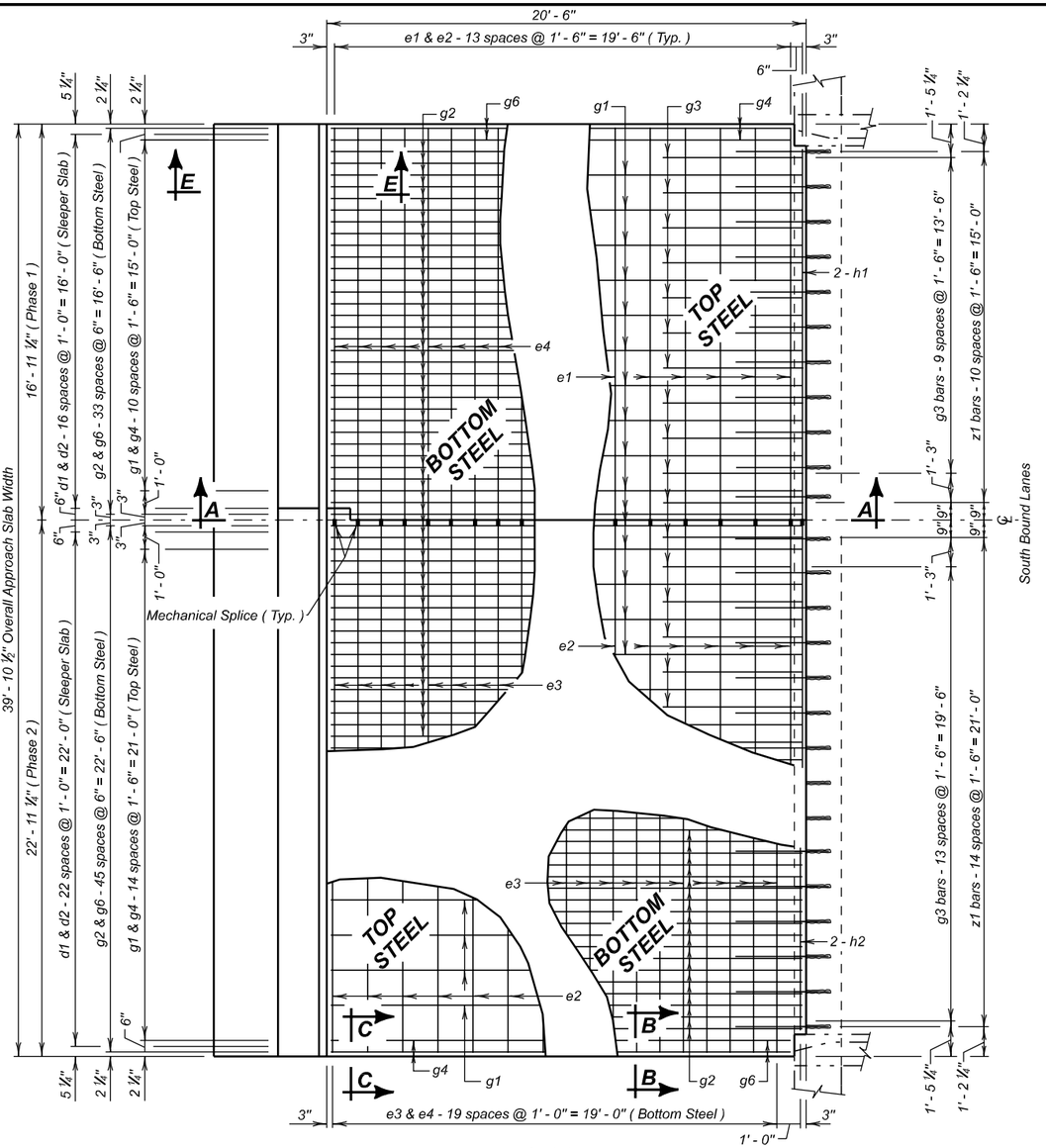
40' - 0" ROADWAY — 0° SKEW
OVER GREAT NORTHERN R. R. — SEC. 10-T118N-R52W
OVER CREEK — IM 0297(34)179
STR. NO. 15-215-078

CODINGTON COUNTY
S. D. DEPT. OF TRANSPORTATION
MAY 2009

15 OF 39

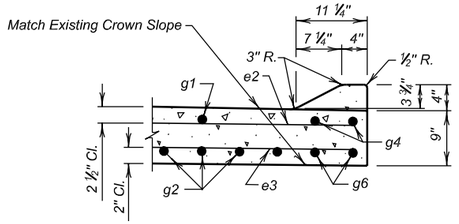
DESIGNED BY	DRAWN BY	CHECKED BY	
EJA	JWL	DJS	Kevin N. Goeden BRIDGE ENGINEER
CODNOIQN	OIQNTBI5		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	IM 0294(60)110	E11	E78

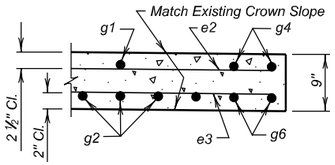


PLAN

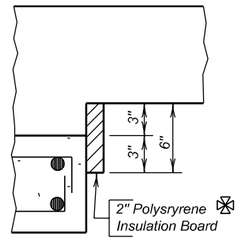
(Approach Slab shown adjacent to Abutment No. 1 - Approach Slab adjacent to Abutment No. 4 similiar by opposite hand.)



SEC. B - B

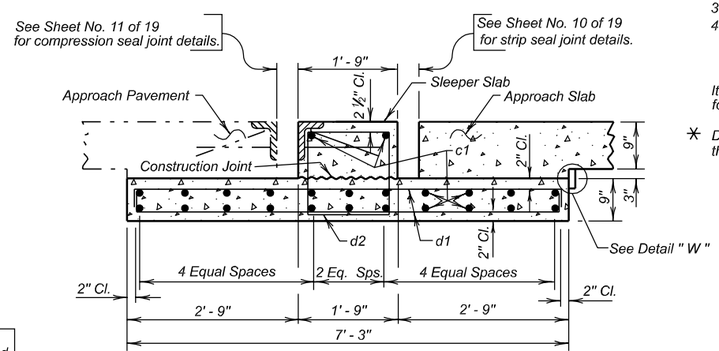


SEC. C - C



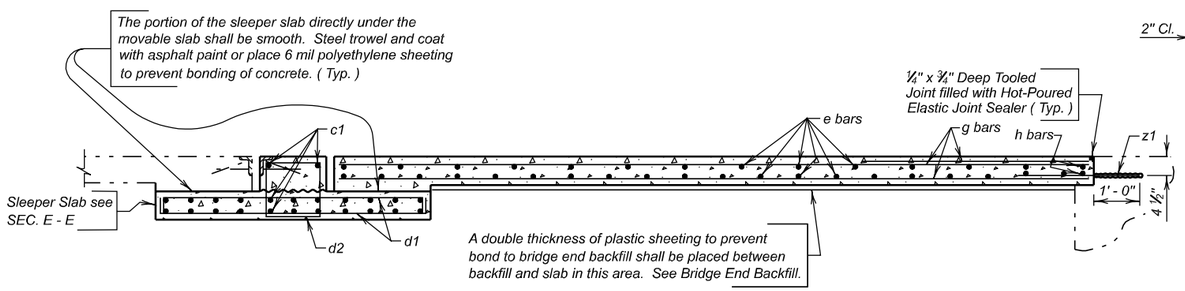
DETAIL "W"

✠ *The Polystyrene Insulation Board shall be firmly attached to the sleeper slab by a method to be approved by the Engineer.*



SEC. E - E

(Sleeper Slab)

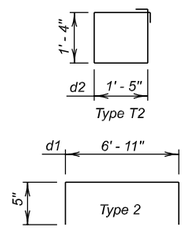


SEC. A - A

REINFORCING SCHEDULE

(For Two Approach and Sleeper Slabs)

	Mk.	No.	Size	Length	Type
PHASE 1	c1	48	5	16' - 9"	Str.
	d1	68	4	7' - 9"	2
	d2	34	4	6' - 5"	T2
☆	e1	28	4	16' - 9"	Str.
☆	e4	40	6	16' - 9"	Str.
	g1	22	4	20' - 2"	Str.
	g2	64	8	20' - 2"	Str.
	g3	22	4	6' - 0"	Str.
	g4	4	4	19' - 8"	Str.
	g6	4	8	19' - 8"	Str.
☆	h1	4	6	15' - 10"	Str.
△	z1	22	6	4' - 0"	Str.
PHASE 2	c2	48	5	22' - 9"	Str.
	d1	92	4	7' - 9"	2
	d2	46	4	6' - 5"	T2
☆	e2	28	4	22' - 9"	Str.
☆	e3	40	6	22' - 9"	Str.
	g1	30	4	20' - 2"	Str.
	g2	88	8	20' - 2"	Str.
	g3	30	4	6' - 0"	Str.
	g4	4	4	19' - 8"	Str.
	g6	4	8	19' - 8"	Str.
☆	h2	4	6	21' - 10"	Str.
△	z1	30	6	4' - 0"	Str.



Note -
All Bars to be Epoxy Coated.
All Dimensions are out to out of bars.
△ Dowels
☆ These bars shall be spliced with mechanical splice devices.
Equivalent Splice Lengths
No. 4 - 2' - 0"
No. 5 - 2' - 6"
No.6 - 3' - 0"

ESTIMATED QUANTITIES

(For Two Approach and Sleeper Slabs)

ITEM	UNIT	PHASE 1 QUANTITY	PHASE 2 QUANTITY
Concrete Approach Slab for Bridge	Sq. Yd.	77.2	104.5
Concrete Approach Sleeper Slab for Bridge	Sq. Yd.	27.3	37.0
Install Dowel in Concrete	Each	22	30
No. 4 Rebar Splice	Each	28	–
No. 5 Rebar Splice	Each	48	–
No. 6 Rebar Splice	Each	44	–

	PHASE 1	PHASE 2
1. Concrete in Approach Slabs.	20.0 Cu. Yd.	27.1 Cu. Yd.
✠ 2. Epoxy Coated Re-steel in Approach Slabs.	5416 Lb.	7357 Lb.
3. Concrete in Sleeper Slabs.	9.0 Cu. Yd.	12.0 Cu. Yd.
4. Epoxy Coated Re-Steel in Sleeper Slabs.	1337 Lb.	1813 Lb.

Item 1 thru 4 are approximate quantities contained in the above bid item and are for information only.

✠ *Does not include the following quantities for z1 bars as these are paid for in the Bid Item "Install Dowel in Concrete".*

PHASE 1	PHASE 2
132 Lb.	180 Lb.

(SOUTH BOUND LANES) APPROACH SLAB DETAILS FOR 80' - 0" CONTINUOUS CONCRETE BRIDGE

38' - 0" ROADWAY — 0° SKEW
OVER COUNTY ROAD — SEC. 6/7-T106N-R49W
STR. NO. 51-065-130 — IM 0294(60)110

MOODY COUNTY

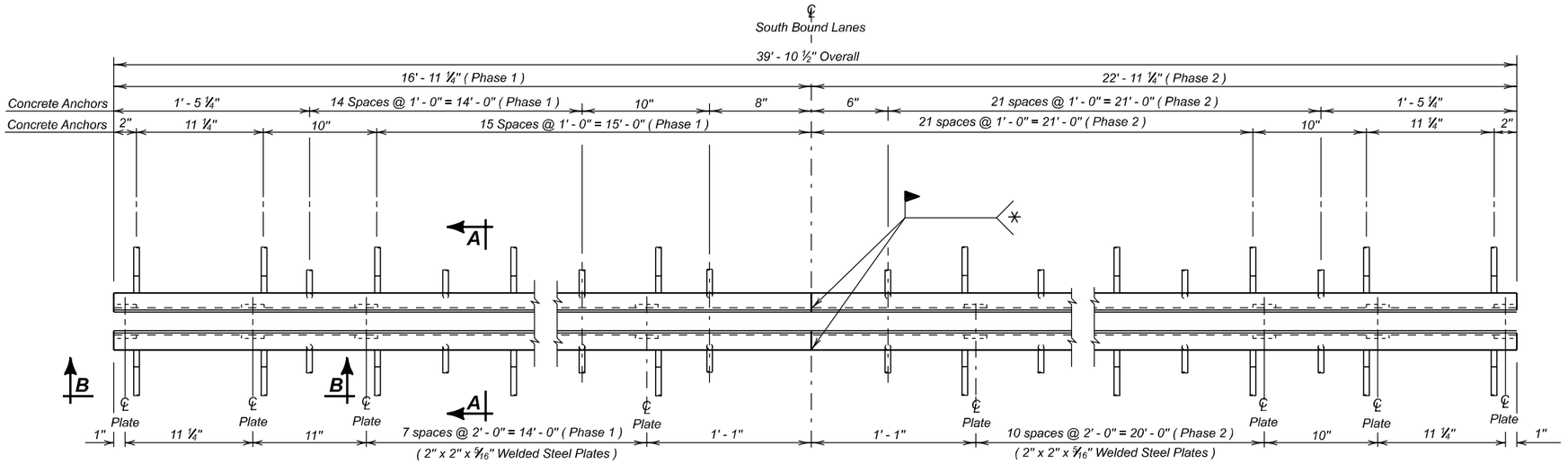
S. D. DEPARTMENT OF TRANSPORTATION

JUNE 2009

9 OF 19

DESIGNED BY	DRAWN BY	CHECKED BY	
EJA	CJD	DJS	Kevin N. Goeden BRIDGE ENGINEER
MODY0109	0109CA09		

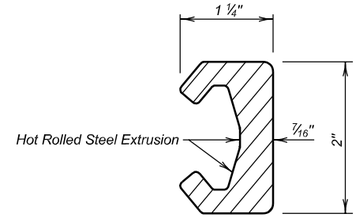
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	IM 0294(60)110	E12	E78



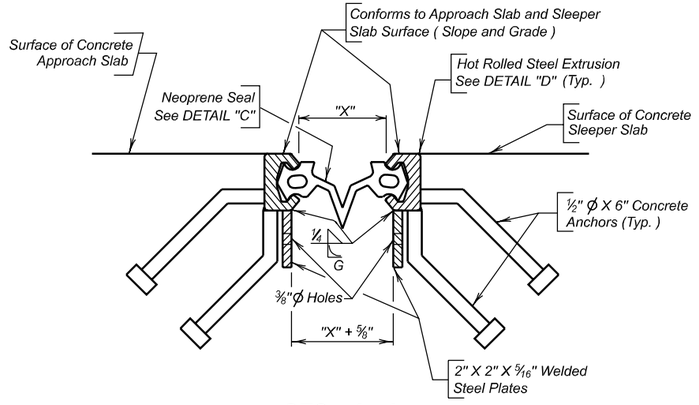
PLAN OF STRIP SEAL

(Neoprene Seal not shown)

TEMP.	DIMENSION "X"
30°	2 3/16"
40°	2 1/8"
50°	2 1/16"
60°	2 1/16"
70°	2"
80°	1 15/16"
90°	1 15/16"



DETAIL "D"



SEC. A - A

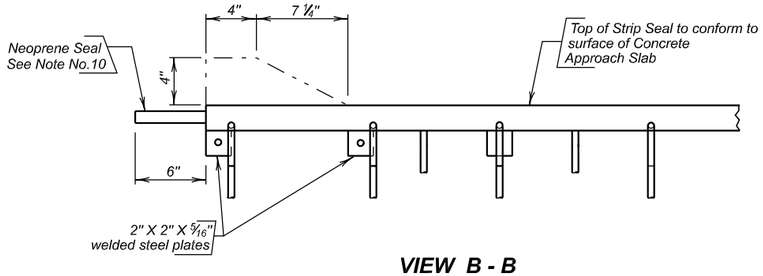
DETAIL "C"

Neoprene Seal shall have a 3" movement capability.

GENERAL NOTES:

1. Materials for the Steel Extrusion shall conform to ASTM-A36, A242 or A588. Materials for the 2" x 2" x 5/16" welded steel plates shall conform to ASTM-A36. Material for the ½" diameter x 6" Concrete Anchors shall conform to Type A steel studs of Section 7 of the latest edition of the ANSI /AWS D1. 1 Structural Welding Code-Steel.
2. Material for the neoprene seal shall conform to ASTM D2628 modified to omit the recovery test. No splices will be permitted in the neoprene seal.
3. A Lubricant-Adhesive shall be used to install the noeprene seal.The Lubricant-Adhesive shall be as recommended by the neoprene-seal manufacturer.
4. The installation of the neoprene seal shall be as recommended by its Manufacturer and approved by the Engineer, but in general shall be as follows: The neoprene seal shall be installed and bonded to the steel extrusion with a high-solids lubricant adhesive. The neoprene surfaces shall be roughened with a wire brush before the application of the lubricant adhesive. The neoprene seal may be installed either prior to or after the time the steel extrusions are concreted in the approach slabs. The steel extrusion shall be dry, clean, free from dirt, grease and contaminates at the time the neoprene seal is installed.
5. Due to the length of the steel extrusions, splices are permitted. No welds shall be permitted in the internal section of the extrusion where the neoprene seal is located. Weld details shall be shown on the shop plans for approval by the Engineer. Welding shall be in accordance with latest edition of the ANSI/AWS D1.1 Structural Welding Code-Steel. Galvanize the steel extrusions and anything welded to them after all welding is completed. They shall be galvanized in accordance with AASHTO M111 (ASTM A123). If welded splices are used subsequent to galvanizing, the weld details and the procedures for preparing the surface for welding and repairing the galvanizing after welding shall be included with the shop plans. Repair of galvanizing shall be by the zinc-based solder method in accordance with ASTM A780.
6. The thickness and shape of the neoprene seal may vary from the sketch shown (Detail "C" on this sheet) according to the manufacturer's design; however, the wedge lugs must properly fit the groove in the steel extrusion. Before installation, the shop plans of the proposed neoprene seal showing the fixed dimensions, thickness of neoprene seal, and dimensions pertinent to the fit of the neoprene seal in the steel extrusion shall be submitted to and approved by the Engineer.
7. Since the configuration and dimensions of the steel extrusion may vary according to each manufacturer's design, they need not conform exactly to that shown in DETAIL "D", however, any deviations from the plan shown configuration or dimensions must be approved by the Office of Bridge Design.
8. The Strip Seal Expansion Joint supplier shall submit a detailed gland installation procedure with the shop plans for approval. Installation one half bridge width at a time will not be allowed unless approved in writing by the Bridge Construction Engineer prior to installation.
9. The cost of welding shall be incidental to the contract cost per foot for Strip Seal Expansion Joint.
10. The neoprene seal shall be of sufficient length such that a minimum length of 6" shall extend beyond each end of the steel extrusions.
11. The Strip Seal Expansion Joint will be measured in feet to the nearest one-tenth foot, complete in place. Measurement will be made of the overall horizontal length. The Strip Seal Expansion Joint will be paid for at the contract unit price per foot complete in place. Payment for this item shall be full compensation for furnishing all the required materials in place, inclusive of labor, equipment and incidentals necessary to complete the work in accordance with plans and the foregoing specifications.

✳ 12. Due to phased construction, the steel extrusion shall be spliced in the Field at the location shown above. The Weld Details and the procedures for preparing the surface for welding and repairing the galvanizing after welding shall be included with the shop plans.



VIEW B - B

ESTIMATED QUANTITIES

(For Two Approach Slabs)

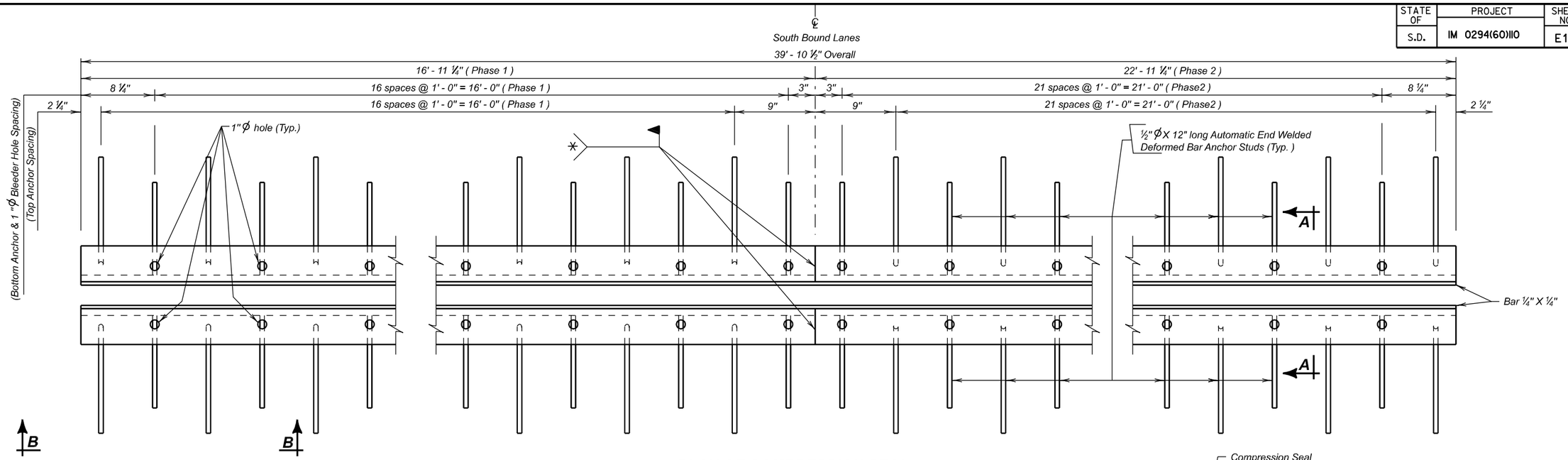
ITEM	UNIT	PHASE 1 QUANTITY	PHASE 2 QUANTITY
Strip Seal Expansion Joint	Ft	33.9	45.9

(SOUTH BOUND LANES)
STRIP SEAL JOINT DETAILS
FOR
80' - 0" CONTINUOUS CONCRETE BRIDGE
38' - 0" ROADWAY — 0° SKEW
OVER COUNTY ROAD — SEC. 6/7-T106N-R49W
STR. NO. 51-065-130 — IM 0294(60)110
MOODY COUNTY
S. D. DEPT. OF TRANSPORTATION
JUNE 2009

(10) OF (19)

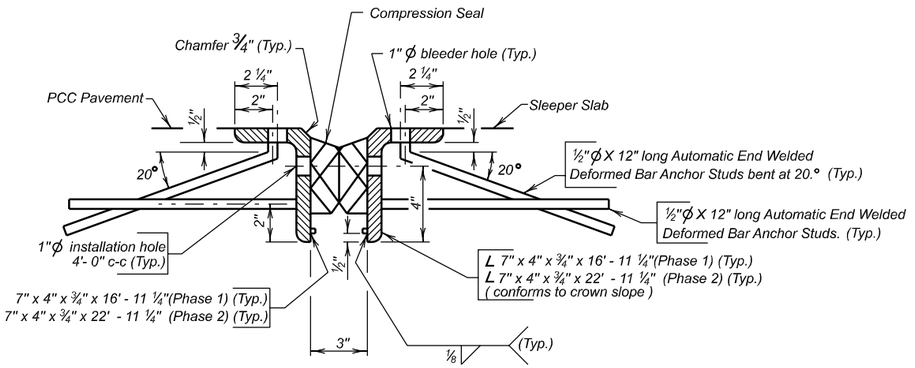
DESIGNED BY	DRAWN BY	CHECKED BY	
EJA	CJD	DJS	Kevin N. Goeden BRIDGE ENGINEER
MODY0109	0109CAIO		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	IM 0294(60)110	E13	E78



PLAN OF COMPRESSION SEAL

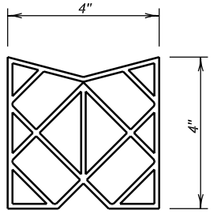
(Neoprene Seal not shown)



SEC. A - A

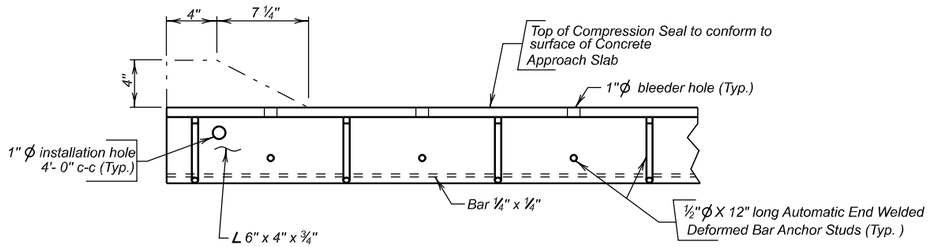
GENERAL NOTES :

1. Steel for the Angles shall conform to ASTM A709, Grade 36. The Automatic End Welded Deformed Bar Anchor Studs shall conform to ASTM A496. The Armor Assembly complete in-place shall be a continuous unit.
2. The shape of the compression seal may vary from that shown in DETAIL ``C'' on this sheet however the overall dimensions and the movement capability shall be met.
3. Material for the Neoprene Compression Seal shall conform to that specified in ASTM D2628. No splices will be permitted in the Neoprene Seal.
4. A Lubricant-Adhesive shall be used to install the neoprene seal. The Lubricant-Adhesive shall be as recommended by the neoprene-seal manufacturer.
5. The Neoprene seal shall be installed and bonded to the joint with a high solids lubricant adhesive. At the time of the Neoprene Seal installation, the steel surfaces of the joint to be in contact with the Neoprene Seal shall be dry, clean and free from dirt, grease and contaminants. The Contractor shall be required to clean those areas by abrasive blasting.
6. The installation of the compression seal shall be as specified by the manufacturer and shall be subject to the approval of the Engineer. The ends of the Neoprene Seal shall be sealed as recommended by the manufacturer.
7. ✳ Galvanize the Angles and anything welded to them after all welding is completed. They shall be galvanized in accordance with AASHTO M111 (ASTM A123). If welded splices are used subsequent to galvanizing, the weld details and the procedures for preparing the surface for welding and repairing the galvanizing after welding shall be included with the shop plans. Repair of galvanizing shall be by the zinc-based solder method in conformance with ASTM A780.
8. Welding for the Angle Assembly shall be in accordance with ANSI/AWS D1.1 Structural Welding Code - Steel.
9. The Compression Seal Joint supplier shall submit a detailed compression seal installation procedure with the shop plans.
10. The cost of welding shall be included in the contract unit price per foot for Compression Seal Joint.
11. The Compression Seal Joint will be measured in feet to the nearest one-tenth foot, complete in place. Measurement will be made of the overall horizontal length. The Compression Seal Joint will be paid for at the contract unit price per foot complete in place. Payment for this item shall be full compensation for furnishing all the required materials in place, inclusive of labor, equipment and incidentals necessary to complete the work in accordance with plans and the foregoing specifications.



DETAIL ``C''

Neoprene Seal shall have a 1 ⅝" movement capability



VIEW B - B

ESTIMATED QUANTITIES

ITEM	UNIT	PHASE 1 QUANTITY	PHASE 2 QUANTITY
Compression Seal Joint	Ft	33.9	45.9

For informational purposes only the estimated quantity of structural steel is 4392 lb.

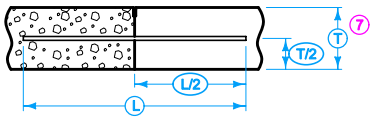
(SOUTH BOUND LANES)
COMPRESSION SEAL JOINT DETAILS
FOR

80' - 0'' CONTINUOUS CONCRETE BRIDGE

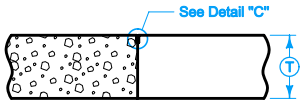
38' - 0'' ROADWAY — 0° SKEW
OVER COUNTY ROAD — SEC. 6/7-T106N-R49W
STR. NO. 51-065-130 — IM 0294(60)110
MOODY COUNTY
S. D. DEPT. OF TRANSPORTATION
JUNE 2009

DESIGNED BY	DRAWN BY	CHECKED BY	
EJA	CJD	DJS	Kevin N. Goeden
MODY0109	0109CAII		BRIDGE ENGINEER

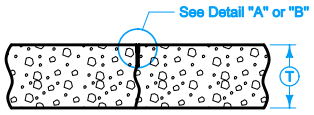
Appendix D: Iowa Drawings



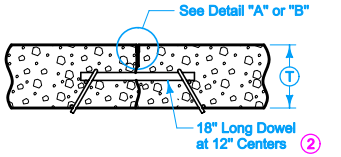
BAR PLACEMENT
(Applies to all joints unless otherwise detailed)



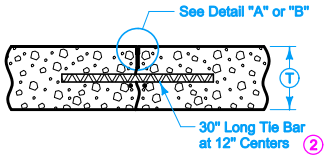
'B' (6)
PLAIN JOINT
Abutting Pavement Slabs



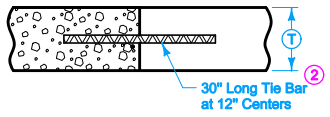
'C' (8)
CONTRACTION JOINT



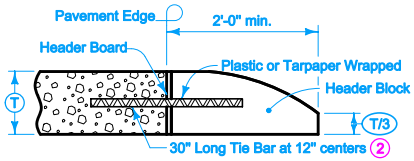
'CD' (1)(5)(8)
DOWELED CONTRACTION JOINT



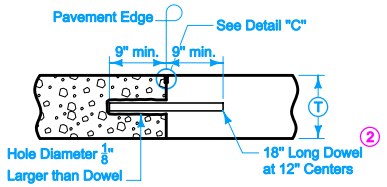
'CT' (5)
TIED CONTRACTION JOINT



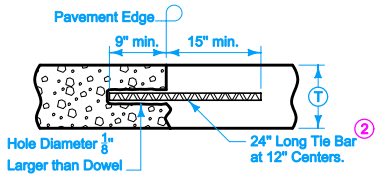
'DW' (4)(5)(9)
DAY'S WORK JOINT (Non-Working)



'HT' (5)(6)
HEADER JOINT
(End Rigid Pavement)

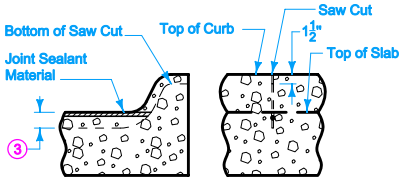


'RD' (5)(6)
ABUTTING PAVEMENT JOINT

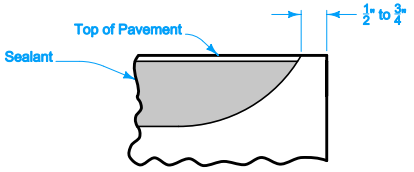


'RT' (5)
ABUTTING PAVEMENT JOINT
RIGID TIE

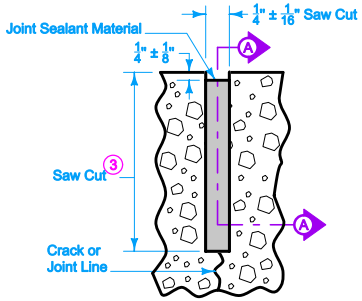
TRANSVERSE CONTRACTION



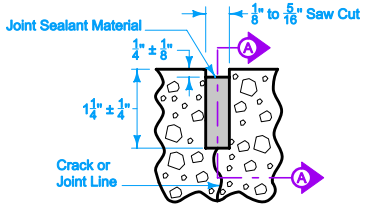
'C' JOINT IN CURB
(Match 'CT', 'CD', or 'C' Joint in Pavement.)



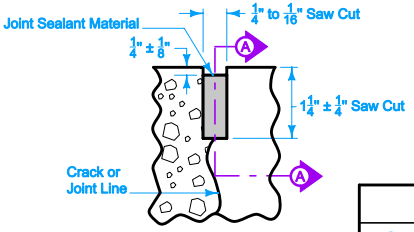
SECTION A-A
(Detail at Edge of Pavement)



DETAIL "A"
(Saw cut formed by conventional concrete sawing equipment)



DETAIL "B"
(Saw cut formed by approved early concrete sawing equipment)



DETAIL "C"

1. See dowel assemblies for fabrication details.
2. See Bar Size Table.
3. Depth of saw cut shall be T/3 ± 1/4, except 'C' joint shall be T/4 ± 1/4.
4. Locate 'DW' joint at a midpanel location between future 'C' or 'CD' joints. Make it no closer than 5 feet to a 'C' or 'CD' joint.
5. Place bars within the limits shown under dowel assemblies.
6. Edge with 1/4 inch tool for length of joint indicated if formed; edging not required when cut with diamond blade saw. Remove header block and board when second slab is poured.
7. When tying into old pavement, (T) represents the depth of sound Portland Cement Concrete.
8. Unless otherwise specified, transverse contract joints in mainline pavement shall be 'CD' when (T) is greater or equal to 8 inches. 'C' when (T) is less than 8 inches.
9. 'RT' joint may be used in lieu of 'DW' joint at the end of the days work. Any pavement damaged due to the drilling shall be removed at the Contractor's expense.

BAR SIZE TABLE		
(T)	Dowel Diameter	Tie Bar Size
< 8"	3/4"	#6
≥ 8" but < 10"	1 1/4"	#10
≥ 10"	1 1/2"	#11

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
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PV-1

SHEET 1 of 5

REVISIONS: Sheet 3 changed 'ED', 'EE', 'EF' Joint note. Sheet 4 changed 'EF' joint opening width in table from 4" to 3.5".

Deanna Maifield
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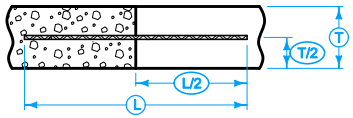
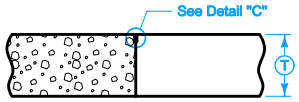
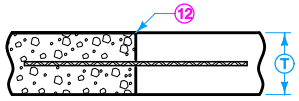
JOINTS



TIE BAR PLACEMENT (7)
(Applies to all joints unless otherwise detailed)

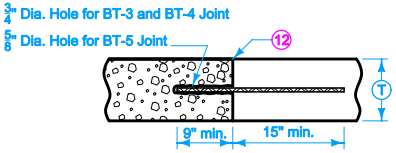


'B'
PLAIN JOINT
Abutting Pavement Slabs



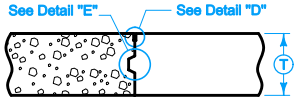
'BT'
ABUTTING PAVEMENT JOINT - RIGID TIE (13)

T	Joint	Bars	Bar Length and Spacing
< 8"	'BT-1'	#4	36" Long at 30" Centers
≥ 8"	'BT-2'	#5	36" Long at 30" Centers

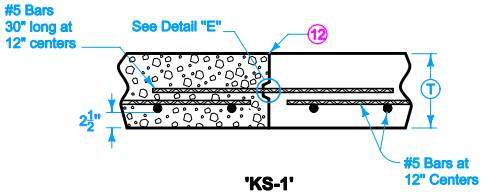


'BT'
ABUTTING PAVEMENT JOINT - RIGID TIE (DRILLED)

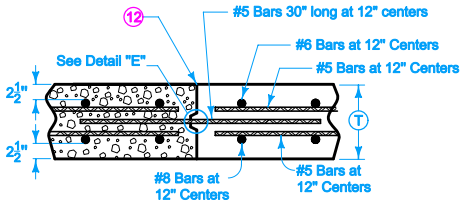
T	Joint	Bars	Bar Length and Spacing
< 8"	'BT-5'	#4	24" Long at 30" Centers
≥ 8"	'BT-3'	#5	24" Long at 30" Centers
	'BT-4'		24" Long at 15" Centers



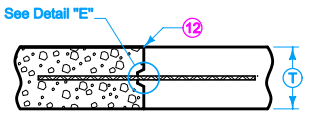
'K'
KEYED JOINT FOR ADJACENT SLABS
(Where T is 8" or more)



'KS-1'
Single-Reinforced Pavement (Bridge Approach)



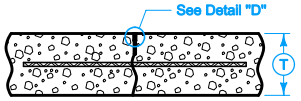
'KS-2'
Double-Reinforced Pavement (Bridge Approach)



'KT'
ABUTTING PAVEMENT JOINT - KEYWAY TIE (10) (13)

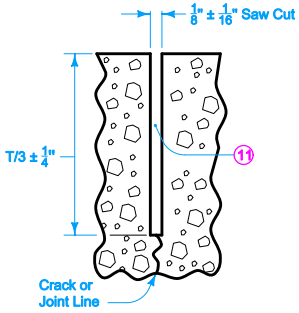
T	Joint	Bars	Bar Length and Spacing
< 8"	'KT-1'	#4	30" Long at 30" Centers
≥ 8"	'KT-2'	#5	30" Long at 30" Centers
	'KT-3'		30" Long at 15" Centers

LONGITUDINAL CONTRACTION

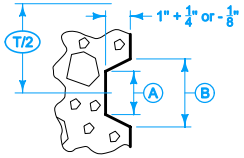


'L'
CONTRACTION JOINT (13)

T	Joint	Bars	Bar Length and Spacing
< 8"	'L-1'	#4	36" Long at 30" Centers
≥ 8"	'L-2'	#5	36" Long at 30" Centers
	'L-3'		36" Long at 15" Centers



DETAIL "D"



DETAIL "E"

KEYWAY DIMENSIONS			
Keyway Type	Pavement Thickness T	A	B
Standard	8" or greater	$1\frac{3}{4}$"	$2\frac{3}{4}$"
Narrow	Less than 8"	1"	2"

(7) When tying into old pavement, (T) represents the depth of sound Portland Cement Concrete.

(10) Bar supports may be necessary for fixed form paving to insure the bar remains in a horizontal position in the plastic concrete.

(11) Sealant or cleaning not required.

(12) Sawing or sealing of joint not required.

(13) The following joints are interchangeable, subject to the pouring sequence:
'BT-1', 'L-1', and 'KT-1'
'KT-2' and 'L-2'
'KT-3' and 'L-3'

Iowa Department of Transportation

STANDARD ROAD PLAN

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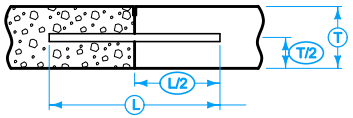
SHEET 2 of 5

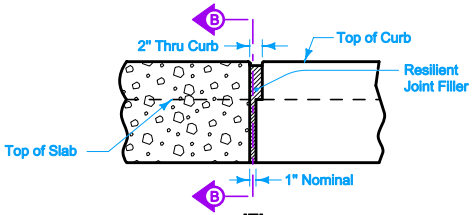
REVISIONS: Sheet 3 changed 'ED', 'EE', 'EF' Joint note. Sheet 4 changed 'EF' joint opening width in table from 4" to 3.5".

Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

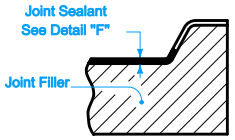
JOINTS



DOWEL PLACEMENT
(Applies to all joints unless otherwise detailed)

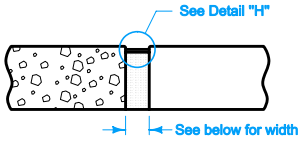


'E'
JOINT IN CURB
(View at Back of Curb)



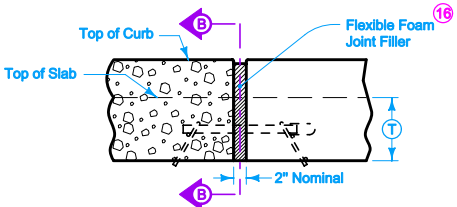
SECTION B-B

- (2) See Bar Size Table.
- (14) Edge with $\frac{1}{4}$ inch tool for length of joint indicated if formed; edging not required when cut with diamond blade saw.
- (15) See dowel assemblies for fabrication details and placement limits. The free end of dowel bar shall be coated to prevent bond with pavement. At intake locations, dowel bars may be cast-in-place.
- (16) Holes for Joint Material shall be predrilled or preformed for appropriate dowel size.
- (17) Compact tire buffings by spading with a square-nose shovel.

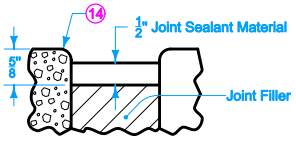


'CF' JOINT

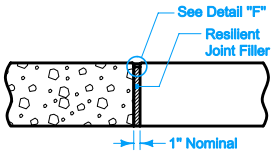
TYPE	WIDTH
CF-1	2"
CF-2	$2\frac{1}{2}$"
CF-3	3"
CF-4	$3\frac{1}{2}$"



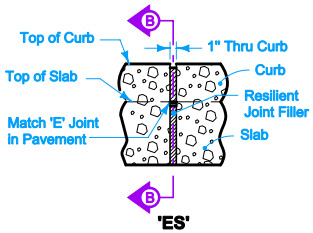
'EE'
JOINT IN CURB
(View at Back of Curb)



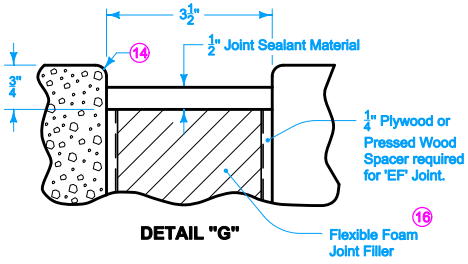
DETAIL "F"



'E'
1" EXPANSION JOINT



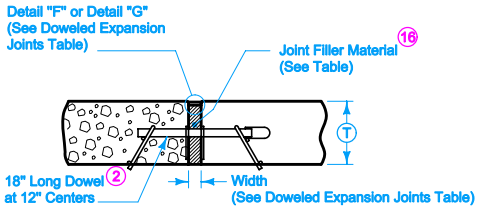
'ES'
JOINT IN CURB
(View at Back of Curb)



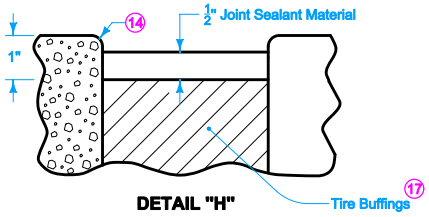
DETAIL "G"

DOWELED EXPANSION JOINTS		
TYPE	WIDTH	FILLER MATERIAL (16)
ED	1"	Resilient (Detail "F")
EE	2"	Flexible Foam (Detail "F")
EF	$3\frac{1}{2}$"	Flexible Foam (Detail "G")

BAR SIZE TABLE			
T	< 8"	≥ 8" but < 10"	≥ 10"
Dowel Diameter	$\frac{3}{4}$"	$1\frac{1}{4}$"	$1\frac{1}{2}$"



'ED', 'EE', 'EF'
DOWELED EXPANSION JOINT (15)



DETAIL "H"

EXPANSION JOINTS

Iowa Department of Transportation

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STANDARD ROAD PLAN

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SHEET 3 of 5

REVISIONS: Sheet 3 changed 'ED', 'EE', 'EF' Joint note. Sheet 4 changed 'EF' joint opening width in table from 4" to 3.5".

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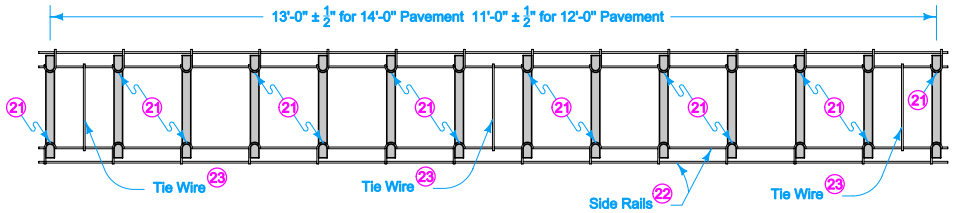
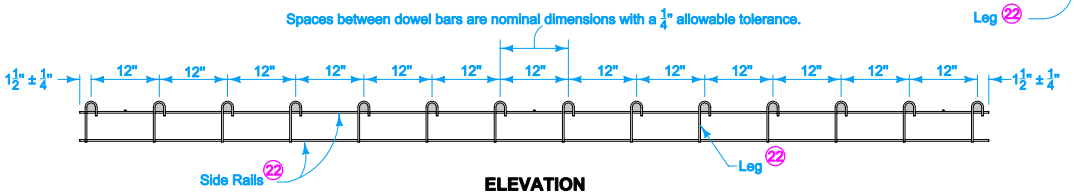
JOINTS

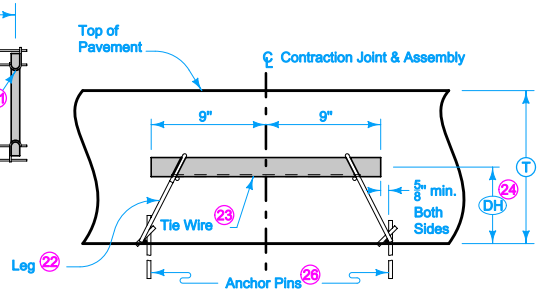
CONTRACTION JOINTS



PLAN

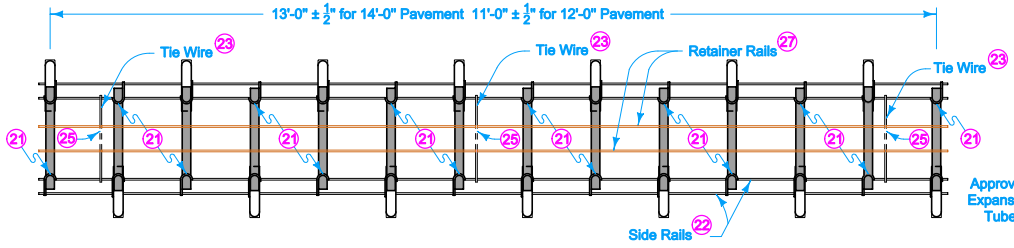


ELEVATION

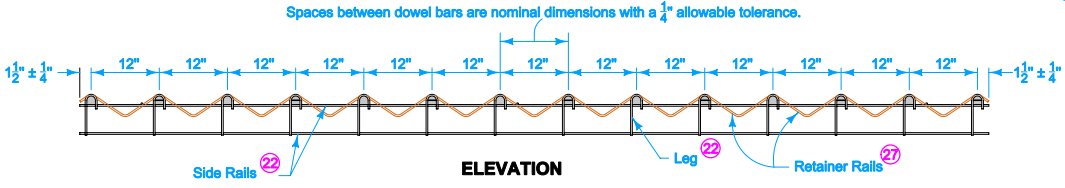


LONGITUDINAL SECTION

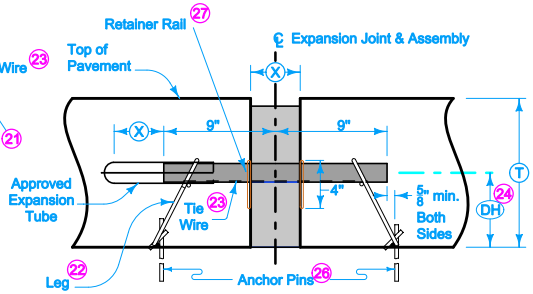
EXPANSION JOINTS



PLAN



ELEVATION



SECTION THRU EXPANSION JOINT

JOINT OPENING AND EXPANSION TUBE EXTENSION

Joint Type	X	Minimum Tube Length
"ED"	1"	6"
"EE"	2"	7"
"EF"	3 1/2"	9"

DOWEL ASSEMBLIES 18 19 20

18 Dowel bars shall be 18 inches long with a tolerance of ± 1/8 inch. The centerline of individual dowels shall be parallel to the other dowels in the assembly within ± 1/8 inch.

19 Wire sizes shown are the minimum required. Wires shall have a minimum tensile strength of 50 ksi.

20 Details apply to both transverse contraction and expansion joints.

21 Weld alternately throughout.

22 #1/0 gauge (0.306 inch diameter) wire.

23 #10 gauge (0.135 inch diameter) wire, welded or friction fit to upper side rail, both sides.

24 Measured from the centerline of dowel bar to bottom of lower side rail + 1/4 inch.

25 Clip and remove center portion of tie during field assembly.

26 Per lane width, a minimum of (8) anchor pins evenly spaced (4 per side), to prevent movement of ssembly during construction. Assemblies placed on pavement or PCC base shall be anchored with devices approved by the Engineer.

27 0.250 inch diameter wire.

DOWEL HEIGHT AND DIAMETER

T	DH 24	Diameter
7" to 7 1/2"	3 1/2"	3/4"
8" to 9 1/2"	4 1/4"	1 1/4"
10" to 11 1/2"	5 1/4"	1 1/2"
12" to 13"	6 1/4"	1 1/2"

Iowa Department of Transportation

STANDARD ROAD PLAN

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SHEET 4 of 5

REVISIONS: Sheet 3 changed 'ED', 'EE', 'EF' Joint note. Sheet 4 changed 'EF' joint opening width in table from 4" to 3.5".

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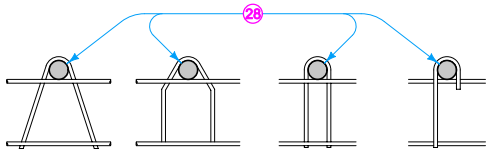
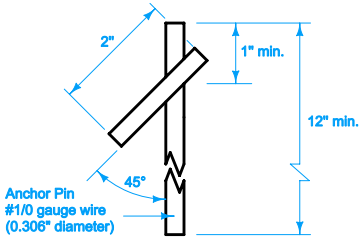
JOINTS



OPTIONAL LEG SHAPES



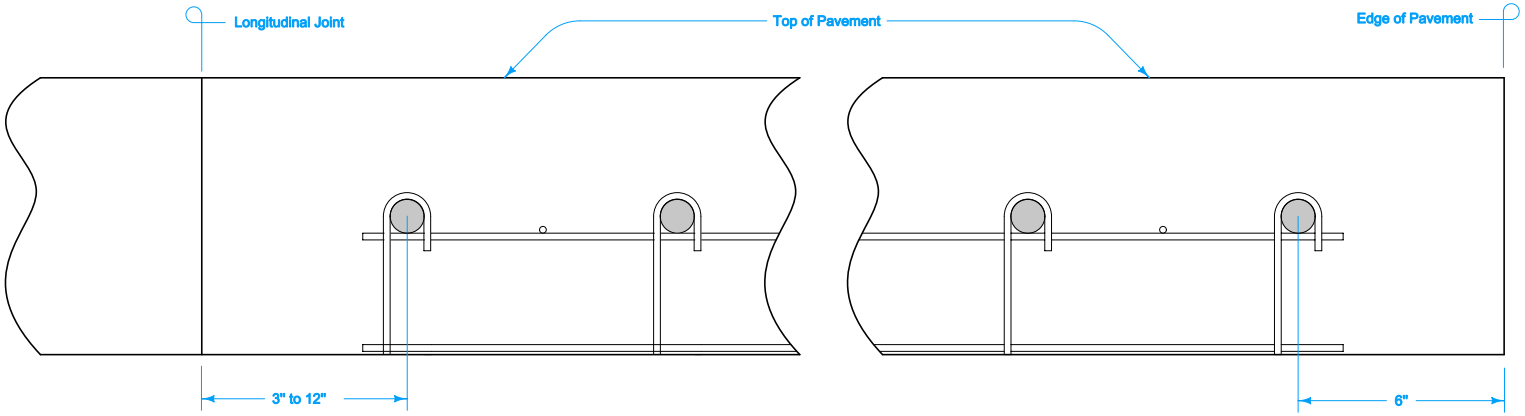
ANCHOR PIN

(18) Dowel bars shall be 18 inches long with a tolerance of $\pm \frac{1}{8}$ inch. The centerline of individual dowels shall be parallel to the other dowels in the assembly within $\pm \frac{1}{8}$ inch.

(19) Wire sizes shown are the minimum required. Wires shall have a minimum tensile strength of 50 ksi.

(20) Details apply to both transverse contraction and expansion joints.

(28) Diameter of bend around dowel is dowel diameter + $\frac{1}{8}$ to $\frac{3}{16}$ inches.



PLACEMENT LIMITS

DOWEL ASSEMBLIES (18)(19)(20)

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION 1 10-19-10

PV-1

SHEET 5 of 5

REVISIONS: Sheet 3 changed 'ED', 'EE', 'EF' Joint note. Sheet 4 changed 'EF' joint opening width in table from 4" to 3.5".

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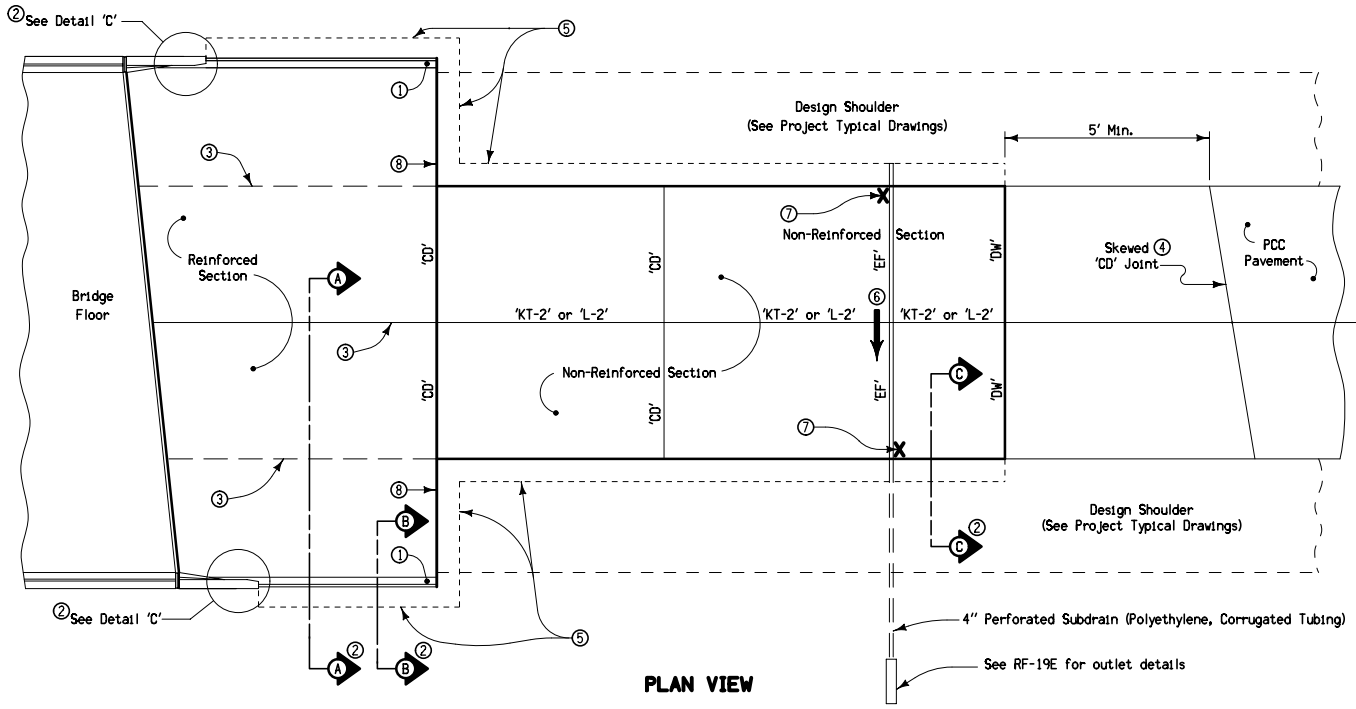
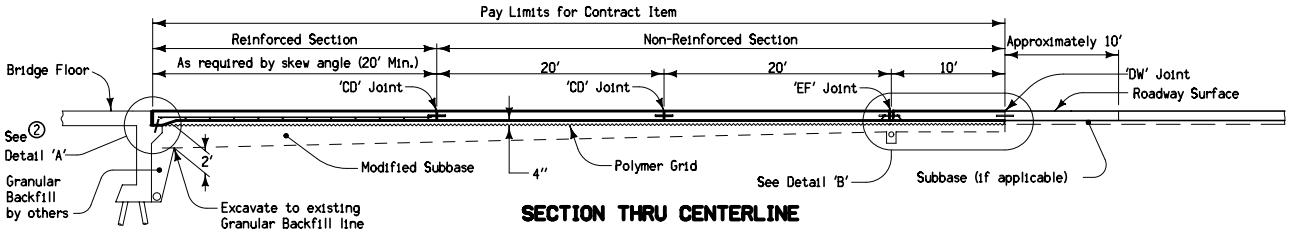
JOINTS



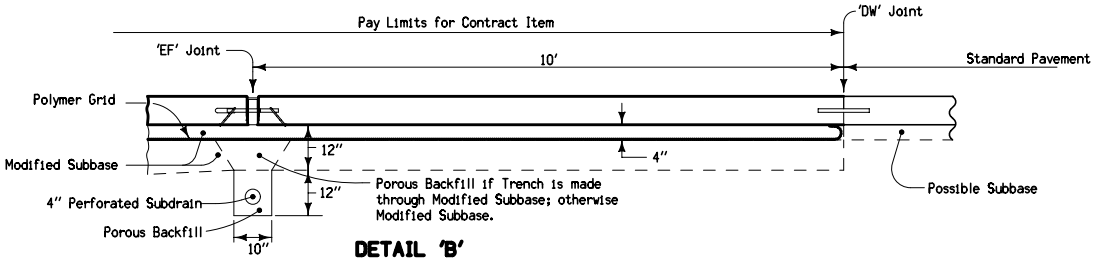
PLAN VIEW

For Joint Details, see PV-1.

1. Build 4 inch Sloped Curb to end of Reinforced Bridge Approach Section. See Curb Location Details (Section B-B).
2. See RK-19A.
3. Longitudinal Joint: (PV-1)
   Single Pour - Saw cut joint per Detail "B."
   Two Pours - Use "KS-1" joint.
4. 'CD' Joints required up to 300' each way from end of Reinforced Bridge Approach Section.
5. Excavation limits of Modified Subbase 2' outside of pavement edge, see RK-19A.
6. Slope subdrain to drain.
7. An "X" shall be placed in the plastic concrete near the 'EF' Joint at the outside edge of pavement.
8. Use 'RD' Joint where PCC shoulder, 'B' Joint otherwise.



SECTION THRU CENTERLINE



DETAIL 'B'
Doweled PCC Pavement

Possible Contract Item:
Bridge Approach, RK-19

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
16	04-20-10

RK-19B

SHEET 1 of 1

REVISIONS: Updated references to renamed standards.

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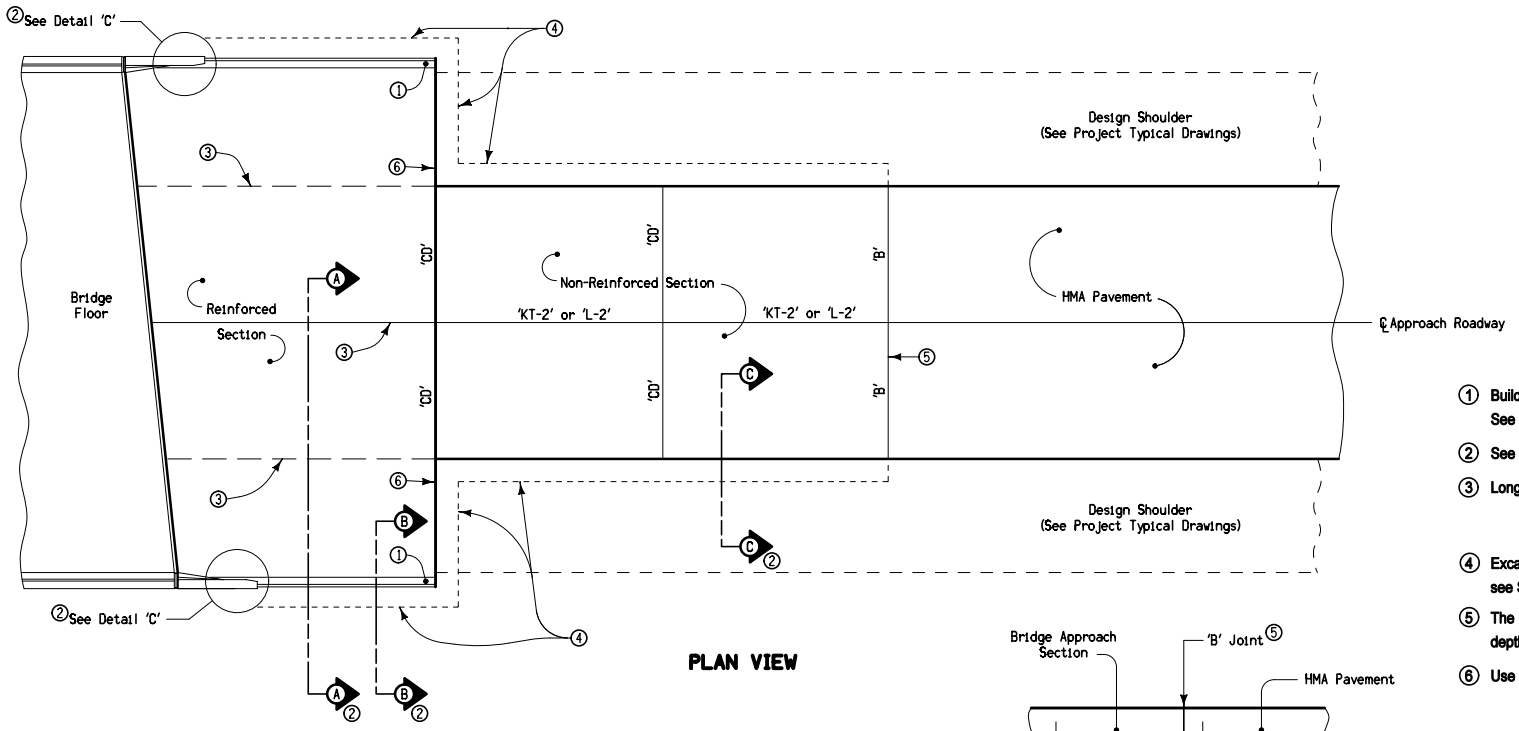
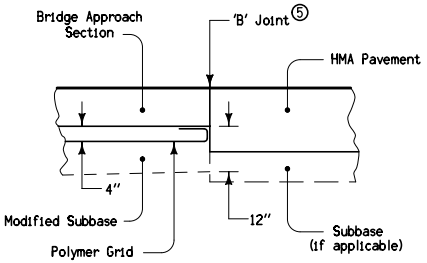
APPROVED BY DESIGN METHODS ENGINEER

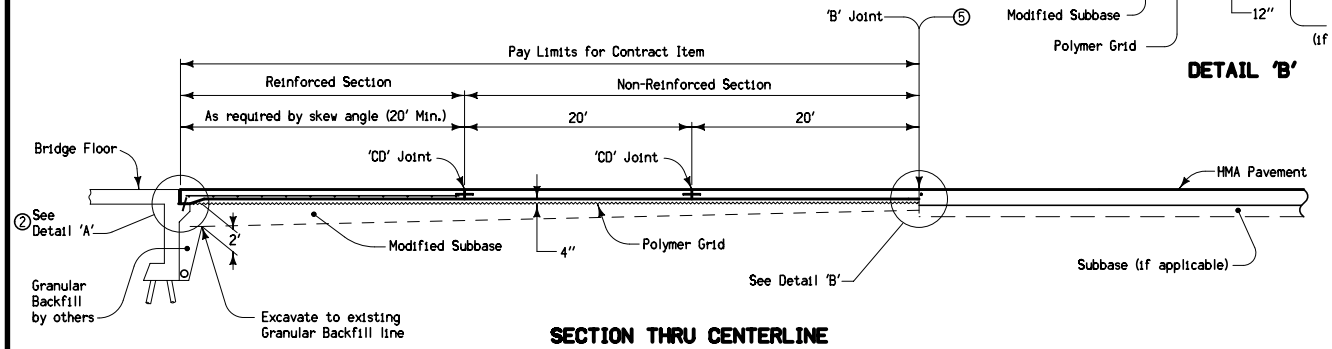
BRIDGE APPROACH SECTION (TWO-LANE) (ABUTTING PCC PAVEMENT)



PLAN VIEW



DETAIL 'B'



SECTION THRU CENTERLINE

For Joint Details,
see PV-1.

1. Build 4" Sloped Curb to end of Reinforced Bridge Approach Section. See curb location details (Section B-B).
2. See Standard Road Plan RK-19A.
3. Longitudinal Joints: (PV-1)
   Single Pour - Saw cut joint per detail B.
   Two Pours - Use 'KS-1' Joint.
4. Excavation limits of Modified Subbase 2' outside of pavement edge, see Standard Road Plan RK-19A.
5. The contractor may be required to saw cut the HMA pavement full depth to accommodate the 'B' joint.
6. Use 'RD' joint where PCC shoulder, 'B' joint otherwise.

Iowa Department of Transportation

STANDARD ROAD PLAN

REVISION	
16	04-20-10

RK-19G

SHEET 1 of 1

REVISIONS: Updated references to renamed standards.

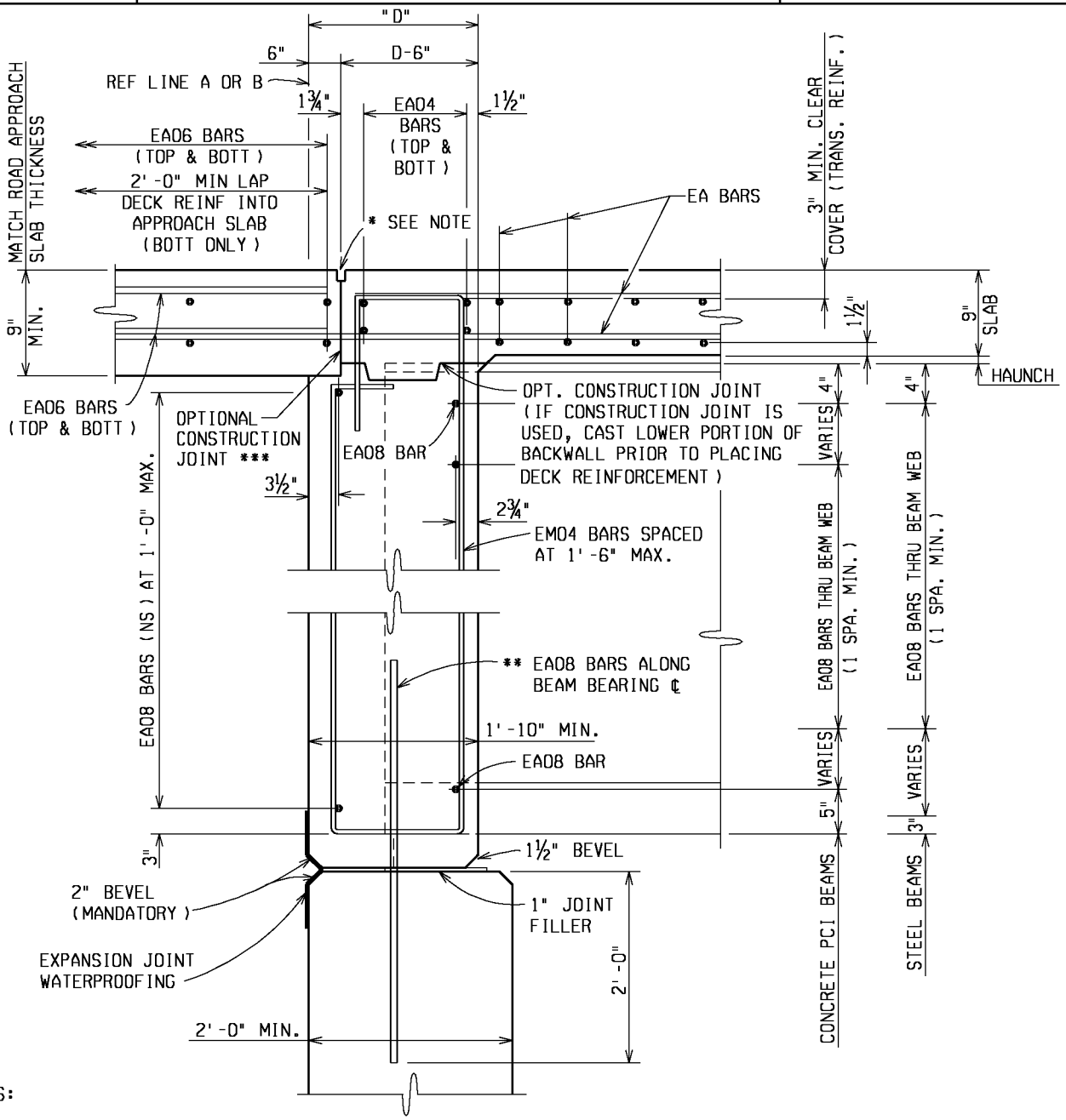
Deanna Maifield
APPROVED BY DESIGN METHODS ENGINEER

BRIDGE APPROACH SECTION (TWO-LANE, HMA PAVEMENT)

Appendix E: Michigan Drawings

DRAWN BY: BLT CHECKED BY: VZ APPROVED BY:	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAY DEVELOPMENT	ISSUED: 08/15/03 SUPERSEDES: 11/27/01

INTEGRAL AND SEMI-INTEGRAL ABUTMENT BACKWALL



PLAN NOTES:

WHERE OPTIONAL CONSTRUCTION JOINTS ARE USED, THERE WILL BE NO PAYMENT FOR THE REQUIRED JOINT WATERPROOFING.

* THE CONTRACTOR IS TO PROVIDE A SAWED JOINT ½" X ¼" WIDE (MIN.). THE JOINT IS TO BE FILLED WITH HOT POURED JOINT SEALANT. INCLUDED IN THE BID ITEM "SUPERSTRUCTURE CONCRETE, NIGHT CASTING."

IF AN OPTIONAL CONSTRUCTION JOINT IS NOT USED, THE JOINT WILL BE SAWED AS SOON AS THE CONCRETE HAS HARDENED ENOUGH SO THAT NO EXCESSIVE RAVELING OR SPALLING OCCURS BUT BEFORE ANY RANDOM CRACKS DEVELOP.

NOTES:

INTEGRAL AND SEMI-INTERGRAL ABUTMENT BRIDGES SHALL BE CONSIDERED FOR STEEL BRIDGES LESS THAN 300' AND CONCRETE BRIDGES LESS THAN 400' IN LENGTH.

APPROACH SLAB THICKNESS WILL MATCH THE ROAD APPROACH THICKNESS (9" MIN.)

CONTINUE BOTTOM MAT OF REINFORCEMENT THROUGH CONSTRUCTION JOINT. ADD EXTRA REINFORCEMENT OVER BEAM (EA050400 BARS).

** USE FOR INTEGRAL ABUTMENT BRIDGES ONLY.

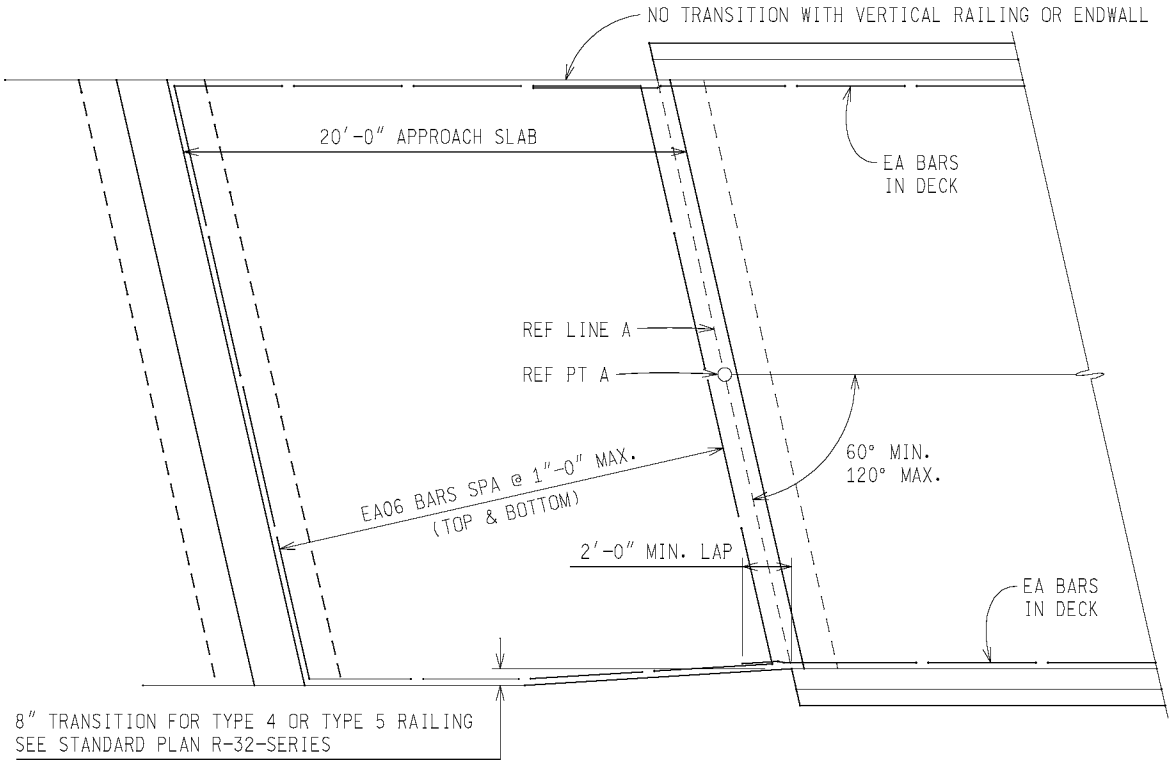
*** THE JOINT IS NOT OPTIONAL, BUT REQUIRED IF CASE I (SEE BRIDGE MANUAL 7.03.01) REQUIRES NOT BACKFILLING ABOVE THE BRIDGE SEAT.

SEMI-INTERGRAL ABUTMENTS SHOULD BE USED AT STREAM CROSSINGS.

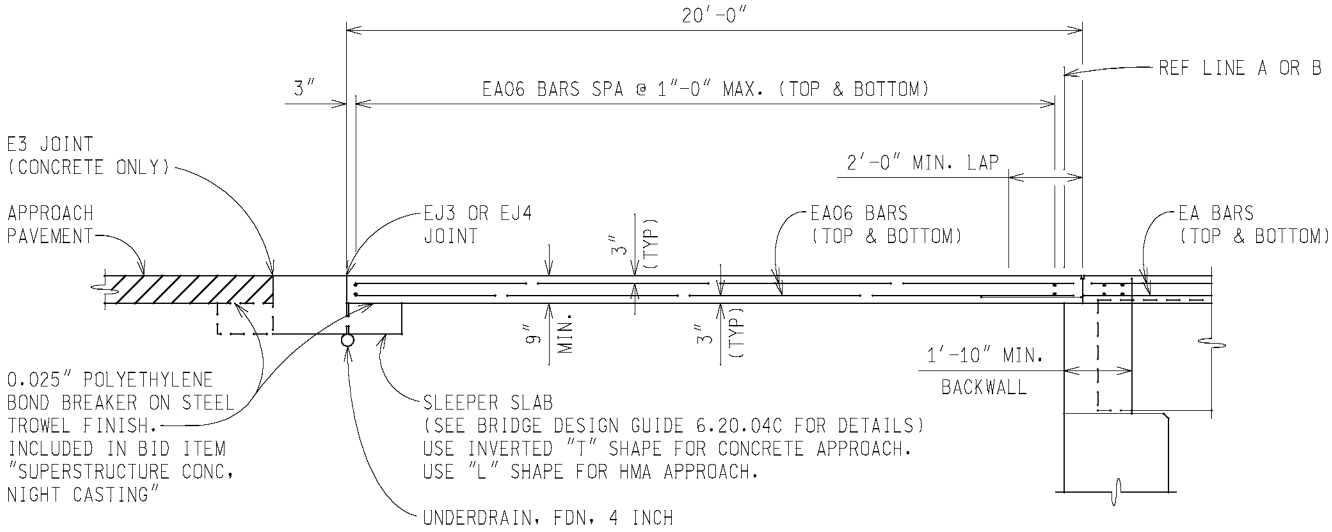
D = BACKWALL THICKNESS. SEE GUIDE 6.20.01 FOR DEFINITION.

PREPARED BY DESIGN SUPPORT AREA	6.20.04

DRAWN BY: BLT APPROVED BY: VZ CHECKED BY:	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAY DEVELOPMENT INTEGRAL AND SEMI-INTEGRAL ABUTMENT EMPIRICAL APPROACH SLAB DETAILS	ISSUED: / / SUPERSEDES: 05/04/06



PLAN OF APPROACH



APPROACH SECTION

SLAB THICKNESS WILL MATCH THE ROAD APPROACH PAVEMENT THICKNESS (9" MIN.)

NOTES:

ATTACH APPROACH CURB AND GUTTER TO THE APPROACH SLAB WITH BOTTOM MAT TRANSVERSE REINFORCEMENT AND TO THE BRIDGE DECK WITH BOTTOM MAT LONGITUDINAL REINFORCEMENT.

POUR APPROACH SLABS FROM EXPANSION LOCATION TOWARD REFERENCE LINE.

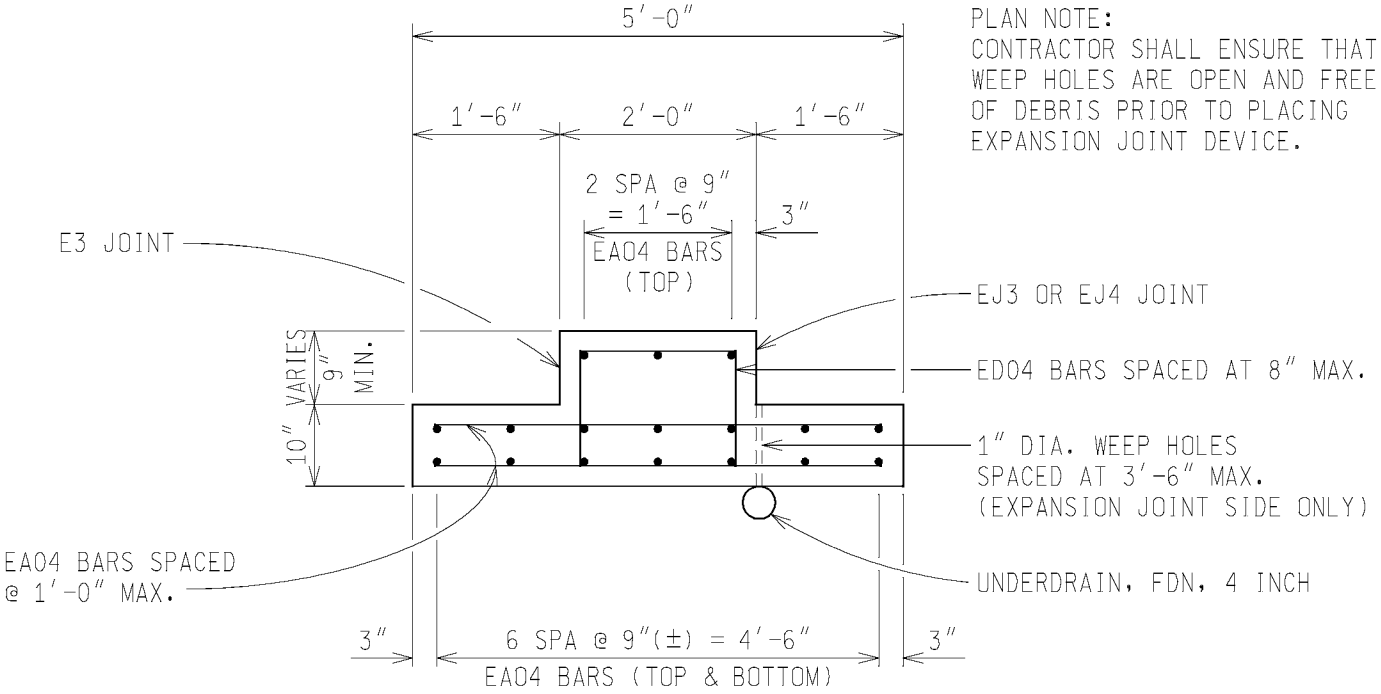
APPROACH SLABS SHOULD BE CAST AT NIGHT WITH NIGHT TIME CASTING OF SUPERSTRUCTURE CONCRETE.

USE SLEEPER SLAB WITH ALL APPROACH SLABS INCLUDING HMA ROADWAY.

USE APPROACH SLAB DETAILS ON STANDARD PLAN R-45-SERIES WHEN THE LENGTH OF BRIDGE CONTRIBUTING TO EXPANSION AT AN ABUTMENT IS LESS THAN 50' FOR CONCRETE BEAM BRIDGES AND LESS THAN 25' FOR STEEL BEAM BRIDGES.

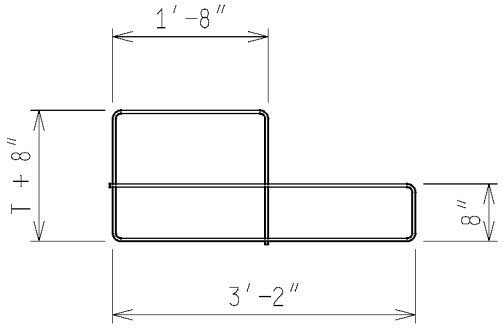
PREPARED BY DESIGN DIVISION	6.20.04B

DRAWN BY: BLT APPROVED BY: VZ CHECKED BY:	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAY DEVELOPMENT INTEGRAL AND SEMI-INTEGRAL ABUTMENT SLEEPER SLAB DETAILS	ISSUED: / / SUPERSEDES: 05/04/06



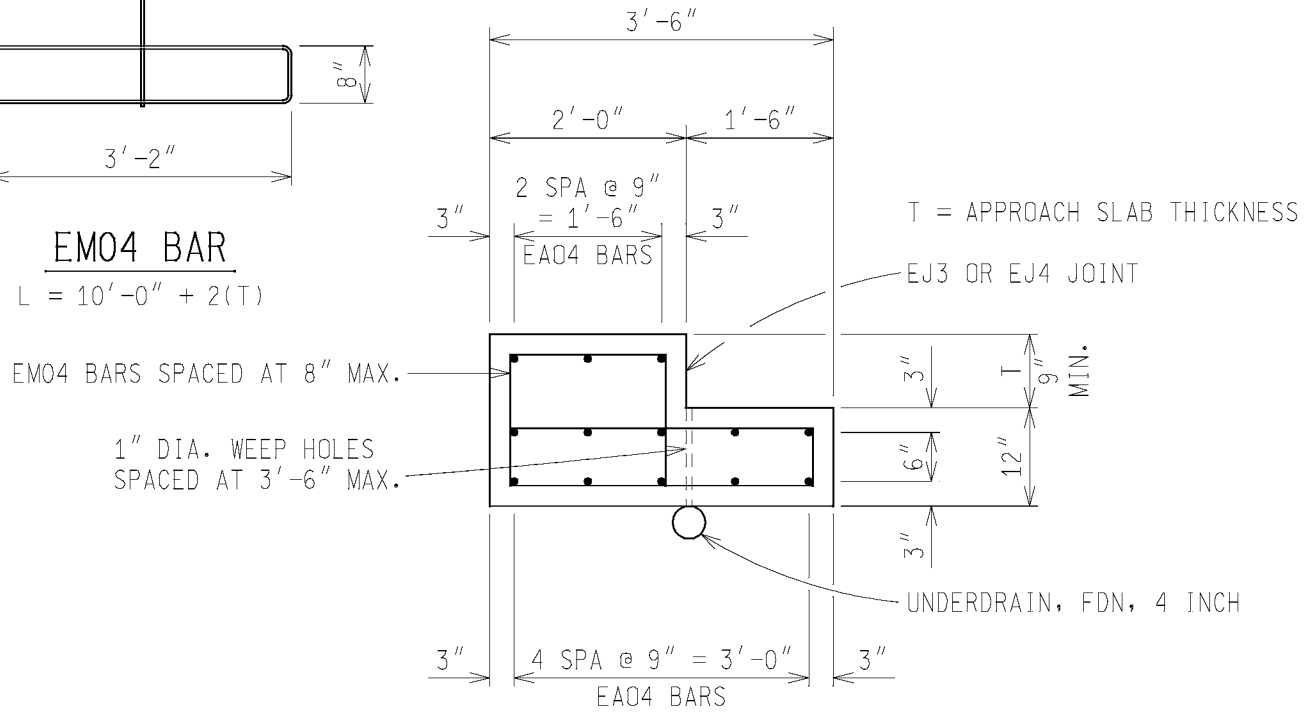
PLAN NOTE:
CONTRACTOR SHALL ENSURE THAT WEEP HOLES ARE OPEN AND FREE OF DEBRIS PRIOR TO PLACING EXPANSION JOINT DEVICE.

TYPICAL SECTION THRU SLEEPER SLAB WITH CONCRETE APPROACH



EM04 BAR

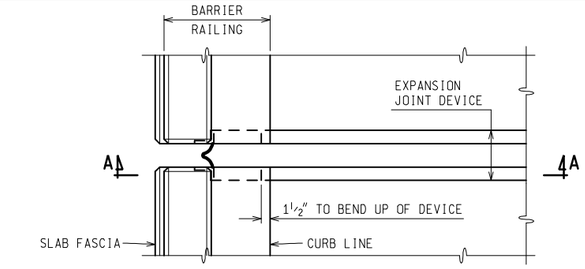
L = 10′-0″ + 2(T)



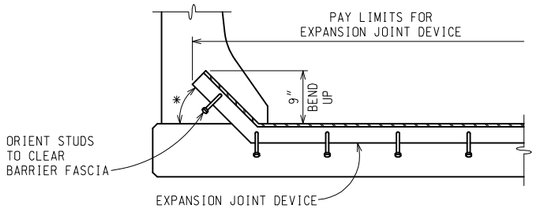
T = APPROACH SLAB THICKNESS

TYPICAL SECTION THRU SLEEPER SLAB WITH HMA APPROACH

PREPARED BY DESIGN DIVISION	6.20.04C

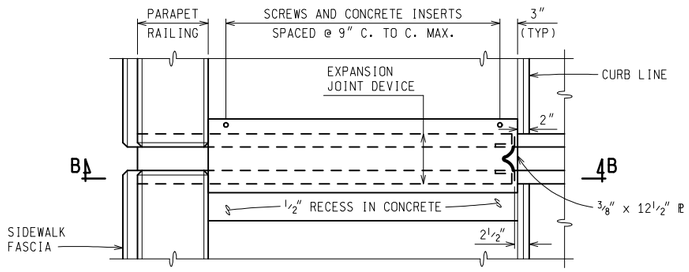


PLAN AT BARRIER RAILING

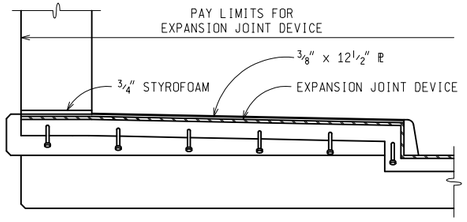


SECTION A – A

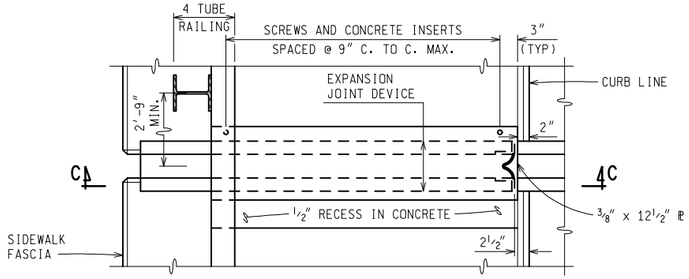
* BEND ANCHORAGE UP 45° ALONG ℄ OF EXPANSION JOINT.



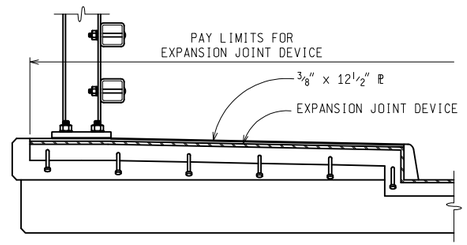
PLAN AT PARAPET RAILING WITH SIDEWALK



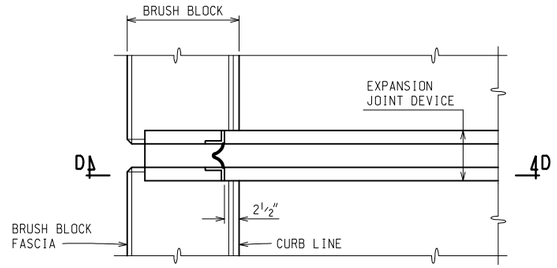
SECTION B – B



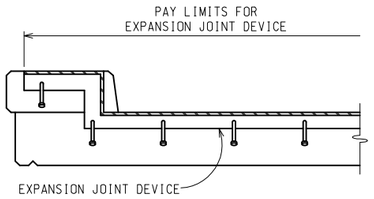
PLAN AT 4 TUBE (PEDESTRAIN) STEEL RAILING



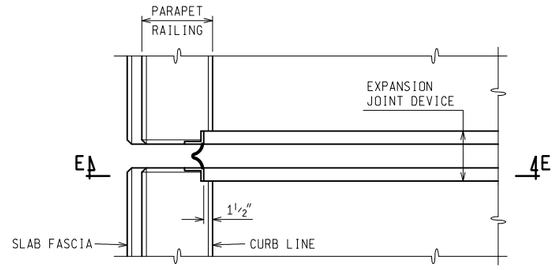
SECTION C – C



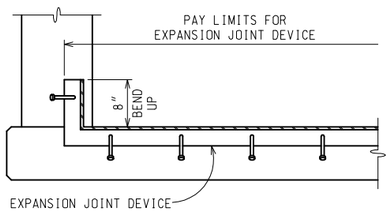
PLAN AT 2 TUBE & 4 TUBE (BICYCLE) STEEL RAILING



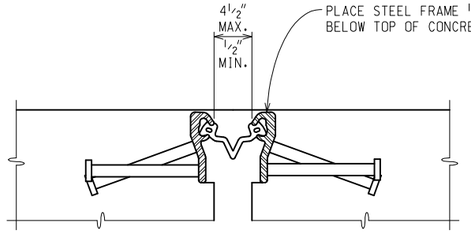
SECTION D – D



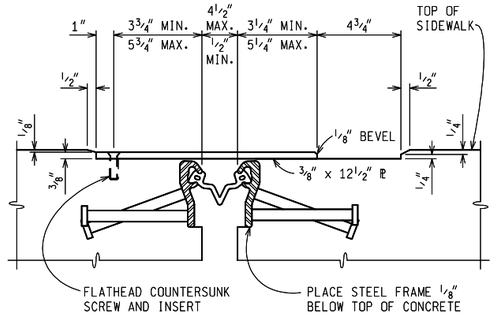
PLAN AT FLUSH MOUNT PARAPET RAILING



SECTION E – E



SECTION THROUGH EXPANSION JOINT



SECTION THROUGH EXPANSION JOINT
AND COVER PLATE

SIDEWALK SECTIONS

ALL STEEL FOR EXPANSION JOINT AND COVER PLATE SHALL BE AASHTO M270, GRADE 36, AND GALVANIZED (ASTM A123) WITH A STATIC COEFFICIENT OF FRICTION OF 0.6 OR GREATER.

USE ASTM F 593 (TYPE 304) STAINLESS STEEL ¾" DIAMETER FLATHEAD COUNTERSUNK SCREWS WITH ¾" DIAMETER INSERTS.

CAST CURBS AND SIDEWALKS WITH ⅜" SLIDING PLATES IN PLACE TO INSURE THAT INSERTS AND SCREWS ARE ALIGNED PROPERLY. APPLY BOND BREAKER TO SLIDING PLATES PRIOR TO INSTALLATION.

FORM CONCRETE RECESS AREA IN SIDEWALK AND GRIND TO PROVIDE SMOOTH SURFACE. TOOL OR GRIND CONCRETE EDGES TO ¼" RADIUS. APPLY ONE COAT OF EPOXY RESIN ADHESIVE TO ALLOW BENT SLIDING PLATE TO MOVE FREELY WITHOUT FRICTION. CARE SHALL BE TAKEN SO THAT NO ADHESIVE COMES IN CONTACT WITH ANY PART OF THE EXPANSION JOINT DEVISE OR GLAND. REMOVE ANY FOREIGN PARTICLES FROM THE SURFACE PRIOR TO INSTALLING PLATES.

INSTALL PLATES SO THAT THE SCREWS AND INSERTS ARE SET ON THE HIGH SIDE OF LONGITUDINAL SIDEWALK GRADE.

THE COST OF ALL MATERIALS AND LABOR REQUIRED FOR PROPER INSTALLATION OF THE COVER PLATE IS INCLUDED IN THE PAYMENT FOR THE EXPANSION JOINT DEVICE COVER PLATE.

NOTES:

JOINT TYPES

THE EXPANSION JOINT DEVICE SHALL BE OF A TYPE THAT INCLUDES A CONTINUOUS NEOPRENE (OR EQUIVALENT) SEAL ACROSS THE DECK. UNLESS OTHERWISE NOTED ON THE PLANS, THE CONTRACTOR HAS THE OPTION OF USING ANY OF THE DEVICES LISTED BELOW:

DEVICE	MANUFACTURER
WABO STRIP SEAL – TYPE M	WATSON-BOWMAN & ACME, INC.
WABO STRIP SEAL – TYPE A	WATSON-BOWMAN & ACME, INC.
STEELFLEX-SSA2	D.S. BROWN
STEELFLEX-SSCM	D.S. BROWN
ONFLEX 40 SS	STRUCTURAL RUBBER PRODUCTS CO.

THE MODEL OF THE JOINT TYPE SELECTED SHALL BE SUITABLE TO ACCOMMODATE THE TOTAL MOVEMENT NOTED ON THE PLANS.

COMPLETE WORKING DRAWINGS OF ALL DETAILS OF FABRICATION OF THE EXPANSION JOINT DEVICE SHALL BE SUBMITTED FOR REVIEW IN ACCORDANCE WITH STANDARD SPECIFICATION 104.02. THIS REQUIREMENT IS WAIVED FOR EXPANSION JOINT DEVICES FOR WHICH A SET OF STANDARD INSTALLATION DETAILS HAS BEEN APPROVED. STANDARD INSTALLATION DETAILS CAN BE OBTAINED FROM THE DESIGN SUPPORT AREA.

FABRICATION AND INSTALLATION

THE EXPANSION JOINT SHALL BE SHOP FABRICATED TO CONFORM TO THE CONTOUR OF THE BRIDGE DECK, BARRIERS, ETC. IT SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS SUBJECT TO NOTES HEREIN AND THE APPROVAL OF THE ENGINEER.

THE TOP OF THE EXPANSION JOINT DEVICE SHALL BE SET ⅛"– ¼" BELOW THE CONCRETE SLAB (PAVEMENT) WITH A TOLERANCE OF ± ⅛".

THE STEEL ANCHORAGE FOR STRIP SEAL GLANDS SHALL BE HOT DIP GALVANIZED IN ACCORDANCE WITH SUBSECTION 707.03C.16 OF THE STANDARD SPECIFICATIONS.

THE AREA OF THE STEEL ANCHORAGE AND SEALING GLAND WHICH WILL BE IN CONTACT WITH A SEALANT, OR LUBRICANT-ADHESIVE SHALL BE CLEANED WITH TOLUENE OR OTHER APPROVED SOLVENT.

WHERE THE SEALING GLAND IS LOCKED INTO A STEEL ANCHORAGE, A LUBRICANT-ADHESIVE CONFORMING TO STANDARD SPECIFICATION 914.04D SHALL BE REQUIRED BETWEEN THE SEAL AND STEEL ANCHORAGE.

IN THE EVENT THAT SPLICING IS REQUIRED OF THE SEALING GLAND, IT SHALL BE SPLICED BY AN APPROVED METHOD (SUCH AS COLD VULCANIZATION) BY A TRAINED REPRESENTATIVE OF THE MANUFACTURER.

DETAILS AT CURBS OR BARRIERS

THE DETAILS ON THIS SHEET SHOW AN APPROVED MEANS OF TERMINATING THE EXPANSION JOINT DEVICE AT CURBS OR BARRIERS. VARIATIONS OR ALTERNATIVE SCHEMES WILL BE CONSIDERED AND MAY BE USED IF APPROVED BY THE ENGINEER.

MATERIALS

THE COST OF ALL MATERIALS AND LABOR REQUIRED FOR PROPER INSTALLATION OF THE EXPANSION JOINT AND THE TERMINAL ASSEMBLIES AT THE CURBS, SIDEWALKS, OR BARRIERS IS INCLUDED IN THE PAYMENT FOR THE EXPANSION JOINT DEVICE.

STRUCTURE NUMBER	ANGLE OF CROSSING TO NEAREST 10°	LOCATION OF JOINT	MIN. TOT. TRAVEL ALONG CENTERLINE OF BRIDGE	REQUIRED LENGTH OF EXPANSION JOINT DEVICE

QUANTITY		
ITEM	UNIT	AMOUNT
Expansion Joint Device	Ft	
Expansion Joint Device, Cover Plate	Ft	

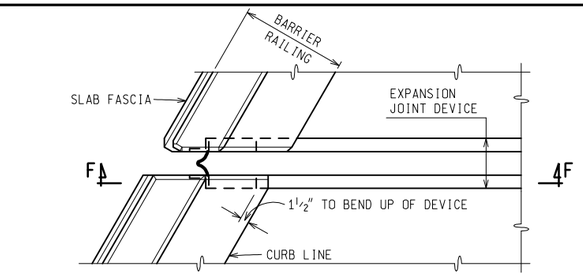
PLAN REVISIONS							
NO.	DATE	AUTH	DESCRIPTION	NO.	DATE	AUTH	DESCRIPTION

MDOT Michigan Department of Transportation

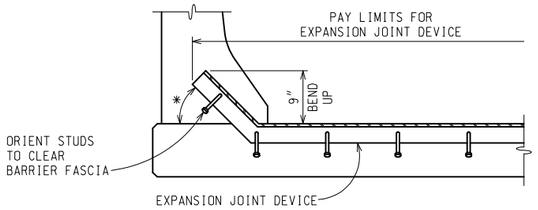
NO SCALE

DRAWN BY:	DATE:	CS:	EXPANSION JOINT DETAILS
CHECKED BY:	DESIGN UNIT:	JN:	EJ3Y (03-14-2007)
FILE:	TSC:		

DRAWING | SHEET

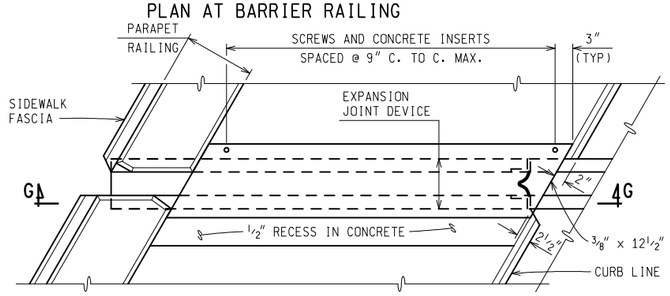


PLAN AT BARRIER RAILING

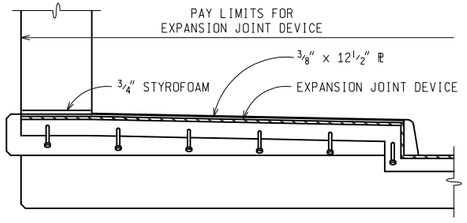


SECTION F – F

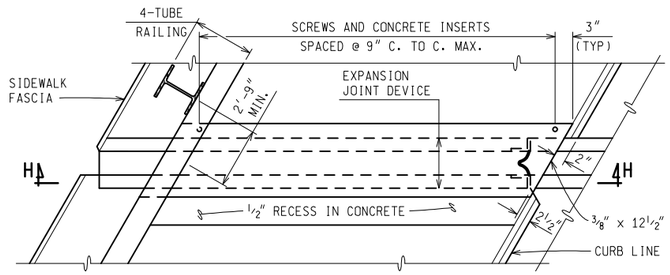
* FOR ANGLES OF CROSSING FROM 69° TO 45° INCLUSIVE, BEND ANCHORAGE UP 45° ALONG ℄ OF EXPANSION JOINT. FOR ANGLES OF CROSSING LESS THAN 45°, A SPECIAL ENDING MAY BE REQUIRED.



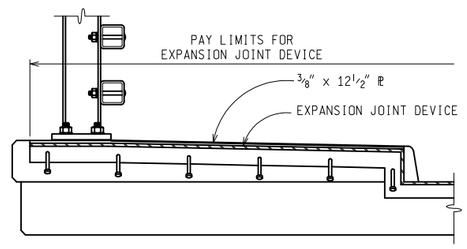
PLAN AT PARAPET RAILING WITH SIDEWALK



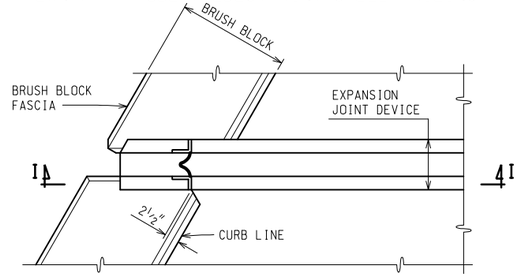
SECTION G – G



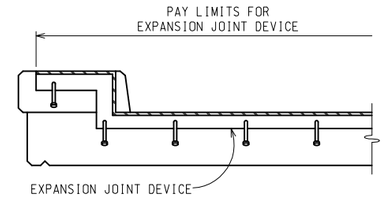
PLAN AT 4 TUBE (PEDESTRAIN) STEEL RAILING



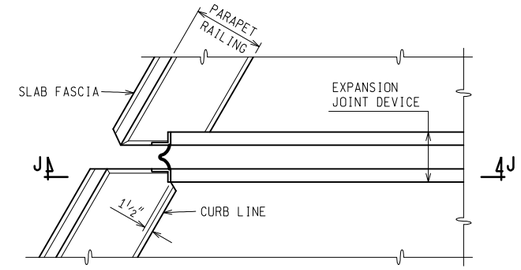
SECTION H – H



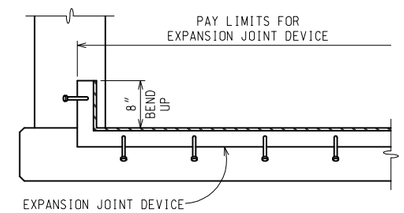
PLAN AT 2 TUBE & 4 TUBE (BICYCLE) STEEL RAILING



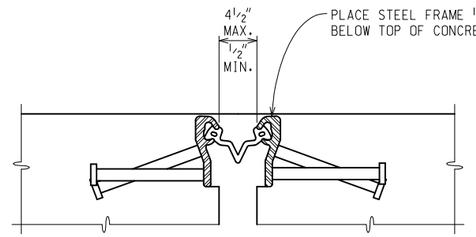
SECTION I – I



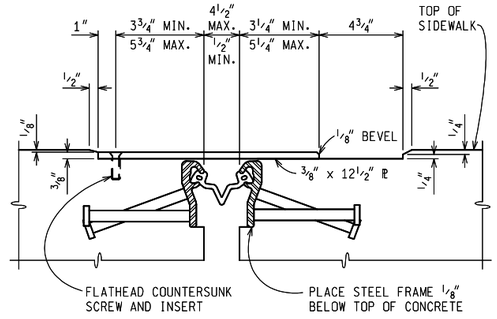
PLAN AT FLUSH MOUNT PARAPET RAILING



SECTION J – J



SECTION THROUGH EXPANSION JOINT



SECTION THROUGH EXPANSION JOINT AND COVER PLATE

SIDEWALK SECTIONS

ALL STEEL FOR EXPANSION JOINT AND COVER PLATE SHALL BE AASHTO M270, GRADE 36, AND GALVANIZED (ASTM A123) WITH A STATIC COEFFICIENT OF FRICTION OF 0.6 OR GREATER.

USE ASTM F 593 (TYPE 304) STAINLESS STEEL ¾" DIAMETER FLATHEAD COUNTERSUNK SCREWS WITH ¾" DIAMETER INSERTS.

CAST CURBS AND SIDEWALKS WITH ⅜" SLIDING PLATES IN PLACE TO INSURE THAT INSERTS AND SCREWS ARE ALIGNED PROPERLY. APPLY BOND BREAKER TO SLIDING PLATES PRIOR TO INSTALLATION.

FORM CONCRETE RECESS AREA IN SIDEWALK AND GRIND TO PROVIDE SMOOTH SURFACE. TOOL OR GRIND CONCRETE EDGES TO ¼" RADIUS. APPLY ONE COAT OF EPOXY RESIN ADHESIVE TO ALLOW BENT SLIDING PLATE TO MOVE FREELY WITHOUT FRICTION. CARE SHALL BE TAKEN SO THAT NO ADHESIVE COMES IN CONTACT WITH ANY PART OF THE EXPANSION JOINT DEVISE OR GLAND. REMOVE ANY FOREIGN PARTICLES FROM THE SURFACE PRIOR TO INSTALLING PLATES.

INSTALL PLATES SO THAT THE SCREWS AND INSERTS ARE SET ON THE HIGH SIDE OF LONGITUDINAL SIDEWALK GRADE.

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NOTES:

JOINT TYPES

THE EXPANSION JOINT DEVICE SHALL BE OF A TYPE THAT INCLUDES A CONTINUOUS NEOPRENE (OR EQUIVALENT) SEAL ACROSS THE DECK. UNLESS OTHERWISE NOTED ON THE PLANS, THE CONTRACTOR HAS THE OPTION OF USING ANY OF THE DEVICES LISTED BELOW:

DEVICE	MANUFACTURER
WABO STRIP SEAL – TYPE M	WATSON-BOWMAN & ACME, INC.
WABO STRIP SEAL – TYPE A	WATSON-BOWMAN & ACME, INC.
STEELFLEX-SSA2	D.S. BROWN
STEELFLEX-SSCM	D.S. BROWN
ONFLEX 40 SS	STRUCTURAL RUBBER PRODUCTS CO.

THE MODEL OF THE JOINT TYPE SELECTED SHALL BE SUITABLE TO ACCOMMODATE THE TOTAL MOVEMENT NOTED ON THE PLANS.

COMPLETE WORKING DRAWINGS OF ALL DETAILS OF FABRICATION OF THE EXPANSION JOINT DEVICE SHALL BE SUBMITTED FOR REVIEW IN ACCORDANCE WITH STANDARD SPECIFICATION 104.02. THIS REQUIREMENT IS WAIVED FOR EXPANSION JOINT DEVICES FOR WHICH A SET OF STANDARD INSTALLATION DETAILS HAS BEEN APPROVED. STANDARD INSTALLATION DETAILS CAN BE OBTAINED FROM THE DESIGN SUPPORT AREA.

FABRICATION AND INSTALLATION

THE EXPANSION JOINT SHALL BE SHOP FABRICATED TO CONFORM TO THE CONTOUR OF THE BRIDGE DECK, BARRIERS, ETC. IT SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS SUBJECT TO NOTES HEREIN AND THE APPROVAL OF THE ENGINEER.

THE TOP OF THE EXPANSION JOINT DEVICE SHALL BE SET ⅛"– ¼" BELOW THE CONCRETE SLAB (PAVEMENT) WITH A TOLERANCE OF ± ⅛".

THE STEEL ANCHORAGE FOR STRIP SEAL GLANDS SHALL BE HOT DIP GALVANIZED IN ACCORDANCE WITH SUBSECTION 707.03C.16 OF THE STANDARD SPECIFICATIONS.

THE AREA OF THE STEEL ANCHORAGE AND SEALING GLAND WHICH WILL BE IN CONTACT WITH A SEALANT, OR LUBRICANT-ADHESIVE SHALL BE CLEANED WITH TOLUENE OR OTHER APPROVED SOLVENT.

WHERE THE SEALING GLAND IS LOCKED INTO A STEEL ANCHORAGE, A LUBRICANT-ADHESIVE CONFORMING TO STANDARD SPECIFICATION 914.04D SHALL BE REQUIRED BETWEEN THE SEAL AND STEEL ANCHORAGE.

IN THE EVENT THAT SPLICING IS REQUIRED OF THE SEALING GLAND, IT SHALL BE SPLICED BY AN APPROVED METHOD (SUCH AS COLD VULCANIZATION) BY A TRAINED REPRESENTATIVE OF THE MANUFACTURER.

DETAILS AT CURBS OR BARRIERS

THE DETAILS ON THIS SHEET SHOW AN APPROVED MEANS OF TERMINATING THE EXPANSION JOINT DEVICE AT CURBS OR BARRIERS. VARIATIONS OR ALTERNATIVE SCHEMES WILL BE CONSIDERED AND MAY BE USED IF APPROVED BY THE ENGINEER.

MATERIALS

THE COST OF ALL MATERIALS AND LABOR REQUIRED FOR PROPER INSTALLATION OF THE EXPANSION JOINT AND THE TERMINAL ASSEMBLIES AT THE CURBS, SIDEWALKS, OR BARRIERS IS INCLUDED IN THE PAYMENT FOR THE EXPANSION JOINT DEVICE.

STRUCTURE NUMBER	ANGLE OF CROSSING TO NEAREST 10°	LOCATION OF JOINT	MIN. TOT. TRAVEL ALONG CENTERLINE OF BRIDGE	REQUIRED LENGTH OF EXPANSION JOINT DEVICE

QUANTITY		
ITEM	UNIT	AMOUNT
Expansion Joint Device	Ft	
Expansion Joint Device, Cover Plate	Ft	

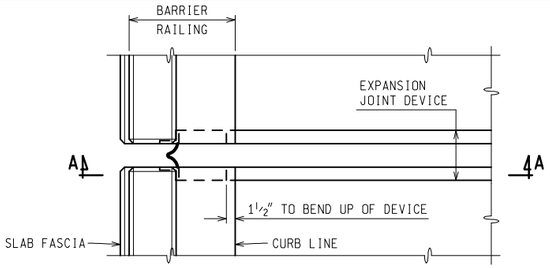
PLAN REVISIONS							
NO.	DATE	AUTH	DESCRIPTION	NO.	DATE	AUTH	DESCRIPTION

MDOT Michigan Department of Transportation

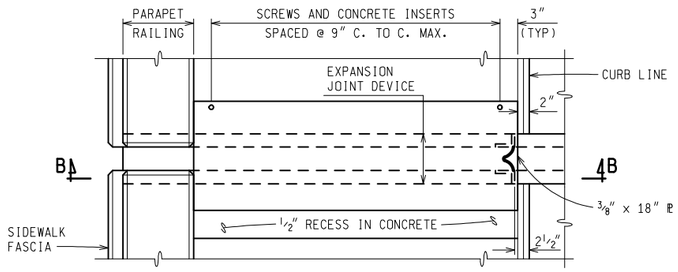
NO SCALE

DRAWN BY:	DATE:	CS:	EXPANSION JOINT DETAILS
CHECKED BY:	DESIGN UNIT:	JN:	EJ3Y (03-14-2007)
FILE:	TSC:		

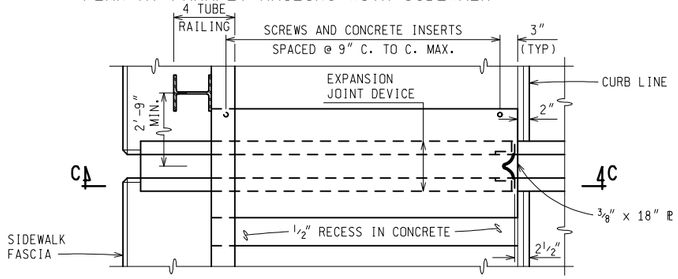
DRAWING | SHEET



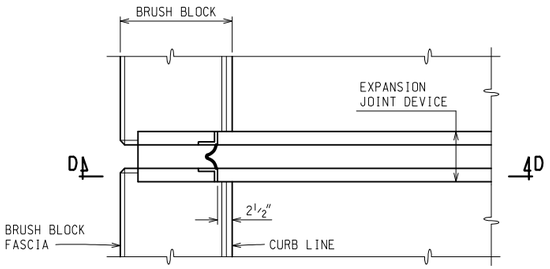
PLAN AT BARRIER RAILING



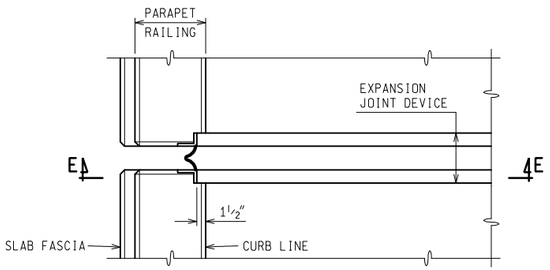
PLAN AT PARAPET RAILING WITH SIDEWALK



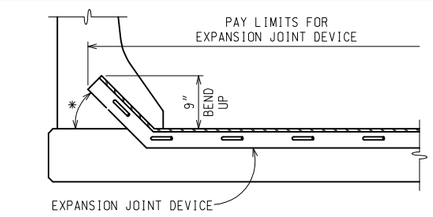
PLAN AT 4 TUBE (PEDESTRAIN) STEEL RAILING



PLAN AT 2 TUBE & 4 TUBE (BICYCLE) STEEL RAILING

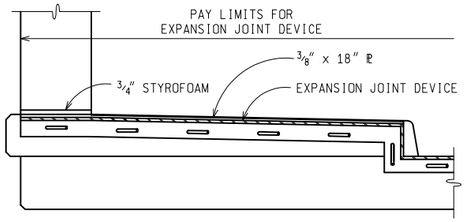


PLAN AT FLUSH MOUNT PARAPET RAILING

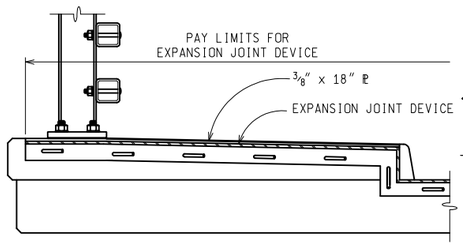


SECTION A - A

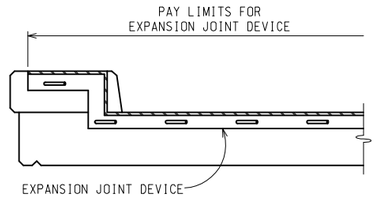
* BEND ANCHORAGE UP 45° ALONG ℄ OF EXPANSION JOINT.



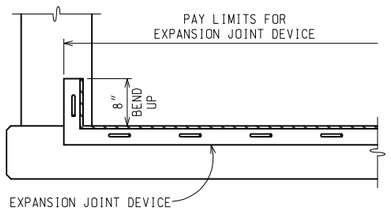
SECTION B - B



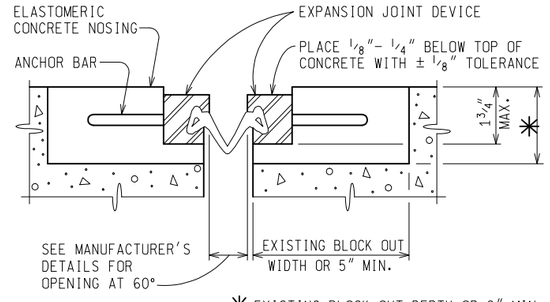
SECTION C - C



SECTION D - D



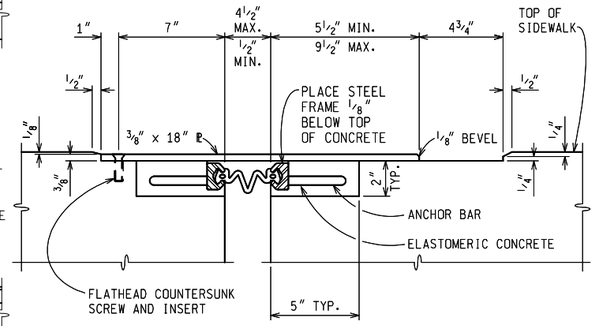
SECTION E - E



* EXISTING BLOCK OUT DEPTH OR 2" MIN.

SECTION THROUGH EXPANSION JOINT

THE MINIMUM BLOCK OUT DIMENSIONS SHOWN ARE APPLICABLE FOR DEVICES WITH STRIP SEALS ONLY.



SECTION THROUGH EXPANSION JOINT AND COVER PLATE

SIDEWALK SECTIONS

ALL STEEL FOR EXPANSION JOINT AND COVER PLATE SHALL BE AASHTO M270, GRADE 36, AND GALVANIZED (ASTM A123) WITH A STATIC COEFFICIENT OF FRICTION OF 0.6 OR GREATER.

USE ASTM F 593 (TYPE 304) STAINLESS STEEL ¾" DIAMETER FLATHEAD COUNTERSUNK SCREWS WITH ¾" DIAMETER INSERTS.

CAST CURBS AND SIDEWALKS WITH ⅜" SLIDING PLATES IN PLACE TO INSURE THAT INSERTS AND SCREWS ARE ALIGNED PROPERLY. APPLY BOND BREAKER TO SLIDING PLATES PRIOR TO INSTALLATION.

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WABO STRIP SEAL - TYPE E	WATSON BOWMAN ACME, CORP.

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STRUCTURE NUMBER	ANGLE OF CROSSING TO NEAREST 10°	LOCATION OF JOINT	MIN. TOT. TRAVEL ALONG CENTERLINE OF BRIDGE	REQUIRED LENGTH OF EXPANSION JOINT DEVICE

QUANTITY		
ITEM	UNIT	AMOUNT
Expansion Joint Device	Ft	
Expansion Joint Device, Cover Plate	Ft	

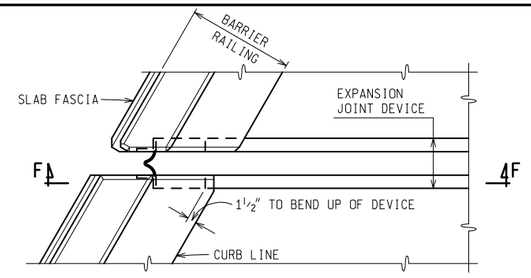
PLAN REVISIONS							
NO.	DATE	AUTH	DESCRIPTION	NO.	DATE	AUTH	DESCRIPTION

MDOT Michigan Department of Transportation

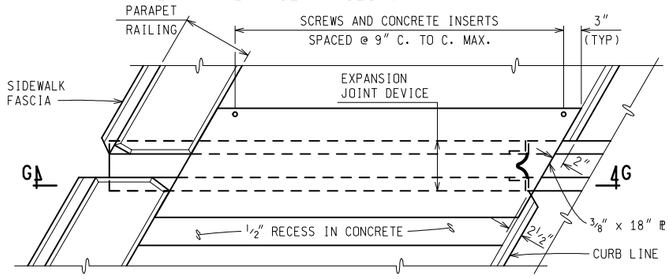
NO SCALE

DRAWN BY:	DATE:	CS:	EXPANSION JOINT DETAILS
CHECKED BY:	DESIGN UNIT:	JN:	EJ4L (03-14-2007)
FILE:	TSC:		

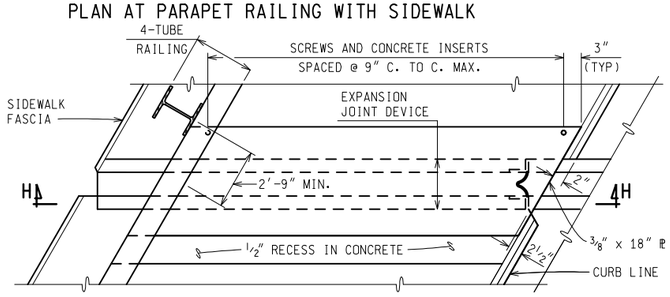
DRAWING | SHEET



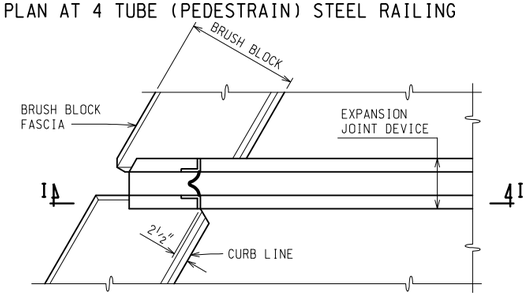
PLAN AT BARRIER RAILING



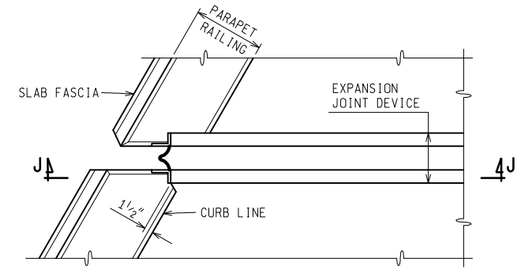
PLAN AT PARAPET RAILING WITH SIDEWALK



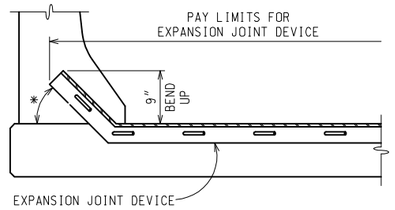
PLAN AT 4 TUBE (PEDESTRAIN) STEEL RAILING



PLAN AT 2 TUBE & 4 TUBE (BICYCLE) STEEL RAILING

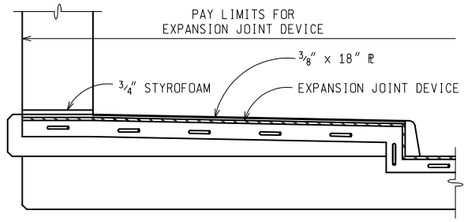


PLAN AT FLUSH MOUNT PARAPET RAILING

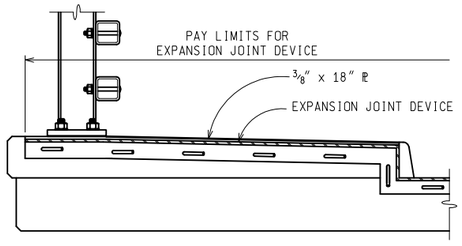


SECTION F - F

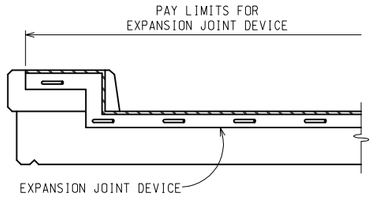
* FOR ANGLES OF CROSSING FROM 69° TO 45° INCLUSIVE, BEND ANCHORAGE UP 45° ALONG ℄ OF EXPANSION JOINT. FOR ANGLES OF CROSSING LESS THAN 45°, A SPECIAL ENDING MAY BE REQUIRED.



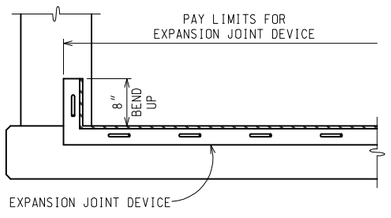
SECTION G - G



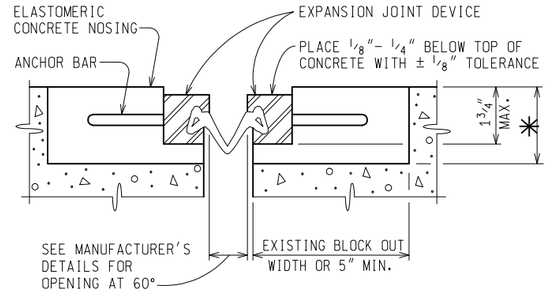
SECTION H - H



SECTION I - I



SECTION J - J



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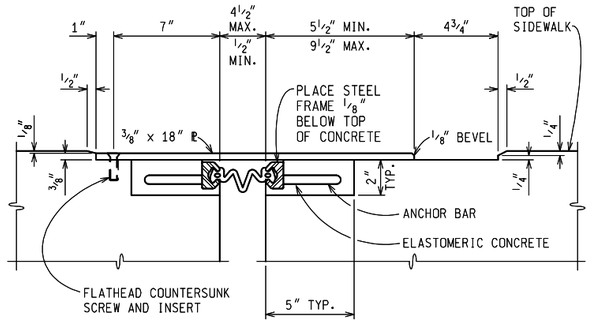
SECTION THROUGH EXPANSION JOINT

THE MINIMUM BLOCK OUT DIMENSIONS SHOWN ARE APPLICABLE FOR DEVICES WITH STRIP SEALS ONLY.



SECTION THROUGH EXPANSION JOINT AND COVER PLATE

SIDEWALK SECTIONS

ALL STEEL FOR EXPANSION JOINT AND COVER PLATE SHALL BE AASHTO M270, GRADE 36, AND GALVANIZED (ASTM A123) WITH A STATIC COEFFICIENT OF FRICTION OF 0.6 OR GREATER.

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STRUCTURE NUMBER	ANGLE OF CROSSING TO NEAREST 10°	LOCATION OF JOINT	MIN. TOT. TRAVEL ALONG CENTERLINE OF BRIDGE	REQUIRED LENGTH OF EXPANSION JOINT DEVICE

QUANTITY		
ITEM	UNIT	AMOUNT
Expansion Joint Device	Ft	
Expansion Joint Device, Cover Plate	Ft	

PLAN REVISIONS							
NO.	DATE	AUTH	DESCRIPTION	NO.	DATE	AUTH	DESCRIPTION

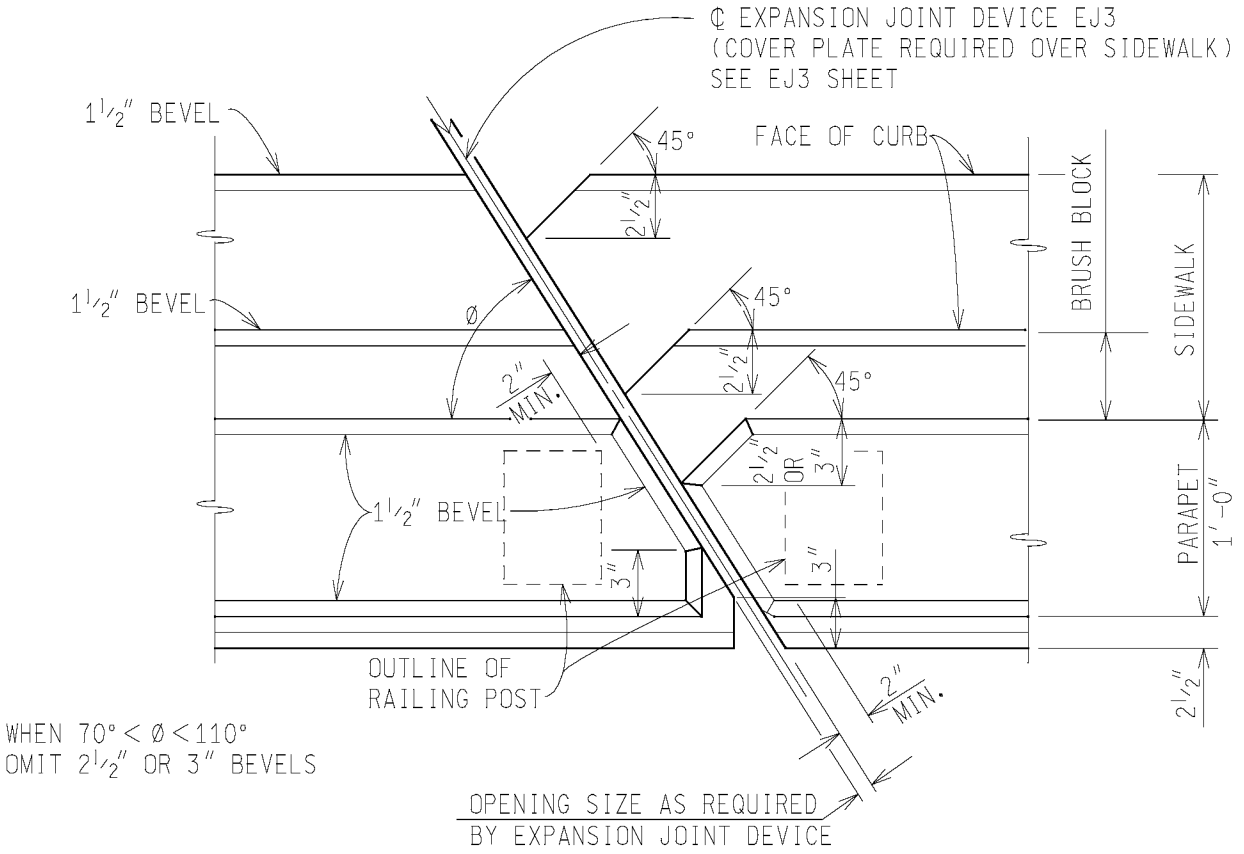
MDOT Michigan Department of Transportation

NO SCALE

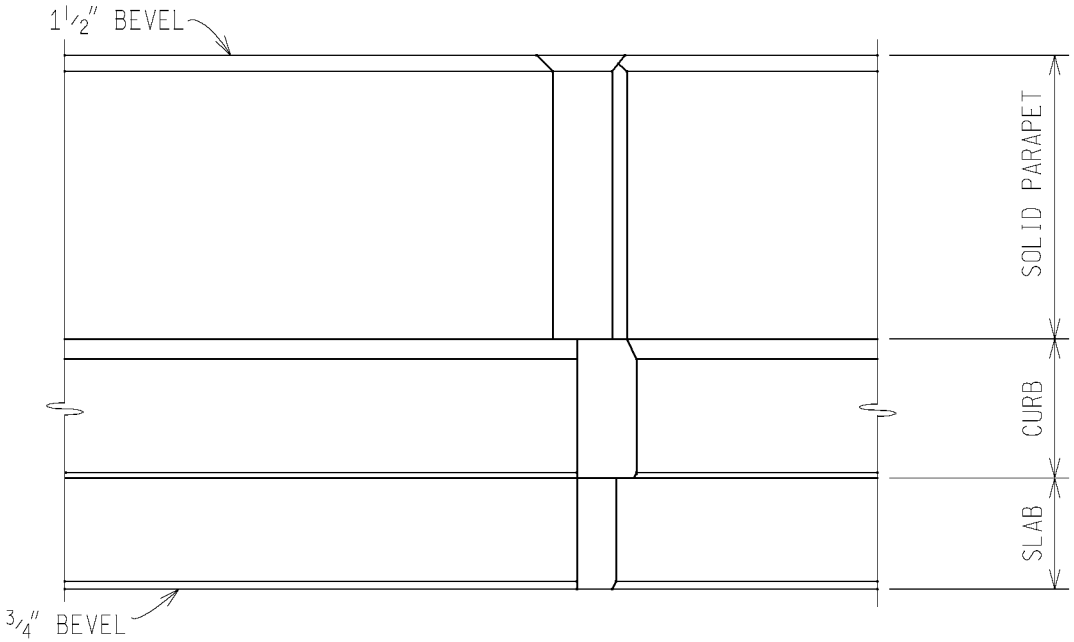
DRAWN BY:	DATE:	CS:	EXPANSION JOINT DETAILS
CHECKED BY:	DESIGN UNIT:	JN:	EJ4L (03-14-2007)
FILE:	TSC:		

DRAWING | SHEET

DRAWN BY: BLT APPROVED BY: VZ CHECKED BY:	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAY DEVELOPMENT **JOINT DETAILS FOR SOLID PARAPET, SIDEWALK OR BRUSH BLOCK WITH EXP. JT. DEVICE EJ3**	ISSUED: / / SUPERSEDES: 05/04/06



PLAN

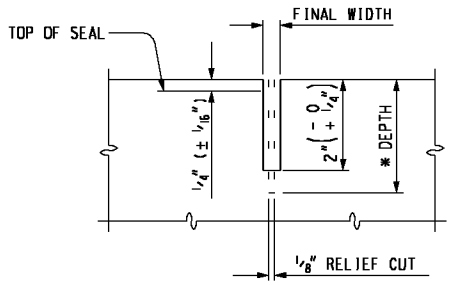


FASCIA ELEVATION

SEE EJ3 STANDARD SHEET FOR EXPANSION JOINT DEVICE DETAILS.

PREPARED BY DESIGN DIVISION	6.29.05

SYMBOL (C) AND (C3)



SAWED JOINT DETAIL

FINAL WIDTH OF SAWED JOINT AND NEOPRENE SEAL WIDTH SHALL BE AS IN THE TABLE BELOW.

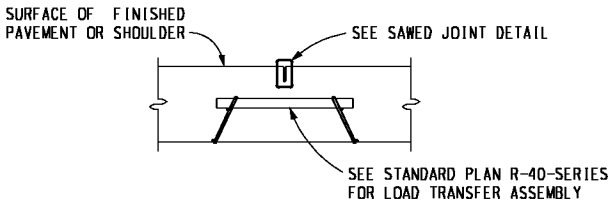
* DEPTH OF RELIEF CUT FOR JOINT (C) AND (C3) SHALL BE 1/3 THE SLAB THICKNESS + 3/8".

THE NEOPRENE JOINT SEAL SHALL BE INSTALLED IN ONE CONTINUOUS PIECE ACROSS PAVEMENT, CONCRETE SHOULDER(S), VALLEY GUTTER, OR CURB AND GUTTER, DETAIL D EXCEPT AS STATED IN THE STANDARD SPECIFICATIONS FOR CONSTRUCTION REGARDING STAGE CONSTRUCTION. SEE DETAILS OF CONCRETE CURB AND GUTTER ON STANDARD PLANS R-30-SERIES AND R-31-SERIES.

FOR PLAIN CONCRETE PAVEMENT USE STANDARD PLAN R-39P-SERIES.

SYMBOL	LOAD TRANSFER ASSEMBLY	JOINT USE
(C)	YES	PAVEMENT
(C3)	NO	SHOULDER

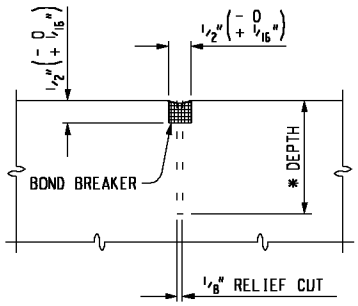
JOINT SPACING	FINAL WIDTH	NEOPRENE SEAL WIDTH
27'	9/16" (- 0, + 1/16")	1"



TRANSVERSE CONTRACTION JOINT

NOTE: FOR PLACEMENT OF PAVEMENT REINFORCEMENT, SEE STANDARD PLAN R-45-SERIES

SYMBOL (C2) AND (C4)

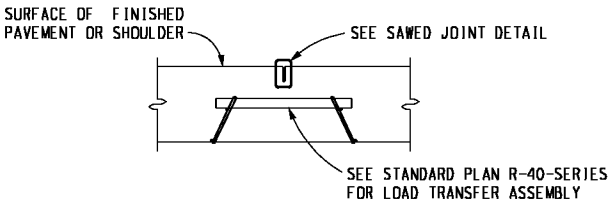


SAWED JOINT DETAIL

SAWED JOINT SEALED WITH LOW MODULUS HOT-POURED RUBBER-ASPHALT TYPE JOINT SEALING COMPOUND.

* DEPTH OF RELIEF CUT FOR JOINT (C2) AND (C4) SHALL BE 1/3 THE SLAB THICKNESS.

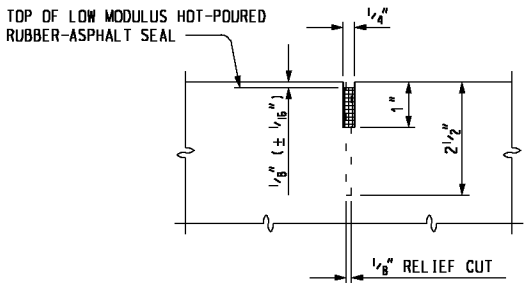
SYMBOL	LOAD TRANSFER ASSEMBLY	JOINT USE
(C2)	YES	PAVEMENT
(C4)	NO	SHOULDER



TRANSVERSE CONTRACTION JOINT

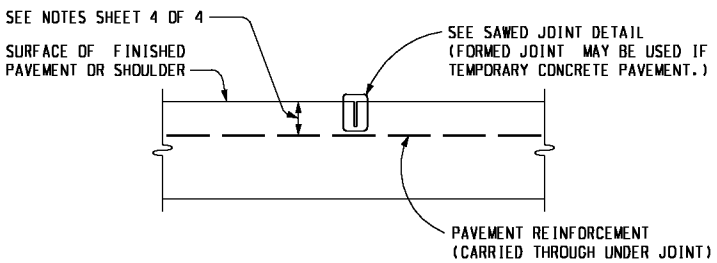
NOTE: FOR PLACEMENT OF PAVEMENT REINFORCEMENT, SEE STANDARD PLAN R-45-SERIES

SYMBOL (D1)



SAWED JOINT DETAIL

SAWED JOINT SEALED WITH LOW MODULUS HOT-POURED RUBBER-ASPHALT TYPE JOINT SEALING COMPOUND.



TRANSVERSE AND INTERSECTION PLANE OF WEAKNESS JOINTS IN CONCRETE PAVEMENT

MDOT Michigan Department of Transportation

PREPARED BY DESIGN SUPPORT AREA

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR
Kirk T. Steudle

APPROVED BY: _____
ENGINEER OF DELIVERY

APPROVED BY: _____
ENGINEER OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

TRANSVERSE PAVEMENT JOINTS
(REINFORCED CONCRETE PAVEMENT)

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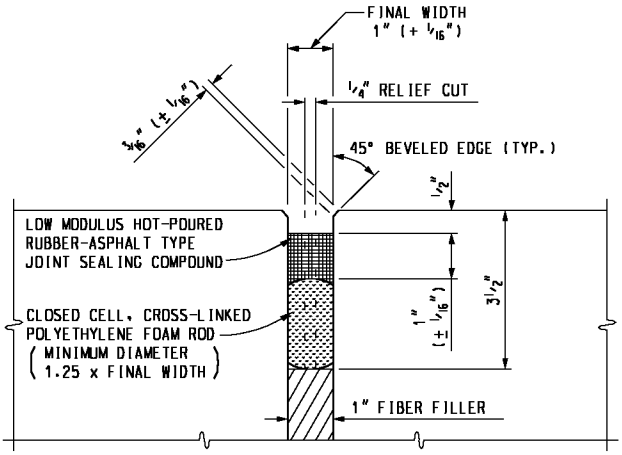
F.H.W.A. APPROVAL	PLAN DATE		

SYMBOL (E2), (E3) AND (E4)



SAWED JOINT DETAIL

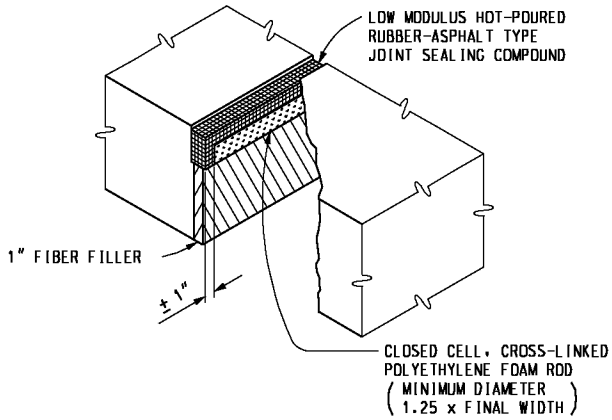
SAWED JOINT SEALED WITH LOW MODULUS HOT-POURED RUBBER-ASPHALT TYPE JOINT SEALING COMPOUND.

NOTE:

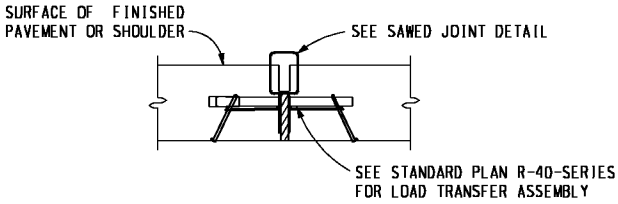
THE FINAL WIDTH OF THE GROOVE SHALL BE 1" + 1/16" PLUS ANY INCREASE OR MINUS ANY DECREASE IN THE WIDTH OF THE RELIEF CUT. THE FINAL SAW CUT SHALL BE TO THE TOP OF THE FIBER FILLER WITH A MINIMUM DEPTH AS SHOWN AND SHALL BE CENTERED OVER THE FIBER FILLER WITH A HORIZONTAL TOLERANCE OF 1/4". FIBER FILLER FOR EXPANSION JOINTS IN CONCRETE SHOULDERS SHALL BE FREE OF HOLES OR OTHER DEFECTS AND TRIMMED TO FIT SHOULDER CONFIGURATIONS.

SYMBOL	LOAD TRANSFER ASSEMBLY	JOINT USE
(E2)	YES	PAVEMENT
* (E3)	NO	PAVEMENT & SHOULDER
(E4)	NO	SHOULDER

* ALSO, SEE STANDARD PLAN R-45-SERIES.



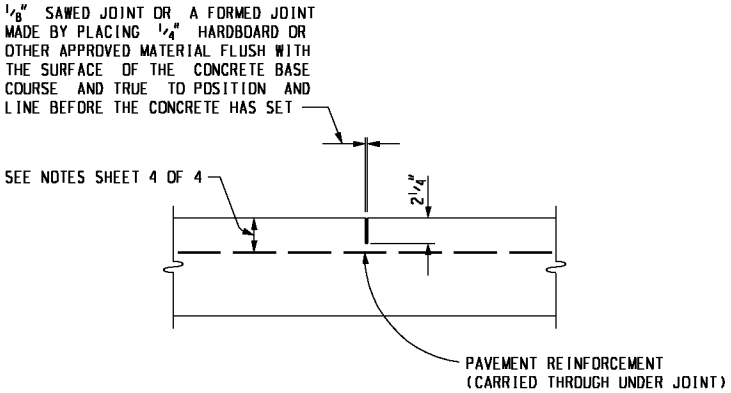
OUTSIDE EDGE TREATMENT



TRANSVERSE EXPANSION JOINT

NOTE: FOR PLACEMENT OF PAVEMENT REINFORCEMENT, SEE STANDARD PLAN R-45-SERIES

SYMBOL (U)



TRANSVERSE PLANE OF WEAKNESS JOINTS IN CONCRETE BASE COURSE

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

TRANSVERSE PAVEMENT JOINTS
(REINFORCED CONCRETE PAVEMENT)

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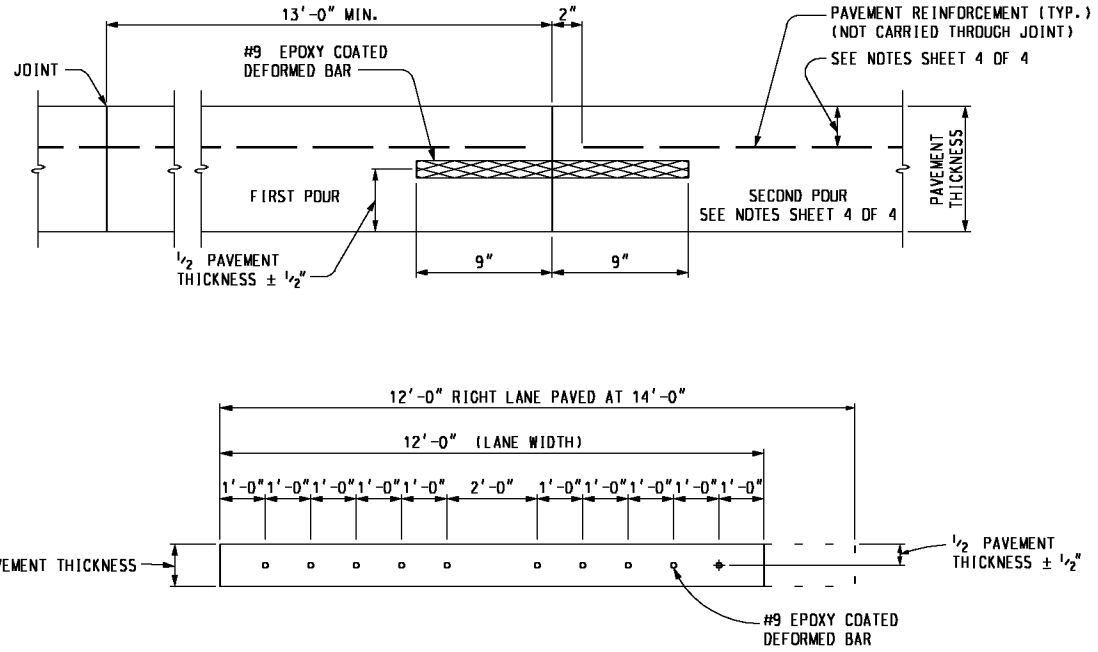
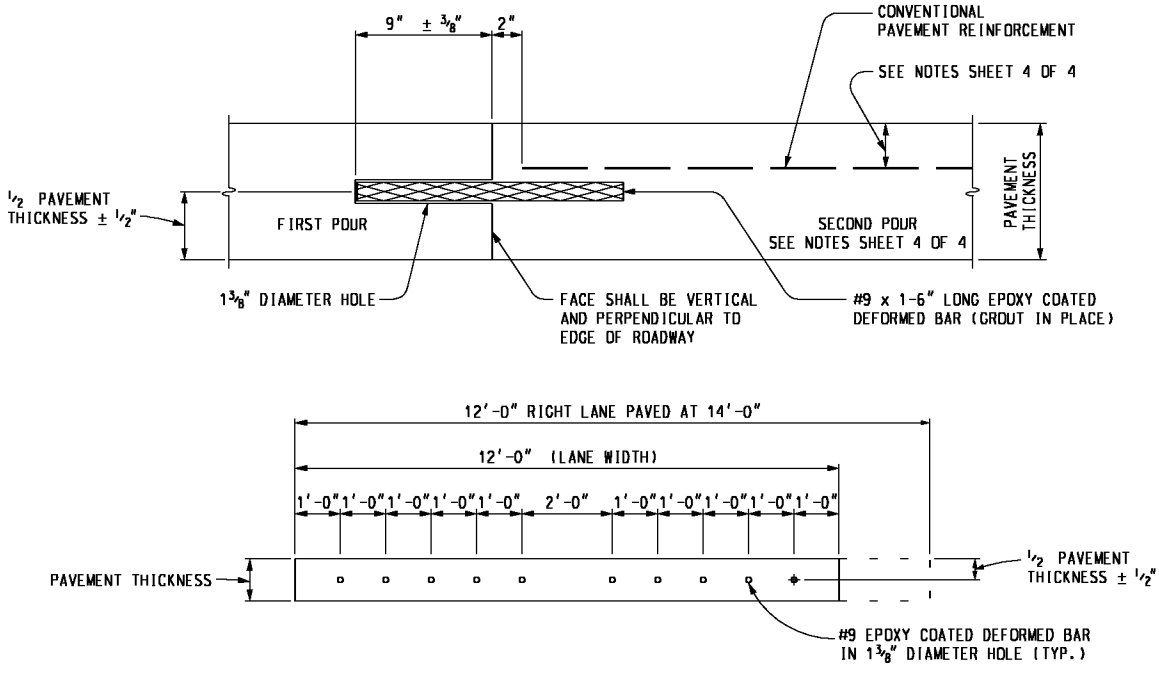
SYMBOL (H)



DEFORMED BAR SPACING

TRANSVERSE END OF POUR JOINT (SPLIT HEADER METHOD)



DEFORMED BAR SPACING

NOTE: THE HOLE SPACING MAY BE ADJUSTED 1" HORIZONTALLY, RAISED 1/2", OR LOWERED 1" FROM THE ABOVE LOCATIONS TO AVOID DRILLING INTO THE REINFORCEMENT.

TRANSVERSE END OF POUR JOINT (DRILLED IN METHOD)

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

TRANSVERSE PAVEMENT JOINTS
(REINFORCED CONCRETE PAVEMENT)

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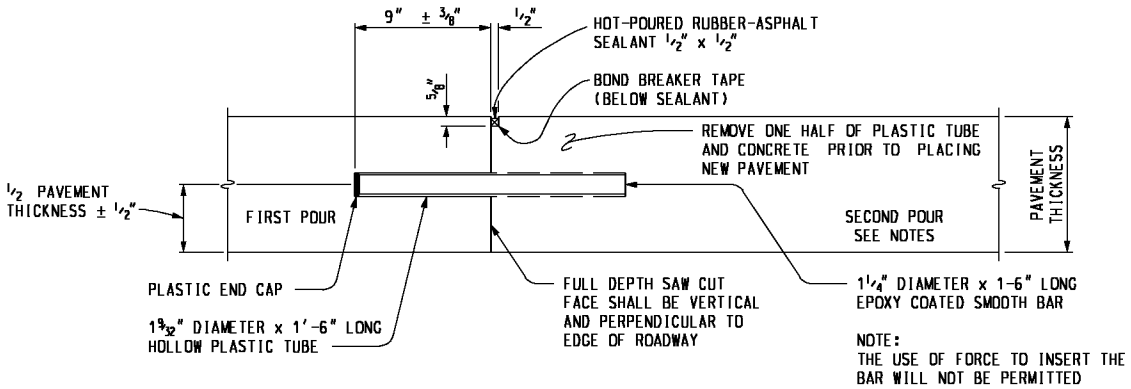
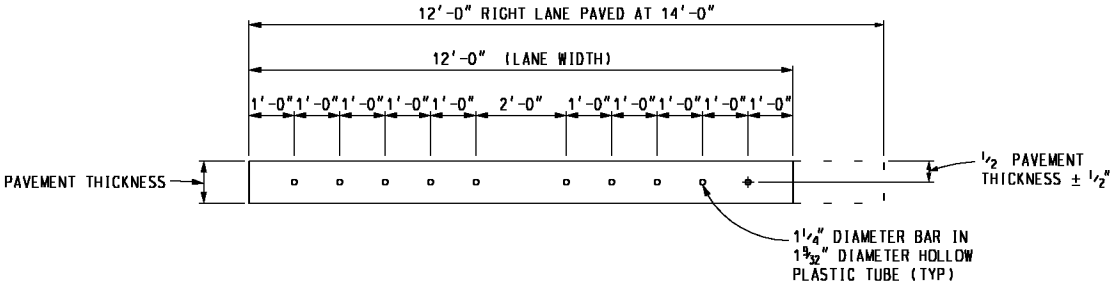
SYMBOL (H)





DEFORMED BAR SPACING

TRANSVERSE END OF POUR JOINT (PLASTIC TUBE METHOD)

NOTES:

LOAD TRANSFER ASSEMBLIES ARE DETAILED ON THE CURRENT STANDARD PLAN R-40-SERIES.

TRANSVERSE JOINTS SHALL BE SPACED ACCORDING TO THE CURRENT STANDARD PLAN R-42-SERIES AND R-43-SERIES.

A TRANSVERSE END OF POUR JOINT (DRILLED IN METHOD) SYMBOL (H), SHALL BE CONSTRUCTED WHEN IT IS ANTICIPATED THAT THE SECOND POUR WILL BE DELAYED 7 DAYS OR LONGER.

A TRANSVERSE END OF POUR JOINT (SPLIT HEADER METHOD) OR (PLASTIC TUBE METHOD) SHALL BE USED AT THE END OF THE DAY'S POUR OR WHEN THERE IS AN UNAVOIDABLE INTERRUPTION OF THE WORK FOR MORE THAN ONE-HALF HOUR AND LESS THAN 7 DAYS. THE JOINT SHALL BE CONSTRUCTED ACCORDING TO TRANSVERSE END OF POUR JOINT (SPLIT HEADER METHOD) OR (PLASTIC TUBE METHOD), SYMBOL (H).

NEOPRENE JOINT SEAL CROSS-SECTION SHALL BE APPROVED BY THE ENGINEER.

THE EXPANSION JOINT MATERIAL IN THE SHOULDERS SHALL BE SUPPORTED BY ONE OF THE FOLLOWING METHODS:

1. A CONTINUOUS SUPPORT WIRE, AS SPECIFIED FOR EXPANSION LOAD TRANSFERS ASSEMBLIES, AS DETAILED ON STANDARD PLAN R-40-SERIES, SHALL BE USED ON EACH SIDE OF EXPANSION MATERIAL. THIS WIRE SHALL BE EQUIPPED WITH STAKES AND STAKE POCKETS TO RIGIDLY HOLD THE EXPANSION MATERIAL IN PLACE DURING CONCRETE PLACEMENT. STAKES SHALL BE AS SPECIFIED ON STANDARD PLAN R-40-SERIES, SPACED NOT MORE THAN 2'-0" APART.

2. "U" OR "J" SHAPE STAPLES OF W8 WIRE (0.319" NOMINAL DIAMETER) SHALL BE SPACED ON 2'-0" CENTERS EACH SIDE OF THE EXPANSION MATERIAL. EACH VERTICAL LEG OF THE STAPLE SHALL BE AT LEAST 1'-3" LONG.

3. OTHER EQUIVALENT METHODS MAY BE USED WHEN APPROVED BY THE ENGINEER.

JOINTS SHALL NOT BE SEALED IN CONCRETE BASE COURSE.

FOR THE USE AND PLACEMENT OF STEEL REINFORCEMENT, SEE THE CURRENT STANDARD PLAN R-45-SERIES.

WHEN CONCRETE SHOULDERS ARE CAST SEPARATELY FROM MAINLINE CONCRETE PAVEMENT, A KEYWAY MAY BE USED TO FACILITATE THE PLACING OF LANE TIES. WHEN A KEYWAY GROOVE IS USED, IT SHALL BE CONTINUOUS AND UNIFORM.

THE LOCATION OF TRANSVERSE JOINTS IN CONCRETE SHOULDERS SHALL MATCH THE LOCATION OF ADJACENT TRANSVERSE PAVEMENT JOINTS. CORRESPONDING TRANSVERSE CONCRETE SHOULDER AND PAVEMENT JOINTS SHALL BE (C3) SHOULDER WITH (C) PAVEMENT, (C4) SHOULDER WITH (C2) PAVEMENT, (E4) SHOULDER WITH (E2) PAVEMENT, AND (E3) BEING THE SAME IN BOTH SHOULDER AND PAVEMENT.

DEFORMED BARS FOR TRANSVERSE END OF POUR JOINTS (DRILLED IN METHOD) SHALL BE GROUTED INTO EXISTING PAVEMENT WITH A GROUT SELECTED FROM THE PREQUALIFIED MATERIALS LISTED IN THE DEPARTMENT'S "MATERIALS SAMPLING GUIDE" UNDER ADHESIVE SYSTEMS FOR GROUTING DOWEL BARS AND TIE BARS FOR FULL-DEPTH PAVEMENT REPAIRS.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

TRANSVERSE PAVEMENT JOINTS
(REINFORCED CONCRETE PAVEMENT)

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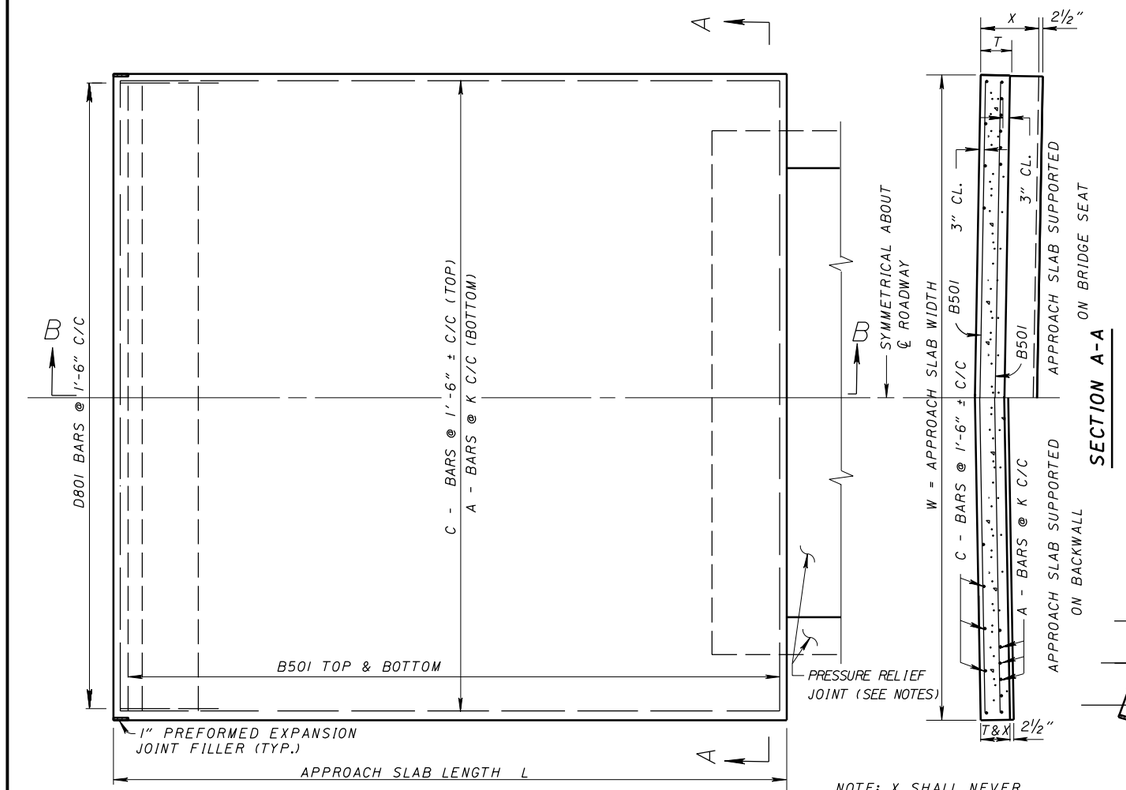
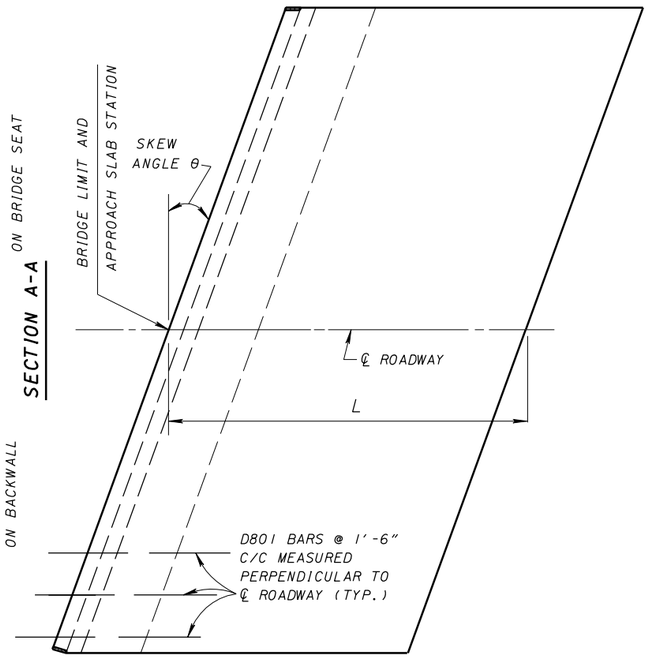
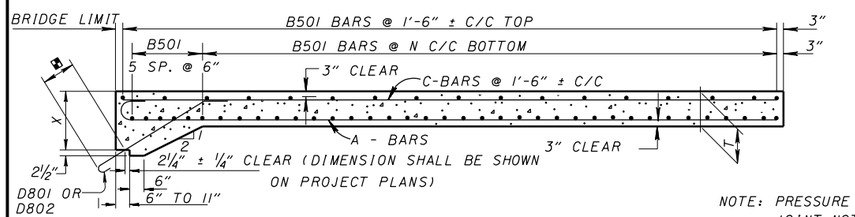
Appendix F: Ohio Drawings



SECTION A-A



NOTE: X SHALL NEVER BE LESS THAN T



■ = (1'-3") SEC θ (AS MEASURED ALONG THE LENGTH OF THE D801 OR D802 BAR)

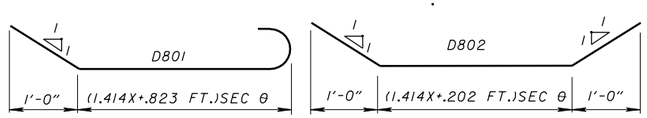
NOTE: PRESSURE RELIEF JOINT NOT SHOWN

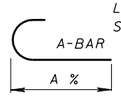
SECTION B-B

REINFORCING STEEL (FOR ONE APPROACH SLAB)

LENGTH L	THICKNESS T	A-BARS					B501 (BOTTOM)			B501 (TOP)		C-BARS			D801 OR D802
		SP'C'G K	MARK	LENGTH	DIMENSION A	NO. REQ'D.	* LENGTH	SP'C'G N	NO. REQ'D.	* LENGTH	NO. REQ'D.	MARK	LENGTH	NO. REQ'D.	NO. REQ'D.
15'-0"	12"	10"	A1001	15'-11"	14'-6"	$\frac{W-0.5}{K}+1$	(W-0.5)sec θ	9"	22	(W-0.5)sec θ	11	C501	14'-6"	$\frac{W-0.5}{18}+1$	$\frac{W-0.5}{18}+1$
20'-0"	13"	7½"	A1002	20'-11"	19'-6"			8"	31		14	C502	19'-6"		
25'-0"	15"	7"	A1003	25'-11"	24'-6"			8"	39		18	C503	24'-6"		
30'-0"	17"	6½"	A1004	30'-11"	29'-6"			8½"	44		21	C504	29'-6"		

W = APPROACH SLAB WIDTH, OUT TO OUT, IN FEET
θ = ANGLE OF SKEW
K = A-BAR SPACING IN INCHES
N = B-BAR SPACING IN INCHES
X = APPROACH SLAB THICKNESS AT ABUTMENT END IN FEET
% = OUT TO OUT





APPROACH SLAB FOR SKEWED STRUCTURE

GENERAL: THIS DRAWING PROVIDES DESIGN AND GENERAL CONSTRUCTION DETAILS. THE PROJECT PLANS WILL SHOW LENGTH, SKEW, CURBS (IF ANY), ESTIMATED QUANTITY (SQUARE YARDS), AND SPECIAL NOTES AND DETAILS WHERE NECESSARY. FOR CONDITIONS OTHER THAN THOSE INDICATED HEREON, THE APPROACH SLAB SHALL BE ADAPTED TO FIT THE ENDS OF THE BRIDGE AND THE APPROACH PAVEMENT.

THE D801 OR D802 ANCHOR BARS SHALL BE DIMENSIONED IN THE CONTRACT PLANS AND INCLUDED WITH ITEM 509 FOR PAYMENT FOR EACH SPECIFIC BRIDGE. D801 BARS CANNOT BE USED AS SHOWN IF APPROACH SLABS ARE SUPPORTED ON BACKWALLS LESS THAN 14 INCHES THICK. D802 BARS SHALL BE USED ON PRESTRESSED CONCRETE BOX BEAM BRIDGES WITH APPROACH SLABS SUPPORTED ON BACKWALLS 11 INCHES THICK.

D801 BARS CANNOT BE USED AS SHOWN WHERE APPROACH SLABS ARE SUPPORTED ON BACKWALLS LESS THAN 14 INCHES THICK. D802 BARS SHALL BE USED ON PRESTRESSED CONCRETE BOX BEAM BRIDGES WHERE THE APPROACH SLAB IS SUPPORTED ON AN 11 INCH THICK BACKWALL.

* AT THE OPTION OF THE CONTRACTOR AND AT NO ADDITIONAL COST TO THE STATE, B501 BARS MAY BE LAPPED 2'-6" MINIMUM AT THE CENTERLINE OF ROADWAY, OR WHERE REQUIRED FOR LONGITUDINAL CONSTRUCTION JOINTS, IN LIEU OF PROVIDING FULL LENGTH BARS AS SHOWN.

DESIGN SPECIFICATIONS: THIS STANDARD DRAWING CONFORMS TO "STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES" ADOPTED BY THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS, 1996, INCLUDING THE 1997, 1998 & 1999 INTERIM SPECIFICATIONS AND THE ODOT BRIDGE DESIGN MANUAL.

DESIGN DATA:

DESIGN LOADING: DEAD LOAD - 60 LB/FT² (F.W.S.)
LIVE LOAD - HS25 AND THE ALTERNATE MILITARY LOADING.

CONCRETE - COMPRESSIVE STRENGTH = 4500 PSI.

REINFORCING STEEL - MIN. YIELD STRENGTH = 60,000 PSI.

REINFORCING STEEL FOR SKEWED BRIDGES: THE A AND C BARS SHALL BE PLACED PARALLEL TO THE CENTER LINE OF ROADWAY AND THE B BARS SHALL BE PLACED PARALLEL TO THE ABUTMENTS.

LONGITUDINAL CONSTRUCTION JOINTS REQUIRED FOR STAGE CONSTRUCTION SHALL BE ACCORDING TO 511.12.

CURBS, BRIDGES WITH SIDEWALKS: FOR BRIDGES CONSTRUCTED WITH RAISED SIDEWALKS, DEFLECTOR PARAPETS OR OTHER TYPES OF CONSTRUCTION WHICH RETAIN ROADWAY SURFACE DRAINAGE, THE APPROACH SLABS SHALL EITHER INCLUDE INTEGRAL CURBS OR BE CONSTRUCTED IN CONJUNCTION WITH BRIDGE CURBS. CURB HEIGHT SHALL BE TRANSITIONED UNIFORMILY BETWEEN BRIDGE CURB HEIGHT AND ROADWAY CURB HEIGHT IN A LENGTH AS FOLLOWS: WHERE WINGWALL EXTENDS BEYOND END OF APPROACH SLAB, USE A MINIMUM LENGTH OF 10 FEET BEYOND END OF WINGWALL. WHERE THE APPROACH SLAB EXTENDS BEYOND THE END OF WINGWALL, TRANSITION IN THIS LENGTH. HOWEVER, THE TRANSITION LENGTH SHALL NOT BE LESS THAN 10 FEET AND THE TRANSITION SHALL EXTEND BEYOND THE END OF APPROACH SLAB IF NECESSARY.

APPROACH SLAB WIDTH (W): APPROACH SLABS SHALL BE THE SAME WIDTH AS THE BRIDGE ROADWAY.

APPROACH SLAB LENGTH (L): THE LENGTH SHOULD BE BASED ON FACTORS SUCH AS THE SIZE AND AMOUNT OF EXCAVATION BEHIND THE ABUTMENTS, NEW OR EXISTING EMBANKMENTS AND SKEW OF THE BRIDGE. THE LENGTH SHALL BE SHOWN ON THE PROJECT PLANS.

DECK CROWN AND SLOPE: THE LOCATION OF THE CROWN POINT AND THE RATE OF CROSS SLOPE ON THE APPROACH SLAB SHALL CONFORM TO THAT OF THE BRIDGE DECK AND APPROACH PAVEMENT. IF THE RATE OF CROSS SLOPE OF THE BRIDGE DECK DIFFERS FROM THAT OF THE APPROACH PAVEMENT, A SMOOTH TRANSITION SHALL BE PROVIDED WITHIN THE LIMITS OF THE APPROACH SLAB WHENEVER POSSIBLE.

WEARING SURFACE: GENERALLY APPROACH SLABS SHALL HAVE AN ASPHALT CONCRETE WEARING SURFACE ONLY WHEN BOTH THE APPROACH PAVEMENT SURFACE AND THE BRIDGE WEARING SURFACE ARE ASPHALT CONCRETE.

PRESSURE RELIEF JOINTS: RELIEF JOINTS, TYPE A, ARE TO BE PROVIDED REGARDLESS OF ABUTMENT DESIGN AT ALL BRIDGE APPROACHES WHERE APPROACH PAVEMENT IS RIGID, OR COMPOSITE CONSISTING OF A RIGID BASE. SEE STANDARD CONSTRUCTION DRAWING BP-2.3 FOR DETAILS

BASIS OF PAYMENT: IN ADDITION TO THE INCIDENTAL ITEMS LISTED IN 526.08, THE DEPARTMENT WILL INCLUDE THE FOLLOWING ITEMS FOR PAYMENT: THE PREFORMED EXPANSION JOINT FILLER AND JOINT SEALER AT THE CORNERS AND SIDES OF THE APPROACH SLAB; AND THE TYPE "A" WATERPROOFING AND THE PREFORMED ELASTOMERIC COMPRESSION JOINT SEAL AT THE BRIDGE LIMIT END OF THE APPROACH SLAB.

THE DEPARTMENT WILL PAY FOR THE PRESSURE RELIEF JOINTS AND ANCHOR BARS (D801 OR D802) SEPARATELY.

DESIGN AGENCY
OFFICE OF STRUCTURAL ENGINEERING

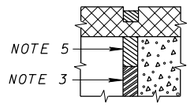
STATE OF OHIO DEPARTMENT OF TRANSPORTATION
10-25-94
DATE
ENGINEER OF BRIDGES

REVIEWED LMW
CHECKED JAM
DESIGNED JFF
DRAWN JFF
AS-1-81

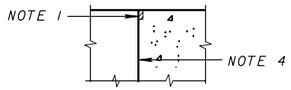
REVISIONS
9-15-94
04-20-01
07-19-02

STANDARD
REINFORCED CONCRETE APPROACH SLAB

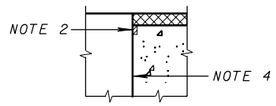
1 / 3



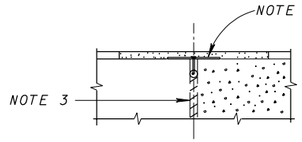
DETAIL A



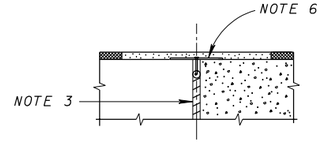
DETAIL B



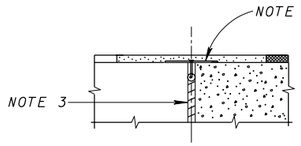
DETAIL C



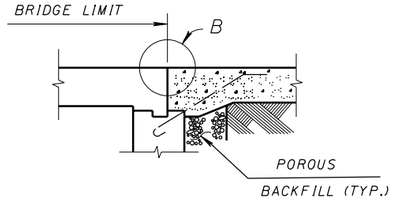
DETAIL D



DETAIL E



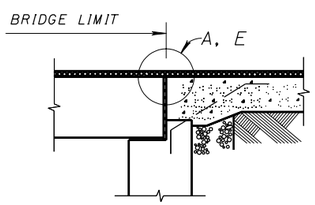
DETAIL F



ON SLAB BRIDGES

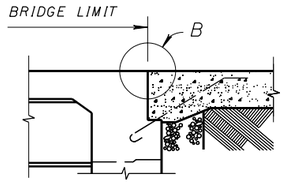
CONCRETE WEARING SURFACE ON BRIDGE DECK AND APPROACH SLAB

ON PRESTRESSED CONCRETE BOX BEAM BRIDGES ◆

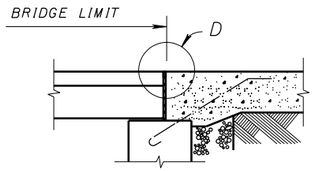


APPROACH SLAB SUPPORTED ON ABUTMENT BACKWALL

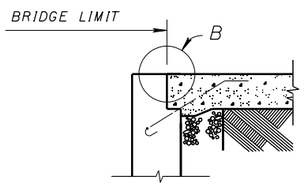
ASPHALT CONCRETE WEARING SURFACE ON BRIDGE DECK AND APPROACH SLAB



ON BRIDGES WITH INTEGRAL CONSTRUCTION
(SEMI-INTEGRAL SIMILAR)

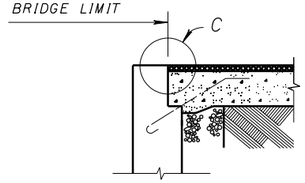


ON PRESTRESSED CONCRETE BOX BEAM BRIDGES ◆

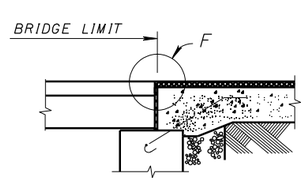


APPROACH SLAB SUPPORTED ON ABUTMENT BACKWALL

CONCRETE WEARING SURFACE ON BRIDGE DECK AND APPROACH SLAB



APPROACH SLAB SUPPORTED ON ABUTMENT BACKWALL



ON PRESTRESSED CONCRETE BOX BEAM BRIDGES ◆

CONCRETE WEARING SURFACE ON BRIDGE DECK ONLY

◆ - THE APPROACH SLAB SEAT FOR THIS PRESTRESSED CONCRETE BOX BEAM BRIDGE IS SHOWN AT THE SAME ELEVATION AS THE BEAM SEAT. HOWEVER, IT MAY ACTUALLY BE HIGHER OR LOWER THAN THE BEAM SEAT DEPENDING ON THE BOX BEAM DEPTH.

NOTE 1: PREFORMED ELASTOMERIC COMPRESSION JOINT SEAL, 705.11 (1¼" WIDE FOR A ½" WIDE GROOVE) PLACED IN ½" x 2¼" GROOVE.

NOTE 2: PREFORMED ELASTOMERIC COMPRESSION JOINT SEAL, 705.11 (1¼" WIDE FOR A ½" WIDE GROOVE) PLACED IN ½" x 2⅛" GROOVE.

NOTE 3: 1" PREFORMED EXPANSION JOINT FILLER, 705.03.

NOTE 4: TYPE "A" WATERPROOFING.

NOTE 5: SEE PLAN INSERT SHEET, "ABUTMENT JOINTS IN BITUMINOUS CONCRETE, BOX BEAM BRIDGES."

NOTE 6: SEE PLAN INSERT SHEET, "POLYMER MODIFIED ASPHALT EXPANSION JOINT SYSTEM."

TYPE "A" WATERPROOFING SHALL NOT EXTEND ABOVE THE BOTTOM OF THE GROOVE INTO WHICH THE PREFORMED ELASTOMERIC COMPRESSION JOINT SEAL IS TO BE PLACED. IT SHALL BE APPLIED TO THE ENTIRE AREA OF THE ABUTMENT OR SUPERSTRUCTURE WHICH COMES INTO CONTACT WITH THE APPROACH SLAB.

FOR PRESTRESSED CONCRETE BOX BEAM BRIDGES WITH ASPHALT CONCRETE ON BOTH BRIDGE DECK AND APPROACH SLAB, THE TOP OF APPROACH SLAB AT THE BRIDGE END SHALL BE CONSTRUCTED TO THE LEVEL OF THE TOP OF THE BEAMS TO FACILITATE WATERPROOFING OF THE JOINT. THE THICKNESS OF ASPHALT CONCRETE AT THE APPROACH END OF THE SLAB SHALL BE THE THICKNESS OF ASPHALT CONCRETE USED ON THE ROADWAY PAVEMENT. THE THICKNESS OF ASPHALT CONCRETE SHALL VARY UNIFORMLY, IF NECESSARY, IN THE LENGTH OF THE APPROACH SLAB. THE SUBGRADE (SUBBASE) SHALL BE GRADED TO PERMIT THE BOTTOM OF THE APROACH SLAB TO BE PARALLEL TO THE TOP.

FOR STRUCTURES WITHOUT STRIP SEAL, COMPRESSION SEAL OR POLYMER MODIFIED ASPHALT EXPANSION JOINTS, THAT HAVE AN ASPHALT CONCRETE WEARING SURFACE ON BOTH THE BRIDGE DECK AND APPROACH SLAB, EXTEND THE DECK WATERPROOFING 2'-0" BEYOND THE BRIDGE LIMITS. FOR STRUCTURES WITH STRIP SEAL AND COMPRESSION SEAL EXPANSION JOINTS, END THE DECK WATERPROOFING AT THE PRESTRESSED BOX BEAM NOTCH. FOR STRUCTURES WITH POLYMER MODIFIED ASPHALT EXPANSION JOINTS, EXTEND THE DECK WATERPROOFING TO THE CENTERLINE OF THE JOINT.

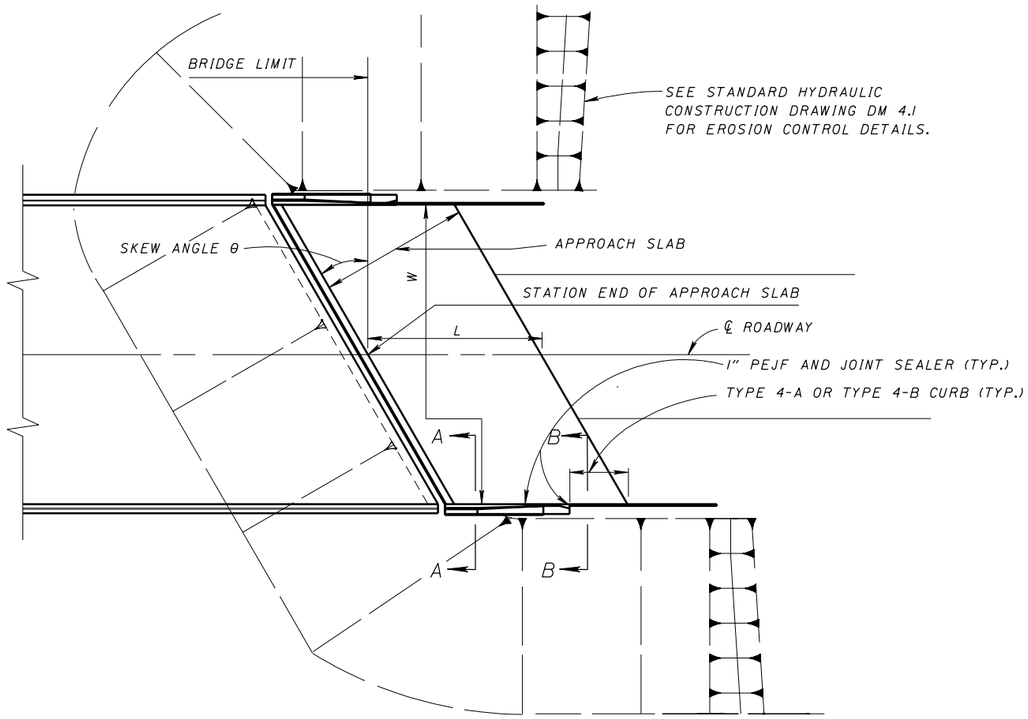
DESIGN AGENCY
OFFICE OF STRUCTURAL ENGINEERING

STATE OF OHIO DEPARTMENT OF TRANSPORTATION
ENGINEER OF BRIDGES
10-25-94
DATE

REVISIONS	DESIGNED	CHECKED	REVIEWED
9-15-94	JFF	JAM	LMW
04-20-01	DRAWN		AS-1-81
07-19-02	JFF		

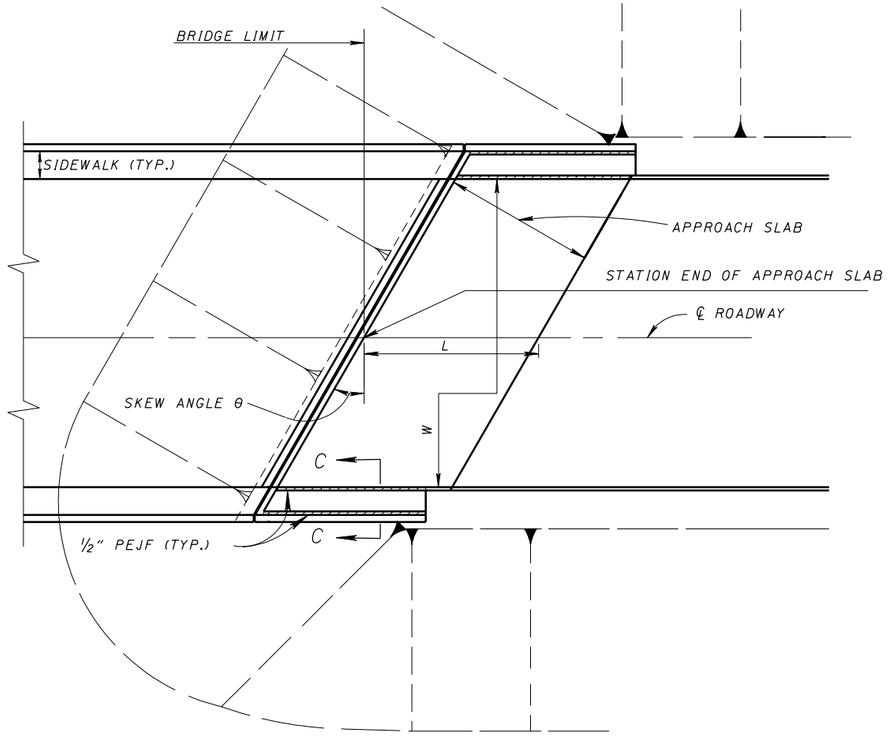
STANDARD
REINFORCED CONCRETE APPROACH SLAB

2 / 3



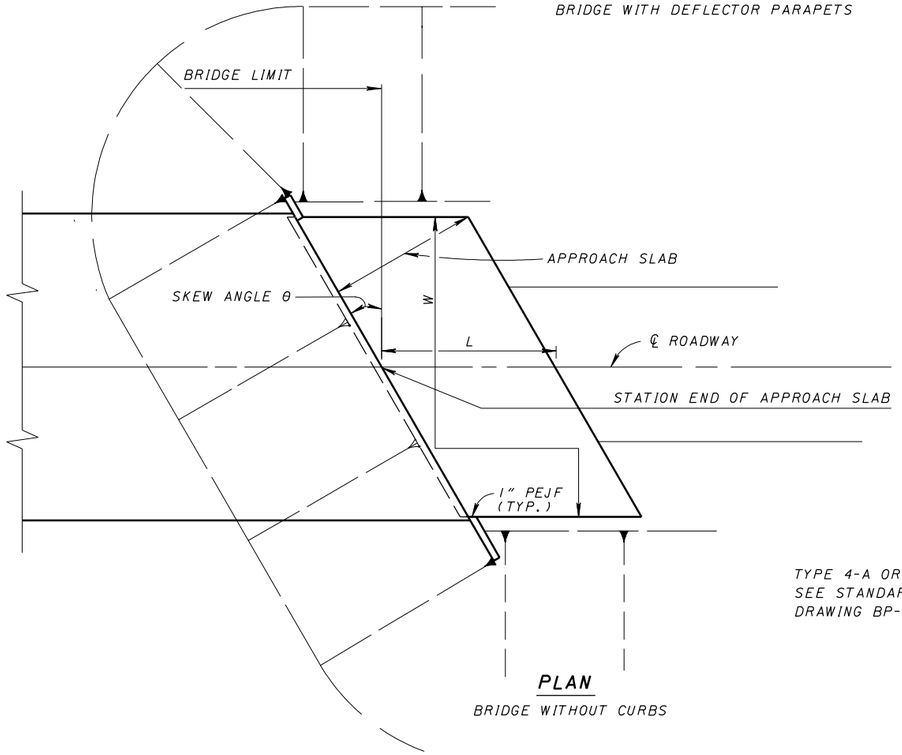
PLAN

BRIDGE WITH DEFLECTOR PARAPETS



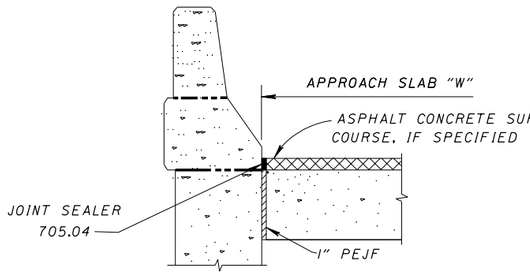
PLAN

BRIDGE WITH SIDEWALKS

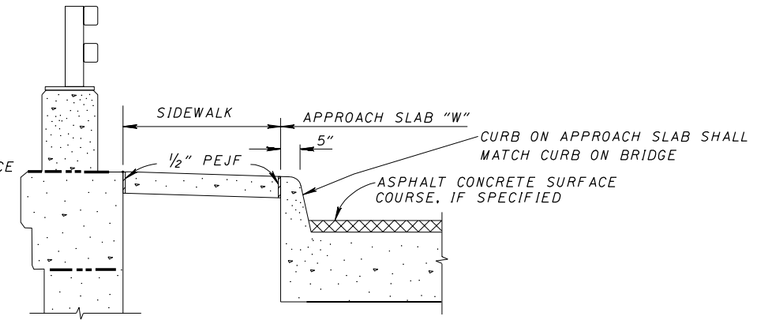


PLAN

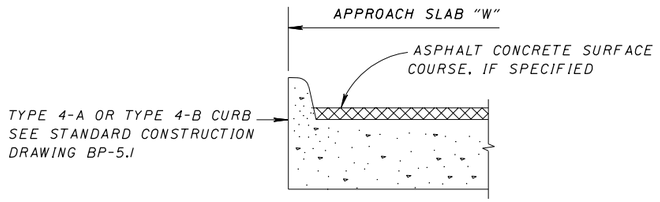
BRIDGE WITHOUT CURBS



SECTION A-A



SECTION C-C



SECTION B-B

LEGEND

W= APPROACH SLAB WIDTH.OUT TO OUT.IN FEET.

L= APPROACH SLAB LENGTH.

PEJF = PREFORMED EXPANSION JOINT FILLER.

DESIGN AGENCY
OFFICE OF STRUCTURAL ENGINEERING

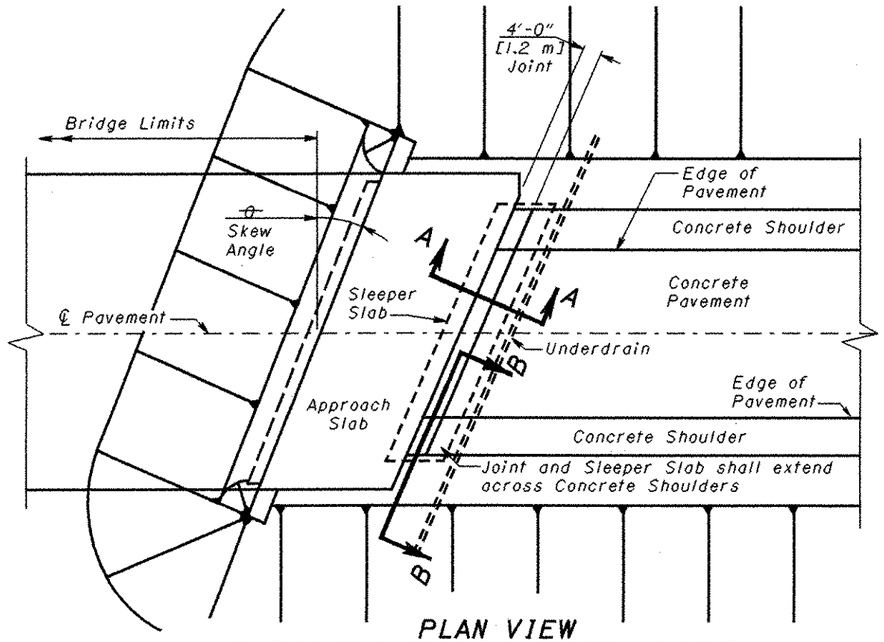
STATE OF OHIO DEPARTMENT OF TRANSPORTATION
10-25-94 DATE
ENGINEER OF BRIDGES

REVISIONS	DESIGNED	DRAWN	CHECKED	REVIEWED
9-15-94 04-20-01 07-19-02	JFF	JFF	JAM	LMW

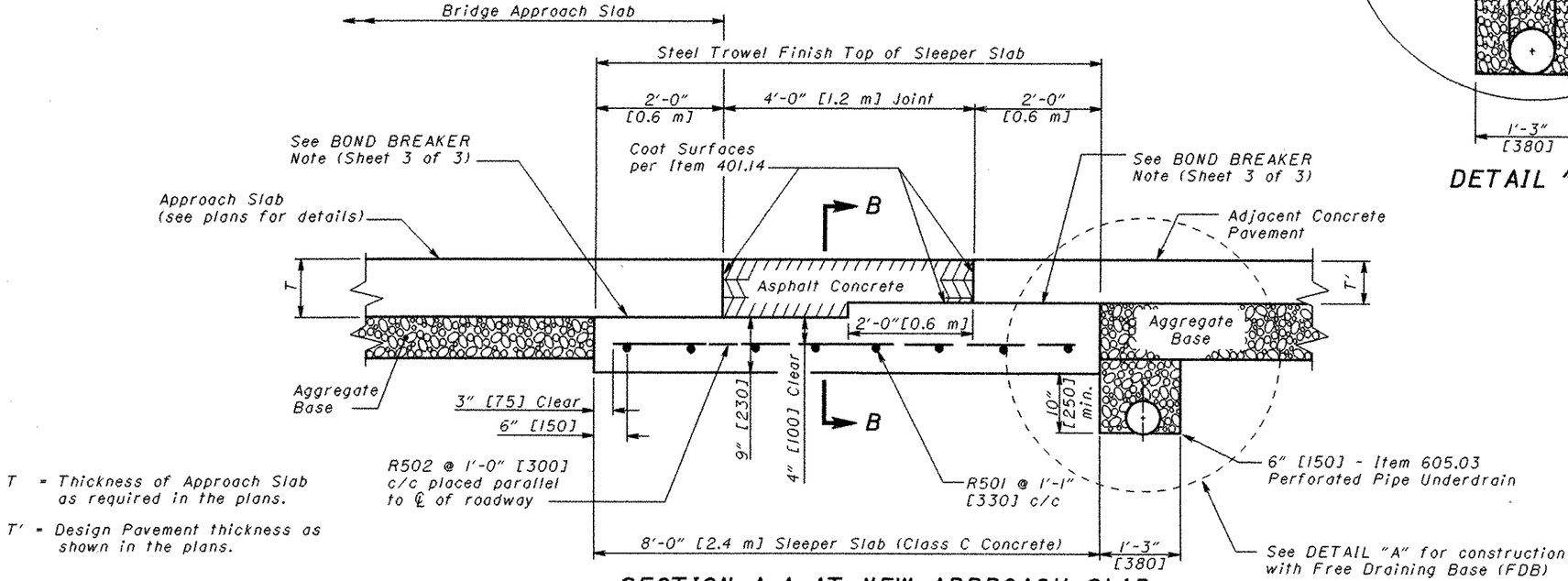
AS-1-81

STANDARD
REINFORCED CONCRETE APPROACH SLAB

3 / 3



PLAN VIEW
PRESSURE RELIEF JOINT - TYPE A
AT NEW APPROACH SLAB
(Concrete Shoulders shown)



T = Thickness of Approach Slab as required in the plans.

T' = Design Pavement thickness as shown in the plans.

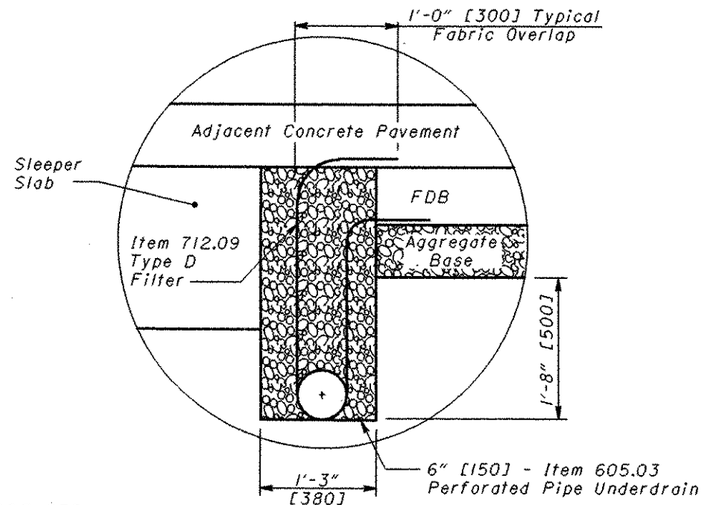
SECTION A-A AT NEW APPROACH SLAB

REINFORCING STEEL LIST

Mark	Shape	Number		Length	
		English	Metric	English	Metric
R501 [#16M] [1]	Straight	8	8	S-0.5 ft.	S-0.15 m
R502 [#16M]	Straight	$N = \frac{S}{1\ ft.}$	$N = \frac{S}{0.3\ m}$	$\frac{8}{\cos\theta}$ ft.	$\frac{2.25}{\cos\theta}$ m

S = Length of sleeper slab in feet [meters]

[1] R501 bars may be furnished in segments with a 1'-7" [485] bar lap between segments.



DETAIL "A"

THIS DRAWING REPLACES BP-2.3 DATED 7-28-00.

OHIO DEPARTMENT OF TRANSPORTATION
ROADWAY DESIGN ENGINEER
7-16-04 DATE

STDS. ENGR. D. Focke

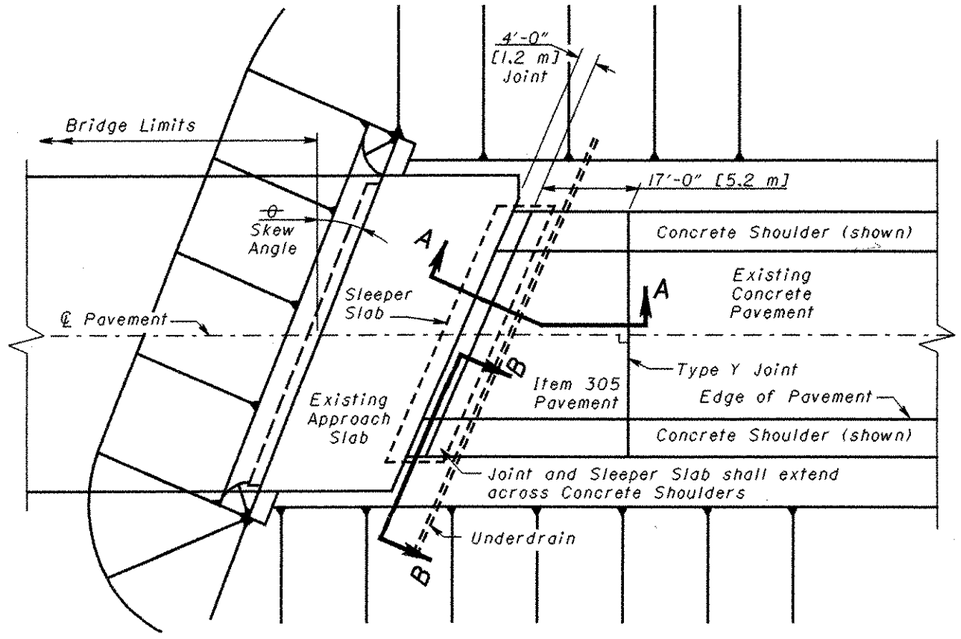
All metric dimensions (in brackets [ ]) are in millimeters unless otherwise noted.

ROADWAY ENGINEERING SERVICES

STANDARD ROADWAY CONSTRUCTION DRAWING
PRESSURE RELIEF JOINT TYPE A (at New Approach Slab)

NUMBER BP-2.3

1 / 3

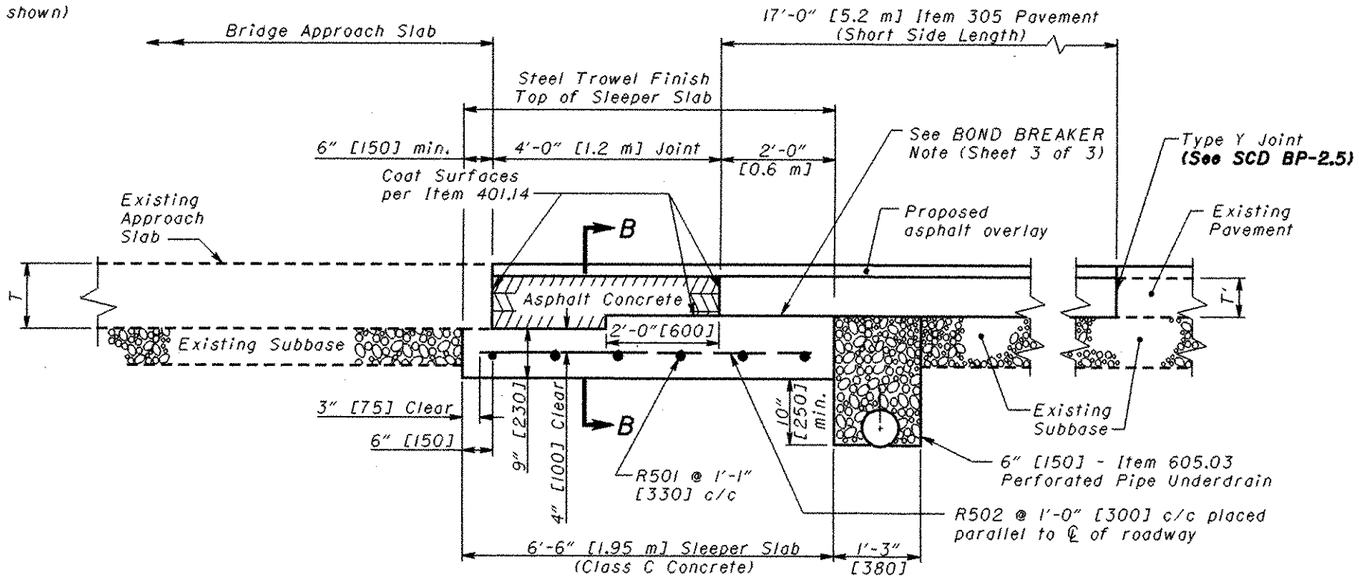


PLAN VIEW
PRESSURE RELIEF JOINT - TYPE A
AT EXISTING APPROACH SLAB
(Concrete Shoulders shown)

REINFORCING STEEL LIST					
Mark	Shape	Number		Length	
		English	Metric	English	Metric
R501 [#16M] [1]	Straight	6	6	S-0.5 ft.	S-0.15 m
R502 [#16M]	Straight	$N = \frac{S}{1\ ft.}$	$N = \frac{S}{0.3\ m}$	$\frac{6}{\cos \theta}$ ft.	$\frac{1.8}{\cos \theta}$ m

S = Length of sleeper slab in feet [meters]

[1] R501 bars may be furnished in segments with a 1'-7" [485] bar lap between segments.



SECTION A-A AT EXISTING APPROACH SLAB

T = Thickness of Approach Slab as shown in the plans.

T' = Design Pavement thickness as shown in the plans.

THIS DRAWING REPLACES BP-2.3 DATED 7-28-00.

OHIO DEPARTMENT OF TRANSPORTATION
7-16-04
DATE
ROADWAY DESIGN ENGINEER
STDS. ENGR.
D. Focke

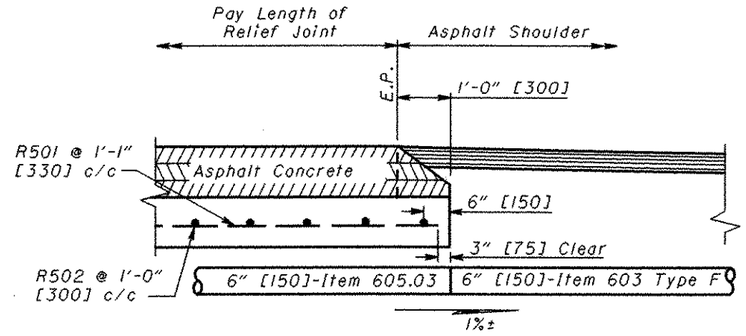
All metric dimensions (in brackets [ ]) are in millimeters unless otherwise noted.

ROADWAY ENGINEERING SERVICES

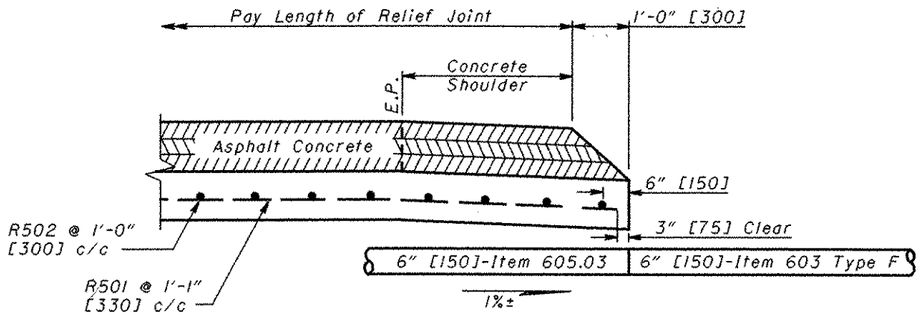
STANDARD ROADWAY CONSTRUCTION DRAWING
PRESSURE RELIEF JOINT TYPE A
(at Existing Approach Slab)

NUMBER BP-2.3

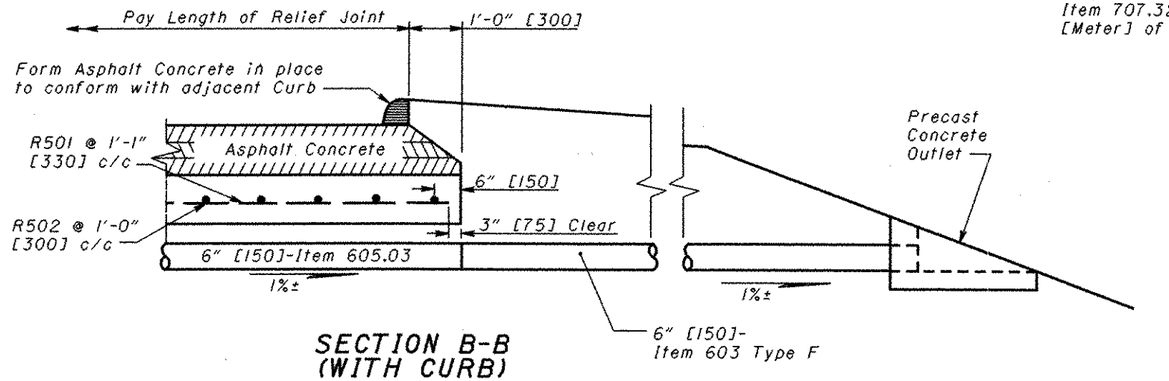
2/3



SECTION B-B (WITH ASPHALT SHOULDERS)



SECTION B-B (WITH CONCRETE SHOULDERS)



SECTION B-B (WITH CURB)

(Showing an Underdrain Outlet through the embankment)

NOTES

APPROACH SLAB PRESSURE RELIEF JOINTS: *Relief joints are to be provided regardless of abutment design at all bridge approaches where approach pavement is rigid, or composite consisting of a rigid base.*

ASPHALT CONCRETE: *Item 448 - Asphalt Concrete Intermediate Course, Type 2 PG 64-22 shall be compacted in equal lifts not exceeding 3" [75] with compaction equipment as approved by the Engineer.*

ITEM 305 PAVEMENT: *shall be constructed in accordance with* ***SCD BP-2.1 & BP-2.2.*** *Longitudinal joints shall be placed in the same location and in the same alignment as the longitudinal joints in the existing pavements.*

BOND BREAKER: *A bond breaker consisting of two 4 foot [1.2 m] sheets of clear or opaque polyethylene film, Item 705.06, shall be centered above the joint between the subbase and the sleeper slab. Care shall be taken in the area beneath the polyethylene film to ensure the surface of the subbase is finished smooth and is flush with or slightly higher than the surface of the sleeper slab. The film shall have a nominal thickness of 4 mils [0.1].*

UNDERDRAIN: *A perforated underdrain shall be placed as shown. It shall extend from edge to edge of the sleeper slab and be outletted as shown on the plan, either to a longitudinal underdrain, a catch basin, or through the embankment or ditch foreslope. For additional information, see* ***SCD DM-1.2.***

PAYMENT: *Measurement of the pressure relief joint for payment purposes shall be along the centerline of the Sleeper Slab 1) between the outside edges of concrete shoulders, 2) between the backs of curb, and 3) between the edges of pavement when asphalt shoulders are used. Payment shall be per Linear Foot [Meter] of* ***Item Special - Pressure Relief Joint, Type A*** *and shall include saw cutting & removal of existing pavement, Items 305 & 448, and all labor, materials and incidentals needed to construct the joint as shown, except for the pipe Underdrain. The Underdrains shall be paid for per Linear Foot [Meter] of* ***Item 605 - 6" [150] Shallow Pipe Underdrain,*** *Item 707.32 Type CP, or 707.41. The outlet pipe shall be paid for per Linear Foot [Meter] of* ***Item 603 - 6" [150] Conduit, Type F.***

THIS DRAWING REPLACES BP-2.3 DATED 7-28-00.

OHIO DEPARTMENT OF TRANSPORTATION — 7-16-04 DATE
ROADWAY DESIGN ENGINEER — Paul F. Ferguson

STDS. ENGR. D. Focke

All metric dimensions (in brackets [ ]) are in millimeters unless otherwise noted.

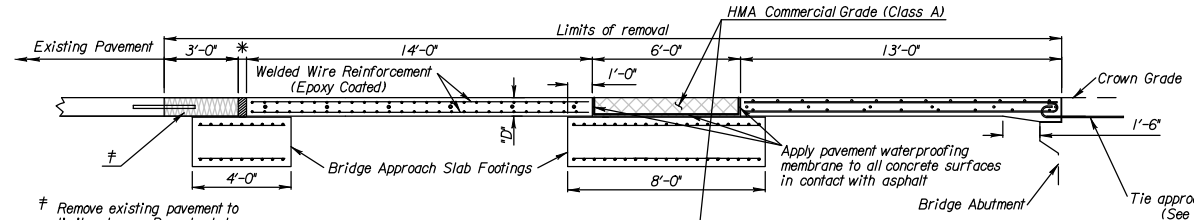
ROADWAY ENGINEERING SERVICES

STANDARD ROADWAY CONSTRUCTION DRAWING
PRESSURE RELIEF JOINT TYPE A (Notes and Section B-B)

NUMBER **BP-2.3**

3 / 3

Appendix G: Kansas Drawings

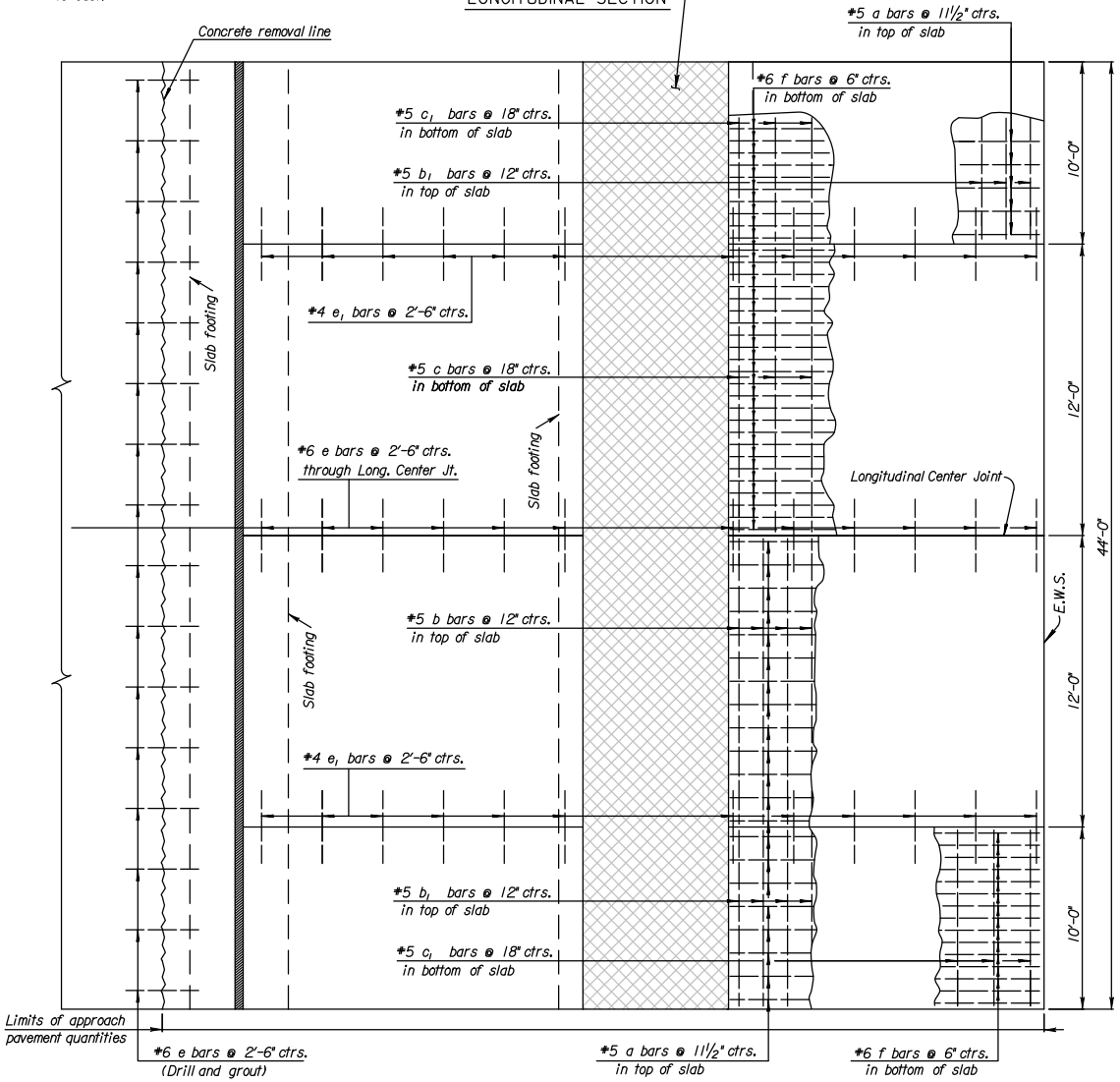


≠ Remove existing pavement to limits shown. Pour back to existing limits after footing is cast.

"D" Thickness = Thickness of Project Concrete Pavement = 10"

* Details for 4" Pressure relief joint, See Standard Drawing RD711.

LONGITUDINAL SECTION



PLAN VIEW

(Bridge (080) & (081))

GENERAL NOTE

Special Concrete Bridge Approach shall be paid for as Sq. Yds. of Concrete Pavement (10" Unif.)(AE) and includes all work and materials required to construct the approach slab as shown on this sheet.

All work and materials required for installation of asphalt expansion joints and pressure relief joints shall be subsidiary to this bid item.

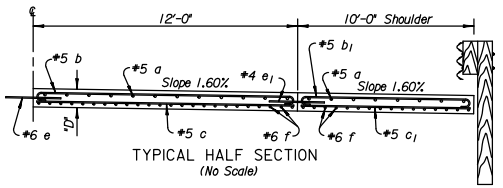
At the Contractor's option #4x3'-0" tie bars @ 15" centers may be substituted for the #6 e bars at 2'-6" centers.

All reinforcing steel shall be epoxy coated.

See Standard Drawing RD711 for details of joints, welded wire reinforcement and edge curb.

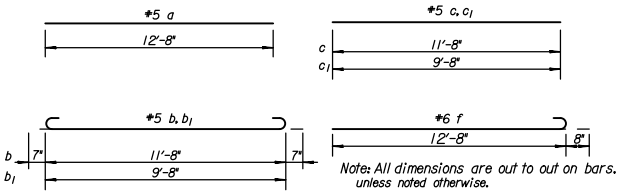
Clearance from the face of concrete for all reinforcing steel shall be 2 inches.

Standard reinforcing bar hooks in accordance with the latest ACI specifications shall be used throughout.



TYPICAL HALF SECTION

(No Scale)



Note: All dimensions are out to out on bars. unless noted otherwise.

BENDING DIAGRAMS

BILL OF MATERIALS											
Bar Schedule											
Bar	a	b	b_1	c	c_1	e	e_1	f			
No.	48	26	26	18	18	30	24	88			
Size	#5	#5	#5	#5	#5	#6	#4	#6			
Length	12'-8"	12'-10"	10'-10"	11'-8"	9'-8"	3'-0"	3'-0"	13'-4"			
Reinforcing Steel (Grade 60)											3625 lbs.
Concrete Pavement (10" Unif.)(AE)											≠ 147 sq. yd.
HMA-Commercial Grade (Class A)											16 tons
Pressure Relief Jt. Membrane Sealant											44 Lin. Ft.
Substructure Waterproofing Membrane											37.5 sq. yd.

Note: Quantities listed for one approach slab only. Two required per bridge.

Reinforcing steel, asphalt, membrane and joint lengths shown for information only.

≠ This quantity does not include area of asphalt.

Rock Excavation for this approach = 50 cu. yd.

KANSAS DEPARTMENT OF TRANSPORTATION

PROJ. NO. 400-63 KA-1602-01

BR. NO. (080 & 081)

MONTGOMERY CO.

PAGE 4

CONSTRUCTION DETAILS (PROPOSED CONSTRUCTION)

View= PLOT4

Plot Date : 23-JUL-2009 14:43

Plot File : \\DOTOMH71\Bridge Maint Projects\Projects\FY 2010\KA1612O1\KA-1612-01b.dgn

Squad: REED / JKW

G-1

KANSAS DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION TO THE
STANDARD SPECIFICATIONS, EDITION 2007

Add a new SECTION to DIVISION 700:

EXPANSION JOINT (MEMBRANE SEALANT)

1.0 DESCRIPTION

Install expansion joints as designated in the Contract Documents. Expansion Joint (Membrane Sealant) consists of: an impregnated, self expanding foam sealant; an adhesive to bond the foam to the joint sides; and a splice adhesive to join the foam sections together.

BID ITEMS	UNITS
Expansion Joint (Membrane Sealant*) *Type (Poly-Tite, Seal-Tite)	Linear Foot

2.0 MATERIALS

a. Foam Sealant. Provide a foam sealant consisting of an open-cell high density polyurethane foam impregnated with either a polymer modified bitumen or a neoprene rubber suspended in chlorinated hydrocarbons. Precompress the foam sealant prior to packaging. The precompressed dimension shall be as recommended by the sealant manufacturer to provide a water tight seal throughout a joint movement range of ±25% (minimum) from the specified joint opening dimension. In no case shall the precompressed dimension exceed 75% of the joint opening width. The foam sealant shall be slowly self expanding to permit workers ample time to install the foam before the foam exceeds the joint opening width. Supply the foam in pieces 5 feet in length or longer. Miter the ends of each piece for ease of joining to the adjacent pieces.

Provide the foam sealant in 4 inch deep pieces (minimum). Provide foam sealant that is ultra-violet and ozone resistant. Meet the following physical requirements when tested according to the procedures specified:

PROPERTY	TEST METHOD	REQUIREMENTS
Tensile Strength	ASTM D3574	21 PSI min.
Elongation, Ultimate	ASTM D3574	125% +- 20%.
Density, Uncompressed		9 lb./cu. ft. min.
Compressed Density at Joint Width		45 lb./cu.ft. min.
Compression Set	ASTM D3574	3% max.
Softening Point	ASTM D816	140° F. min.
Low Temperature Flexibility 32°F to -10° F	ASTM C711	No Cracking or Splitting

b. Bonding Adhesive. Provide a waterproof epoxy adhesive that is compatible with concrete and recommended by the manufacturer of the foam sealant.

c. Splice Adhesive. Provide any polyurethane adhesive recommended by the manufacturer of the foam sealant.

d. Basis of Acceptance. Receipt and approval of a Type D certification as specified in **DIVISION 2600** and visual inspection at destination for condition and compliance with dimensional and other requirements.

3.0 CONSTRUCTION REQUIREMENTS

The minimum ambient air temperature during the installation and curing process is 40° F.

Provide a technical representative of the material manufacturer at the jobsite during installation.

Just prior to the sealant being applied, clean the faces of the joint by sand blasting each joint face followed by an air blast to clean incompressibles from the joint. To obtain complete bonding with the adhesive, the concrete must be surface dry.

Apply the adhesive according to the manufacturer recommendations.

Install the membrane sealant material into the joint, positioning it either flush with, or with a maximum recess of ½ inch from the top surface of the joint, however recommended by the manufacturer.

Apply the polyurethane splice adhesive liberally to both mitered ends of the 2 sections of membrane sealant material that will meet in the joint as the final step before installation. Install successive lengths of membrane sealant material by maintaining pressure toward the previously installed section while positioning the length being installed. Do not stretch the membrane sealant material.

4.0 MEASUREMENT AND PAYMENT

When shown as a bid item in the contract, the Engineer will measure the expansion joint (membrane sealant) by the linear foot, measured along the centerline of the expansion joint.

Payment for "Expansion Joint (Membrane Sealant*)" at the contract unit price is full compensation for the specified work.

04-30-09 C&M (LAL)
Jul-09 Letting

Kansas DOT
Approach Expansion Joints

Added 05/27/2009 *Contact: Bridge Design Manuals, Modeling and Policy Engineer. Phone: 785-368-7175*

After field review and comments from the KDOT District forces, the Road and Bridge Design Sections have eliminated the Type "B" two part silicone and the Type "C" preformed elastomeric neoprene expansion joints. A membrane sealant will be used for all joint locations "W" shown on the Road Standard RD712 for the 13' approach slab, there is an accompanying Special Provision for this new joint type. (Polytite is currently used although other membrane sealants may meet the requirements of the Special provision.) The Road Design Section has also elected to use a membrane sealant at the pressure relief joint location (at the end of the 20' approach slab). This joint has a range of applicability for steel structures of 380' (length of expansion), and for concrete structures of 410' (length of expansion). A reduction for the skew effects of 4% for every 10 degrees of skew will be used. The 2010 LFD Bridge Design Manual will be updated to reflect these changes.

The attached RD712 can be used now however, because it is a FHWA standard, line thru the number ~~RD712~~ until it is formally approved for use by FHWA.

- Bridge Approach Slab Details
- rd712.zip

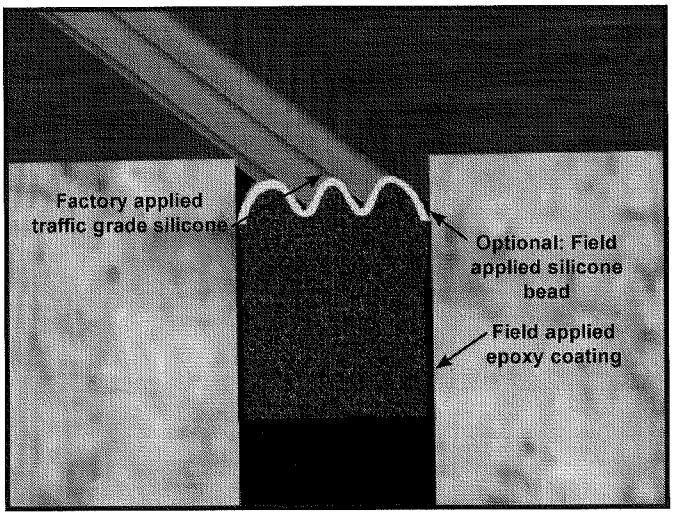
Sealtite™ 50N

Pre-compressed Joint Sealant, High Density, Polyurethane Foam, Waterproofs Horizontal Applications.

PRIMARY USES
Road and Bridge Joints
Horizontal Expansion Joints
Parking Structure Expansion Joints

PRODUCT DESCRIPTION

- Sealtite™ 50N is a premium quality joint sealant composed of a high density, open micro-cell polyurethane foam impregnated with a hydrophobic polymer sealing compound.
- Developed to meet the high performance needs of state and federal DOT projects.
- Provides a waterproof, dustproof, airtight, UV stable, chemically resistant, soundproof and insulated urethane primary seal.
- Works under its own constant internal pressure to provide a permanent, watertight seal eliminating costly water damage, as well as allowing for a greater degree of joint movement.
- Once Sealtite™ 50N is installed in the joint, the material expands depending on temperature, adapting to the width of the joint and the irregularities of the substrate provided such profile changes are not sudden or extreme.
- Developed to meet all applicable standards for pre-compressed sealants.
- Permanently resilient; The material will expand and contract with the movement of the joint under any weather condition.
- Available Sizes (Joint Width)
  Rolls: 1/2" to 1"
  *Sticks: 1-1/4" to 4"
  *(Custom sizes available upon request)



ADVANTAGES

- Can accommodate rapid rates of joint movement
- Supplied in pre-compressed state for ease of installation
- Excellent compression recovery
- Permanently conforms to varying joint contours
- Used for joints up to 4" wide
- Allows for up to 100% (±50%) movement
- Consistent depth of product
- Not based on asphaltic or bitumastic impregnation
- Resilient and flexible to -40°F (long term)

PRIMARY APPLICATIONS

- Horizontal movement - expansion, control, and isolation joints
- Road and bridge joints
- Parking garages
- Retrofit joints
- Plaza decks
- Other joints requiring a watertight seal

Sealtite™ 50N

SPECIFICATION

Sealant shall be Sealtite™ 50N as manufactured by Schul International Company, LLC, 800-848-1120. Sealant shall be a high density, open micro-cell polyurethane foam impregnated with a waterproof polymer sealing compound. Sealtite™ 50N shall be installed in the joint in a pre-compressed state and after expansion shall provide a watertight joint. When compressed to 50% of its fully expanded size, Sealtite™ 50N must provide a watertight joint. The manufacturer shall furnish a Certificate of Compliance with these requirements.

TEST DATA

Thermal Resistance	ASTM C518	3.3 hr-°F-ft²/Btu
UV Resistance		Excellent
Density		10 lb/cu. ft. (160kg/m³)
Temperature Stability Range		-40°F to 185°F
Resistance to Compression Set	ASTM 3574	Max 2.5%
Shear Strength		Min. 8N/cm²
Thermal Conductivity		0.05W/m. °C
Tensile Strength	ASTM 3574	Meets 21 psi min.
Ultimate Elongation	ASTM 3574	125% ±20%
Mildew Resistance		Excellent

LIMITATIONS

- Joints must be sized by measuring every 5-7ft. (1.524 – 2.137 meters) to ensure gap opening is uniform and depth is sufficient for the supplied material.
- Do not install when substrate or ambient temperatures are below -14°F (-25°C) or above 95°F (35°C).
- Will not adhere to surfaces contaminated by oil or grease.
- If ambient storage temperatures are below 50°F (10°C), store material at a minimum of 68°F(20°C) for a minimum of 24 hours prior to installation, regardless of temperature at location of installation.
- Store material in a dry, enclosed area, off the ground, and out of direct sunlight. Do not install when raining or snowing.

NOT INTENDED FOR

- Joints submerged in water
- Joints in contact with harsh chemicals
- Joints in roofing applications
- Joints requiring pick resistance
- Cross joints in copings and projecting stone work

WARRANTY

Subject to certain limitations Schul warrants Sealtite 50N Expansion Joint against defects in material for a period of ten (10) years from the date of delivery, provided Schul limitations and project specific recommendations were followed.

INSTALLATION

PREPARATION

- Verify that the joint is clean, sound, and will provide an appropriate surface for installation of the joint sealant.
- Check material for the appropriate lengths, widths, and depths.
- Prepare the material for seams and proper lengths.
- Apply a 1/16" – 1/8" coating of the epoxy mixture to both sides of the joint to a depth of the sealant material plus ½".

ROLL INSTALLATION

- When fully prepared to install, remove the outer lining surrounding the joint material and the first 1"-2" of material.
- Remove the white release liner as the material is installed in the joint.
- Allow material to expand before applying a layer of the supplied topcoat.

STICK INSTALLATION

- When fully prepared to install, open the sealant material by removing the shrink packaging and masonite strapping.
- Remove the white release liner on both sides of the material.
- Insert the material into the joint while pressing the material to the side of the joint.

CLEAN UP

- Remove any excess epoxy left on the surface of the material or substrate.
- Remove all waste materials from the jobsite.
- Do not reuse waste material.
- Leave site to the satisfaction of the owner/architect.

International Quality Registrars Corp. Quality System Registration · MGMT. SYS. RvA C073 The Dutch Accreditation Council · FM Approvals Quality System Registration

ISO 9001: 2000 Certified

For complete installation instructions and product information, contact Technical Support: 800.848.1120 or visit us on the web at www.sealtiteusa.com

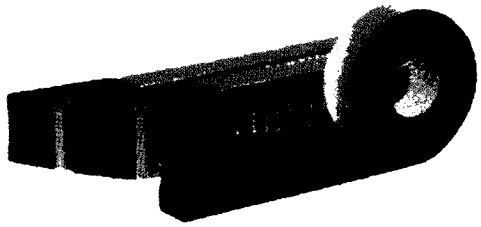
SCHUL INTERNATIONAL COMPANY, LLC ONE INDUSTRIAL DRIVE, PELHAM, NH 03076
TELEPHONE: 800.848.1120 • FAX: 800.998.9105 • WEB ADDRESS: www.sealtiteusa.com

DAYTON SUPERIOR®
CHEMICAL DIVISION

Technical Data

POLYTITE® N

Pre-compressed Joint Sealant



Density	10 lb./cu. ft. (160 kg/m³)
Thermal Conductivity	0.05 W/m.°C
Temperature Stability Range	-40°F to 212°F (-40°C to 100°C)
Bleeding	None at 212°F at 20% compression
Tensile Strength	ASTM 3574, meets 21 psi (0.14 MPa) min.
Ultimate Elongation	ASTM 3574 125% ±20%
Resistance to Compression Set	Max 2.5%
Shear Strength Min	8N/cm²
Mildew Resistance	Excellent
Staining	None
Flammability	Self-Extinguishing UL 94VO Meets CAL 117
Flash Point	590°F (310°C)

PRODUCT DESCRIPTION:
Polytite N is composed of polyurethane, micro-cell foam waterproofed with a hydrophobic polymer compound that is UV stable and chemical resistant. When installed in a properly sized joint, Polytite N forms a weather tight seal. It is permanently resilient and will expand and contract with the movement of the joint under any weather conditions. Polytite N is designed to meet the high performance needs of state and federal DOT projects. It is supplied in precompressed, self- adhesive rolled tape or stick form. For added adhesion in horizontal joints, Polytite Joint Loc N, a two component epoxy adhesive, is recommended for use with the Polytite N.

PURPOSE:
Polytite N is most commonly used to fill horizontal expansion joints. It is designed to make almost any joint weatherproof. Polytite N works under its own constant internal pressure to provide a permanent, weather tight seal eliminating costly water damage.

Primary applications include road and bridge joints, plaza decks, parking garages and other joints that require a high performance joint.

ADVANTAGES:
- Can be used in joints up to 4" (101.6 mm) wide
- Allows for +/- 25% movement of mean joint size
- Ease of installation
- Made in the USA
- Excellent compression recovery
- Ideal for wide joints, contact Dayton Superior for joints over 4"(101.6 mm) wide

SPECIFICATIONS:
Sealant shall be Polytite N as manufactured by Dayton Superior. Sealant shall be polyurethane foam impregnated with a waterproof polymer sealing compound. Sealant shall be applied to joint in a pre-compressed state. When compressed to 50% of its fully expanded size it must produce a weather tight joint. The manufacturer shall furnish a Certificate of Compliance with these requirements.

APPLICATION INSTRUCTIONS:
Surface Preparation:
Surfaces to be sealed must be sound, dry, clean and free of oil, grease, cures, laitance, rust and other foreign material that would prevent proper adhesion. Excessive moisture will defeat the self-adhesive application advantage of the tape but will not lessen the effectiveness of the expanded material as a seal. Remove dirt and other loose particles. No priming or masking is required.

Installation General Instructions:
Rolls: Unwind Polytite N along the joint to be sealed, remove the backing to expose adhesive side. Discard the final three inches of each roll, it is a leader and will not expand. Actual roll length is the nominal length plus the leader. Press adhesive side firmly against one side of full length of joint. Polytite N will expand to fill the joint. Ends of Polytite N can either be mitered or butted. When mitering or butting, leave an extra 1/2" (12.7 mm) of tape at each end to ensure proper sealing characteristics.
Sticks: Cut the shrink wrap and remove the masonite strapping from the Polytite N. Remove the white release paper on both sides of the stick. Notice that one side has a pressure sensitive adhesive. Place material in joint and recess the Polytite N at least 1/4" (6.4 mm) from the face of the joint. Press adhesive side firmly against one side of full length of joint. Polytite N will expand to fill the joint. The rate of expansion is somewhat dependent on the temperature to which the material is exposed. When installing Polytite N in extreme heat, store in a cool place to give the installer sufficient time

(Continued on Back)

POLYTITE® N
Pre-compressed Joint Sealant

for placement. Installation instructions are available from Dayton Superior and are included with the material.

Horizontal Installations:
Follow the above guidelines and recess the Polytite at least 1/4 " (6.4 mm) below the top surface of the joint. Joint Loc N, an epoxy adhesive should be applied to the edges of the joint prior to installation of the Polytite N to ensure adequate, long term adhesion. Joints subject to high-heel foot traffic should be covered with a plate or topped with an appropriate sealant.

CLEAN UP:
Remove all waste materials. Do not re-use. Leave site to the satisfaction of the owner/architect.

LIMITATIONS:
Joints must be sized by measuring every 5-7 ft. (1.5 - 2.1 m) to ensure gap opening is uniform and depth is sufficient for the supplied material. Do not install when substrate or ambient temperatures are below -14°F (-25°C) or above 95°F (35°C). If ambient storage temperatures are below 50°F (10°C), store material at a minimum of 68°F (20°C) for a minimum of 24 hours prior to installation, regardless of temperature at location of installation. Store materials in dry, enclosed area, off the ground, out of direct sunlight. Do not install when raining or snowing. Do not use scrap material. Do not unwrap material until ready for installation, packaging maintains material in compression. Product must be covered in joints subject to high-heel foot traffic. Must be recessed 1/4" (6.4 mm) and adhered with Joint Loc N in horizontal applications. Do not stretch or pull material. Do not bend or radius material.

NOT INTENDED FOR THE FOLLOWING JOINTS:
- Submerged in water
- In contact with harsh chemicals
- In roofing applications
- Joints requiring pick resistance
- Below grade
- In tanks
- In secondary containment tanks

PACKAGING:
Available in rolls for up to 1" (25.4 mm) joints. Standard Sizes: (Other sizes available)

JOINT SIZE (W X D)		LENGTH PER ROLL	
inches	millimeters	feet	meters
1/16 x 3/8	1.6 x 9.5	25	7.62
1/8 x 3/8	3.2 x 9.5	25	7.62
3/16 x 3/4	4.8 x 19.1	25	7.62
1/4 x 3/4	6.4 x 19.1	12-1/2	3.81
3/8 x 3/4	9.5 x 19.1	12-1/2	3.81
1/2 x 3/4	12.7 x 19.1	12-1/2	3.81
5/8 x 1	15.9 x 25.4	8	2.44
3/4 x 1	19.5 x 25.4	8	2.44
1 x 1-1/2	25.4 x 38.1	8	2.44

Available in "sticks" for joints over 1" (25.4 mm).

JOINT SIZE (W X D)		LENGTH PER STICK	
inches	millimeters	feet	meters
1-1/4 x 2	31.8 x 50.8	5	1.52
1-1/2 x 2	38.1 x 50.8	5	1.52
1-3/4 x 2	44.5 x 50.8	5	1.52
2 x 2	50.8 x 50.8	5	1.52
2-1/2 x 3	63.5 x 76.2	5	1.52
2-3/4 x 3	69.9 x 76.2	5	1.52
3 x 3	76.2 x 76.2	5	1.52
3-1/4 x 4	82.6 x 101.6	5	1.52
3-1/2 x 4	88.9 x 101.6	5	1.52
3-3/4 x 4	95.3 x 101.6	5	1.52
4 x 4	101.6 x 101.6	5	1.52

TECHNICAL SERVICES:
Call the technical staff for assistance at:

DAYTON SUPERIOR®
CHEMICAL DIVISION

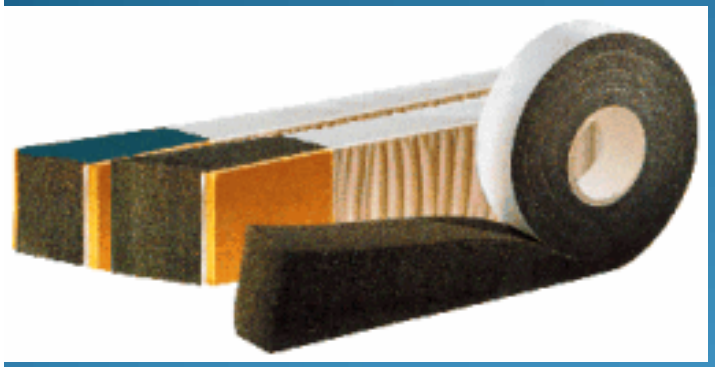
1-800-745-3707
1-815-732-3136
or
Fax: 1-815-732-2866

Dayton Superior Chemical Division
Operations Office & Plant
402 South First Street, Oregon, IL 61061
Telephone (815) 732-3136

"FOR INDUSTRIAL USE ONLY"

8-00L

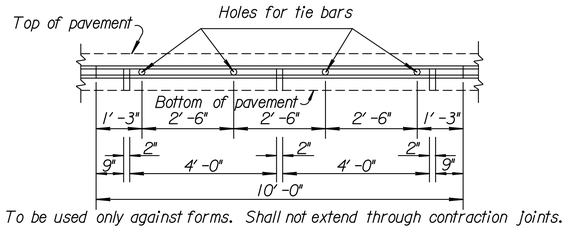
Polytite Joint



Polytite Joint

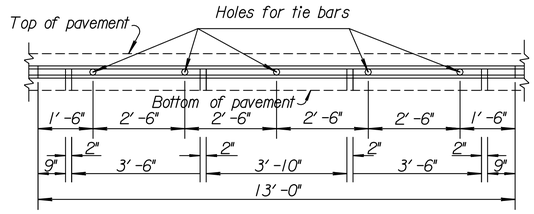
Completed By District Forces

STATE	PROJECT NO.	YEAR	SHEET NO.	TOTAL SHEETS
KANSAS				



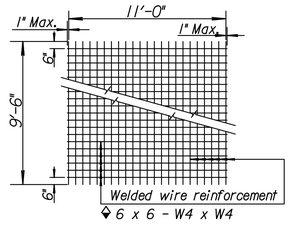
To be used only against forms. Shall not extend through contraction joints.

METAL STRIP FOR
LONGITUDINAL CONSTRUCTION JOINT (10'-0")



To be used only against forms. Shall not extend through contraction joints.

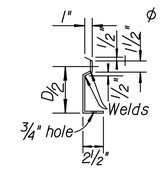
METAL STRIP FOR
LONGITUDINAL CONSTRUCTION JOINT (13'-0")



♦ 6 x 6 - W4 x W4

TYPICAL SHEET OF WELDED WIRE REINFORCEMENT
FOR SPECIAL BRIDGE APPROACH PAVEMENT

♦ Note: Epoxy coated #3 bars longitudinally @ 12" ctrs. & #3 bars transversely @ 18" ctrs. may be substituted for each layer of epoxy coated welded wire reinforcement.



ϕ Snap-in leg or other approved designs may be used in lieu of welded leg.

SECTION OF RECESSED
FORM LEG

DETAIL OF LAP FOR WELDED WIRE REINFORCEMENT

The lap shall extend beyond the first transverse or bag wire of each sheet.

The sheet shall be wired securely at the edges and at intervals not to exceed 2'-6" for the full width of the sheet. Approximate weight of welded wire reinforcement = 58 lbs. per 100 sq. ft. Other methods for fastening the sheets of welded wire reinforcement at the laps may be used with the approval of the Engineer.

GENERAL NOTES

All work shall be done in conformity with the Standard Specifications applicable to the project.

The cost of all bars and joint material shown on this sheet is to be included in the bid price for Concrete Pavement.

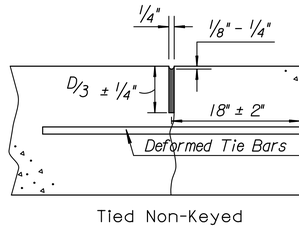
At each planned transverse joint location, a 4 to 6 inch wide strip of the pavement surface shall be protected from the texturing operation to provide a transverse textureless surface centered over the joint sawcut.

All sawed joints on this project shall be filled with sealant in accordance with Standard Specifications.

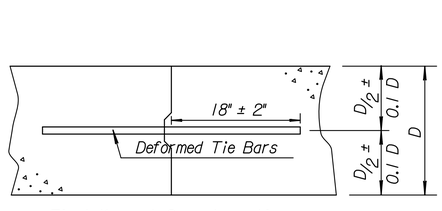
The 4 inch edge curb shall be constructed integral with the approach slab shoulder.

All materials and work required for this construction shall be Subsidiary to the concrete approach slab.

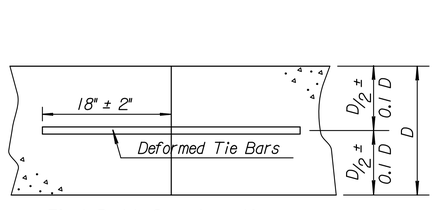
Tie bars shall be evenly spaced along the length of the slab and no tie bars shall be within 12" of contraction joint.



Tied Non-Keyed



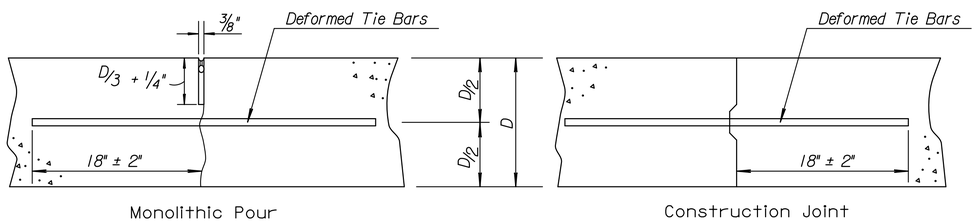
Tied Keyed Construction



Tied Butt Construction

LONGITUDINAL JOINTS

Note: For longitudinal construction joints the contractor has the option of using either the keyed or butt type.



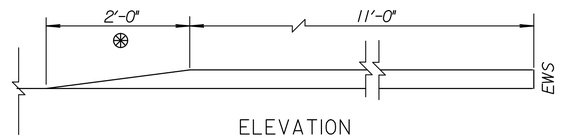
Monolithic Pour

Construction Joint

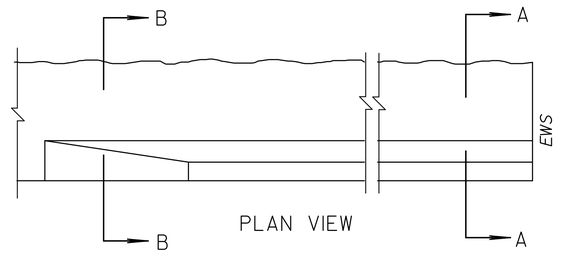
TRANSVERSE JOINTS

Note: A construction joint is required when the concrete placement has been interrupted for a substantial length of time or at the end of a day's placement.

⊛ No 4" Curb transition when adjacent to Flume Inlet.

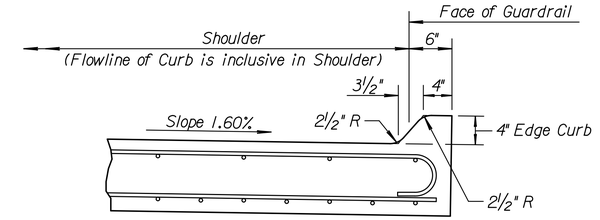


ELEVATION

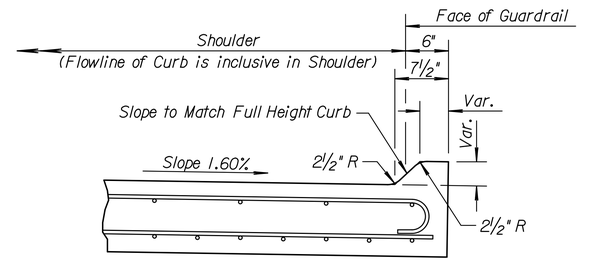


PLAN VIEW

4" EDGE CURB DETAIL



SECTION A-A



SECTION B-B

NO.	DATE	REVISIONS	BY	APP'D
12	5-14-09	Pres. Relief Jt. to RD712/tie bar lab.	S.W.K.	J.O.B.
11	10-23-08	Revised Sec. A-A and Sec. B-B	S.W.K.	J.O.B.
10	10-3-07	Add. manufacturer jt. size recom'd.	S.W.K.	J.O.B.

KANSAS DEPARTMENT OF TRANSPORTATION

MISCELLANEOUS DETAILS FOR CONCRETE BRIDGE APPROACH PAVEMENT

RD711

FHWA APPROVAL	6-9-09	APP'D. James O. Brewer	
DESIGNED	DETAILED	QUANTITIES	TRACED Bowser
DESIGN CK.	DETAIL CK.	QUAN.CK.	TRACE CK. King

KDOT Graphics Certified 07-22-2010

KDOT Graphics Certified

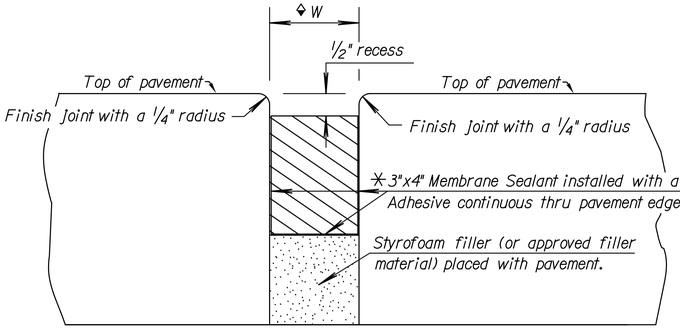
Plotted :22-JUL-2010 18:26

Drawn By : marks
File : rd711.dgn (rd711)

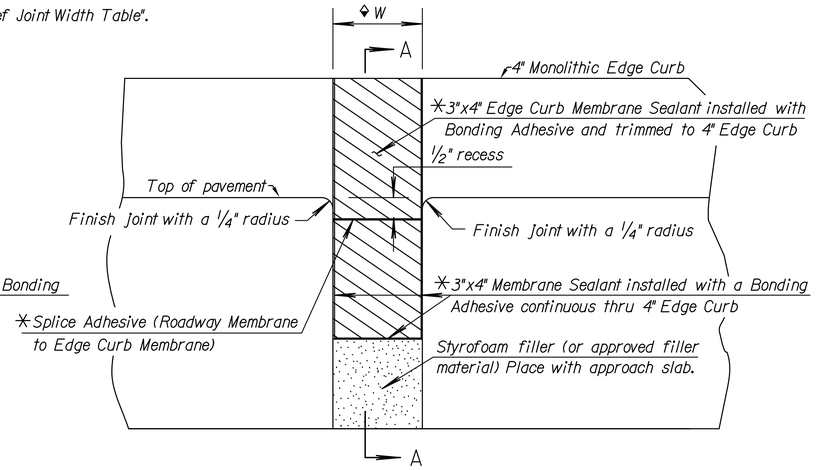
STATE	PROJECT NO.	YEAR	SHEET NO.	TOTAL SHEETS
KANSAS				

Note to Designer: For Membrane Sealant Expansion Joint on Non-skewed Bridges the maximum length of expansion is: 380' for Steel Bridges, 410' for Concrete Bridges.

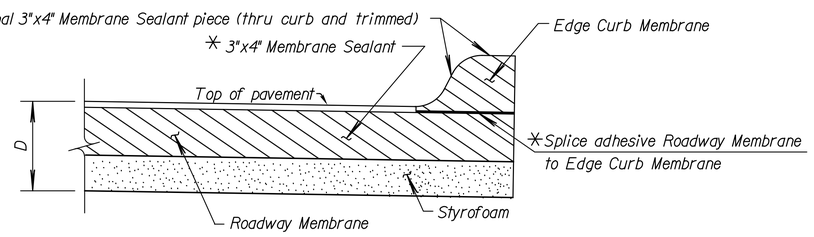
◆ W= Formed Concrete Opening Size - See "Temperature Expansion/Pressure Relief Joint Width Table".



ELEVATION PRESSURE RELIEF JT.

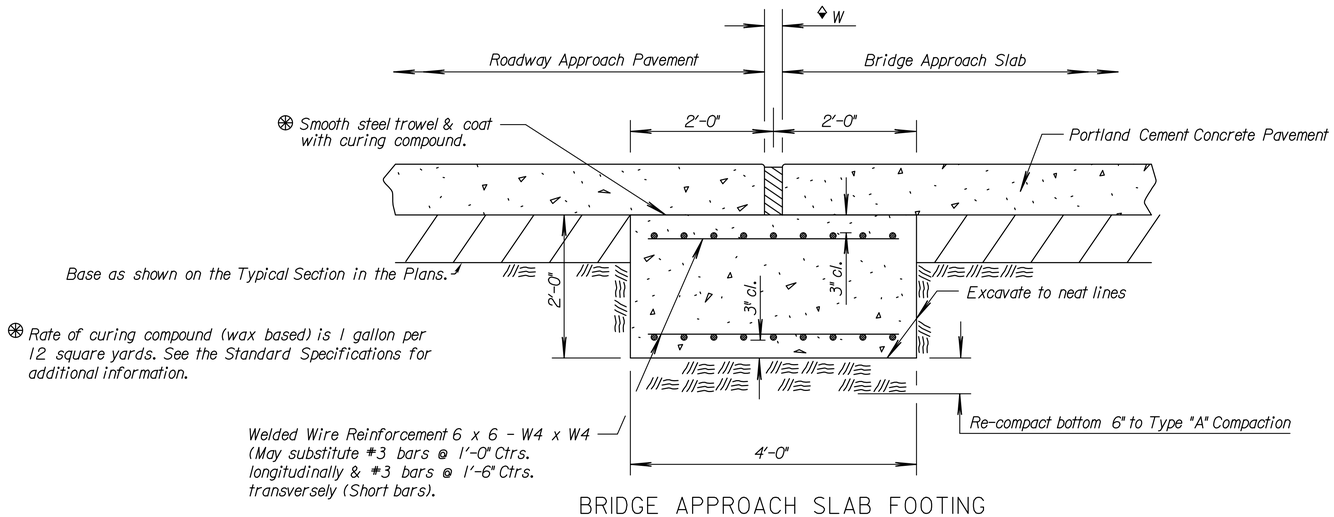


ELEVATION EXPANSION JT.



SECTION A-A

(See Std. Drawing RD711 for details of 4" Edge Curb.)



BRIDGE APPROACH SLAB FOOTING

GENERAL NOTES

EXPANSION/PRESSURE RELIEF JOINTS

See Concrete Bridge Approach Pavement standard drawings for location of expansion and pressure relief joints.

The Joint opening shall be formed prior to placement of the pavement approach. The material used to form the joint opening shall be removed after the pavement approach has been in place for a minimum of six days.

Cleaning and construction of the joint shall not begin until the concrete in the approach slab has cured a minimum of 7 days.

The joint shall be thoroughly cleaned by sandblasting and by high pressure air blast to remove all laitance and contaminants from the joint. When any part of the joint is shaped by saw cutting in lieu of forming, a water blast shall preceed sandblasting and air cleaning.

Sandblasting shall be accomplished in two passes to clean each face of the joint (one pass for each face). The nozzle shall be held at an angle to the joint face and within 1 to 2 inches of the face.

Any contaminants such as oil, curing compound, etc. shall be removed by sandblasting to the satisfaction of the Engineer. Solvents, wire brushing, or grinding shall not be permitted.

The joint shall be air blasted just prior to installation of Membrane Sealant. The air compressor used for joint cleaning shall be equipped with trap devices capable of providing moisture-free and oil-free air at a recommended pressure of 90 psi. The joint shall be spot checked to insure residual dust or dirt has been removed. It is required that the Engineer inspect the joint immediately prior to installation of the joint material.

✳ See KDOT Standard Specifications for Membrane Sealant, Bonding Adhesive and Splice Adhesive.

Traffic shall not be allowed on the joint for a minimum of 3 hours unless otherwise directed by the Engineer.

Splices will use materials & methods recommended by the Manufacturer.

All work and materials necessary for the preparation, construction, and installation of the joint will be subsidiary to the concrete approach pavement.

BRIDGE APPROACH SLAB FOOTING

Payment for the Bridge Approach Slab Footing shall be at the unit price bid per cubic yard for "Bridge Approach Slab Footing". This price shall be full compensation for furnishing all materials and labor including Concrete Grade 4.0 (AE) Pavement, Reinforcing Steel (Gr. 60) (Epoxy Coated), excavation, Type "A" Compaction and materials used to prevent bonding of concrete. At the contractor's option, the concrete for the slab footing may be concrete Grade 4.0 (AE) or the mix used in the concrete pavement.

EXPANSION JOINT WIDTH							
⊗ Temperature (F°)	40°	50°	60°	70°	80°	90°	100°
◆ Formed Concrete Opening Size	4.0"	3 3/4"	3 1/2"	3 1/4"	3.0"	2 3/4"	2 1/2"

⊗ Average Ambient Temperature over previous 24 hours.

NO.	DATE	REVISIONS	BY	APP'D
7	7-10-09	Adjusted Expansion Joint table	S.W.K.	J.O.B.
6	5-13-09	Therm. width jt. & membrane sealant	S.W.K.	J.O.B.
5	8- 8-07	Added Ins. Gap Temp. Corr. table note	S.W.K.	J.O.B.
4	4- 6-05	Rev. reinforcing callout, conc. grade	S.W.K.	J.O.B.

KANSAS DEPARTMENT OF TRANSPORTATION

BRIDGE APPROACH SLAB DETAILS EXPANSION/PRESSURE RELIEF JOINT/ BRIDGE APPROACH SLAB FOOTING

RD712

FHWA APPROVAL	6-9-09	APP'D. James O. Brewer	
DESIGNED	DETAILED	QUANTITIES	TRACED Bowser
DESIGN CK.	DETAIL CK.	QUAN.CK.	TRACE CK. King

KDOT Graphics Certified 07-22-2010

KDOT Graphics Certified

Plotted : 22-JUL-2010 18:26

Drawn By : marks
File : rd712.dgn (rd712)

Appendix H: Ontario Drawings

Ontario

Ministry of Transportation | Ministère des Transports

Bridge Office
Highway Standards Branch
301 St Paul St., 2nd Floor
St Catharines, ON L2R 7R4
Tel: (905) 704-2406 Fax: (905) 704-2060

MEMORANDUM

DATE: March 16, 2010

TO: Distribution List (Attached)

FROM: Bala Tharmabala
Manager, Bridge Office

RE: **Bridge Office Design Bulletin**
Guidelines on how to accommodate movement at the end of the approach slab for Integral and Semi-integral bridges.

Purpose

To provide guidelines for the selection of the appropriate methods of accommodating movements due to expansion and contraction at the ends of the approach slabs for integral and semi-integral bridges.

Background

Integral abutment bridges are single or multi-span bridges with the superstructure integrally connected to the abutments. Each abutment is supported on a single row of piles and moves together with the superstructure to accommodate expansion and contraction. The approach slab is also integrally connected to and moves together with the superstructure and the abutment.

The movement demand is directly proportional to the expansion length of the superstructure.

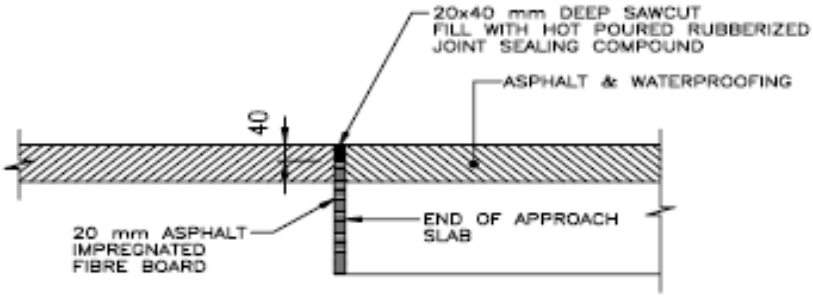
Current trend is to make longer and longer bridges integral and semi-integral in order to eliminate expansion joints and the problems associated with them. Consequently, we find that we have to accommodate larger and larger movements at the ends of the approach slabs.

Presently, a bridge can be made integral when the expansion length of the superstructure does not exceed 75 m (total length of 150 m).

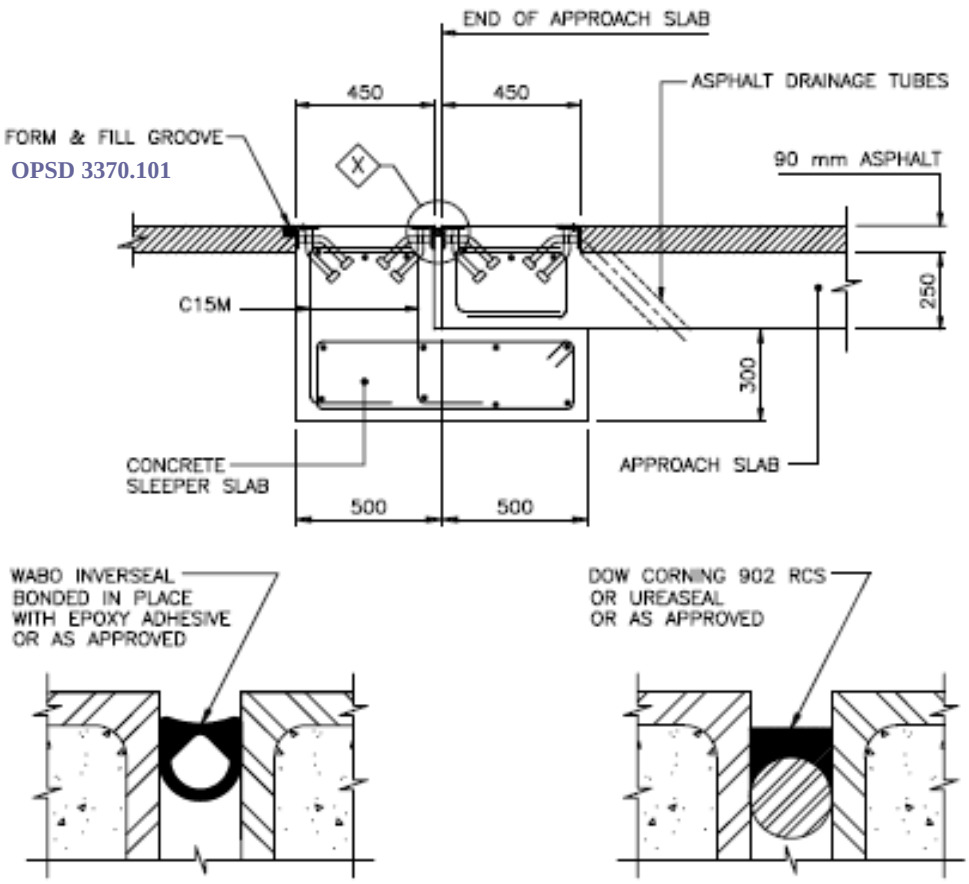
The specified treatment at the end of the approach slab should logically vary with the expected movement.

Recommendations

1. For integral and semi integral bridges where the expected movement at the end of the approach slab does not exceed 25 mm, the requirements shall be as shown below:



2. For integral and semi integral bridges where the expected movement at the end of the approach slab is between 25 and 50 mm, the requirements shall be as shown below:



3. For integral and semi integral bridges where the expected movement at the end of the approach slab is greater than 50 mm, SS113-36 - “TYPE C STRIP SEAL EXPANSION JOINT AND SLEEPER SLAB FOR INTEGRAL AND SEMI-INTEGRAL BRIDGES” shall be used.

These recommendations shall be effective immediately for all future projects.

Bala Tharmabala,
Manager, Bridge Office

cc: J. Chaput
G. Todd

Distribution List:

Managers of Engineering

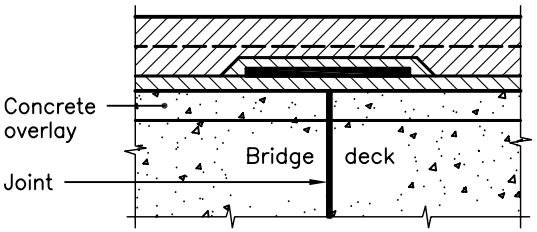
P. Lecoarer, Northeastern Region
K. Bentley, Southwestern Region
P. Makula, Eastern Region
P. Verok, Central Region
I. Galloway (Acting), Northwestern Region

Heads, Regional Structural Sections

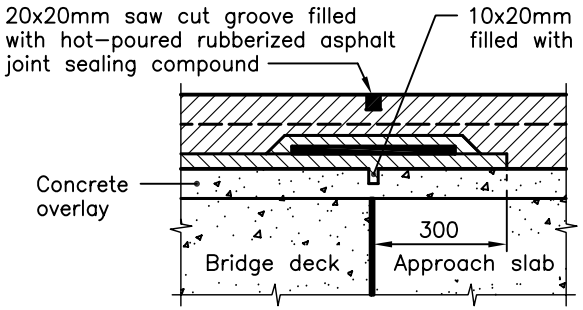
A. Ho, Central Region
Q. Islam, Eastern Region
R. Albino, Northeastern Region
R. Krisciunas, Northwestern Region
W. Young, Southwestern Region

Heads, Bridge Office

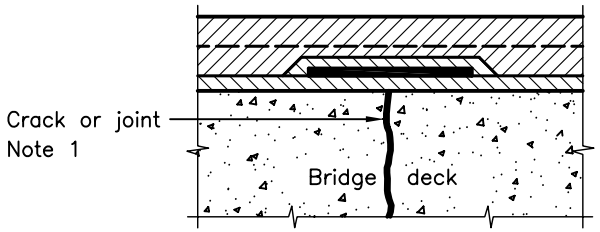
C. Lam, Bridge Research
D. Bagnariol, Evaluation
D. Lai, Rehabilitation
I. Husain, Design
N. Theodor, Standards
R. Mihaljevic, Quality Assurance
T. Merlo, Design Systems



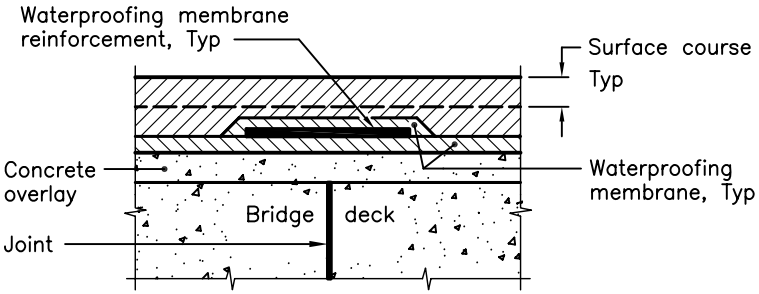
JOINT IN CONCRETE OVERLAY
DIRECTLY ABOVE JOINT
IN BRIDGE DECK



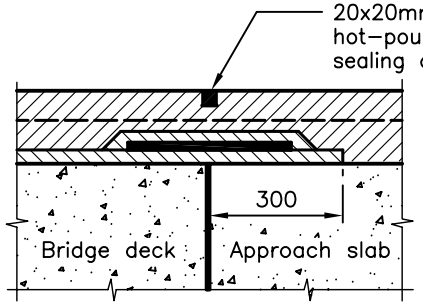
JOINT BETWEEN BRIDGE DECK
AND APPROACH SLAB
WITH CONCRETE OVERLAY



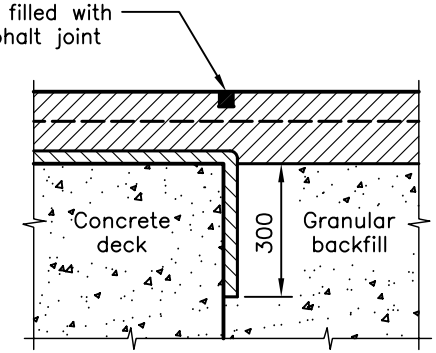
JOINT OR ACTIVE WIDE CRACK
IN BRIDGE DECK



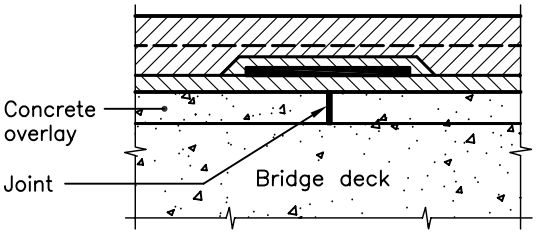
NO JOINT IN CONCRETE OVERLAY
JOINT IN BRIDGE DECK



JOINT BETWEEN BRIDGE DECK
AND APPROACH SLAB
WITHOUT CONCRETE OVERLAY



JOINT BETWEEN CONCRETE DECK
AND GRANULAR BACKFILL



JOINT IN CONCRETE OVERLAY
NO JOINT IN BRIDGE DECK

NOTES:

1 Cracks in concrete to be repaired as specified.

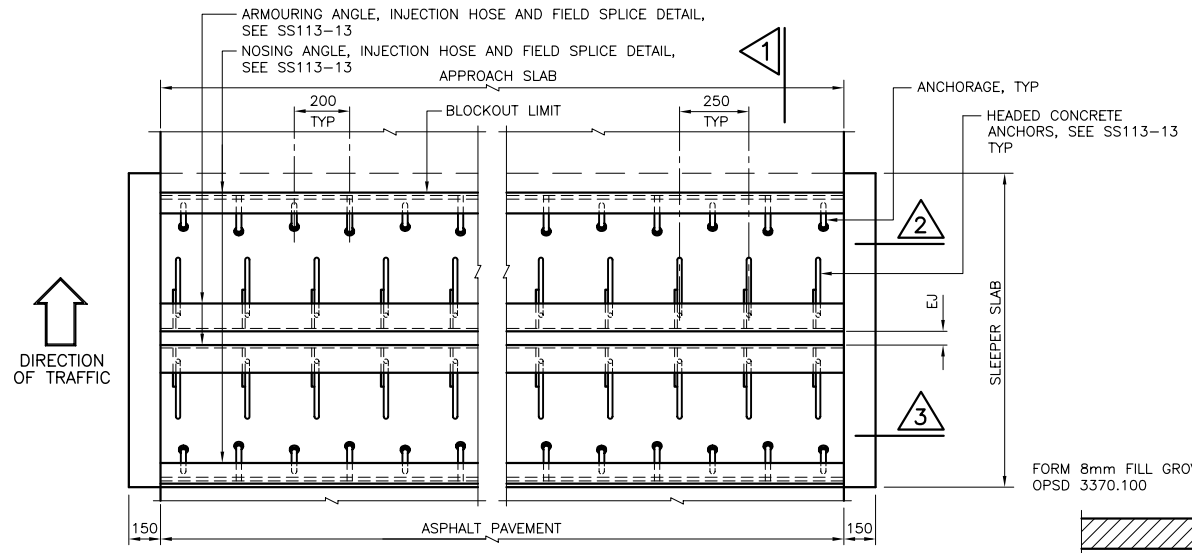
A This OPSD is to be read in conjunction with OPSD 3370.100.

B Protection board is not shown for clarity.

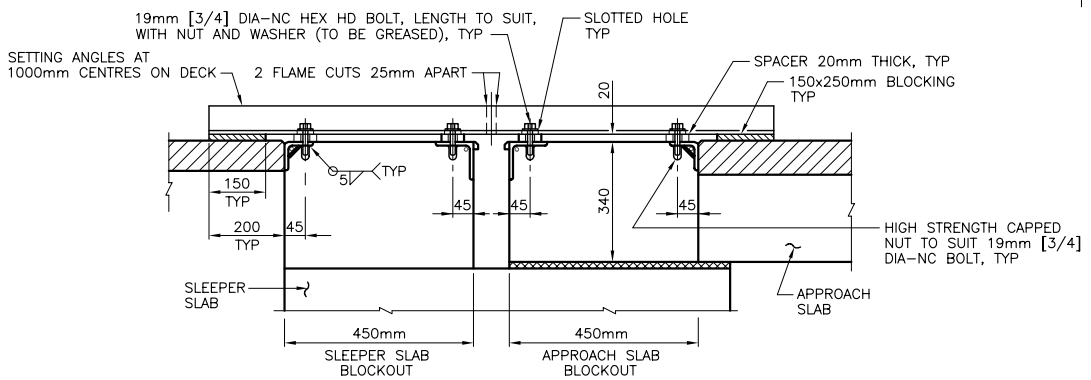
C All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2008	Rev 2
DECK, WATERPROOFING HOT APPLIED ASPHALT MEMBRANE AT ACTIVE CRACKS GREATER THAN 2mm WIDE AND CONSTRUCTION JOINTS		
		OPSD 3370.101

H-5



PLAN OF JOINT



SETTING DEVICE AND BLOCKOUTS

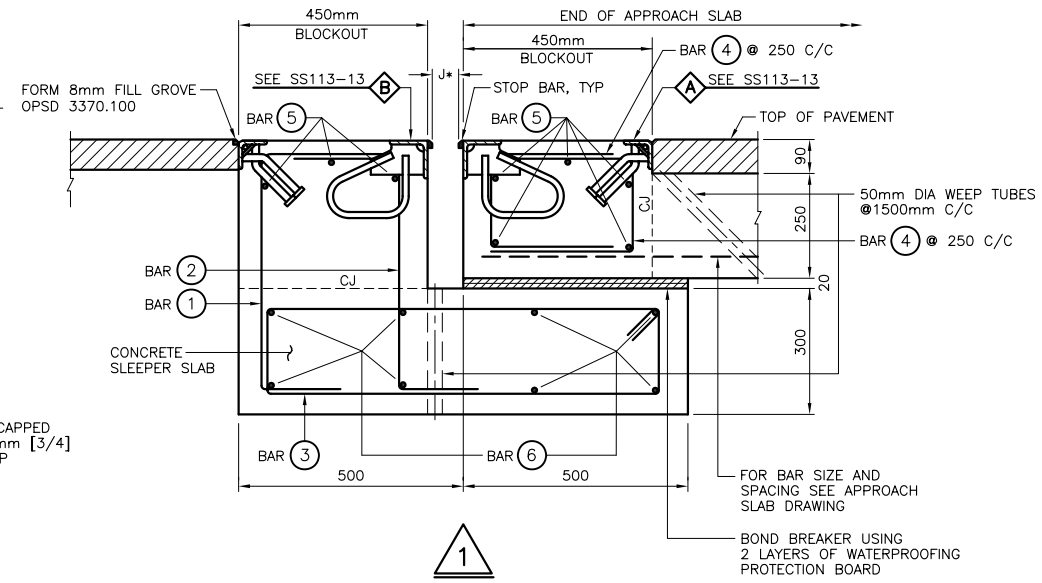
TABLE OF DESIGN REQUIREMENTS (TO BE FULLY COMPLETED BY DESIGNER)

EXP. JOINT LOCATION	MTO GAP ** RATING (mm)		DESIGN *** MOVEMENT	* "J" AT INSTALLATION TEMPERATURE (C) (mm)							
	MIN	MAX		–5°	0°	5°	10°	15°	20°	25°	30°

* DIMENSION 'J' MEASURED PERPENDICULAR TO CENTRELINE OF EXPANSION JOINT. WHERE MIN. AND MAX. FOR JOINT SUPPLIED DIFFER FROM THOSE SHOWN IN TABLE, 'J' DIMENSIONS SHALL BE REVISED BY CONTRACTOR AND SHOWN ON SHOP DRAWINGS. FOR STAGED CONSTRUCTION ON STRUCTURES OTHER THAN POST–TENSIONED, THE CONTRACTOR SHALL USE THE FIRST STAGE OBSERVED 'J' GAP TO INSTALL THE SECOND STAGE.

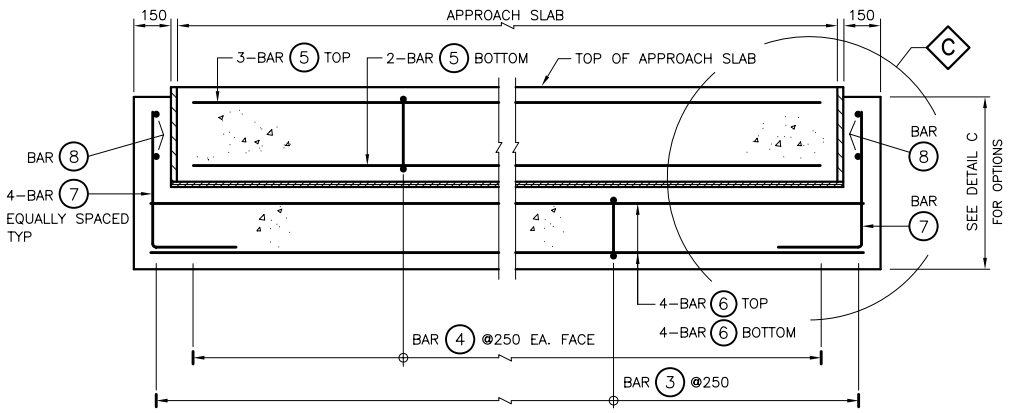
** MTO GAP, MEASURED BETWEEN PROJECTING FACES OF STEEL CLAMPING BAR, IS TAKEN FROM DSM 9.40.27, TYPE "C".

*** CALCULATED TOTAL MOVEMENT AT SLS OCCURRING AFTER TIME OF JOINT INSTALLATION. (MEASURED PARALLEL TO CENTRELINE OF STRUCTURE)



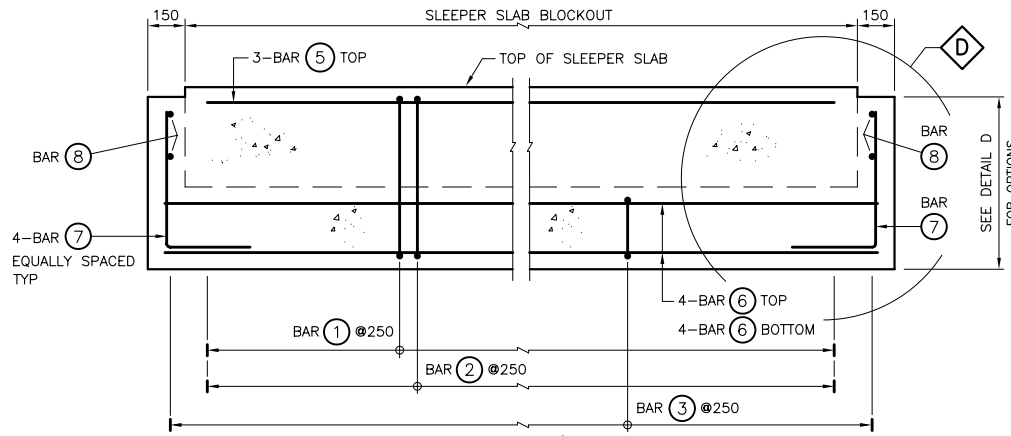
1

(EXPANSION JOINT SEAL NOT SHOWN)



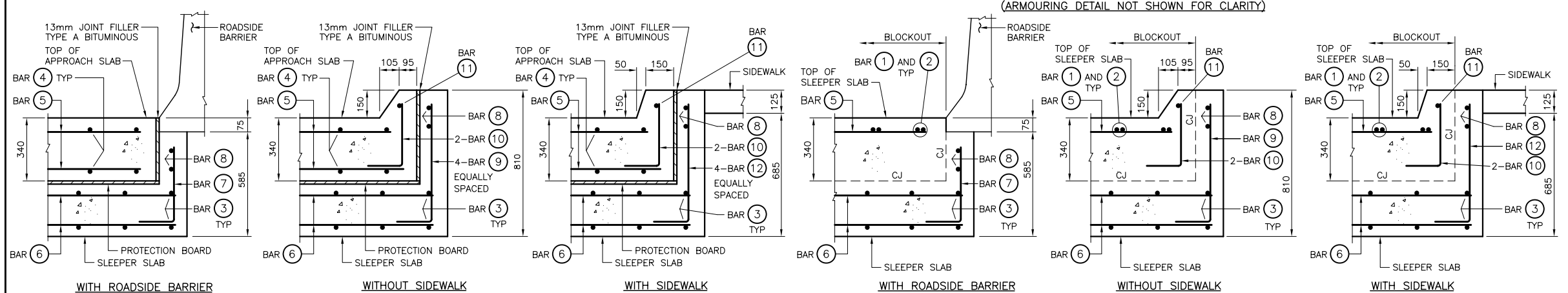
2

(ARMOURING DETAIL NOT SHOWN FOR CLARITY)



3

(ARMOURING DETAIL NOT SHOWN FOR CLARITY)



DETAIL C

DETAIL D

DRAWING NOT TO BE SCALED
100mm ON ORIGINAL DRAWING

METRIC
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN

CONT No
WP No

TYPE 'C' STRIP SEAL EXPANSION JOINT AND SLEEPER SLAB FOR INTEGRAL AND SEMI–INTEGRAL ABUTMENT BRIDGES

SHEET

BAR MARK	SIZE	SHAPE
1	C15M	310 / 500 / 180
2	C15M	300 / 520 / 180
3	C15M	160 / 860
4	C15M	200 / 310
5	C15M	STRAIGHT
6	C15M	STRAIGHT
7	C15M	180 / 445
8	C15M	STRAIGHT
9	C15M	180 / 670
10	C15M	180 / 370
11	C15M	STRAIGHT
12	C15M	180 / 545

NOTES:

1. THIS DRAWING SHOWS EXPANSION JOINT AND SLEEPER SLAB AT THE END OF APPROACH SLAB OF INTEGRAL AND SEMI–INTEGRAL ABUTMENT BRIDGES AND THIS DETAIL IS ONLY APPLICABLE FOR CONCRETE BRIDGES GREATER THAN 100m IN LENGTH AND STEEL BRIDGES GREATER THAN 75m IN LENGTH.
2. CLASS OF CONCRETE TO BE 30 MPa.
3. REINFORCING STEEL TO BE GRADE 400 EXCEPT AS NOTED.
4. COVER TO REINFORCING STEEL 70±mm EXCEPT AS NOTED.
5. EXPANSION JOINT SHALL BE IN ACCORDANCE WITH THE DESIGNATED SOURCES FOR MATERIALS LIST DSM 9.40.27, TYPE C.
6. EXPANSION JOINT ASSEMBLY CONSTRUCTION AND MATERIAL SHALL BE ACCORDING TO OPSS 920 AND OPSS 1210, AND AS SPECIFIED IN THE CONTRACT DOCUMENTS.
7. JOINT ASSEMBLY SHALL BE COMPLETELY SHOP ASSEMBLED (EXCEPT FOR SEALS) AND PRESET TO DIMENSION 'J' FOR 15°C AND ADJUSTED IN THE FIELD TO SUIT INSTALLATION TEMPERATURE.
8. JOINT ASSEMBLY INSTALLATION TEMPERATURE SHALL BE TAKEN AS MEAN SHADE AIR TEMPERATURE AT STRUCTURE PRIOR TO JOINT INSTALLATION AS FOLLOWS:
   – FOR CONCRETE STRUCTURES – 48 HOURS
   – FOR STEEL STRUCTURES – 24 HOURS
9. FIELD SPLICES IN JOINT ASSEMBLY ARE ONLY PERMITTED AT STAGED CONSTRUCTION, AND/OR AS SHOWN ON THE CONTRACT DRAWINGS.
10. FIELD SPLICE DETAILS AT STAGED CONSTRUCTION FOR ARMOURING PLATES AND NOSING ANGLES SHALL REFER TO DRAWING SS113–13.
11. IF THE JOINT ARMOURING FOR A SKEW STRUCTURE IS SPLICED AT A CROWN, THE SPLICE SHALL BE DETAILED PARALLEL TO THE CENTRELINE OF THE TRAFFIC LANE.
12. SETTING ANGLES SHALL BE FLAME CUT ACCORDING TO OPSS 920, BUT IN NO CASE PRIOR TO CONCRETE REACHING INITIAL SET.
13. AFTER CURING OF THE CONCRETE FOR A MINIMUM OF 7 DAYS, THE SETTING DEVICES MAY BE REMOVED. THE VOIDS UNDER THE ARMOURING ANGLE AND NOSING ANGLE SHALL THEN BE PRESSURE INJECTED.
14. PREFORMED SEALS SHALL HAVE MINIMUM THICKNESS OF 50mm OR AS PER DSM.
15. ALL STEEL RETAINER SURFACES COMING IN CONTACT WITH PREFORMED SEAL SHALL BE CLEANED PRIOR TO INSTALLATION OF THE SEAL.
16. PREFORMED SEALS SHALL BE INSTALLED AFTER JOINT ASSEMBLY HAS BEEN BEEN CAST PLACE, STYROFOAM OR FILLER BETWEEN APPROACH SLAB AND SLEEPER SLAB REMOVED, AND EXPANSION GAP CLEARED OF ANY DEBRIS.
17. HEADED CONCRETE ANCHORS IN NOSING ANGLES SHALL BE LOCATED WITHIN 75mm OF EITHER SIDE OF FIELD SPLICES.
18. PROTECT INJECTION HOSE AND FITTINGS ADJACENT TO FIELD SPLICE DURING WELDING AND REMOVE PROTECTION PRIOR TO PLACING OF CONCRETE IN BLOCKOUT.
19. FOR SKEWED STRUCTURE, WORKING DRAWING SHALL BE DETAILED TO SUIT GEOMETRY OF STRUCTURE.
20. ALL JOINT ANCHORAGES SHALL BE DETAILED ON WORKING DRAWINGS PERPENDICULAR TO THE EXPANSION JOINT ON BOTH THE APPROACH SLAB SIDE AND THE SLEEPER SLAB SIDE EXCEPT AS FOLLOW. STRUCTURE SKEWED FROM OVER 15° AND UP TO 45° SHALL HAVE ANCHORAGES DETAILED 30° OFFSET FROM THE PERPENDICULAR TO THE EXPANSION JOINT ON THE APPROACH SLAB SIDE.

LEGEND:

[ ] DENOTED FASTENER SIZE IN INCHES

STANDARD DRAWING
MARCH 16, 2010

SS113–36

TYPE 'C' STRIP SEAL EXPANSION JOINT AND SLEEPER SLAB FOR INTEGRAL AND SEMI–INTEGRAL ABUTMENT BRIDGES

DRAFT

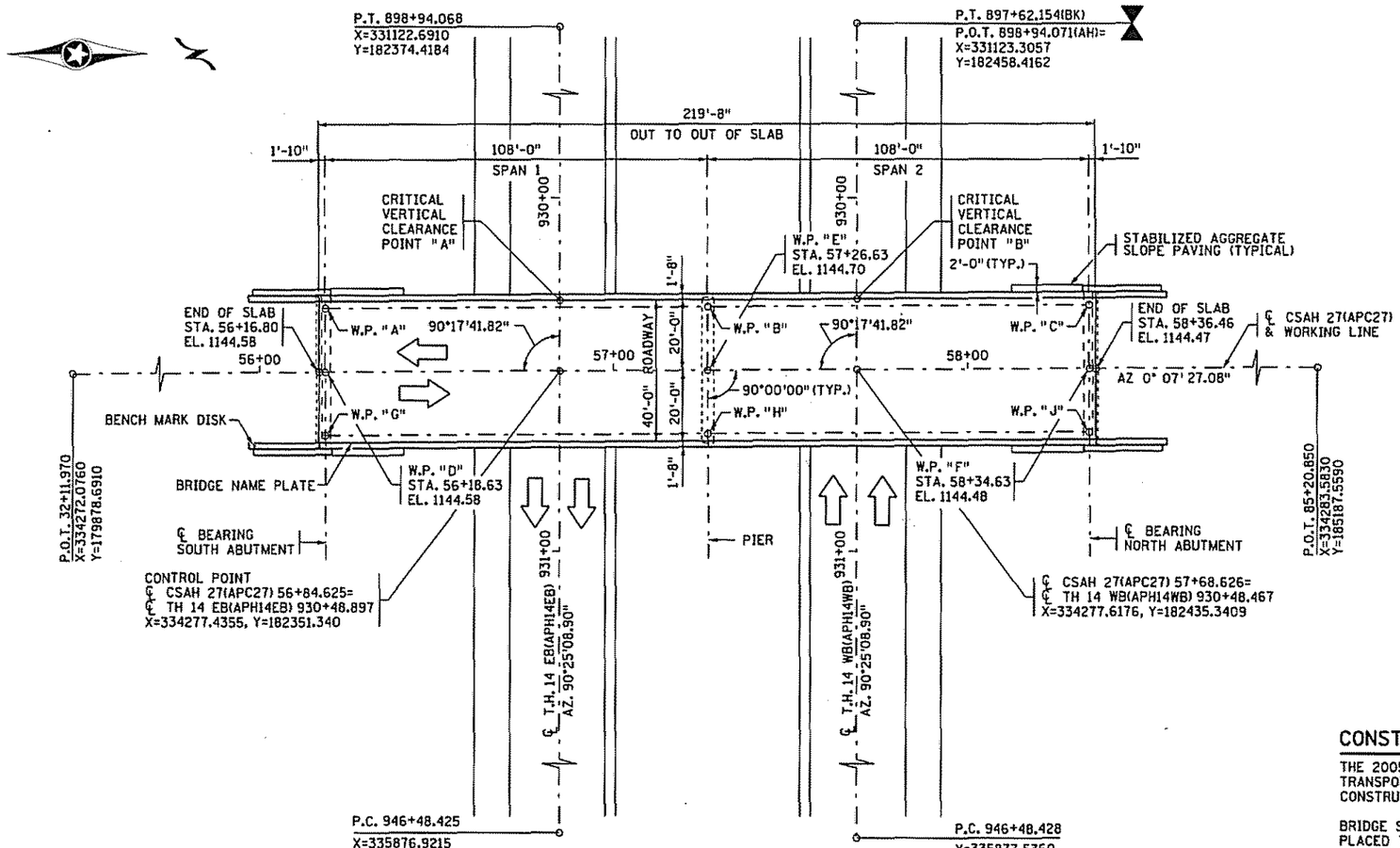
REVISIONS			
		DESCRIPTION	
DESIGN	CHK	CODE CHBDC–06	CL 625–ON	DATE
DRAWN	CHK	SITE		DWG

MINISTRY OF TRANSPORTATION, ONTARIO PR–D–707 88–05

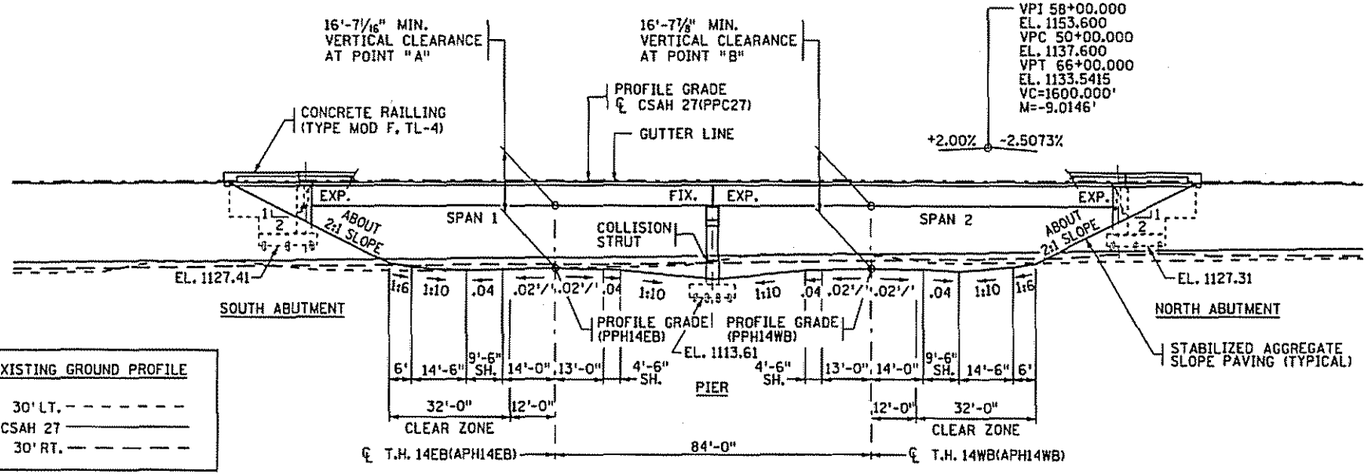
DRAWING NAME: s113–36.dwg CREATED: 1998/04/08 MODIFIED: 2010/02/03 15:53:46

H–6

Appendix I: Bridge 81007 Plans



GENERAL PLAN



GENERAL ELEVATION

EXISTING GROUND PROFILE
30' LT.
℄ CSAH 27
30' RT.

CONSTRUCTION NOTES

THE 2005 EDITION OF THE MINNESOTA DEPARTMENT OF TRANSPORTATION "STANDARD SPECIFICATIONS FOR CONSTRUCTION" SHALL GOVERN.

BRIDGE SEAT REINFORCEMENT SHALL BE CAREFULLY PLACED TO AVOID INTERFERENCE WITH DRILLING HOLES FOR ANCHOR RODS. THE BEAMS SHALL BE ERECTED IN FINAL POSITION PRIOR TO DRILLING HOLES FOR AND PLACING ANCHOR RODS.

THE FIRST TWO DIGITS OF EACH BAR MARK INDICATE THE BAR NUMBER WHICH APPROXIMATES THE NOMINAL DIAMETER OF THE BAR IN MILLIMETERS (mm).

BARS MARKED WITH THE SUFFIX "E" SHALL BE EPOXY COATED IN ACCORDANCE WITH SPEC. 3301.

THE SUBSURFACE UTILITY INFORMATION IN THIS PLAN IS UTILITY QUALITY LEVEL D. THIS UTILITY QUALITY LEVEL WAS DETERMINED ACCORDING TO THE GUIDELINES OF CI/ASCE 38-02, ENTITLED "STANDARD GUIDELINES FOR THE COLLECTION AND DEPICTION OF EXISTING SUBSURFACE UTILITY DATA".

THE PILE LOADS SHOWN IN THE PLANS AND THE CORRESPONDING NOMINAL PILE RESISTANCE (Rn) WERE COMPUTED USING LRFD METHODOLOGY. ULTIMATE PILE CAPACITY DETERMINED IN THE FIELD SHALL INCORPORATE THE METHODS AND/OR FORMULAS DESCRIBED IN THE SPECIAL PROVISIONS.

CONSTRUCTION OF EACH ABUTMENT SHALL NOT BE STARTED UNTIL THE APPROACH FILL AT THAT ABUTMENT HAS BEEN CONSTRUCTED TO THE FULL HEIGHT AND CROSS SECTION AND ALLOWED TO SETTLE. TIME DELAY FOR SETTLEMENT OF EMBANKMENTS DEPENDS ON THE VERTICAL DRAIN/SURCHARGE INSTALLATION OPTION TO BE DETERMINED BY THE DISTRICT.

SEE SHEET NO. 30 FOR INPLACE UTILITIES.

FEDERAL PROJ. NO. NH0014 (320)

DESIGN DATA

2007 AND CURRENT INTERIM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

LOAD AND RESISTANCE FACTOR DESIGN METHOD

HL 93 LIVE LOAD

DEAD LOAD INCLUDES 20 p.s.f. ALLOWANCE FOR FUTURE WEARING COURSE MODIFICATIONS

MATERIAL DESIGN PROPERTIES:
REINFORCED CONCRETE:
f'c = 4 ksi n = 8
Fy = 60 ksi FOR REINFORCEMENT
PRESTRESSED CONCRETE:
f'c = 8 ksi n = 1
fpu = 270 ksi FOR 0.6" DIAMETER LOW RELAXATION STRANDS

DECK AREA = 9519 SQ. FT.
2400 PROJECTED ADT FOR YEAR 2024
DESIGN SPEED:
OVER = 60 M.P.H. UNDER = 70 M.P.H.
BRIDGE OPERATING RATING HS 44.7

LIST OF SHEETS

I HEREBY CERTIFY THAT THIS PLAN WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

SIGNED Kent P. Molnau DATE 10-1-07
LICENSED PROFESSIONAL ENGINEER

NAME: KEITH P. MOLNAU LIC NO. 22467

TRUNK HIGHWAY NO. 14
MINNESOTA
DEPARTMENT OF TRANSPORTATION

BRIDGE NO. 81007

C.S.A.H. 27 OVER T.H. 14
2.57 MI. WEST OF JCT. T.H. 14 & T.H. 13
109', 109' PRESTRESSED CONCRETE BEAM SPANS,
40'-0" ROADWAY, TYPE MODIFIED F CONCRETE RAILINGS

IDENTIFICATION NO. 501

GENERAL PLAN AND ELEVATION

SEC. 23,24 TWP. 107 N R 25 W
ST. MARY TOWNSHIP WASECA COUNTY

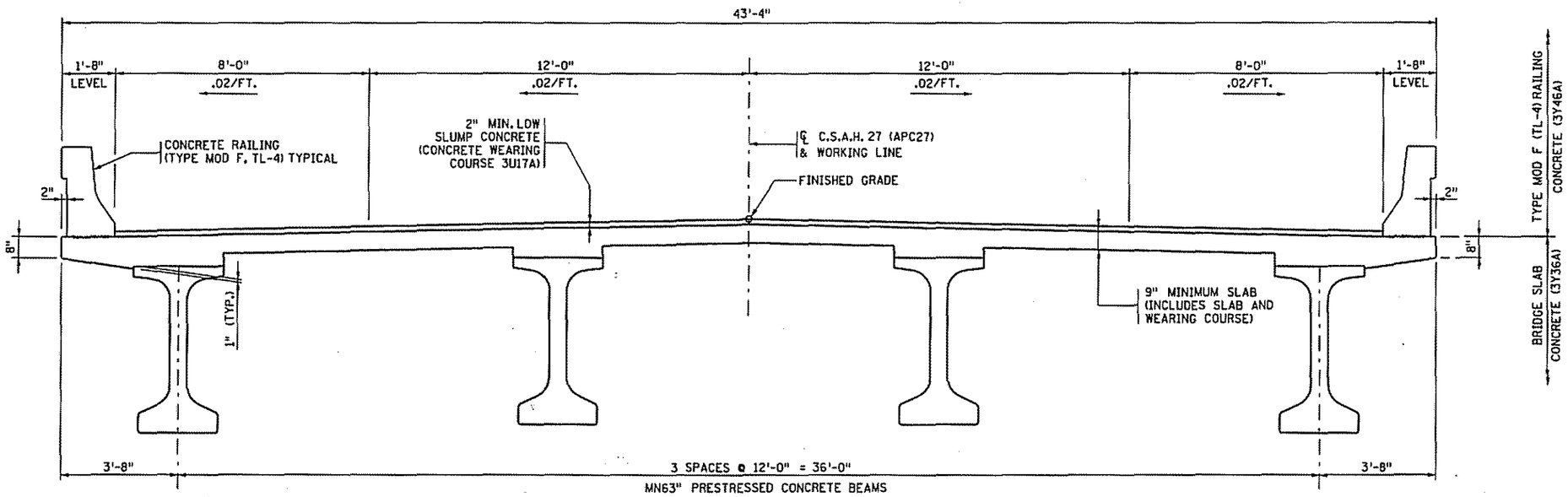
APPROVED Kevin Western STATE BRIDGE ENGINEER
DATE 10/1/07

DES.	M.H.	DR. A.R.D./J.A.J.	81007
CHK.	K.R.H.	CHK. J.A.J.	

9/24/2007 S:\Design\81007\br81007_gaj_base.dgn

$10-1-07 JAJ

JOB NUMBER: T79376 DESIGN UNIT: KEITH P. MOLNAU STATE PROJ. NO. 8103-81007 (T.H. 14=007) SHEET NO. 1 OF 31 SHEETS



TRANSVERSE SECTION THRU DECK

SCHEDULE OF QUANTITIES FOR ENTIRE BRIDGE

	ITEM NO.	ITEM	UNIT	QUANTITY
	2401.501	STRUCTURAL CONCRETE (1A43)	CU.YD.	143 (P)
	2401.501	STRUCTURAL CONCRETE (3Y43)	CU.YD.	198 (P)
	2401.512	BRIDGE SLAB CONCRETE (3Y36A)	SQ.FT.	9519 (P)
	2401.513	TYPE MOD F (TL-4) RAILING CONCRETE (3Y46A)	LIN. FT.	520 (P)
	2401.541	REINFORCEMENT BARS	POUND	9030 (P)
	2401.541	REINFORCEMENT BARS (EPOXY COATED)	POUND	110290 (P)
	2401.601	STRUCTURE EXCAVATION	LUMP SUM	1
	2402.595	BEARING ASSEMBLY	EACH	16 (P)
(1)	2404.501	CONCRETE WEARING COURSE (3U17A)	SQ. FT.	10387 (P)
	2405.502	PRESTRESSED CONCRETE BEAMS MN63	LIN. FT.	868 (P)
	2405.511	DIAPHRAGMS FOR TYPE MN63 PRESTRESSED BEAMS	LIN. FT.	216 (P)
	2411.618	ARCHITECTURAL CONCRETE TEXTURE (FRACTURED FIN)	SQ. FT.	758 (P)
	2411.618	ARCHITECTURAL SURFACE FINISH (SINGLE COLOR)	SQ. FT.	758 (P)
	2452.507	C-I-P CONCRETE PILING DELIVERED 12"	LIN. FT.	4660
	2452.508	C-I-P CONCRETE PILING DRIVEN 12"	LIN. FT.	4660
	2452.519	C-I-P CONCRETE TEST PILE 120 FT LONG 12"	EACH	2
	2452.519	C-I-P CONCRETE TEST PILE 100 FT LONG 12"	EACH	2
	2452.519	C-I-P CONCRETE TEST PILE 90 FT LONG 12"	EACH	2
	2452.527	PILE REDRIVING	EACH	6
(2)	2452.602	PILE ANALYSIS	EACH	1
	2502.502	DRAINAGE SYSTEM TYPE (B910)	LUMP SUM	1
	2514.503	AGGREGATE SLOPE PAVING	SQ. YD.	242 (P)

(1) ITEM INCLUDES 1600 SQ. FT. FOR BRIDGE APPROACH PANELS.

(2) MONITOR 1 TEST PILE AT ANY LOCATION ON BRIDGE.

4/13/2007 S:\Design\81007\br81007_sq_beam.dgn

CERTIFIED BY Keith P. Molnau 9-14-07
LICENSED PROFESSIONAL ENGINEER DATE
NAME: KEITH P. MOLNAU LIC. NO. 22467

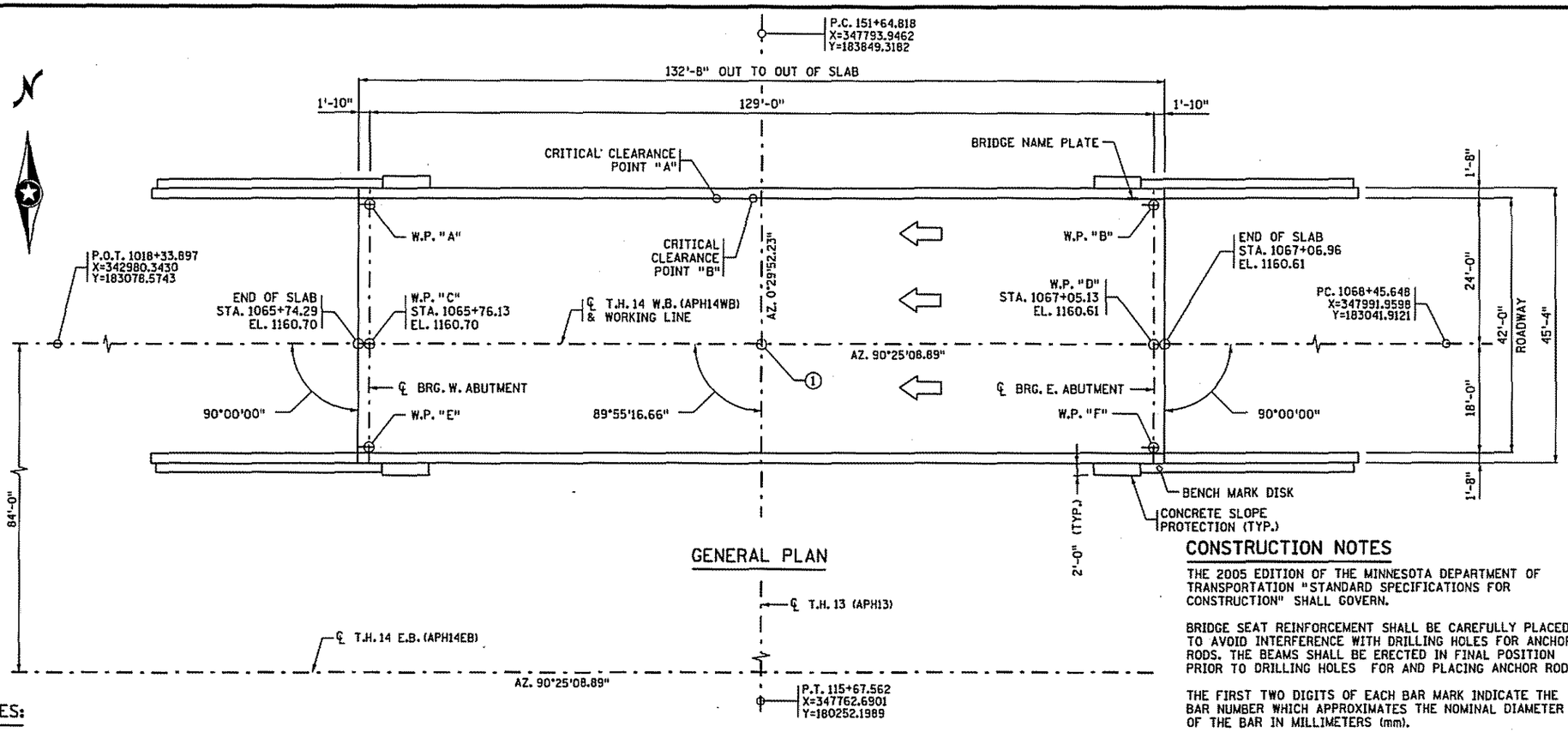
TITLE: SCHEDULE OF QUANTITIES

DES: M.H. DR: J.A.J. APPROVED: 10/1/07
CHK: K.R.H. CHK: K.G.S.

SHEET NO. 2 OF 31 SHEETS

BRIDGE NO. 81007

Appendix J: Bridge 81013 Plans



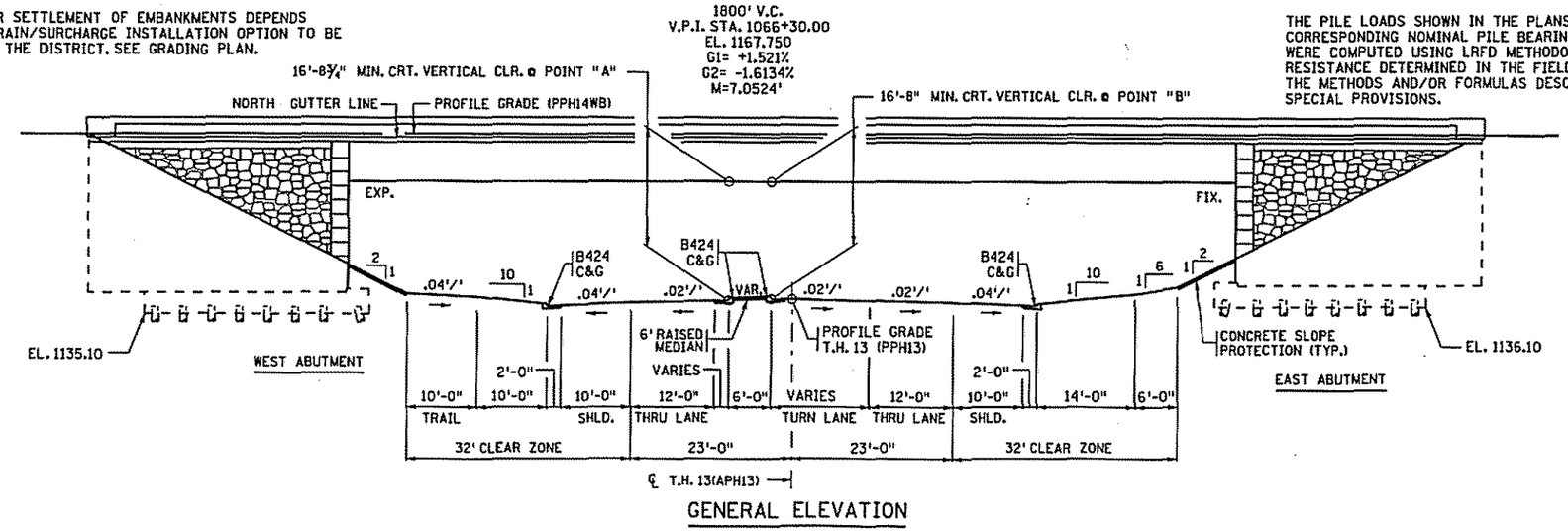
GENERAL PLAN

NOTES:

① ℄ T.H. 14 W.B. (APH14WB) STA. 1066+40.626=
℄ T.H. 13(APH13) STA. 143+58.881
X=347786.9435, Y=183043.4119
∢ 89°55'16.66"

CONSTRUCTION OF EACH ABUTMENT SHALL NOT BE STARTED UNTIL THE APPROACH FILL AT THAT ABUTMENT HAS BEEN CONSTRUCTED TO THE FULL HEIGHT AND CROSS SECTION. WAITING PERIODS VARY DEPENDING ON THE USE OF WICK DRAINS.

TIME DELAY FOR SETTLEMENT OF EMBANKMENTS DEPENDS ON VERTICAL DRAIN/SURCHARGE INSTALLATION OPTION TO BE DETERMINED BY THE DISTRICT. SEE GRADING PLAN.



GENERAL ELEVATION

CONSTRUCTION NOTES

THE 2005 EDITION OF THE MINNESOTA DEPARTMENT OF TRANSPORTATION "STANDARD SPECIFICATIONS FOR CONSTRUCTION" SHALL GOVERN.

BRIDGE SEAT REINFORCEMENT SHALL BE CAREFULLY PLACED TO AVOID INTERFERENCE WITH DRILLING HOLES FOR ANCHOR RODS. THE BEAMS SHALL BE ERECTED IN FINAL POSITION PRIOR TO DRILLING HOLES FOR AND PLACING ANCHOR RODS.

THE FIRST TWO DIGITS OF EACH BAR MARK INDICATE THE BAR NUMBER WHICH APPROXIMATES THE NOMINAL DIAMETER OF THE BAR IN MILLIMETERS (mm).

BARS MARKED WITH THE SUFFIX "E" SHALL BE EPOXY COATED IN ACCORDANCE WITH SPEC. 3301.

THE SUBSURFACE UTILITY INFORMATION IN THIS PLAN IS UTILITY QUALITY LEVEL D. THIS UTILITY QUALITY LEVEL WAS DETERMINED ACCORDING TO THE GUIDELINES OF CI/ASCE 38-02, ENTITLED "STANDARD GUIDELINES FOR THE COLLECTION AND DEPICTION OF EXISTING SUBSURFACE UTILITY DATA".

THE PILE LOADS SHOWN IN THE PLANS AND THE CORRESPONDING NOMINAL PILE BEARING RESISTANCE (R_n) WERE COMPUTED USING LRFD METHODOLOGY. PILE BEARING RESISTANCE DETERMINED IN THE FIELD SHALL INCORPORATE THE METHODS AND/OR FORMULAS DESCRIBED IN THE SPECIAL PROVISIONS.

FEDERAL PROJ. NO. NH 0014 (320)

DESIGN DATA

2004 AND CURRENT INTERIM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

LOAD AND RESISTANCE FACTOR DESIGN METHOD

HL 93 LIVE LOAD

DEAD LOAD INCLUDES 20 p.s.f. ALLOWANCE FOR FUTURE WEARING COURSE MODIFICATIONS

MATERIAL DESIGN PROPERTIES:
REINFORCED CONCRETE:
f'c = 4 ksi n = 8
Fy = 60 ksi FOR REINFORCEMENT
PRESTRESSED CONCRETE:
f'c = 9 ksi n=1
fpu = 270 ksi LOW RELAXATION STRANDS
0.75 fpu = FOR INITIAL PRESTRESS

DECK AREA = 6014 SQ. FT.
11200 PROJECTED ADT FOR YEAR 2024
DESIGN SPEED = 70 MILES PER HOUR
BRIDGE OPERATING RATING HS 57.0

LIST OF SHEETS

I HEREBY CERTIFY THAT THIS PLAN WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

SIGNED Jihshya Lin DATE 10/16/07
LICENSED PROFESSIONAL ENGINEER
NAME: JIHSHYA LIN LIC NO. 19115

TRUNK HIGHWAY NO. 14
MINNESOTA
DEPARTMENT OF TRANSPORTATION

BRIDGE NO. 81013

T.H. 14 OVER T.H. 13 AT THE JUNCTION OF T.H. 13 AND T.H. 14 SOUTH OF WASECA
MN63 PRESTRESSED CONCRETE BEAM SPAN
0° SKEW, 42'-0" ROADWAY. TYPE MODIFIED F RAILS

IDENTIFICATION NO. 501

GENERAL PLAN AND ELEVATION

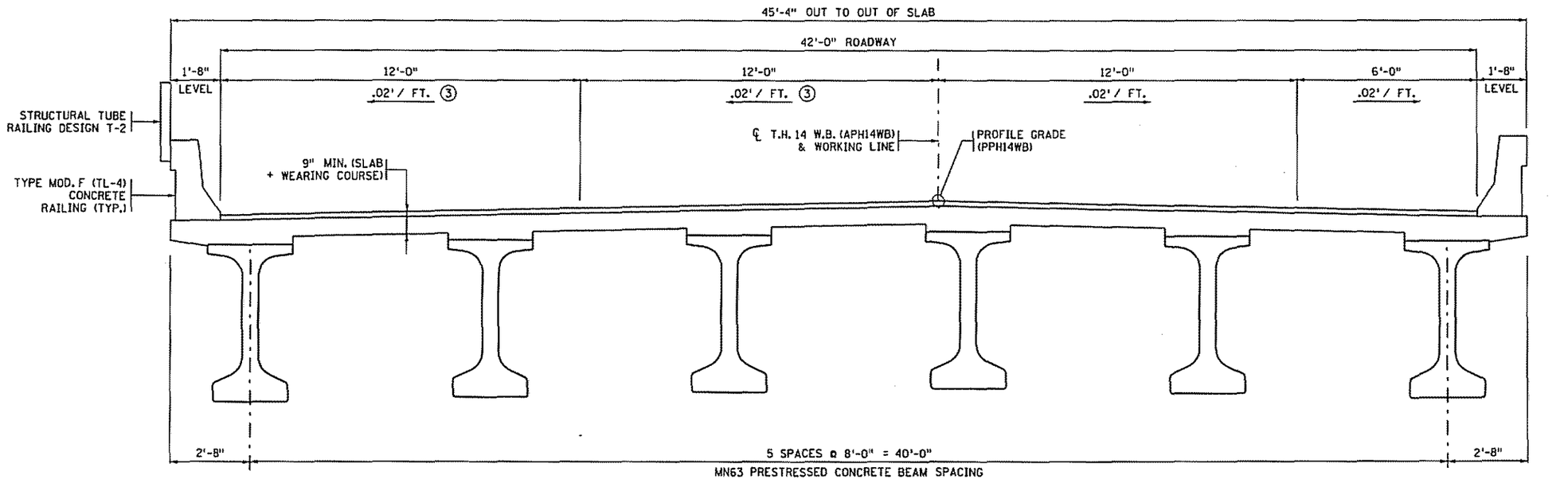
SEC. 20 T 107 N R 22 W
WOODVILLE TOWNSHIP WASECA COUNTY

APPROVED [signature] STATE BRIDGE ENGINEER
DATE 10/16/07

DES. Y.W.W.	DR. L.A.B.	81013
CHK. D.L.T.	CHK. M.A.K.	

S:\Design\B\81013\BR81013_S12.DGN
10/11/2007

JOB NO. T79376 DESIGN UNIT: JIHSHYA LIN STATE PROJ. NO. 8103-81013 (T.H. 14=007) SHEET NO. 1 OF 34 SHEETS



TRANSVERSE SECTION

	SCHEDULE OF QUANTITIES FOR ENTIRE BRIDGE			
	ITEM NO.	ITEM	UNIT	QUANTITY
	2401.501	STRUCTURAL CONCRETE (1A43)	CU.YD.	248 (P)
	2401.501	STRUCTURAL CONCRETE (3Y43)	CU.YD.	420 (P)
	2401.512	BRIDGE SLAB CONCRETE (3Y36A)	SQ. FT.	6014 (P)
(1)	2401.513	TYPE MOD F (TL-4) RAILING CONCRETE (3Y46A)	LIN. FT.	398 (P)
	2401.541	REINFORCEMENT BARS	POUND	22830 (P)
(1)	2401.541	REINFORCEMENT BARS (EPOXY COATED)	POUND	75460 (P)
	2401.601	STRUCTURE EXCAVATION	LUMP SUM	ONE
(1)	2402.584	STRUCTURAL TUBE RAILING DESIGN T-2	LIN. FT.	199 (P)
	2402.595	BEARING ASSEMBLY	EACH	12
(2)	2404.501	CONCRETE WEARING COURSE (3U17A)	SQ. FT.	8344 (P)
	2405.502	PRESTRESSED CONCRETE BEAMS MN63	LIN. FT.	782 (P)
	2405.511	DIAPHRAGMS FOR TYPE MN63 PRESTRESSED BEAMS	LIN. FT.	112 (P)
	2411.618	ARCHITECTURAL CONCRETE TEXTURE (FIELDSTONE)	SQ. FT.	2190 (P)
	2411.618	ARCHITECTURAL SURFACE FINISH (MULTI COLOR)	SQ. FT.	2190 (P)
	2411.618	ANTI-GRAFFITI COATING	SQ. FT.	2190 (P)
	2452.507	C-I-P CONCRETE PILING DELIVERED 12"	LIN. FT.	3680
	2452.508	C-I-P CONCRETE PILING DRIVEN 12"	LIN. FT.	3680
	2452.519	C-I-P CONCRETE TEST PILE 50 FT LONG 12"	EACH	2
	2452.519	C-I-P CONCRETE TEST PILE 60 FT LONG 12"	EACH	2
	2452.527	PILE REDRIVING	EACH	4
*	2452.602	PILE ANALYSIS	EACH	ONE
	2502.502	DRAINAGE SYSTEM TYPE (B910)	LUMP SUM	ONE
	2514.501	CONCRETE SLOPE PAVING	SQ. YD.	101 (P)

NOTES:

(1) INCLUDES RAILING ON THE APPROACH PANELS.

(2) INCLUDES 2772 SQ. FT. FOR APPROACH PANELS.

(3) SEE SHEET NO. 33 FOR SUPERELEVATION CHART.

* MONITOR 1 TEST PILE AT ANY LOCATION ON BRIDGE.

11/8/2007 S:\Design\81\81013\BH81013_SI2.DGN

CERTIFIED BY Jihshya D. Lin LICENSED PROFESSIONAL ENGINEER 10/16/07 DATE
NAME: JIHSHYA LIN LIC. NO. 19115

TITLE: TRANSVERSE SECTION AND SCHEDULE OF QUANTITIES

DES: Y.W.W. DR: L.A.B. APPROVED: 10/16/07
CHK: D.L.T. CHK: M.A.K.
SHEET NO. 2 OF 34 SHEETS

BRIDGE NO. 81013