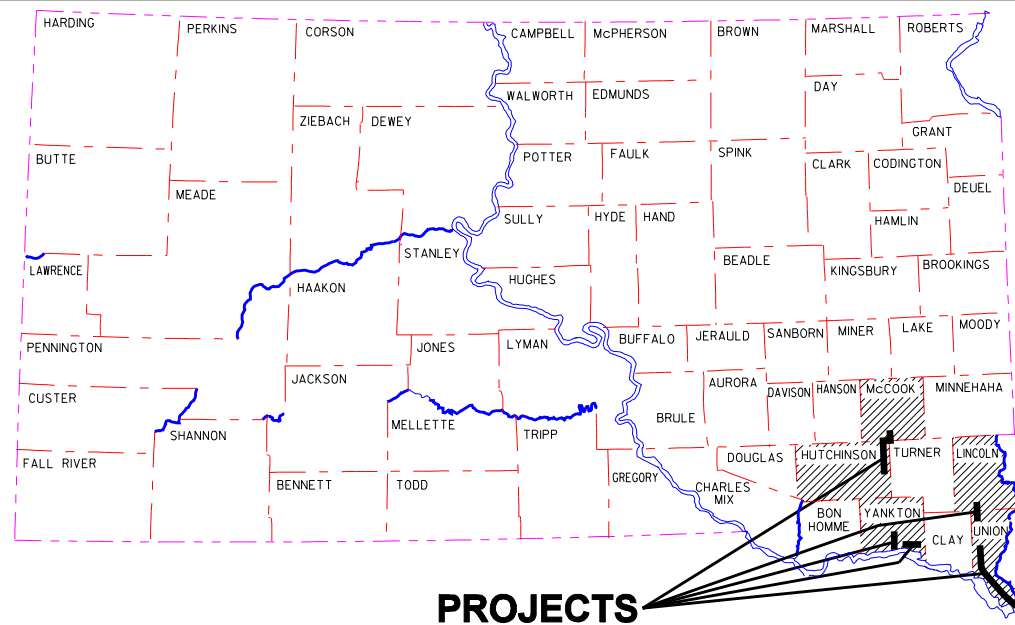


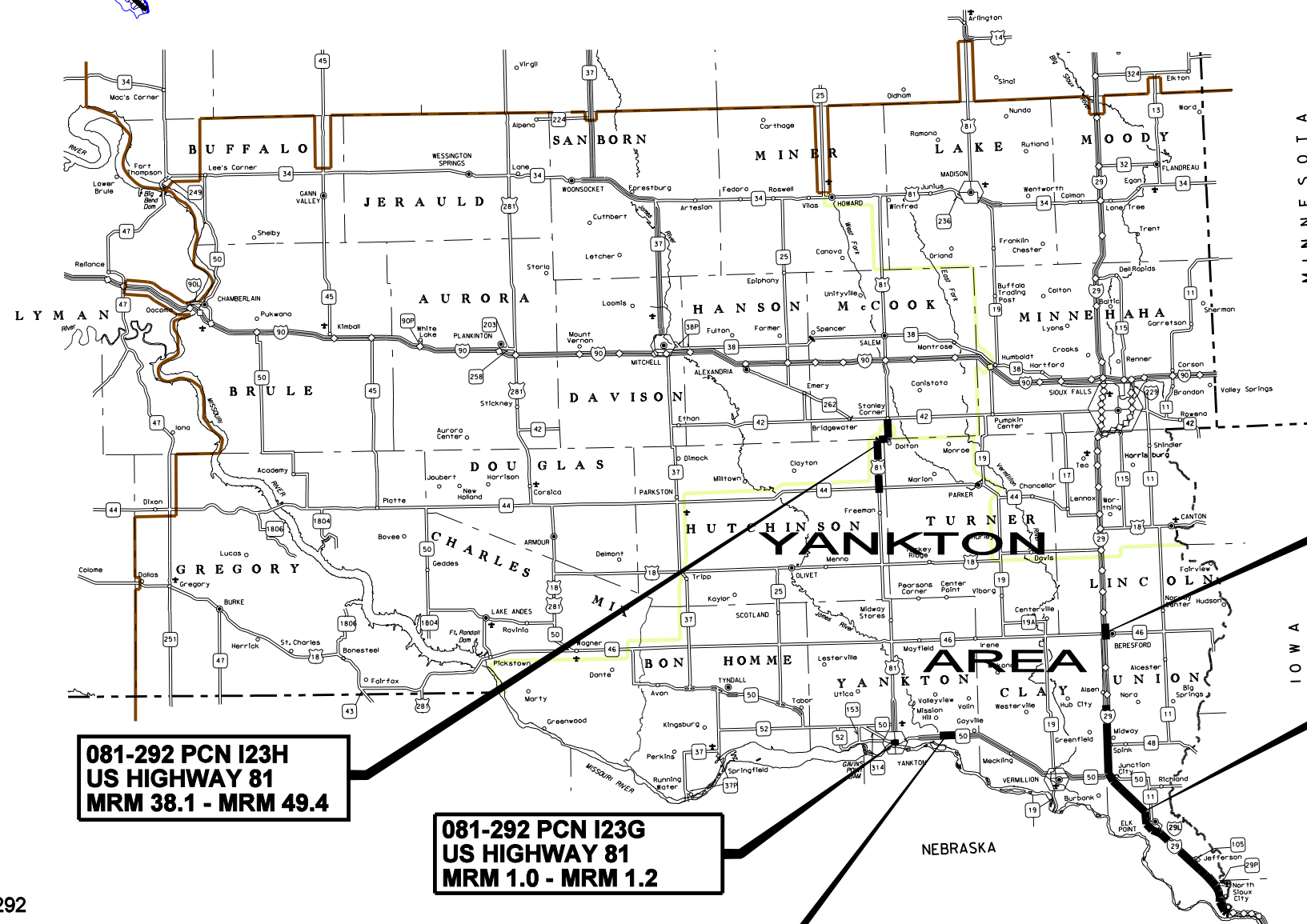
|                                |   |       |                 |
|--------------------------------|---|-------|-----------------|
| STATE<br>OF<br>SOUTH<br>DAKOTA | PROJECT                                 | SHEET | TOTAL<br>SHEETS |
|                                | 2011 YANKTON AREA<br>CRCP & PCCP REPAIR | 1     | 24              |

## INDEX OF SHEETS

|                |                             |
|----------------|-----------------------------|
| Sheet 1        | Title Sheet & Map Layout    |
| Sheet 2        | Estimate of Quantities      |
| Sheet 3        | Table of CRCP & PCCP Repair |
| Sheets 4 - 7   | Plan Notes                  |
| Sheets 8 - 12  | Traffic Control             |
| Sheets 13 - 17 | PCC Pavement Repair Details |
| Sheets 18 - 24 | CRC Pavement Repair Details |



## PROJECTS



**I29N-291 PCN I23F**  
**INTERSTATE 29**  
**MRM 46.5 - MRM 47.7**

**I29S-291 PCN I23E**  
**INTERSTATE 29**  
**MRM 0.4 - MRM 28.5**

**081-292 PCN I23H**  
**US HIGHWAY 81**  
**MRM 38.1 - MRM 49.4**

**081-292 PCN I23G**  
**US HIGHWAY 81**  
**MRM 1.0 - MRM 1.2**

**050W-292 PCN I23D  
SD HIGHWAY 50  
MRM 393.0 - MRM 394.0**

| PROJECT   | 050W-292    | 029S-291 | 029N-291  | 081-292 | 081-292   |
|-----------|-------------|----------|-----------|---------|-----------|
| PCN       | I23D        | I23E     | I23F      | I23G    | I23H      |
| ROUTE     | SD50        | I29      | I29       | US81    | US81      |
| MRM-MRM   | 393.0-394.0 | 0.4-28.5 | 46.5-47.8 | 1.0-1.2 | 38.1-49.4 |
| ADT(2009) | 2235        | 6280     | 6610      | 16925   | 1380      |
| ADT(2029) | 2920        | 10885    | 11010     | 23615   | 2150      |
| DHV       | 440         | 1490     | 1510      | 2250    | 325       |
| D         | 100%        | 100%     | 100%      | 50%     | 50%       |
| T DHV     | 6.9%        | 10.6%    | 10.7%     | 2.0%    | 11.8%     |
| T ADT     | 15.2%       | 23.3%    | 23.5%     | 4.3%    | 26.0%     |

**STORM WATER PERMIT**  
(None required)



ESTIMATE OF QUANTITIES

| BID ITEM<br>NUMBER | ITEM  | 050W-292<br>PCN I23D<br>QUANTITY | 029S-291<br>PCN I23E<br>QUANTITY | 029N-291<br>PCN I23F<br>QUANTITY | 081-292<br>PCN I23G<br>QUANTITY | 081-292<br>PCN I23H<br>QUANTITY | TOTAL<br>QUANTITY | UNIT |
|--------------------|---|----------------------------------|----------------------------------|----------------------------------|---------------------------------|---------------------------------|-------------------|------|
| 009E0010           | Mobilization                                | <-----Lump Sum----->             |                                  |                                  |                                 |                                 | Lump Sum          | LS   |
| 380E5030           | Nonreinforced PCC Pavement Repair           | 30.0                             | 12.0                             | 146.1                            | 8.0                             | 201.7                           | 397.8             | SqYd |
| 380E5100           | Continuously Reinforced PCC Pavement Repair | -                                | 18.6                             | -                                | -                               | -                               | 18.6              | SqYd |
| 380E6000           | Dowel Bar                                   | 50                               | 18                               | 104                              | 12                              | 92                              | 276               | Each |
| 380E6110           | Insert Steel Bar in PCC Pavement            | 80                               | 92                               | 156                              | 20                              | 108                             | 456               | Each |
| 634E0010           | Flagging                                    | 5                                | 5                                | 5                                | 5                               | 25                              | 45                | Hour |
| 634E0100           | Traffic Control                             | 156                              | 156                              | 156                              | 156                             | 734                             | 1358              | Unit |
| 634E0120           | Traffic Control, Miscellaneous              | <-----Lump Sum----->             |                                  |                                  |                                 |                                 | Lump Sum          | LS   |
| 634E0310           | Temporary Road Markers                      | 780                              | 2340                             | 1980                             | 360                             | 6000                            | 11460             | Ft   |
| 634E0420           | Type C Advance Warning Arrow Panel          | <-----2 each----->               |                                  |                                  |                                 |                                 | 2                 | Each |
| 634E0610           | 4" Temporary Pavement Marking Tape Type 2   | -                                | -                                | -                                | -                               | 432                             | 432               | Ft   |
| 998E0100           | Railroad Protective Insurance               | -                                | -                                | -                                | -                               | LS                              | Lump Sum          | LS   |



TABLE FOR PCC PAVEMENT REPAIR ON 050W-292 PCN I23D

INSERT STEEL BAR  
IN PCC PAVEMENT

| MRM                    | LANE | WB DRIVING<br>LANE |         | PCCP<br>SqYds | NEW<br>JOINT<br>CON-<br>FIG. | No. 8 x 18"<br>DEFORMED<br>TIE BARS<br>Each | No. 5 x 24"<br>DEFORMED<br>TIE BARS<br>Each | DOWEL<br>BAR<br>Each |
|------------------------|------|--------------------|---------|---------------|------------------------------|---|---|----------------------|
|                        |      | L<br>Ft            | W<br>Ft |               |                              |   |   |                      |
| 393.023                | WBDL | 6                  | 6       | 4.0           | R                            | 8   | 2   | 6                    |
| 393.389                | WBDL | 6                  | 6       | 4.0           | R                            | 8   | 2   | 6                    |
| 393.412                | WBDL | 6                  | 6       | 4.0           | R                            | 8   | 2   | 6                    |
| 393.427                | WBDL | 6                  | 6       | 4.0           | R                            | 8   | 2   | 6                    |
| 393.432                | WBDL | 6                  | 6       | 4.0           | R                            | 8   | 2   | 6                    |
| TOTALS:                |      |                    |         | 20.0          |                              | 40  | 10  | 30                   |
| ADDITIONAL QUANTITIES: |      |                    |         | 10.0          |                              | 20  | 10  | 20                   |
| GRAND TOTALS:          |      |                    |         | 30.0          |                              | 60  | 20  | 50                   |

TABLE FOR CRC & PCC PAVEMENT REPAIR ON 029S-291 PCN I23E

INSERT STEEL BAR  
IN PCC PAVEMENT

| MRM     | LANE | SB DRIVING<br>LANE |         | PCCP<br>SqYds | NEW<br>JOINT<br>CON-<br>FIG. | No. 9 x 18"<br>DEFORMED<br>TIE BARS<br>Each | No. 5 x 24"<br>DEFORMED<br>TIE BARS<br>Each | DOWEL<br>BAR<br>Each |
|---------|------|--------------------|---------|---------------|------------------------------|---|---|----------------------|
|         |      | L<br>Ft            | W<br>Ft |               |                              |   |   |                      |
| 0.562   | SBDL | 6                  | 6       | 4.0           | R                            | 8   | 4   | 6                    |
| 2.054   | SBDL | 6                  | 6       | 4.0           | R                            | 8   | 4   | 6                    |
| 3.198   | SBDL | 6                  | 6       | 4.0           | R                            | 8   | 4   | 6                    |
| TOTALS: |      |                    |         | 12.0          |                              | 24  | 12  | 18                   |

INSERT STEEL BAR  
IN PCC PAVEMENT

| MRM     | LANE | SB DRIVING<br>LANE |         | CRC<br>SqYds | NEW<br>JOINT<br>CON-<br>FIG. | No. 6<br>DEFORMED<br>TIE BARS<br>Each | No. 4 x 24"<br>DEFORMED<br>TIE BARS<br>Each |
|---------|------|--------------------|---------|--------------|------------------------------|---------------------------------------|---|
|         |      | L<br>Ft            | W<br>Ft |              |                              |                                       |   |
| 28.097  | SBDL | 6                  | 14      | 9.3          |                              | 24                                    | 4   |
| 28.118  | SBDL | 6                  | 14      | 9.3          |                              | 24                                    | 4   |
| TOTALS: |      |                    |         | 18.6         |                              | 48                                    | 8   |

TABLE FOR PCC PAVEMENT REPAIR ON 029N-291 PCN I23F

INSERT STEEL BAR  
IN PCC PAVEMENT

| MRM     | LANE      | NB DRIVING<br>LANE |         | PCCP<br>SqYds | NEW<br>JOINT<br>CON-<br>FIG. | No. 9 x 18"<br>DEFORMED<br>TIE BARS<br>Each | No. 5 x 24"<br>DEFORMED<br>TIE BARS<br>Each | DOWEL<br>BAR<br>Each |
|---------|-----------|--------------------|---------|---------------|------------------------------|---|---|----------------------|
|         |           | L<br>Ft            | W<br>Ft |               |                              |   |   |                      |
| 46.950  | NBDL      | 6                  | 8       | 5.3           | R                            | 10  | 4   | 6                    |
| 46.970  | NBDL      | 6                  | 14      | 9.3           | R                            | 16  | 4   | 12                   |
| 47.450  | NB ONRAMP | 25                 | 20      | 55.6          | R                            | 16 *  | 20  | 20                   |
| 47.550  | NB ONRAMP | 24                 | 20      | 53.3          | R                            | 16 *  | 18  | 36                   |
| 47.556  | NBDL      | 6                  | 6       | 4.0           | R                            | 8   | 4   | 6                    |
| 47.635  | NBDL      | 6                  | 14      | 9.3           | R                            | 16  | 4   | 12                   |
| 47.654  | NBDL      | 6                  | 14      | 9.3           | R                            | 16  | 4   | 12                   |
| TOTALS: |           |                    |         | 146.1         |                              | 98  | 58  | 104                  |

NOTE

\* NB ONRAMP Bars shall be No. 8 x 18".

TABLE FOR PCC PAVEMENT REPAIR ON 081-292 PCN I23G

INSERT STEEL BAR  
IN PCC PAVEMENT

| MRM     | LANE | SB DRIVING<br>LANE |         | SB PASSING<br>LANE |         | PCCP<br>SqYds | NEW<br>JOINT<br>CON-<br>FIG. | No. 9 x 18"<br>DEFORMED<br>TIE BARS<br>Each | No. 5 x 24"<br>DEFORMED<br>TIE BARS<br>Each | DOWEL<br>BAR<br>Each |
|---------|------|--------------------|---------|--------------------|---------|---------------|------------------------------|---|---|----------------------|
|         |      | L<br>Ft            | W<br>Ft | L<br>Ft            | W<br>Ft |               |                              |   |   |                      |
| 1.158   | NBDL | 6                  | 6       |                    |         | 4.0           | R                            | 8   | 2   | 6                    |
| 1.158   | NBPL |                    |         | 6                  | 6       | 4.0           | R                            | 8   | 2   | 6                    |
| TOTALS: |      |                    |         |                    |         | 8.0           |                              | 16  | 4   | 12                   |

TABLE FOR PCC PAVEMENT REPAIR ON 081-292 PCN I23H

INSERT STEEL BAR  
IN PCC PAVEMENT

| MRM                    | LANE | SB DRIVING<br>LANE |         | NB DRIVING<br>LANE |         | PCCP<br>SqYds | NEW<br>JOINT<br>CON-<br>FIG. | No. 9 x 18"<br>DEFORMED<br>TIE BARS<br>Each | No. 5 x 24"<br>DEFORMED<br>TIE BARS<br>Each | DOWEL<br>BAR<br>Each |
|------------------------|------|--------------------|---------|--------------------|---------|---------------|------------------------------|---|---|----------------------|
|                        |      | L<br>Ft            | W<br>Ft | L<br>Ft            | W<br>Ft |               |                              |   |   |                      |
| 38.111                 | NBL  |                    |         | 6                  | 14      | 9.3           | R                            | 16  |   | 12                   |
| 38.111                 | SBL  | 6                  | 14      |                    |         | 9.3           | R                            | 16  |   | 12                   |
| 45.554                 | SBL  | 12                 | 14      |                    |         | 18.7          | T                            | 16  | 8   |                      |
| 49.330                 | NBL  |                    |         | 40                 | 14      | 62.2          | R                            | 16  |   | 24                   |
| 49.330                 | SBL  | 40                 | 14      |                    |         | 62.2          | R                            | 16  |   | 24                   |
| TOTALS:                |      |                    |         |                    |         | 161.7         |                              | 80  | 8   | 72                   |
| ADDITIONAL QUANTITIES: |      |                    |         |                    |         | 40.0          |                              | 20  | 0   | 20                   |
| GRAND TOTALS:          |      |                    |         |                    |         | 201.7         |                              | 100   | 8   | 92                   |

JOINT REPAIR CONFIGURATION KEY

W = Two Working Joints (Use only if repair is full roadway width and uniform length (across all lanes))

T = Two Tied Joints

B = One Working & One Tied Joint

R = Two Tied Joints with Original Joint Restored with Dowel Bar Assembly



| STATE<br>OF<br>SOUTH<br>DAKOTA | PROJECT                                 | SHEET | TOTAL<br>SHEETS |
|--------------------------------|---|-------|-----------------|
|                                | 2011 YANKTON AREA<br>CRCP & PCCP REPAIR | 4     | 24              |

**SPECIFICATIONS**

Standard Specifications for Roads and Bridges, 2004 Edition and Required Special Provisions, Supplemental Specifications and/or Special Provisions as included in the Proposal.

**UTILITIES**

The Contractor shall contact the involved utility companies through South Dakota One Call (1-800-781-7474) prior to starting work. It shall be the responsibility of the Contractor to coordinate work with the utility owners to avoid damage to existing facilities.

Utilities are not planned to be affected on this project. If utilities are identified near the improvement area through the SD One Call Process as required by South Dakota Codified Law 49-7A and Administrative Rule Article 20:25, the Contractor shall contact the Project Engineer to determine modifications that will be necessary to avoid utility impacts.

**SCOPE OF WORK**

This project consists of full depth replacement of concrete pavement in areas where concrete pavement blowups or major failures have occurred. Full depth areas vary in length and width, however the minimum length is 6 feet.

Project 029S-291 also consists of full depth replacement of Continuously Reinforced Concrete (CRC) Pavement in areas where major failures have occurred. Full depth areas may vary in length and width, however the minimum length is 6 feet.

**RAILROAD CROSSING**

The Contractor is to coordinate work with the Railroad Company regarding any work to be done adjacent to the railroad tracks on US HWY 81 and give 30 days notice to the Railroad Company in advance of required flagging dates. See Special Provision for Working on Railroad Company Right of Way.

**HISTORICAL PRESERVATION OFFICE CLEARANCES**

To obtain State Historical Preservation Office (SHPO) clearance, a cultural resources survey may need to be conducted by a qualified archaeologist. In lieu of a cultural resources survey, the Contractor could request a records search from Jim Donohue, State Archaeological Research Center (SARC). Provide SARC with the following: a topographical map or aerial view on which the site is clearly outlined, site dimensions, project number, and PCN. If applicable, provide evidence that the site has been previously disturbed by farming, mining, or construction activities with a landowner statement that no artifacts have been found on the site. The Contractor shall arrange and pay for the cultural resource survey and/or records search.

If any earth disturbing activities occur within the current geographical or historic boundaries of any South Dakota reservation, the Contractor shall obtain Tribal Historical Preservation Office (THPO) clearance. If no THPO exists, the required SHPO clearance shall suffice, with documentation of Tribal contact efforts provided to SHPO.

To facilitate SHPO or THPO responses, the Contractor should submit a records search or cultural resources survey report to the DOT Environmental Engineer, 700 East Broadway Avenue, Pierre, SD 57501-2586 (605-773-3268). Allow 30 days from the date this information is submitted to the Environmental Engineer for SHPO/THPO approval. The Contractor is responsible for obtaining all required permits and clearances for staging areas, borrow sites, waste disposal sites, and all material processing sites. The Contractor shall provide the required permits and clearances to the Engineer at the preconstruction meeting.

**WASTE DISPOSAL SITE**

The Contractor will be required to furnish a site(s) for the disposal of construction/demolition debris generated by this project.

Construction/demolition debris may not be disposed of within the State ROW.

The waste disposal site(s) shall be managed and reclaimed in accordance with the following from the General Permit for Highway, Road, and Railway Construction/Demolition Debris Disposal under the South Dakota Waste Management Program issued by the Department of Environment and Natural Resources.

The waste disposal site(s) shall not be located in a wetland, within 200 feet of surface water, or in an area that adversely affects wildlife, recreation, aesthetic value of an area, or any threatened or endangered species, as approved by the Engineer.

If the waste disposal site(s) is located such that it is within view of any ROW, the following additional requirements shall apply:

1. Construction/demolition debris consisting of concrete, asphalt concrete, or other similar materials shall be buried in a trench completely separate from wood debris. The final cover over the construction/demolition debris shall consist of a minimum of 1 foot of soil capable of supporting vegetation. Waste disposal sites provided outside of the State ROW shall be seeded in accordance with Natural Resources Conservation Service recommendations. The seeding recommendations may be obtained through the appropriate County NRCS Office. The Contractor shall control the access to waste disposal sites not within the State ROW through the use of fences, gates, and placement of a sign or signs at the entrance to the site stating No Dumping Allowed.
2. Concrete and asphalt concrete debris may be stockpiled within view of the ROW for a period of time not to exceed the duration of the project. Prior to project completion, the waste shall be removed from view of the ROW or buried and the waste disposal site reclaimed as noted above.

The above requirements will not apply to waste disposal sites that are covered by an individual solid waste permit as specified in SDCL 34A-6-58, SDCL 34A-6-1.13, and ARSD 74:27:10:06.

Failure to comply with the requirements stated above may result in civil penalties in accordance with South Dakota Solid Waste Law, SDCL 34A-6-1.31.

Cost associated with furnishing waste disposal site(s), disposing of waste, maintaining control of access (fence, gates and signs), and reclamation of the waste disposal site(s) shall be incidental to the various contract items.

**EXISTING PCC & CRC PAVEMENT**

The existing pavement thicknesses are as follows:

- 8" PCCP on 050W-292 - PCN I23D, 081-292 - PCN I23H & the On Ramp on 029N-291 - PCN I23F.
- 9.5" PCCP on 081-292 - PCN I23G between MRM 1.0 to 1.2.
- 10" CRCP on 029S-291 - PCN I23E between MRM 28.0 to 28.2.
- 10.5" PCCP on 029N-291 - PCN I23F on the mainline areas.
- 11.5" PCCP on 029S-291 - PCN I23E between MRM 0.4 to 4.0.

The aggregate in the existing PCC & CRC Pavement is quartzite.

**RESTORATION OF GRAVEL CUSHION**

An inspection of the gravel cushion subgrade shall be made after removing concrete from each pavement replacement area. Areas of excess moisture shall be dried to the satisfaction of the Engineer. Loose material shall be removed. Each replacement area shall be leveled and compacted to the satisfaction of the Engineer.

If additional gravel cushion material is required, the Contractor shall place and compact gravel cushion to the satisfaction of the Engineer at no additional cost to the State. Additional gravel cushion can be obtained from the Department of Transportation Maintenance shops located in Beresford, Junction City, Menno or Yankton.

Cost for this work shall be incidental to the contract unit prices per square yard for Nonreinforced PCC Pavement Repair and Continuously Reinforced PCC Pavement Repair.

**NONREINFORCED PCC PAVEMENT REPAIR – GENERAL**

Locations and size (length or width) of concrete repair areas are subject to change in the field, at the discretion of the Engineer, at no additional cost to the state. Payment will be based on actual area replaced.

Existing concrete pavement shall be sawed full depth at the beginning and end of the PCCP repair areas. When either the beginning or end of a PCCP repair area falls close to an existing joint or crack, the PCCP repair area shall be extended to eliminate the existing joint or crack. Where possible, new working joints shall be adjacent to existing working joints.

Saw cuts that extend beyond the repair area shall be minimized and filled with a non-shrinkage mortar mix at the Contractor's expense.

Existing concrete pavement in the replacement areas shall be removed by the lift out method or by means that minimize damage to the base and sides of remaining in place concrete. All removed material shall be removed from within the right-of-way by the end of the workday. Damage to adjacent concrete caused by the Contractor's operations shall be removed and replaced at the Contractor's expense.

If the pavement replacement area is entirely on either side of the existing contraction joint, the location of one of the working joints will be at the original location. Any existing dowel bar assemblies shall be sawed off or removed.

Concrete placed adjacent to gravel and asphalt concrete shoulders shall be formed full depth to match the width of existing concrete pavement. Asphalt concrete shoulders adjacent to concrete pavement replacements shall be repaired with new hot-mix asphalt concrete.

At repair locations where the new working joint is not opposite the existing working joint, the Contractor shall place a ¼" preformed asphalt expansion joint material along the longitudinal joint from the existing working joint to the new working joint. The expansion joint material shall meet the requirements of AASHTO M33. Cost for this material shall be incidental to the contract unit price per square yard for Nonreinforced PCC Pavement Repair.

All joints (longitudinal and transverse) through and around the repair areas will be sawed and sealed in accordance with the details shown in these plans. Refer to Saw and Seal Joints notes.



NONREINFORCED PCC PAVEMENT REPAIR

New pavement thickness shall be a 1” thicker than the existing pavement.

Concrete shall meet the requirements of the Standard Specifications Section 380, except as modified by the following notes:

The fine aggregate shall be screened over a one-inch square-opening screen just prior to introduction into the concrete paving mix if required by the Engineer.

The slump requirement will be limited to 3" maximum after water reducer is added and the concrete shall contain 4.5% to 7.0% entrained air. Coarse aggregate shall be crushed ledge rock, Size No. 1. The Contractor is responsible for the mix design used. The Contractor shall submit a mix design and supporting documentation for approval at least 2 weeks prior to use. In lieu of submitting a mix design the Contractor may use one of the following dependent upon type of cement to be used:

|                  |                    |                   |
|------------------|--------------------|-------------------|
|                  | <u>LB./CU.YD.</u>  | <u>LB./CU.YD.</u> |
| CEMENT           | 800 (TYPE I or II) | 710 (TYPE III)    |
| WATER            | 282                | 300               |
| FINE AGGREGATE   | 1039               | 1114              |
| COARSE AGGREGATE | 1726               | 1668              |

The use of a water reducer at manufacturer's recommended dosage will be required.

Concrete shall be cured with white pigmented curing compound (AASHTO M148, Type 2) applied as soon as practical at a rate of 125 square feet per gallon. Concrete shall be cured for a minimum of 48 hours before opening to traffic. The 48 hours is based upon a concrete surface temperature of 60° F or higher throughout the cure period. If the concrete temperature falls below 60° F, the cure time shall be extended or other measures shall be taken, at no additional cost to the State. In addition to the curing requirements, a strength of 4,000 psi must be attained prior to opening to traffic.

Concrete shall be covered with suitable insulation blanket consisting of a layer of closed cell polystyrene foam protected by at least one layer of plastic. Insulation blanket shall have an R-value of at least 0.5, as rated by the manufacturer. Insulation blanket shall be left in place, except for joint sawing operations, until the 4000 psi is attained. Insulation blanket shall be overlapped on to the existing concrete by 4'. The initial contraction joint sawing shall be performed as soon as practical after placement to avoid random cracking.

Cost for performing the aforementioned work including sawing and removing concrete, furnishing and placing concrete, sawing and sealing joints, repairing gravel and asphalt concrete shoulders, labor, tools and equipment shall be included in the contract unit price per square yard for Nonreinforced PCC Pavement Repair.

CONTINUOUSLY REINFORCED PCC PAVEMENT REPAIR

Locations and size (length or width) of pavement repair areas are subject to change in the field, at the discretion of the Engineer, at no additional cost to the state. Payment will be based on actual area replaced.

The Engineer will mark the location of the area to be repaired on construction. Where repair crosses both lanes, the passing lane should be repaired first.

The Contractor shall saw the in place concrete transversely at four locations for each repair area. Two saw cuts shall be full depth. The other two saw cuts shall be partial depth saw cuts and shall be made to a depth just above the in place reinforcing steel (3"+), and be placed outside of the previous full depth saw cuts. The outside cuts shall be a minimum of 6” from the nearest tight crack outside of the patch.

The Contractor shall lift out or break out the center section (including reinforcing steel) and then use light chipping hammers (not exceeding 15 pounds) to remove the remaining concrete at each end of the repair area, leaving the reinforcing steel in place. Care shall be taken not to cut, bend or otherwise damage the in place reinforcing steel. Damage to in place reinforcing steel or to in place concrete beyond the repair area will be replaced at the Contractor's expense, to the satisfaction of the Engineer.

The Contractor shall remove and dispose of the in place concrete and in place asphalt concrete.

Existing exposed reinforcing steel and concrete faces shall be cleaned by sandblasting and compressed air to remove dirt and debris prior to placement of concrete.

Place reinforcing steel according to the notes for Reinforcing Steel and Steel Bar Insertion.

Concrete placed adjacent to asphalt concrete shoulders shall be formed full depth to match the width of existing concrete pavement. The excavated area of the asphalt concrete shoulder adjacent to repair areas shall be filled with asphalt concrete.

Concrete shall not be placed in the repair areas before 12:00 pm and should be placed in the late afternoon. Temperature of the concrete at the time of placement shall be between 50°F and 90°F. The temperature of the concrete shall be maintained above 40°F during the curing period.

Saw cuts that extend beyond the repair area shall be minimized and filled with a non-shrinkage mortar mix at the Contractor's expense.

Upon placement of the concrete, repair areas shall be straight edged to ensure a smooth riding surface and shall be textured longitudinally with the pavement by finishing with a stiff broom. Repair areas shall then be checked with a 10' foot straight edge. The permissible longitudinal and transverse surface deviation shall be 1/8" in 10'.

New pavement thickness shall be equal to existing pavement thickness.

Concrete shall meet the requirements of the Standard Specifications Section 380, except as modified by the following notes:

The fine aggregate shall be screened over a one-inch square-opening screen just prior to introduction into the concrete paving mix if required by the Engineer.

CONTINUOUSLY REINFORCED PCC PAVEMENT REPAIR (CONTINUED)

The slump requirement will be limited to 3" maximum after water reducer is added and the concrete shall contain 4.5% to 7.0% entrained air. Coarse aggregate shall be crushed ledge rock, Size No. 1. The Contractor is responsible for the mix design used. The Contractor shall submit a mix design and supporting documentation for approval at least 2 weeks prior to use. In lieu of submitting a mix design the Contractor may use one of the following dependent upon type of cement to be used:

|                  |                    |                   |
|------------------|--------------------|-------------------|
|                  | <u>LB./CU.YD.</u>  | <u>LB./CU.YD.</u> |
| CEMENT           | 800 (TYPE I or II) | 710 (TYPE III)    |
| WATER            | 282                | 300               |
| FINE AGGREGATE   | 1039               | 1114              |
| COARSE AGGREGATE | 1726               | 1668              |

The use of a water reducer at manufacturer's recommended dosage will be required.

Concrete shall be cured with white pigmented curing compound (AASHTO M148, Type 2) applied as soon as practical at a rate of 125 square feet per gallon. Concrete shall be cured a minimum of 48 hours before opening to traffic. The 48 hours is based upon a concrete surface temperature of 60° F or higher throughout the cure period. If the concrete temperature falls below 60° F, the cure time shall be extended or other measures shall be taken, at no additional cost to the State. In addition to the curing requirements, a strength of 4,000 psi must be obtained prior to opening to traffic.

Concrete shall be covered with suitable insulation blanket consisting of a layer of closed cell polystyrene foam protected by at least one layer of plastic. Insulation blanket shall have an R-value of at least 0.5, as rated by the manufacturer. Insulation blanket shall be left in place, except for joint sawing operations. Insulation blanket shall be overlapped on to the existing concrete by 4'.

Cost for performing the aforementioned work including sawing, chipping and removing concrete, sandblasting, cleaning, furnishing and placing concrete and reinforcing steel, finishing and curing, replacing gravel and asphalt concrete shoulders, labor and equipment shall be included in the contract unit price per square yard for Continuously Reinforced PCC Pavement Repair.



REINFORCING STEEL

After removal of the in place concrete and repair of the gravel cushion subgrade, new reinforcing steel shall be installed. Refer to the CRC Pavement Repair Area layouts for details.

1. New No. 6 longitudinal bars shall be lap spliced with the preserved in place longitudinal bars.
2. At full lane width repair areas, additional No. 6 longitudinal bars shall be centered between every other set of two spliced longitudinal bars throughout the width of the repair area. The additional longitudinal bars shall overlap into the existing concrete 9" on both sides of the repair area. Drilled holes will be required and the additional longitudinal bars shall be inserted in accordance with the notes for STEEL BAR INSERTION. The additional longitudinal bars shall then be lap spliced.
3. Additional No. 4 transverse bars shall be centered between the in place transverse bars throughout the length of the repair area. The spacing of transverse bars in the completed repair area should be half the spacing of the in place transverse reinforcing steel (New spacing will be 1.5' or 2').
  - For less than full lane width repair areas and repair areas adjacent to tied longitudinal joints, the additional transverse bars shall overlap into the existing concrete 9". Drilled holes will be required and the additional transverse bars shall be inserted according to the notes for STEEL BAR INSERTION.
  - For full roadway width repair areas, a keyway with factory bent No. 4 lap spliced transverse bars shall be constructed in the longitudinal joint to tie to the transverse bars that will be placed in the adjacent lane.

Cost for this work, including reinforcing steel, ties, labor and equipment shall be incidental to the contract unit price per square yard for Continuously Reinforced PCC Pavement Repair.

STEEL BAR INSERTION - CONTINUOUSLY REINFORCED CONCRETE PAVEMENT (CRCP)

Locations and quantities of concrete repair are subject to change in the field at the discretion of the Engineer. The Contractor will be responsible for ordering the actual quantity of steel bars necessary to complete the work.

Steel bars (No. 6 longitudinal deformed tie bars) shall be inserted 9 inches into the in place concrete at the transverse joint and centered between every other set of two spliced longitudinal bars throughout the width of the repair area. Steel bars (No. 4 transverse deformed tie bars) shall be inserted 9 inches into the in place concrete at the longitudinal joint throughout the length of the repair area. Refer to the notes for REINFORCING STEEL. An epoxy resin adhesive must be used to anchor the steel bar in the drilled hole.

Epoxy resin adhesive shall be of the type intended for horizontal applications, and shall conform to the requirements of ASTM C 881, Type IV, Grade 3 (equivalent to AASHTO M235, Type IV, Grade 3).

The diameter of the drilled holes in the existing concrete pavement for the steel bars shall not be less than 1/8 inch nor more than 3/8 inch greater than the overall diameter of the steel bar. Holes drilled into the existing concrete pavement shall be located at mid-depth of the slab and true and normal (Exception: In the transverse joints, the drilled in longitudinal steel bar angle will be slightly under 90° to allow for centering of the lap splice between existing longitudinal steel).

STEEL BAR INSERTION - CONTINUOUSLY REINFORCED CONCRETE PAVEMENT (CRCP) (CONTINUED)

The drilled holes shall be blown out with compressed air using a device that will reach to the back of the hole to ensure that all debris or loose material has been removed prior to epoxy injection.

A rigid frame or mechanical device will be required to guide the drill to ensure proper horizontal and vertical alignment of the steel bars in the drilled holes.

Mix the epoxy resin as recommended by the manufacturer and apply by an injection method approved by the Engineer. If an epoxy pump is utilized, it shall be capable of metering the components at the manufacturer's designated rate and be equipped with an automatic shut-off. The pump shall shut off when any of the components are not being metered at the designated rate.

Fill the drilled holes 1/3 to 1/2 full of epoxy, or as recommended by the manufacturer, prior to steel bar insertion. Care shall be taken to prevent epoxy from running out of the horizontal holes prior to steel bar insertion. Rotate the steel bar during insertion to eliminate voids and ensure complete bonding of the bar. Insertion of the bars by the dipping method will not be allowed.

Cost for steel bars shall be incidental to the contract unit price per square yard for Continuously Reinforced PCC Pavement Repair.

Cost for the epoxy resin adhesive, drilling of holes, applying the adhesive, inserting the steel bars into the drilled holes and all other items incidental to the insertion of the steel bars shall be incidental to the contract unit price per each for Insert Steel Bar in PCC Pavement.

SAW AND SEAL LONGITUDINAL JOINTS - CRCP

Longitudinal joints (in line with existing longitudinal joints) at concrete repair areas shall be sawed and sealed.

Joints shall not be sealed unless they are thoroughly clean and dry. Cleaning shall be accomplished by sand blasting and other tools as necessary. Just prior to sealing, each joint shall be blown out using a jet of compressed air to remove all traces of dust.

Longitudinal joints shall be sealed with Low Modulus Silicone Sealant or Hot Poured Elastic Joint Sealer.

Acceptance of the Low Modulus Silicone Sealant and Hot Poured Elastic Joint Sealer will be based on visual inspection by the Engineer.

Cost for sawing and sealing of the longitudinal construction joint shall be incidental to the contract unit price per square yard for Continuously Reinforced PCC Pavement Repair.

STEEL BAR INSERTION – NONREINFORCED PCC PAVEMENT

Locations and quantities of concrete repair are subject to change in the field at the discretion of the Engineer. The Contractor will be responsible for ordering the actual quantity of steel bars necessary to complete the work.

On 8" concrete repair areas:

The Contractor shall insert the steel bars (1" x 18" epoxy coated plain round dowel bars and No. 8 x 18" epoxy coated deformed tie bars for transverse joints and No. 5 x 24" epoxy coated deformed tie bars for longitudinal joints) into drilled holes in the existing concrete pavement. An epoxy resin adhesive must be used to anchor the steel bar in the drilled hole.

STEEL BAR INSERTION – NONREINFORCED PCC PAVEMENT (CONTINUED)

On 8.5" to 11.5" concrete repair areas:

The Contractor shall insert the steel bars (1¼" x 18" epoxy coated plain round dowel bars and No. 9 x 18" epoxy coated deformed tie bars for transverse joints and No. 5 x 24" epoxy coated deformed tie bars for longitudinal joints) into drilled holes in the existing concrete pavement. An epoxy resin adhesive must be used to anchor the steel bar in the drilled hole.

Plain round dowel bars shall be cut to the specified length by sawing and shall be free from burring or other deformations. Shearing will not be permitted.

Epoxy resin adhesive shall be of the type intended for horizontal applications, and shall conform to the requirements of ASTM C 881, Type IV, Grade 3 (equivalent to AASHTO M235, Type IV, Grade 3).

Steel bars shall be inserted in the transverse joint on 18" centers. The first steel bar in the transverse joint shall be placed 9" from the edge of the slab closest to centerline. Steel bars shall be inserted in the longitudinal joint on 30" centers and shall be a minimum of 15" from either transverse joint. A typical one-lane patch 12' wide and 6' long will require 18 steel bars (8 in each transverse joint and 2 in the longitudinal joint).

The diameter of the drilled holes in the existing concrete pavement for the steel bars shall not be less than 1/8 inch nor more than 3/8 inch greater than the overall diameter of the steel bar. Holes drilled into the existing concrete pavement shall be located at mid-depth of the slab and true and normal. The drilled holes shall be blown out with compressed air using a device that will reach to the back of the hole to ensure that all debris or loose material has been removed prior to epoxy injection.

A rigid frame or mechanical device will be required to guide the drill to ensure proper horizontal and vertical alignment of the steel bars in the drilled holes.

Mix the epoxy resin as recommended by the manufacturer and apply by an injection method approved by the Engineer. If an epoxy pump is utilized, it shall be capable of metering the components at the manufacturer's designated rate and be equipped with an automatic shut-off. The pump shall shut off when any of the components are not being metered at the designated rate.

Fill the drilled holes 1/3 to 1/2 full of epoxy, or as recommended by the manufacturer, prior to insertion of the steel bar. Care shall be taken to prevent epoxy from running out of the horizontal holes prior to steel bar insertion. Rotate the steel bar during insertion to eliminate voids and ensure complete bonding of the bar. Insertion by the dipping method will not be allowed.

Cost for the epoxy resin adhesive, steel bars, drilling of holes, inserting the steel bars into the drilled holes and all other items incidental to the insertion of the steel bars shall be included in the contract unit price per each for Insert Steel Bar In PCC Pavement.



| STATE<br>OF<br>SOUTH<br>DAKOTA | PROJECT                                 | SHEET | TOTAL<br>SHEETS |
|--------------------------------|---|-------|-----------------|
|                                | 2011 YANKTON AREA<br>CRCP & PCCP REPAIR | 7     | 24              |

**SAW AND SEAL JOINTS – NONREINFORCED PCC PAVEMENT**

All longitudinal and transverse joints at concrete repair areas shall be sawed and sealed.

Joints shall not be sealed unless they are thoroughly clean and dry. Cleaning shall be accomplished by sand blasting and other tools as necessary. Just prior to sealing, each joint shall be blown out using a jet of compressed air to remove all traces of dust.

Longitudinal and transverse joints in urban sections shall be sealed with Hot Poured Elastic Joint Sealer. Transverse joints in rural sections shall be sealed with Low Modulus Silicone Sealant. Longitudinal joints in rural sections may be sealed with either Hot Poured Elastic Joint Sealer or Low Modulus Silicone Sealant.

Acceptance of the Low Modulus Silicone Sealant and Hot Poured Elastic Joint Sealer will be based on visual inspection by the Engineer.

Cost for sawing and sealing of the longitudinal construction joint and both transverse joints shall be incidental to the contract unit price per square yard for Nonreinforced PCC Pavement Repair.

**TEMPORARY PAVEMENT MARKING**

Temporary pavement marking on lane closure tapers shall consist of Temporary Road Markers. (Two workspaces with a 180’ taper on 081-292 PCN I23G, one workspace with a 780’ taper on 050W-292 PCN I23D, three workspaces with 780’ tapers on 029S-291 PCN I23E , one workspace with a 780’ taper on 029 N-291 PCN I23F, two workspaces with 600’ tapers on 029N-291 PCN I23F). Three workspaces require 1000’ double yellow on 081-292 PCN I23H for no passing zone marking.

Cost shall be included in the contract unit price per foot for Temporary Road Markers.

Temporary pavement marking for stop bars shall consist of 4” Temporary Pavement Marking Tape Type 2. Placement of each 24” white stop bar shall be accomplished by placing six pieces of 4” x 12’ tape adjacent to one another. Each workspace requires two stop bars which is an equivalent of approximately 144’ of 4” tape (three workspaces at 144’ =432’).

Cost shall be included in the contract unit price per foot for 4” Temporary Pavement Marking Tape Type 2.

**GENERAL MAINTENANCE OF TRAFFIC**

Removing, relocating, covering, salvaging and resetting of permanent traffic control devices, including delineation, shall be the responsibility of the Contractor. Cost for this work shall be incidental to the contract unit prices for the various items unless otherwise specified in the plans. Any delineators and signs damaged or lost shall be replaced by the Contractor at no cost to the State.

Storage of vehicles and equipment shall be outside the clear zone and as near as possible to the right-of-way line. Contractor’s employees should mobilize at a location off the right-of-way and arrive at the work sites in a minimum number of vehicles necessary to perform the work.

Indiscriminate driving and parking of vehicles within the right-of-way will not be permitted. Any damage to the vegetation, surfacing, embankment, delineators and existing signs resulting from such indiscriminate use shall be repaired and/or restored by the Contractor, at no expense to the State, and to the satisfaction of the Engineer.

The Contractor shall provide documentation that all breakaway sign supports comply with FHWA NCHRP 350 or MASH crash-worthy requirements. The Contractor shall provide installation details at the preconstruction meeting for all breakaway sign support assemblies.

Sufficient traffic control devices have been included in these plans to sign two workspaces on a two-lane highway and two workspaces on a four-lane highway. If the Contractor elects to work on additional sites simultaneously, the cost for additional traffic control devices shall be incidental to the contract unit price per unit for Traffic Control.

**MAINTENANCE OF TRAFFIC – PCC PAVEMENT REPAIR**

A Type III Barricade shall be installed at the end of a lane closure taper as detailed in these plans. Additional Type III Barricades shall be installed facing traffic within the closed lane at a spacing of 1/4 mile.

Each mainline concrete repair location from which the in place concrete has been removed shall be marked with a minimum of two reflectorized cones (42” minimum height) or two reflectorized drums. In areas containing numerous concrete repair locations, two reflectorized drums should be installed at a spacing of 660’ alternating with the Type III Barricades.

Signs may be mounted on portable supports.

Drivers in one lane two-way traffic workspaces must be able to see approaching traffic through and beyond the workspaces.

Construction workspaces on divided roadways shall be limited to 3 miles in length. Construction workspaces on undivided roadways shall be limited to 300 feet in length. The distance between the closest points of any two construction workspaces, including channeling devices, shall not be less than 3 miles. Drivers in two-way traffic workspaces must be able to see approaching traffic through and beyond the work zone.

Construction workspaces in urban areas shall be limited to 3 blocks in length. The minimum distance between workspaces shall be 3 blocks.

When work is in progress within an intersection, Flaggers will be required to direct traffic.

Holes adjacent to centerline in the lane open to traffic created during removal and replacement of PCC Pavement Repair areas shall be filled with gravel and cold-mix asphalt concrete prior to opening the lane to traffic. Gravel and cold-mix asphalt concrete can be obtained from the Department of Transportation Maintenance shops located at Tyndall, Yankton or Junction City.

**MAINTENANCE OF TRAFFIC – PCC PAVEMENT REPAIR (CONTINUED)**

Holes in the gravel and asphalt concrete shoulders created during removal and replacement of PCC Pavement Repair areas shall be filled with gravel and hot-mix asphalt concrete (to match the shoulder surfacing) prior to opening the lane to traffic. Gravel can be obtained from the Department of Transportation Maintenance shops located at Tyndall, Yankton or Junction City. Hot-mix asphalt concrete shall be furnished by the Contractor.

Cost for furnishing, hauling and placing gravel and asphalt concrete shall be incidental to the contract unit price per square yard for Nonreinforced PCC Pavement Repair and Continuously Reinforced PCC Pavement Repair.

Routing traffic onto the shoulders during any phase of the construction will not be allowed.

Damage to the shoulders, median or ditch due to the Contractor's operations shall be repaired by the Contractor, to the satisfaction of the Engineer, at no expense to the State. This includes the routing of traffic onto these shoulders around the work zones.

**MAINTENANCE OF TRAFFIC (INTERSTATE HIGHWAYS)**

Lane closures shall be limited to 3 miles in length. The distance between the closest points of any two-lane closures, excluding taper, shall not be less than 3 miles.

Work activities shall not be conducted simultaneously on the median and outside shoulders of the same directional set of lanes.

The use of interstate maintenance crossovers will not be permitted.

Traffic will be permitted on the ramp shoulders when necessary to allow traffic around a workspace.



ITEMIZED LIST FOR TRAFFIC CONTROL

| SIGN CODE   | SIGN SIZE  | DESCRIPTION                                   | NUMBER<br>REQUIRED | UNITS PER<br>SIGN | UNITS |
|-------------|------------|---|--------------------|-------------------|-------|
| E5-1        | 36" x 32"  | EXIT GORE SIGN                                |                    | 24                |       |
| G20-2       | 36" x 18"  | END ROAD WORK                                 | 8                  | 17                | 136   |
| R1-1        | 48" x 48"  | STOP  | 4                  | 34                | 136   |
| R1-2        | 48" x 48"  | YIELD   |                    | 34                |       |
| R2-1        | 30" x 36"  | SPEED LIMIT __                                |                    | 23                |       |
| R2-6        | 24" x 24"  | FINES DOUBLE                                  |                    | 16                |       |
| R4-7        | 24" x 30"  | KEEP RIGHT (SYMBOL)                           |                    | 18                |       |
| R5-1        | 48" x 48"  | DO NOT ENTER                                  |                    | 34                |       |
| R5-1a       | 48" x 36"  | WRONG WAY                                     |                    | 29                |       |
| R10-6       | 24" x 36"  | STOP HERE ON RED                              |                    | 20                |       |
| R11-2       | 48" x 30"  | ROAD CLOSED                                   |                    | 27                |       |
| R11-3a      | 60" x 30"  | ROAD CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY |                    | 30                |       |
| R11-4       | 60" x 30"  | ROAD CLOSED TO THRU TRAFFIC                   |                    | 30                |       |
| SW12-1b     | 120" x 60" | HIGHWAY WORKERS GIVE'EM A BRAKE               |                    | 80                |       |
| W1-1        | 48" x 48"  | LEFT OR RIGHT TURN ARROW                      |                    | 34                |       |
| W1-2        | 48" x 48"  | LEFT OR RIGHT CURVE ARROW                     |                    | 34                |       |
| W1-3        | 48" x 48"  | REVERSE TURN SIGN (LEFT OR RIGHT)             | 2                  | 34                | 68    |
| W1-4        | 48" x 48"  | REVERSE CURVE SIGN (LEFT OR RIGHT)            |                    | 34                |       |
| W3-1        | 48" x 48"  | STOP AHEAD (SYMBOL)                           | 4                  | 34                | 136   |
| W3-2        | 48" x 48"  | YIELD AHEAD (SYMBOL)                          |                    | 34                |       |
| W3-3        | 48" x 48"  | SIGNAL AHEAD (SYMBOL)                         |                    | 34                |       |
| W3-4        | 48" x 48"  | BE PREPARED TO STOP                           |                    | 34                |       |
| W3-5        | 48" x 48"  | SPEED REDUCTION (__ MPH)                      |                    | 34                |       |
| W4-1        | 48" x 48"  | MERGE (SYMBOL)                                |                    | 34                |       |
| W4-2        | 48" x 48"  | LEFT OR RIGHT LANE ENDS (SYMBOL)              | 2                  | 34                | 68    |
| W5-2        | 48" x 48"  | NARROW BRIDGE                                 |                    | 34                |       |
| W5-4        | 48" x 48"  | RAMP NARROWS                                  | 1                  | 34                | 34    |
| W7-3a       | 30" x 24"  | NEXT __ MILES                                 |                    | 18                |       |
| W8-1        | 36" x 36"  | BUMP  |                    | 27                |       |
| W8-6        | 48" x 48"  | TRUCK CROSSING                                |                    | 34                |       |
| W8-7        | 36" x 36"  | LOOSE GRAVEL                                  |                    | 27                |       |
| W8-9a       | 48" x 48"  | SHOULDER DROP-OFF                             |                    | 34                |       |
| W8-11       | 48" x 48"  | UNEVEN LANES                                  |                    | 34                |       |
| W13-1       | 24" x 24"  | ADVISORY SPEED PLATE                          | 3                  | 16                | 48    |
| W13-4       | 24" x 24"  | ON RAMP                                       | 1                  | 16                | 16    |
| W20-1       | 48" x 48"  | ROAD WORK AHEAD                               | 6                  | 34                | 204   |
| W20-2       | 48" x 48"  | DETOUR AHEAD                                  |                    | 34                |       |
| W20-3       | 48" x 48"  | ROAD CLOSED AHEAD                             |                    | 34                |       |
| W20-4       | 48" x 48"  | ONE LANE ROAD AHEAD                           | 4                  | 34                | 136   |
| W20-5       | 48" x 48"  | LT. OR RT. LANE CLOSED AHEAD                  | 2                  | 34                | 68    |
| W20-7a      | 48" x 48"  | FLAGGER                                       | 2                  | 34                | 68    |
| W21-1a      | 48" x 48"  | WORKERS (SYMBOL)                              |                    | 34                |       |
| W21-2       | 36" x 36"  | FRESH OIL                                     |                    | 27                |       |
| W21-3       | 48" x 48"  | ROAD MACHINERY AHEAD                          |                    | 34                |       |
| W21-5       | 48" x 48"  | SHOULDER WORK                                 |                    | 34                |       |
| W21-5a      | 48" x 48"  | RIGHT SHOULDER CLOSED                         |                    | 34                |       |
| W21-5b      | 48" x 48"  | RIGHT SHOULDER CLOSED AHEAD                   |                    | 34                |       |
| *****       | 12" x 36"  | TYPE III OBJECT MARKER                        |                    | 15                |       |
| *****       | *****      | TYPE III BARRICADE - 8 FT. SINGLE SIDED       | 6                  | 40                | 240   |
| *****       | *****      | TYPE III BARRICADE - 8 FT. DOUBLE SIDED       |                    | 56                |       |
| TOTAL UNITS |            |   |                    | 1358              |       |



Plotting Date: 21-MAR-2011

| Posted Speed Prior to Work (M.P.H.) | Spacing of Advance Warning Signs (Feet) (A) | Spacing of Channelizing Devices (Feet) (G) |
|-------------------------------------|---|--|
| 0 - 30                              | 200   | 25   |
| 35 - 40                             | 350   | 25   |
| 45 - 50                             | 500   | 50   |
| 55                                  | 750   | 50   |
| 60 - 65                             | 1000  | 50   |

- Flagger
- Channelizing Device

For low-volume traffic situations with short work zones on straight roadways where the flagger is visible to road users approaching from both directions, a single flagger may be used.

The ROAD WORK AHEAD and the END ROAD WORK signs may be omitted for short duration operations (1 hour or less).

For tack and/or flush seal operations, when flaggers are not being used, the FRESH OIL sign (W21-2) shall be displayed in advance of the liquid asphalt areas.

Flashing warning lights and/or flags may be used to call attention to the advance warning signs.

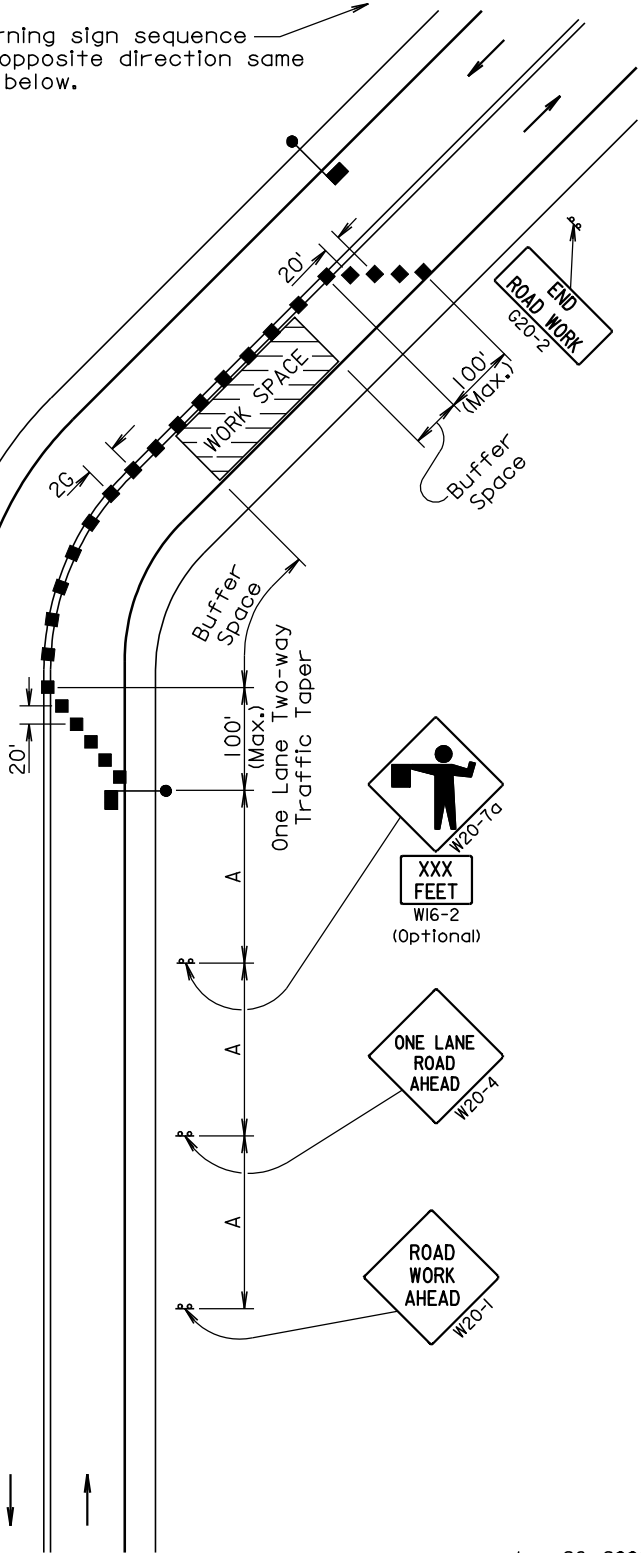
The channelizing devices shall be drums or type II barricades if traffic control must remain overnight or longer. During daylight hours, 42" cones may be used in lieu of drums or type II barricades along the centerline.

Channelizing devices are not required along the centerline adjacent to work area when pilot cars are utilized for escorting traffic through the work area.

Channelizing devices and flaggers shall be used at intersecting roads to control intersecting road traffic as required.

The buffer space shall be a sufficient length so that the channelizing devices are visible to approaching traffic.

Warning sign sequence in opposite direction same as below.



June 26, 2006

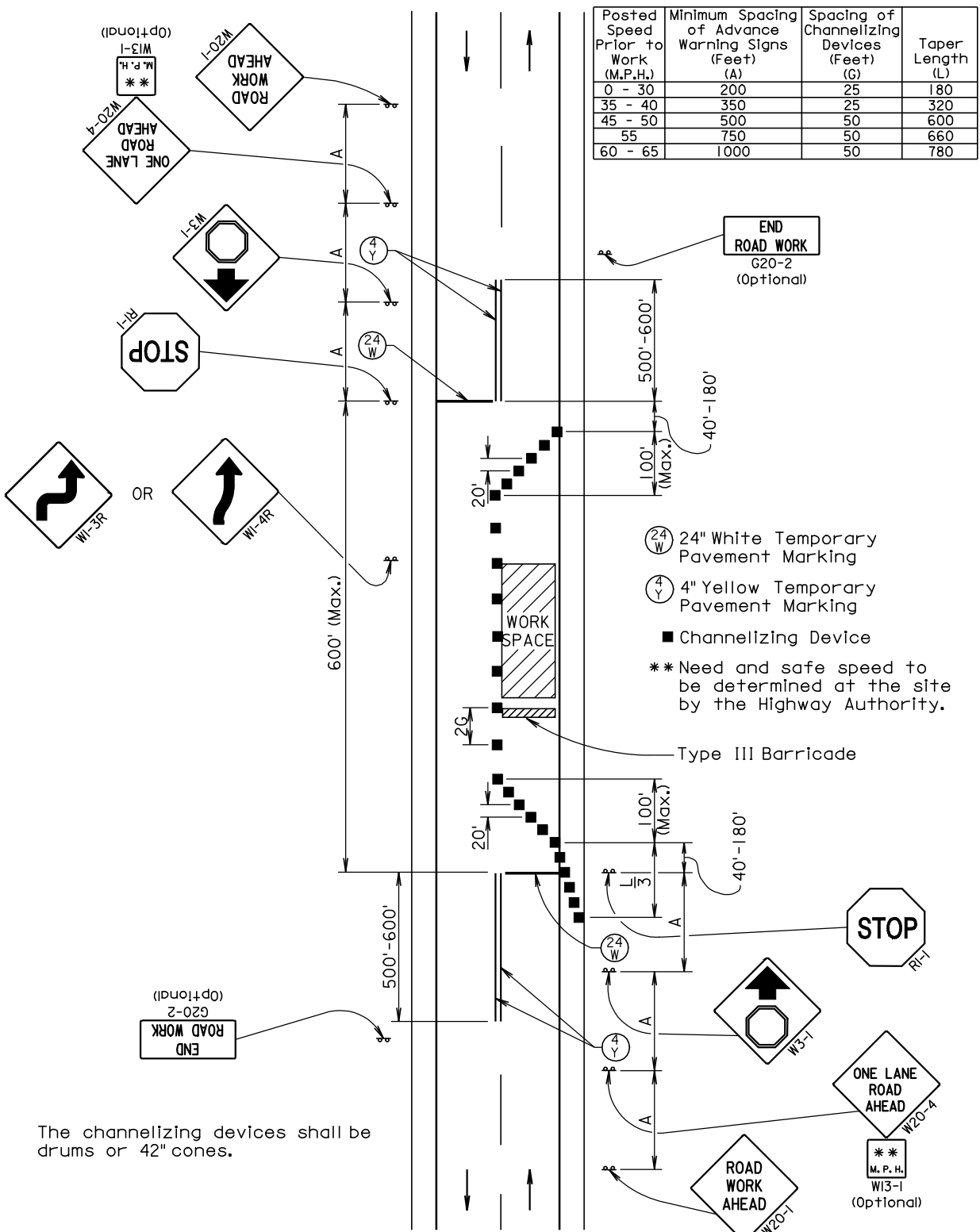
Published Date: 1st Qtr. 2011

SDOT

GUIDES FOR TRAFFIC CONTROL DEVICES  
LANE CLOSURE WITH FLAGGER PROVIDED

PLATE NUMBER  
634.23

Sheet 1 of 1



December 23, 2010

Published Date: 1st Qtr. 2011

SDOT

GUIDES FOR TRAFFIC CONTROL DEVICES  
LANE CLOSURE USING STOP SIGNS

PLATE NUMBER  
634.25

Sheet 1 of 1



Plotting Date: 21-MAR-2011

| Posted<br>Speed<br>Prior to<br>Work<br>(M.P.H.) | Spacing of<br>Advance Warning<br>Signs<br>(Feet) |     |     | Taper<br>Length<br>(Feet) | Spacing of<br>Channelizing<br>Devices<br>(Feet) |
|---|--|-----|-----|---------------------------|---|
|   | (A)  | (B) | (C) |                           |   |
| 0 - 30  | 200  |     |     | 180                       | 25  |
| 35 - 40   | 350  |     |     | 320                       | 25  |
| 45 - 50   | 500  |     |     | 600                       | 50  |
| 55  | 750  |     |     | 660                       | 50  |
| 60 - 65   | 1000   |     |     | 780                       | 50  |

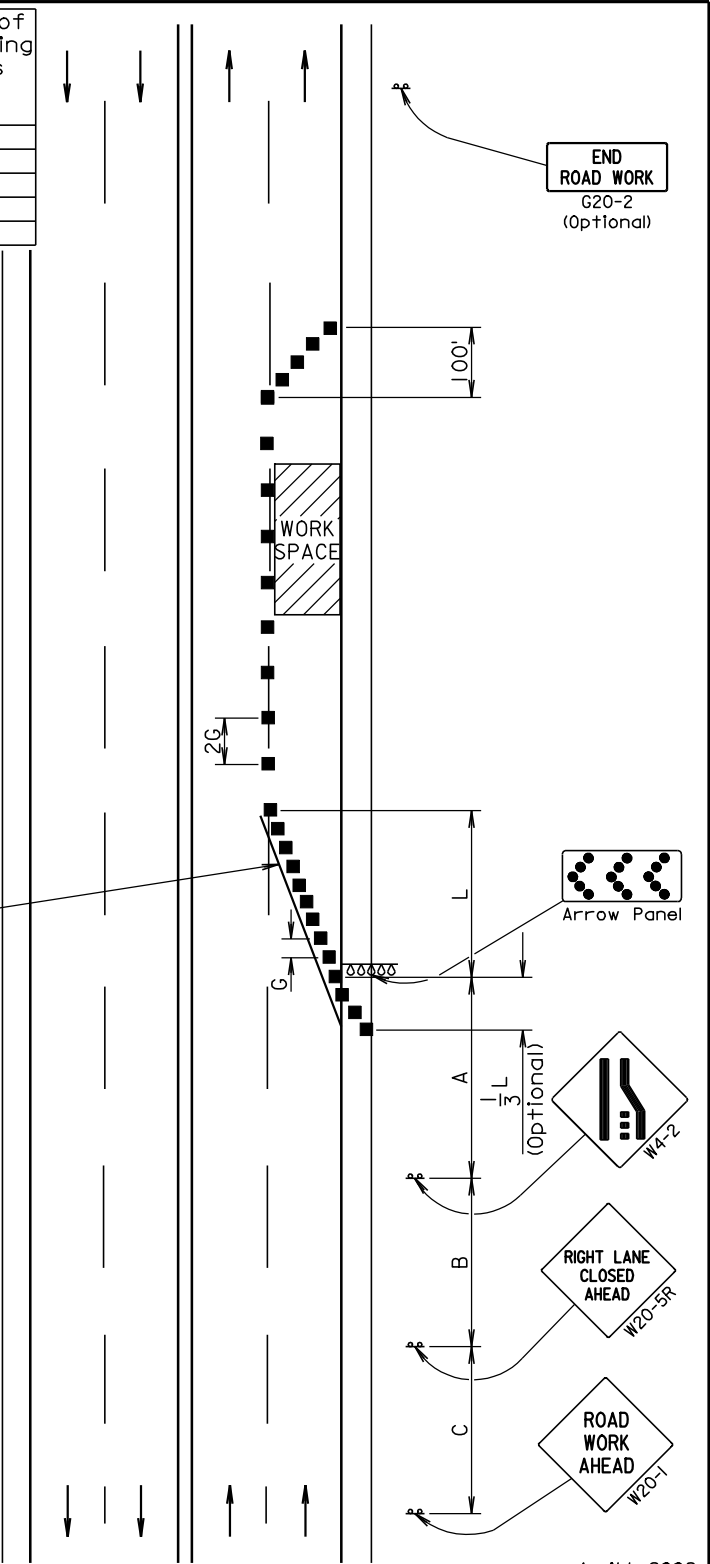
■ Channelizing Device

Drums or Type II Barricades shall be used if required overnight.

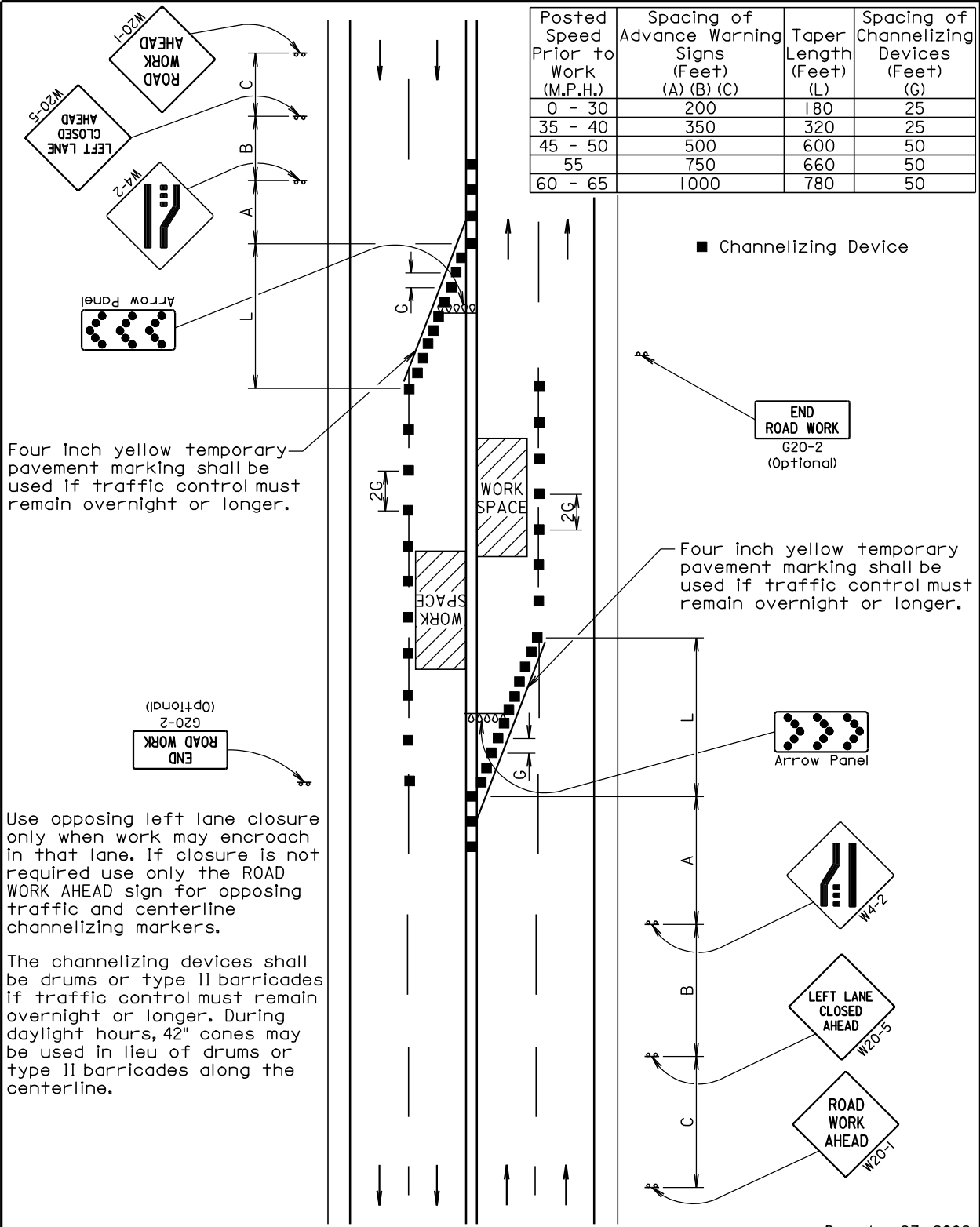
42" cones may be used along centerline

Longitudinal dimensions may be adjusted to fit project conditions such as horizontal curves, vertical curves, and other site restrictions.

Four inch white temporary pavement marking shall be used if traffic control must remain overnight or longer.



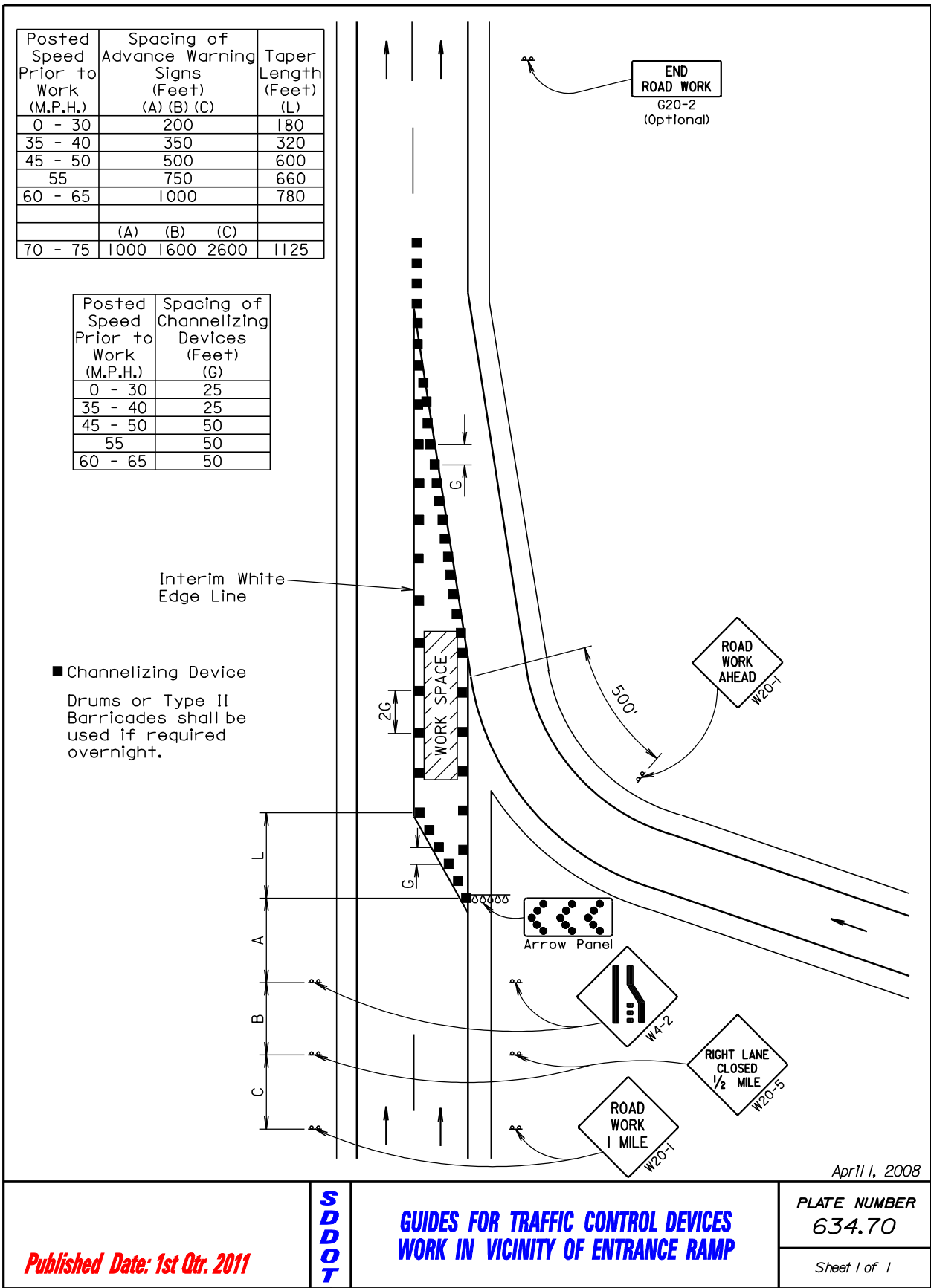
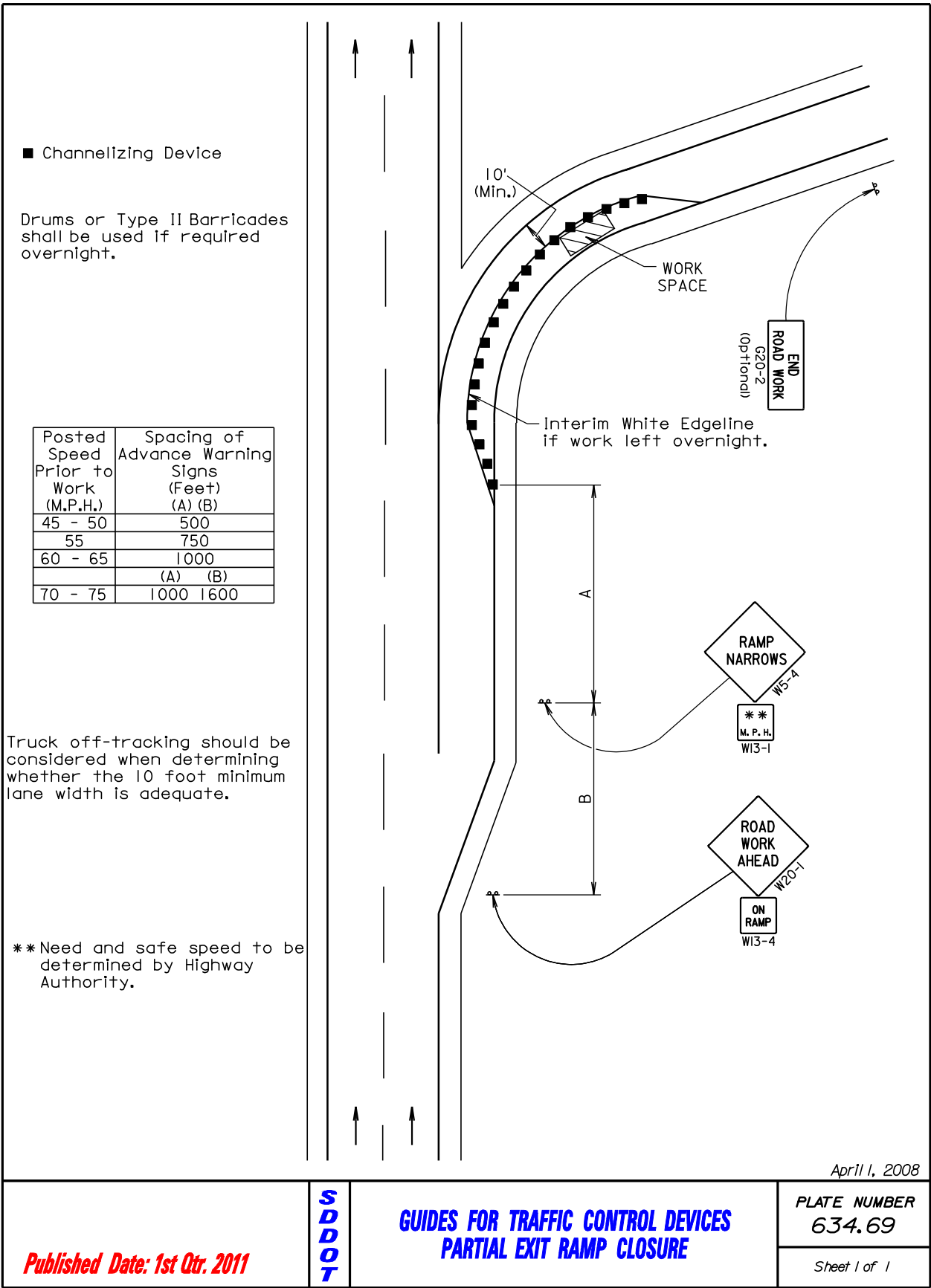
April 1, 2008



December 23, 2008

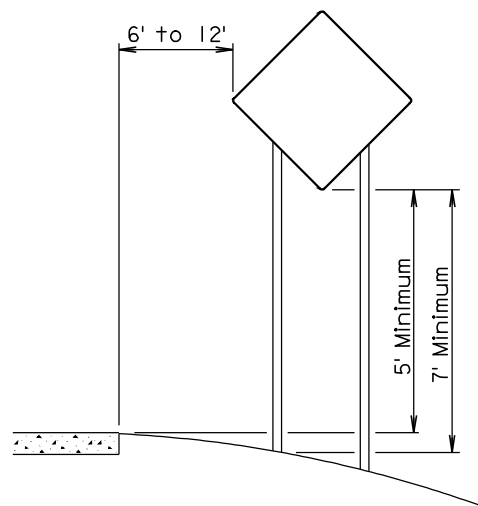


Plotting Date: 21-MAR-2011

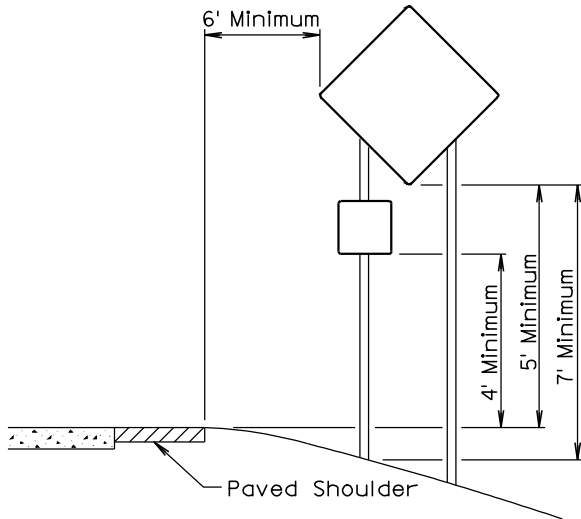




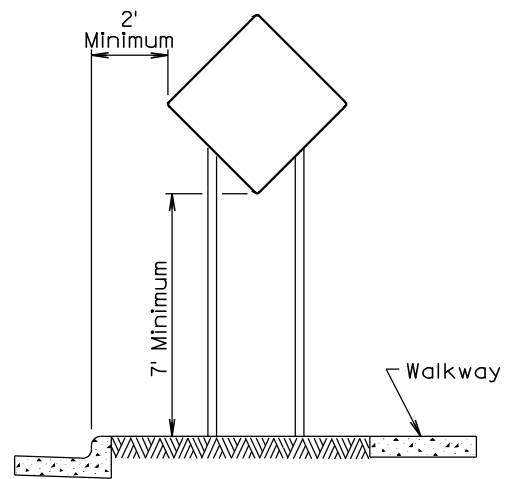
Plotting Date: 21-MAR-2011



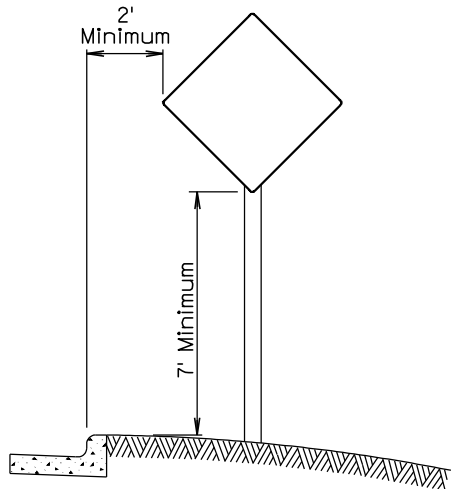
RURAL DISTRICT



RURAL DISTRICT WITH  
SUPPLEMENTAL PLATE



URBAN DISTRICT



URBAN DISTRICT

December 23, 2003

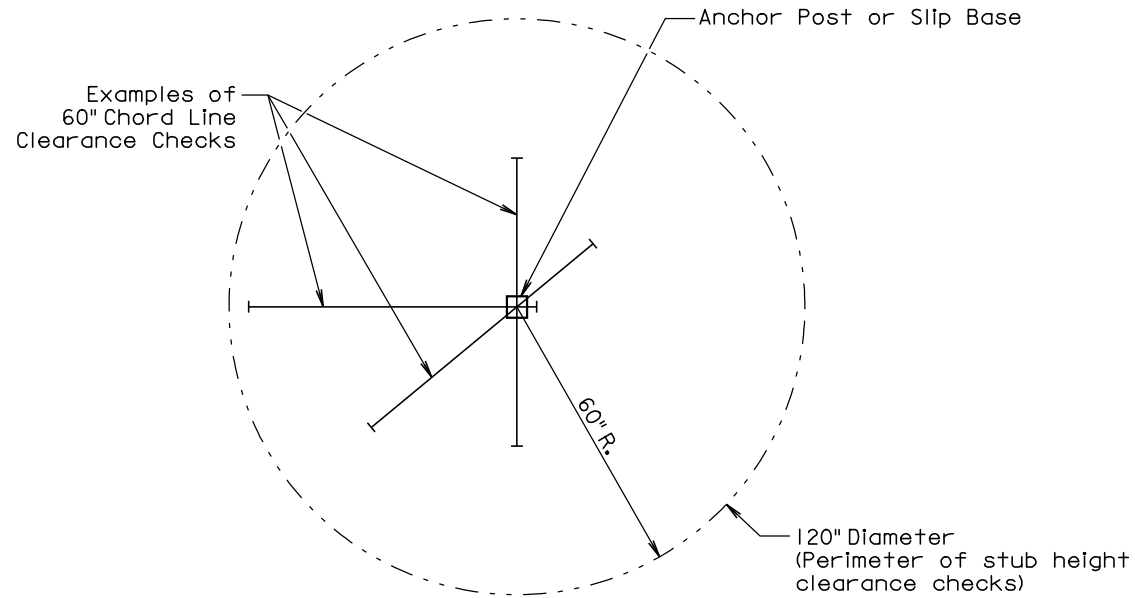
Published Date: 1st Qtr. 2011

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**BREAKAWAY SIGN SUPPORTS**  
(Typical Construction Signing)

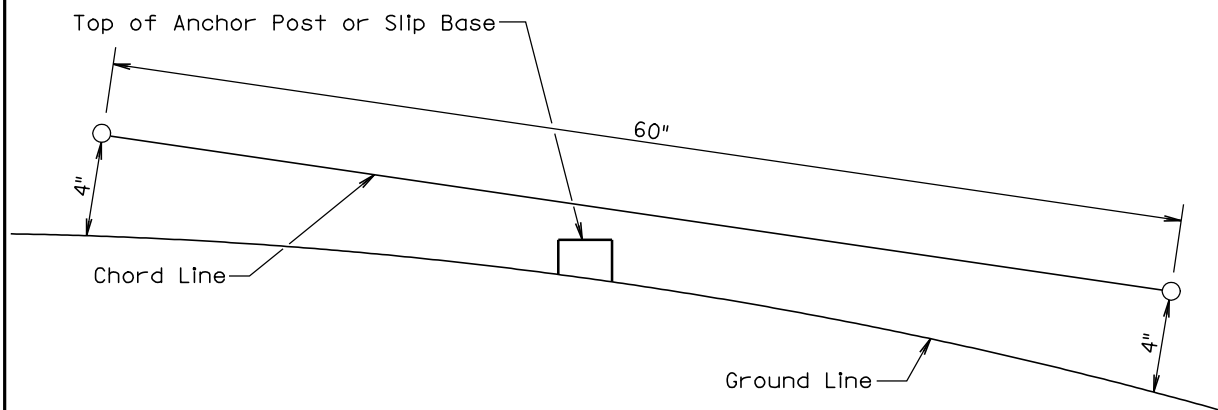
PLATE NUMBER  
634.85

Sheet 1 of 1



PLAN VIEW

(Examples of stub height clearance checks)



ELEVATION VIEW

GENERAL NOTES:

The top of anchor posts and slip bases SHALL NOT extend above a 60" chord line within a 120" diameter circle around the post with ends 4" above the ground.

At locations where there is curb and gutter adjacent to the breakaway sign support, the stub height shall be a maximum of 4" above the ground line at the localized area adjacent to the breakaway support stub.

The 4" stub height clearance is not necessary for U-channel lap splices where the support is designed to yield (bend) at the base.

July 1, 2005

Published Date: 1st Qtr. 2011

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**BREAKAWAY SUPPORT STUB CLEARANCE**

PLATE NUMBER  
634.99

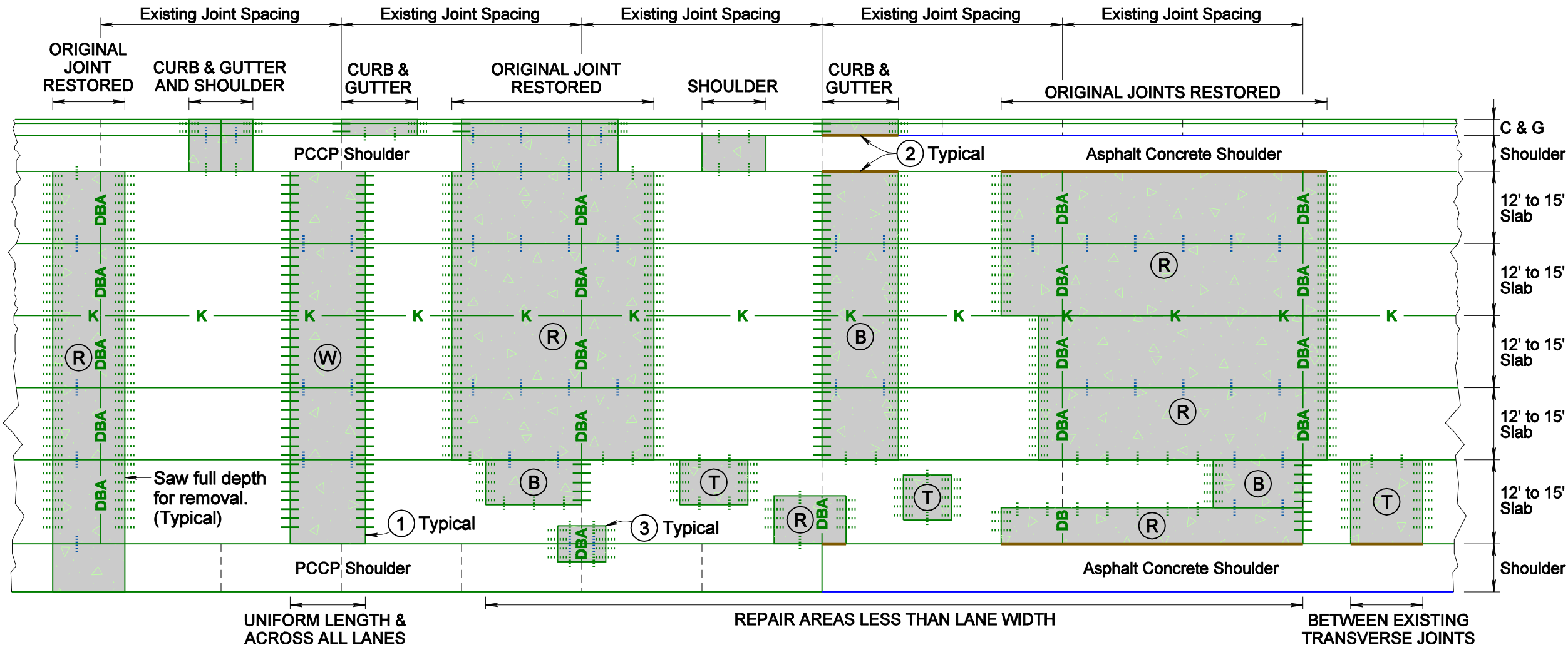
Sheet 1 of 1



# NONREINFORCED PCC PAVEMENT REPAIR

UP TO FOUR LANE ROADWAY WITH CENTER TURN LANE OR UP TO TEN LANE DIVIDED ROADWAY  
TYPICAL REPAIR AREAS

| STATE OF SOUTH DAKOTA | PROJECT                              | SHEET | TOTAL SHEETS |
|-----------------------|--------------------------------------|-------|--------------|
|                       | 2011 YANKTON AREA CRCP & PCCP REPAIR | 13    | 24           |



**KEY:**

PCC Pavement Repair Area

**PCC PAVEMENT REPAIR AREA TYPES:**

- (W)** Two Working Joints (Use only if repair is full roadway width and uniform length (across all lanes))
- (T)** Two Tied Joints
- (B)** One Working & One Tied Joint
- (R)** Two Tied Joints with Original Joint Restored with Dowel Bar Assembly

**Longitudinal Keyway Joints Without Bars**

**K** Where a repair area intersects an existing longitudinal keyway joint without tie bars, the newly constructed joint should also be a keyway without tie bars.

**Steel Bars for Transverse Joints**

**Pavement Thickness  $\geq 8.5"$**

Drilled in  $1\frac{1}{4}" \times 18"$  epoxy coated deformed tie bars spaced 18" center to center.

Drilled in No. 9  $\times 18"$  epoxy coated deformed tie bars spaced 18" center to center.

**Pavement Thickness  $< 8.5"$**

Drilled in  $1" \times 18"$  epoxy coated deformed tie bars spaced 18" center to center.

Drilled in No. 8  $\times 18"$  epoxy coated deformed tie bars spaced 18" center to center.

**DBA** Dowel Bar Assembly

**Steel Bars for Longitudinal Joints**

No. 5  $\times 30"$  epoxy coated deformed tie bars. Sawn Joint - spaced 48" center to center. Construction Joint - spaced 48" center to center.

No. 5  $\times 24"$  epoxy coated deformed tie bars. Drilled In - spaced 30" center to center.

**NOTES:** Saw around repair areas full depth for removal.

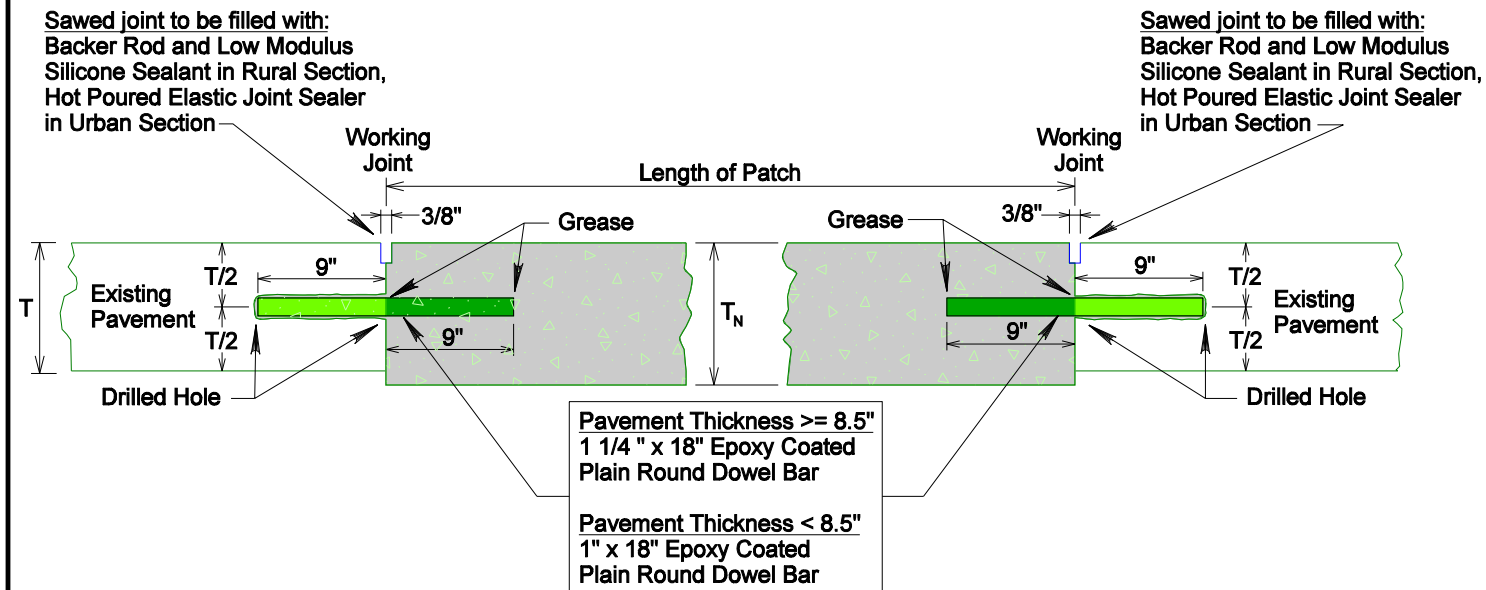
- (1)** Where possible, transverse joints shall be constructed/maintained full roadway width.
- (2)** Edges of repair areas shall be formed to match the width of the existing concrete pavement.
- (3)** Need for bars in small repair areas on/near the shoulder to be determined on a case-by-case basis, on construction by the Engineer.



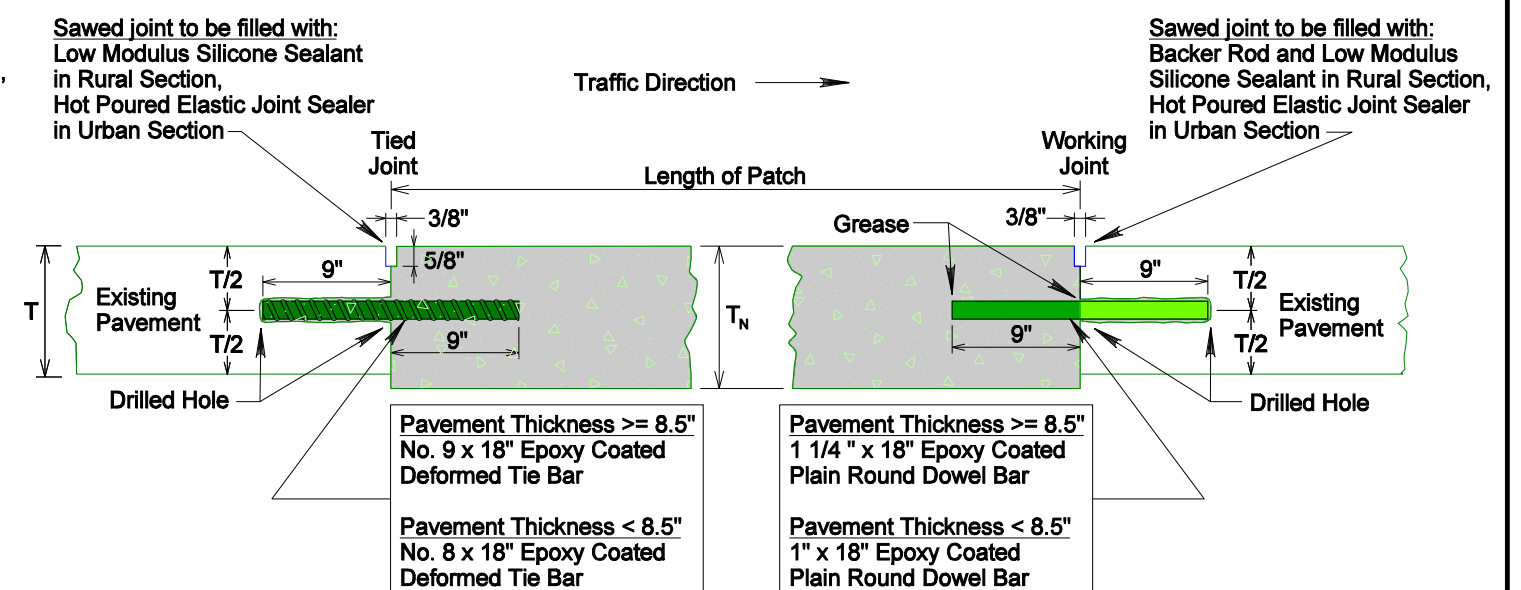
# NONREINFORCED PCC PAVEMENT REPAIR

| STATE<br>OF<br>SOUTH<br>DAKOTA | PROJECT                                 | SHEET | TOTAL<br>SHEETS |
|--------------------------------|---|-------|-----------------|
|                                | 2011 YANKTON AREA<br>CRCP & PCCP REPAIR | 14    | 24              |

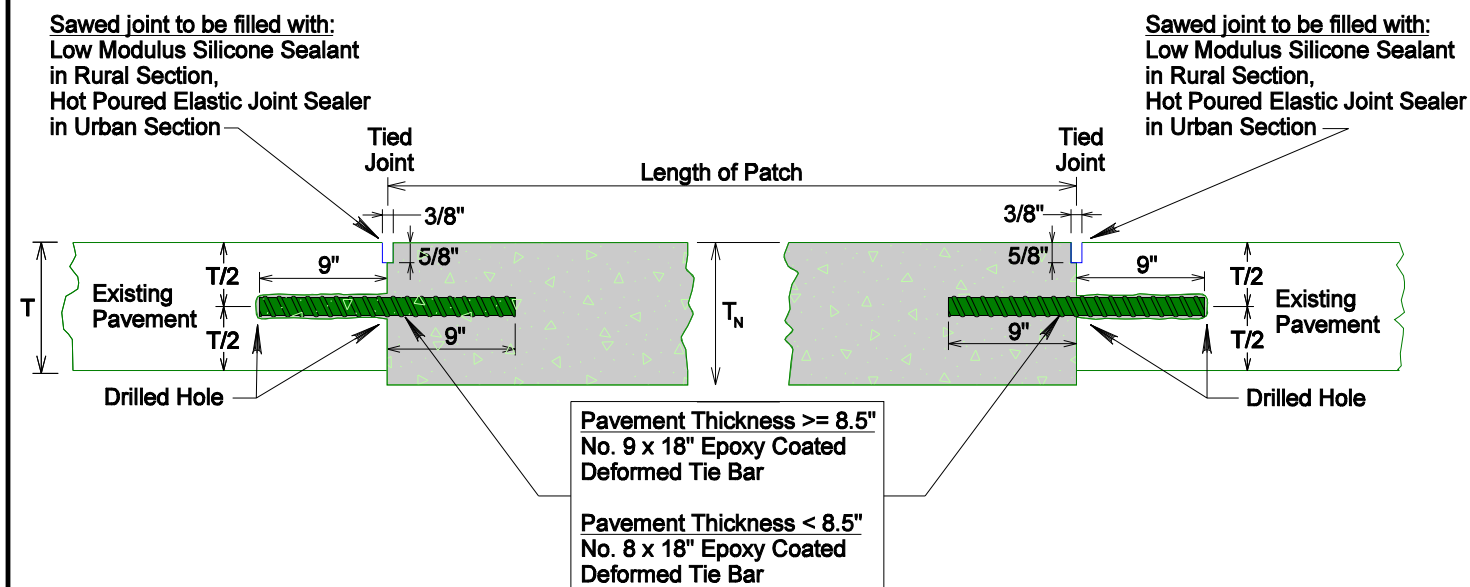
**PLAIN ROUND DOWEL BAR INSERTION  
TYPE W - (TWO WORKING JOINTS)**



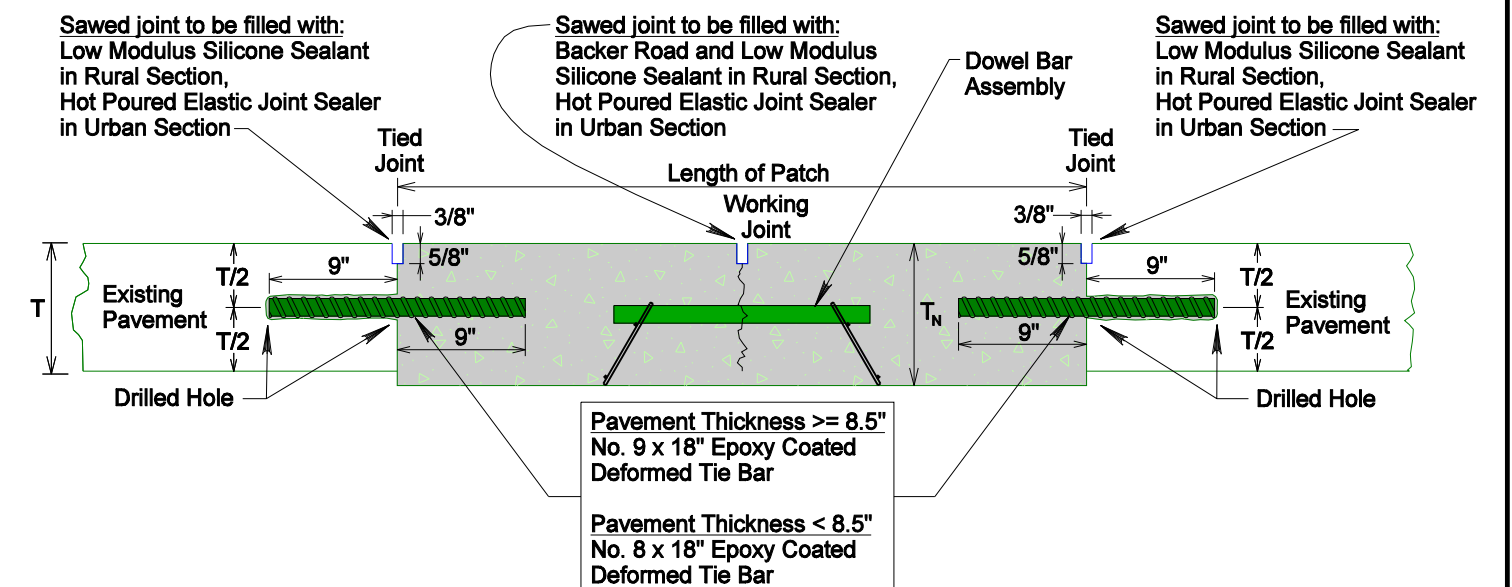
**DEFORMED TIE BAR AND PLAIN ROUND DOWEL BAR INSERTION  
TYPE B - (ONE TIED JOINT AND ONE WORKING JOINT)**



**DEFORMED TIE BAR INSERTION  
TYPE T - (TWO TIED JOINTS)**



**DEFORMED TIE BAR INSERTION WITH DOWEL BAR ASSEMBLY  
TYPE R - (TWO TIED JOINTS AND ONE WORKING JOINT - ORIGINAL JOINT RESTORED)**



T = Existing pavement thickness.  
T<sub>N</sub> = New pavement thickness (1" thicker than existing).

Bar embedded to a minimum depth of 9 inches into the existing pavement by utilizing an epoxy resin adhesive.

Cost for furnishing and inserting steel bars (deformed tie and plain round dowel) shall be included in the contract unit price per each for Insert Steel Bar in PCC Pavement.

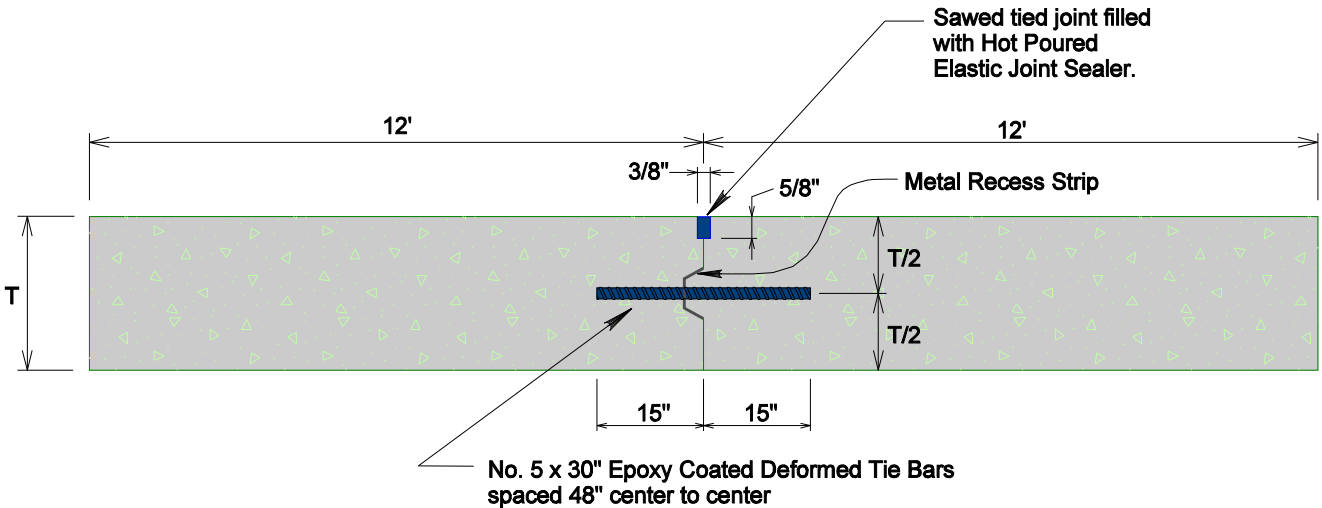
Cost for furnishing and installing dowel bar assembly shall be included in the contract unit price per each for Dowel Bar.



# NONREINFORCED PCC PAVEMENT REPAIR

| STATE<br>OF<br>SOUTH<br>DAKOTA | PROJECT                                 | SHEET | TOTAL<br>SHEETS |
|--------------------------------|---|-------|-----------------|
|                                | 2011 YANKTON AREA<br>CRCP & PCCP REPAIR | 15    | 24              |

## LONGITUDINAL CONSTRUCTION JOINT WITH TIE BARS & KEYWAY

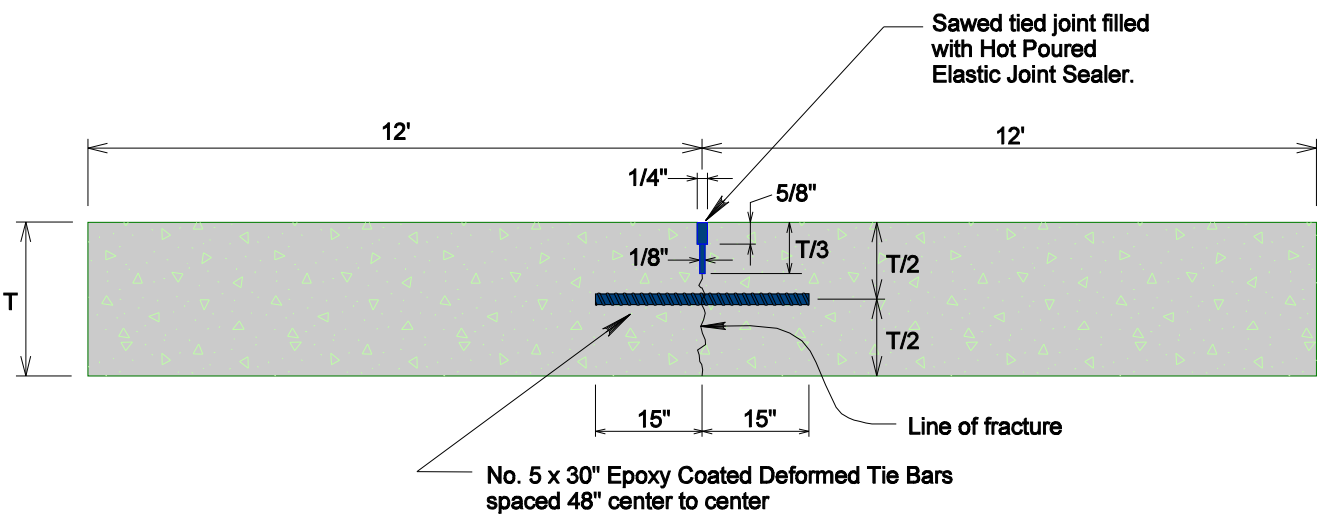


T = New pavement thickness.

Deformed tie bars will only be inserted on centerline when there is full width pavement removal.

Cost for furnishing and inserting centerline tie bars shall be incidental to the contract unit price per square yard for Nonreinforced PCC Pavement Repair.

## SAWED LONGITUDINAL JOINT

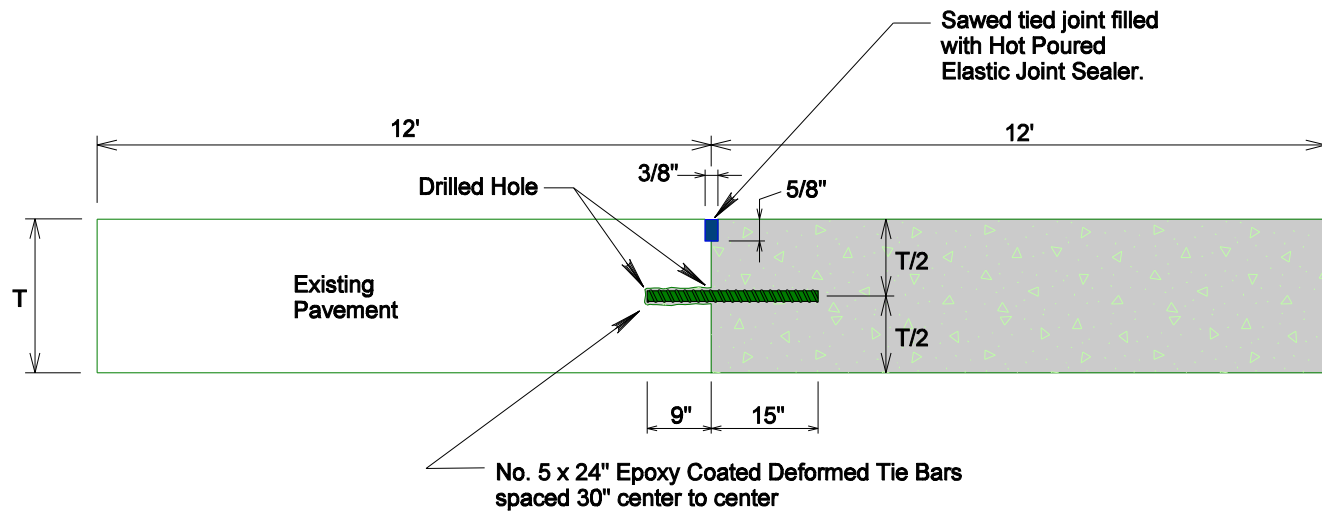


T = New pavement thickness.

The first saw cut to control cracking shall be a minimum of 1/3 the depth of the pavement. Additional sawing for widening the saw cut will be necessary.

Cost for furnishing and inserting centerline tie bars shall be incidental to the contract unit price per square yard for Nonreinforced PCC Pavement Repair.

## LONGITUDINAL CONSTRUCTION JOINT WITH DRILLED IN TIE BARS



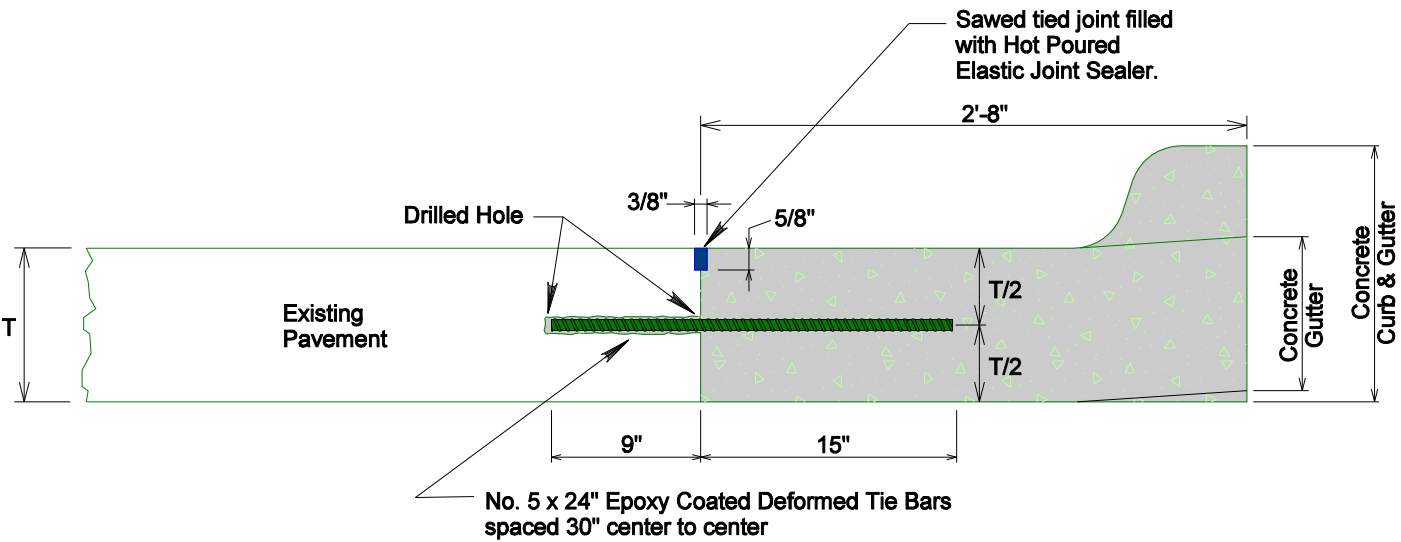
T = Existing and new pavement thickness.

Bar embedded a minimum depth of 9 inches into the existing pavement by utilizing an epoxy resin adhesive.

Bars shall be placed a minimum of 15 inches from existing transverse contraction joints.

Cost for furnishing and inserting drilled in centerline tie bars shall be included in the contract unit price per each for Insert Steel Bar in PCC Pavement.

## LONGITUDINAL CONSTRUCTION JOINT WITH DRILLED IN TIE BARS



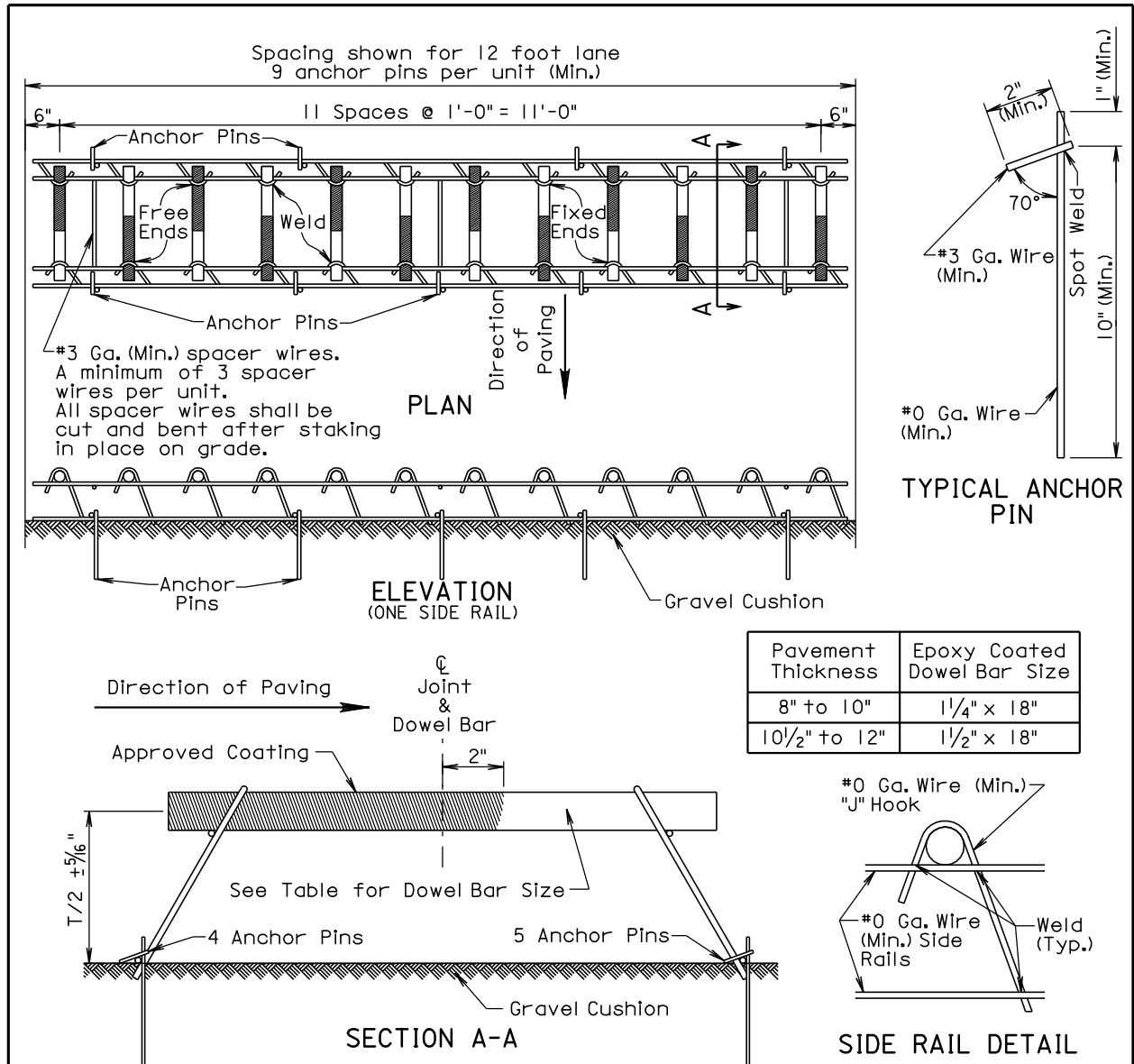
T = Existing and new pavement thickness.

Bar embedded a minimum depth of 9 inches into the existing pavement by utilizing an epoxy resin adhesive.

Bars shall be placed a minimum of 15 inches from existing transverse contraction joints.

Cost for furnishing and inserting drilled in tie bars shall be included in the contract unit price per each for Insert Steel Bar in PCC Pavement.





GENERAL NOTES:

Longitudinal construction joint tie bars shall be placed a minimum of 15 inches from the transverse contraction joint.

Centerline of individual dowel bars shall be parallel to top of subgrade  $\pm 1/8$  inch in 18 inches and to all other dowel bars in the assembly  $\pm 1/16$  inch in 18 inches.

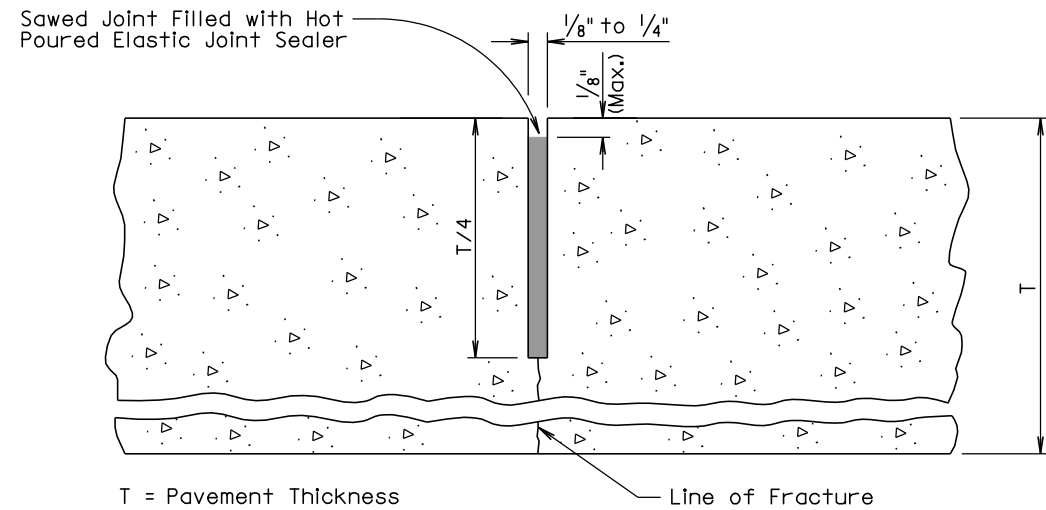
Centerline of individual dowel bars shall be parallel to the centerline of the roadway  $\pm 1/2$  inch in 18 inches.

The transverse contraction joints shall be sawed perpendicular to the centerline of the roadway and the dowel bars shall be centered on the sawed joint  $\pm 1$  inch.

Supporting devices of the type shown on this sheet, or equivalent as approved by the Engineer, shall be used to maintain proper horizontal and vertical alignment of the dowel bars.

December 23, 2007

|                               |                       |  |              |
|-------------------------------|-----------------------|--|--------------|
| Published Date: 1st Qtr. 2011 | S<br>D<br>D<br>O<br>T | PCC PAVEMENT DOWEL BAR ASSEMBLY<br>FOR TRANSVERSE CONTRACTION JOINTS | PLATE NUMBER |
|                               |                       |  | 380.01       |
|                               |                       |  | Sheet 1 of 1 |



GENERAL NOTES:

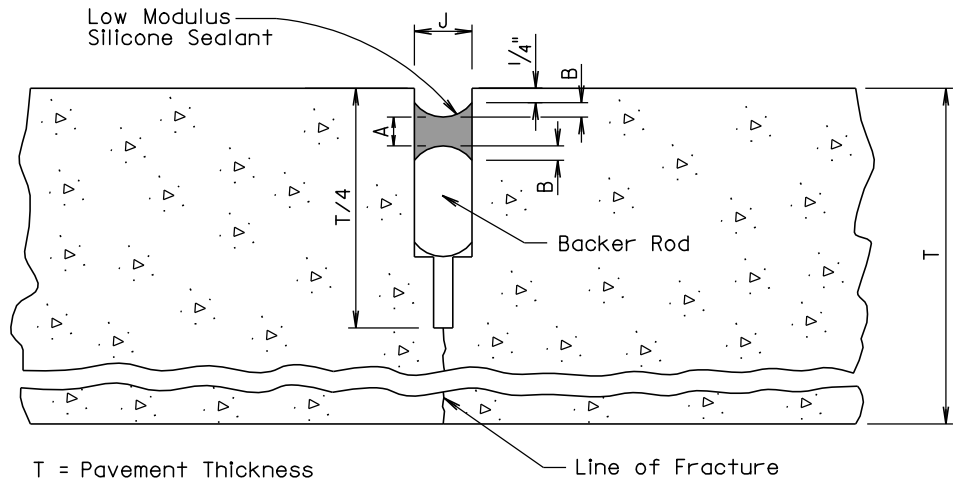
The saw cut to control cracking shall be a minimum of 1/4 the thickness of the pavement.

All hot poured elastic joint sealer material spilled on the surface of the concrete pavement shall be removed as soon as the material has cooled. The extent of removal of material shall be to the satisfaction of the Engineer. All costs for removal of the spilled joint sealer material shall be borne by the Contractor.

December 23, 2007

|                               |                       |   |              |
|-------------------------------|-----------------------|---|--------------|
| Published Date: 1st Qtr. 2011 | S<br>D<br>D<br>O<br>T | PCC PAVEMENT TRANSVERSE CONTRACTION<br>JOINT WITH OR WITHOUT DOWEL BAR ASSEMBLY | PLATE NUMBER |
|                               |                       |   | 380.03       |
|                               |                       |   | Sheet 1 of 1 |





| LOW MODULUS SILICONE SEALANT<br>ALLOWABLE CONSTRUCTION TOLERANCES |                  |                  |                  |
|---|------------------|------------------|------------------|
| J = 3/8"  |                  |                  |                  |
| A (Min.)<br>(In)  | A (Max.)<br>(In) | B (Min.)<br>(In) | B (Max.)<br>(In) |
| 3/16  | 5/16             | 1/8              | 1/4              |
| J = 1/2"  |                  |                  |                  |
| A (Min.)<br>(In)  | A (Max.)<br>(In) | B (Min.)<br>(In) | B (Max.)<br>(In) |
| 3/16  | 3/8              | 1/8              | 1/4              |
| J = 5/8"  |                  |                  |                  |
| A (Min.)<br>(In)  | A (Max.)<br>(In) | B (Min.)<br>(In) | B (Max.)<br>(In) |
| 1/4   | 7/16             | 1/8              | 5/16             |

GENERAL NOTE:

The backer rod shall be a nonmoisture absorbing resilient material approximately 25% larger in diameter than the width of the joint to be sealed.

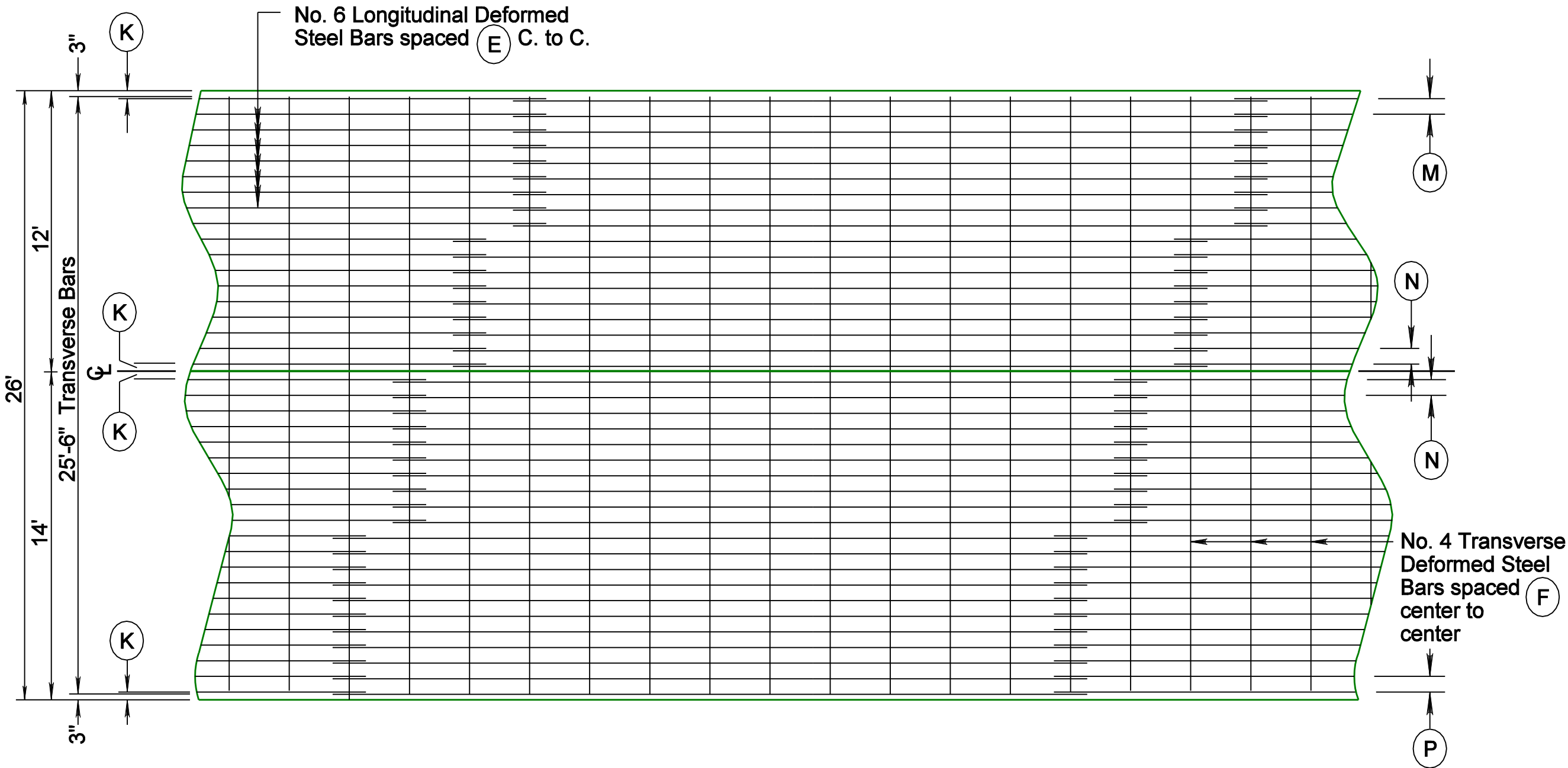
June 26, 2009

|                                      |                                  |   |                        |
|--------------------------------------|----------------------------------|---|------------------------|
| <b>Published Date: 1st Qtr. 2011</b> | <b>S<br/>D<br/>D<br/>O<br/>T</b> | <b>RESEAL PCC PAVEMENT JOINT (SILICONE)</b> | PLATE NUMBER<br>380.13 |
|                                      |                                  |   | Sheet 1 of 1           |



26' CONTINUOUSLY REINFORCED PCC PAVEMENT - IN PLACE

| STATE<br>OF<br>SOUTH<br>DAKOTA | PROJECT                                 | SHEET | TOTAL<br>SHEETS |
|--------------------------------|---|-------|-----------------|
|                                | 2011 YANKTON AREA<br>CRCP & PCCP REPAIR | 18    | 24              |



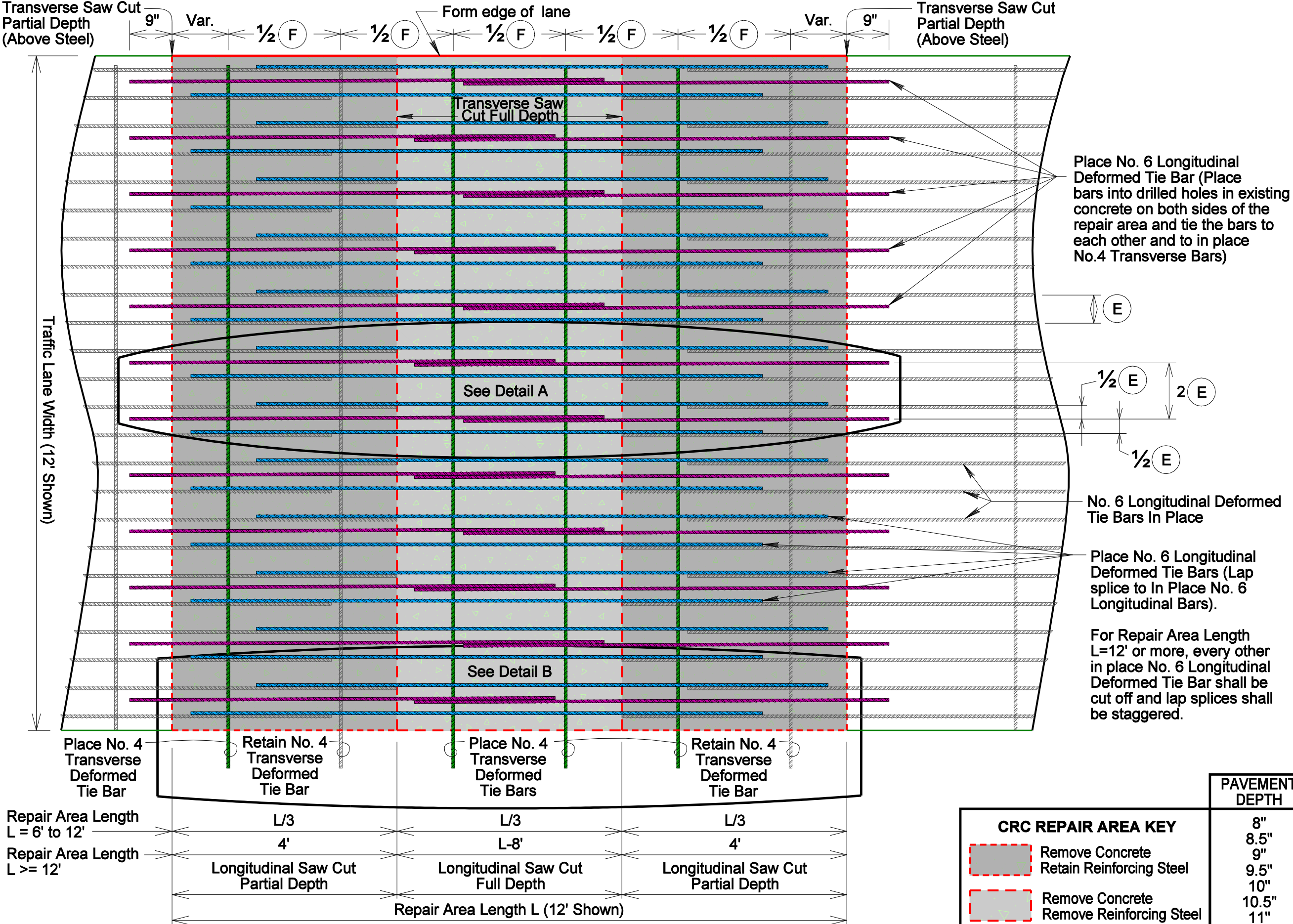
| Depth of Pavement | (E) | (F) | (K) | (M) | (N) | (P) |
|-------------------|-----|-----|-----|-----|-----|-----|
| 8"                | 8"  | 36" | 4"  | 8"  | 8"  | 8"  |
| 8.5"              | 7½" | 36" | 4"  | 4"  | 4½" | 5½" |
| 9"                | 7"  | 36" | 4"  | 5"  | 5"  | 8"  |
| 9.5"              | 6½" | 48" | 3¾" | 6½" | 6½" | 4½" |
| 10"               | 6½" | 48" | 3¾" | 6½" | 6½" | 4½" |
| 10.5"             | 6"  | 48" | 4"  | 5"  | 5"  | 5"  |
| *11"              | 6"  | 48" | 4"  | 5"  | 5"  | 5"  |

\*Exception for Southbound Lanes on I29 from MRM 62.1 to MRM 72.8.  
E = 6 1/2"  
F = 48"  
K = 3 3/4"  
M = 6 1/2"  
N = 6 1/2"  
P = 4 1/2"



# CRC PAVEMENT REPAIR (FULL LANE WIDTH) - TYPICAL

| STATE OF SOUTH DAKOTA | PROJECT                              | SHEET | TOTAL SHEETS |
|-----------------------|--------------------------------------|-------|--------------|
|                       | 2011 YANKTON AREA CRCP & PCCP REPAIR | 19    | 24           |





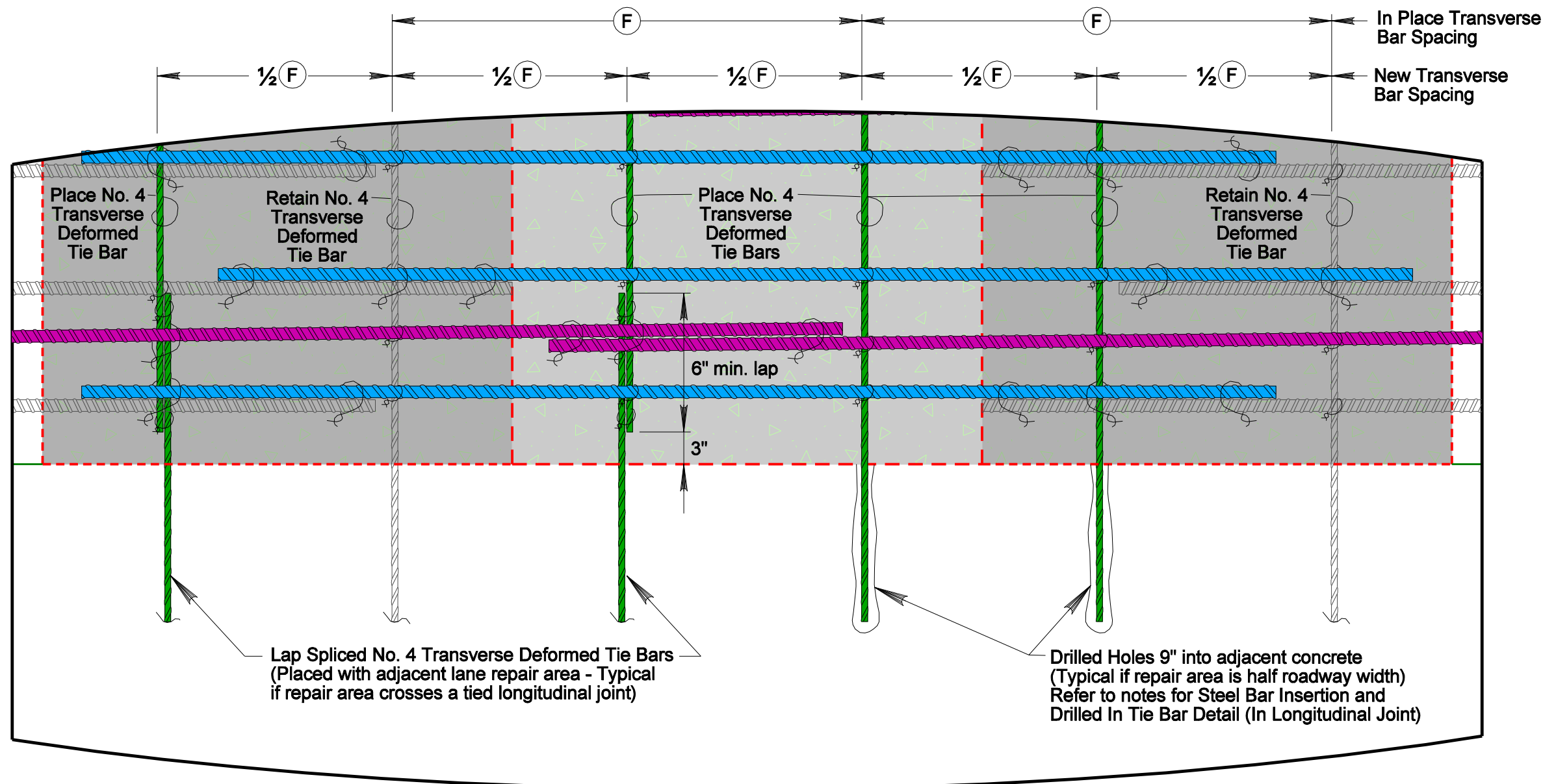




# CRC PAVEMENT REPAIR (FULL LANE WIDTH)

## Detail B

| STATE<br>OF<br>SOUTH<br>DAKOTA | PROJECT                                 | SHEET | TOTAL<br>SHEETS |
|--------------------------------|---|-------|-----------------|
|                                | 2011 YANKTON AREA<br>CRCP & PCCP REPAIR | 21    | 24              |



### DEFORMED TIE BAR KEY

|  |  |
|--|--|
|  | No. 4 Transverse Deformed Tie Bar In Place (Retain)  |
|  | Place No. 4 Transverse Deformed Tie Bar<br>(Tie to In Place No. 6 Longitudinal Bars)   |
|  | No. 6 Longitudinal Deformed Tie Bar In Place (Retain)  |
|  | Place No. 6 Longitudinal Deformed Tie Bar<br>(Tie to In Place No. 6 Longitudinal Bars)   |
|  | Place No. 6 Longitudinal Deformed Tie Bar<br>(Place bars into drilled holes in existing concrete on both sides of the repair area and tie the bars to each other and to in place No.4 Transverse Bars) |

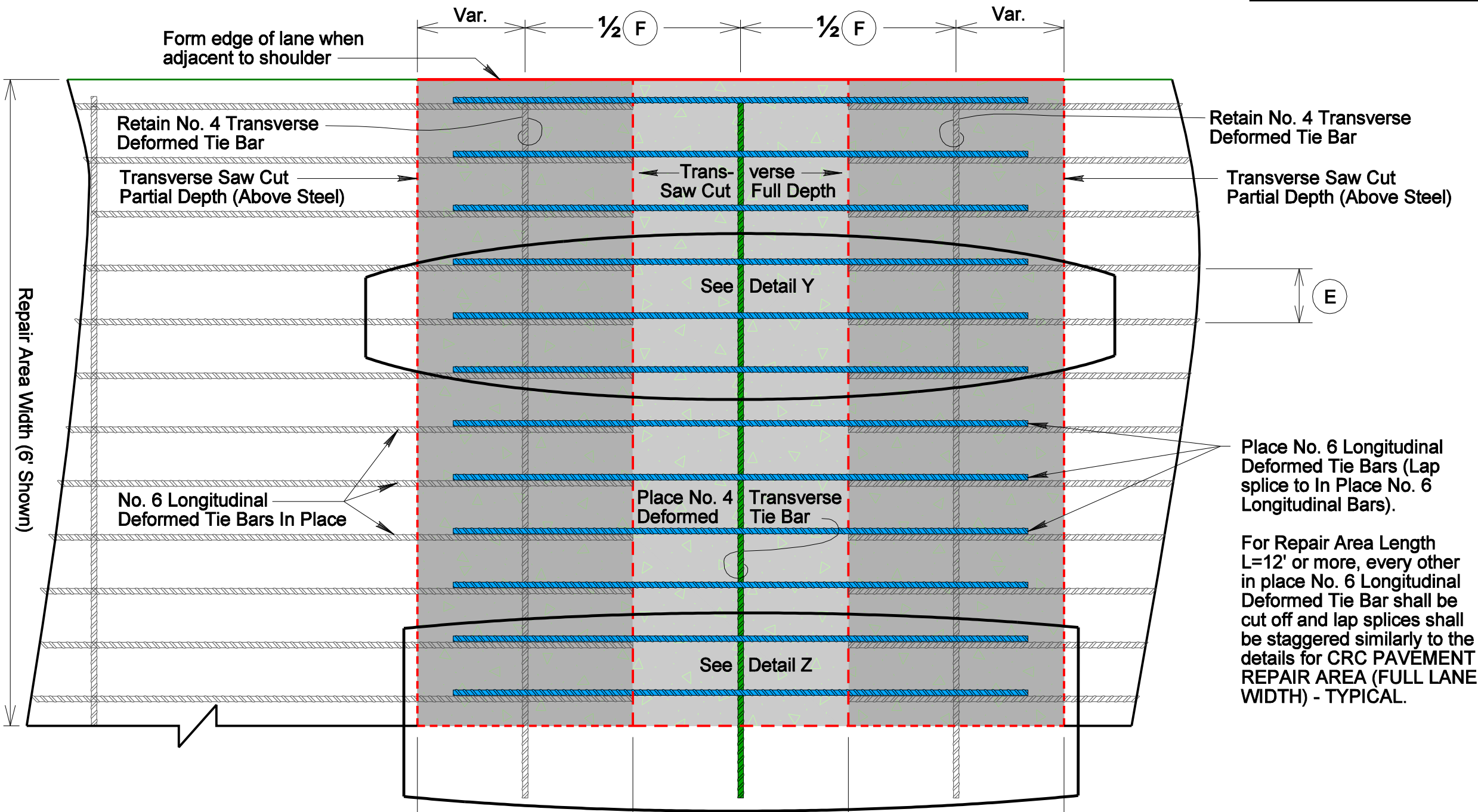
Note: All lapped bars shall have a minimum of two ties per lap.

| CRC REPAIR AREA KEY |                          | PAVEMENT DEPTH | E      | F   |
|---------------------|--------------------------|----------------|--------|-----|
|                     | Remove Concrete          | 8"             | 8"     | 36" |
|                     | Retain Reinforcing Steel | 8.5"           | 7 1/2" | 36" |
|                     | Remove Concrete          | 9"             | 7"     | 36" |
|                     | Retain Reinforcing Steel | 9.5"           | 6 1/2" | 48" |
|                     | Remove Concrete          | 10"            | 6 1/2" | 48" |
|                     | Retain Reinforcing Steel | 10.5"          | 6"     | 48" |
|                     | Remove Concrete          | 11"            | 6"     | 48" |



CRC PAVEMENT REPAIR (PARTIAL LANE WIDTH) - TYPICAL

| STATE<br>OF<br>SOUTH<br>DAKOTA | PROJECT                                 | SHEET | TOTAL<br>SHEETS |
|--------------------------------|---|-------|-----------------|
|                                | 2011 YANKTON AREA<br>CRCP & PCCP REPAIR | 22    | 24              |



DEFORMED TIE BAR KEY

No. 4 Transverse Deformed Tie Bar In Place (Retain)

Place No. 4 Transverse Deformed Tie Bar (Tie to In Place No. 6 Longitudinal Bars)

No. 6 Longitudinal Deformed Tie Bar In Place (Retain)

Place No. 6 Longitudinal Deformed Tie Bar (Tie to In Place No. 6 Longitudinal Bars)

|                                    |                                 |                                    |                                      |
|------------------------------------|---------------------------------|------------------------------------|--------------------------------------|
| 1.5'                               | L-3'                            | 1.5'                               | Repair Area Length $L = 4'$ to $<6'$ |
| L/3                                | L/3                             | L/3                                | Repair Area Length $L = 6'$ to $12'$ |
| 4'                                 | L-8'                            | 4'                                 | Repair Area Length $L \geq 12'$      |
| Longitudinal Saw Cut Partial Depth | Longitudinal Saw Cut Full Depth | Longitudinal Saw Cut Partial Depth |                                      |
| Repair Area Length L (6' Shown)    |                                 |                                    |                                      |

CRC REPAIR AREA KEY

Remove Concrete Retain Reinforcing Steel

Remove Concrete Remove Reinforcing Steel

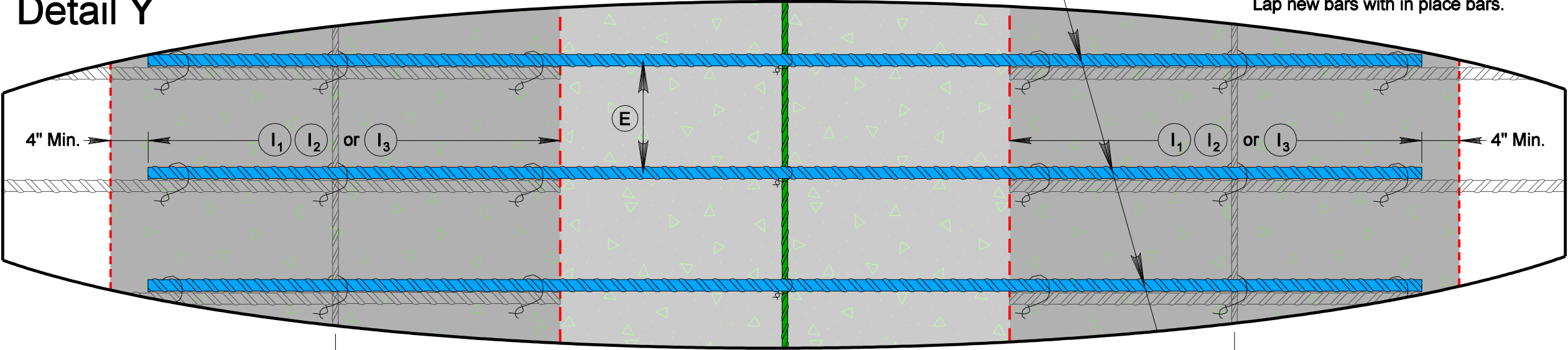
| PAVEMENT DEPTH | E   | F   |
|----------------|-----|-----|
| 8"             | 8"  | 36" |
| 8.5"           | 7½" | 36" |
| 9"             | 7"  | 36" |
| 9.5"           | 6½" | 48" |
| 10"            | 6½" | 48" |
| 10.5"          | 6"  | 48" |
| 11"            | 6"  | 48" |



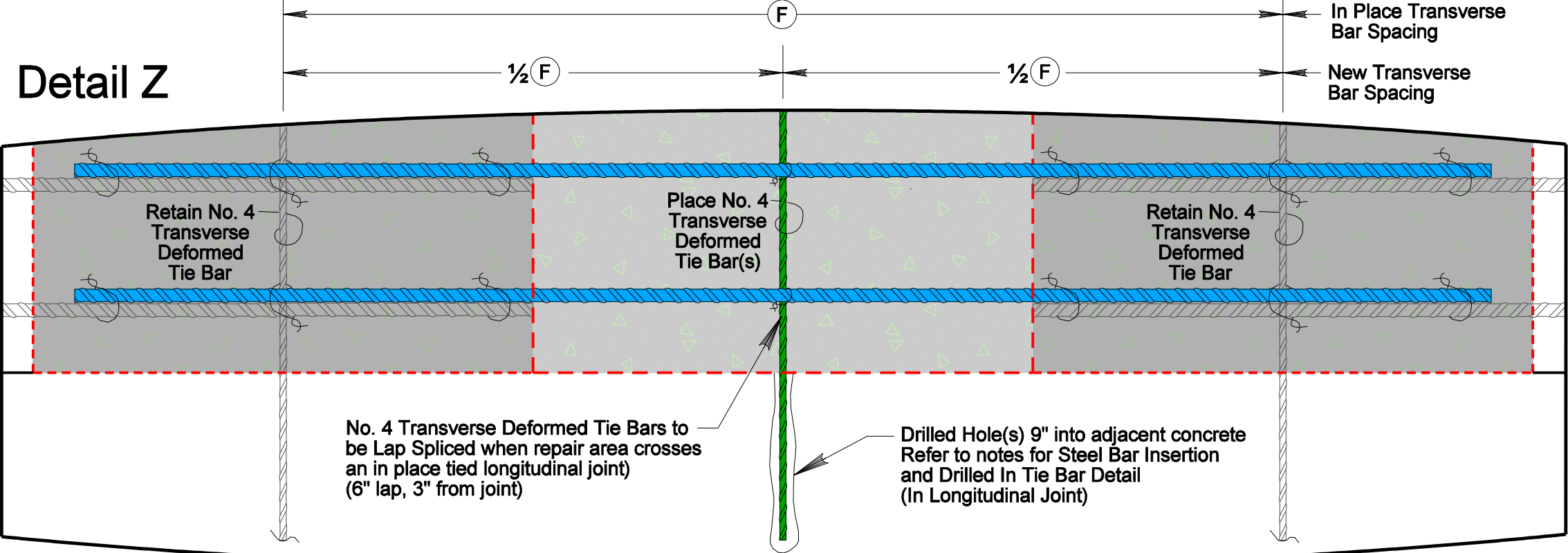
CRC PAVEMENT REPAIR (PARTIAL LANE WIDTH)

| STATE OF SOUTH DAKOTA | PROJECT                              | SHEET | TOTAL SHEETS |
|-----------------------|--------------------------------------|-------|--------------|
|                       | 2011 YANKTON AREA CRCP & PCCP REPAIR | 23    | 24           |

Detail Y



Detail Z



Note: All lapped bars shall have a minimum of two ties per lap.

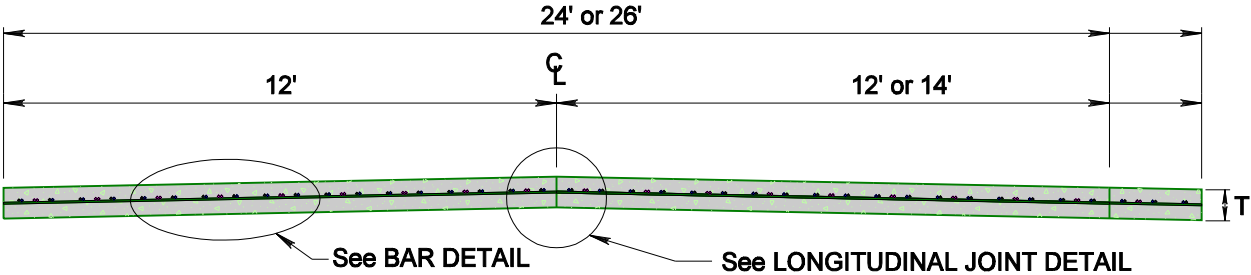
| DEFORMED TIE BAR KEY |   | CRC REPAIR AREA KEY |  | PAVEMENT DEPTH | E      | F   | I <sub>1</sub> | I <sub>2</sub> | I <sub>3</sub> | LAP SPLICE LENGTH KEY |  |
|----------------------|---|---------------------|--|----------------|--------|-----|----------------|----------------|----------------|-----------------------|--|
|                      | No. 4 Transverse Deformed Tie Bar In Place (Retain)                                 |                     | Remove Concrete Retain Reinforcing Steel | 8"             | 8"     | 36" | 14"            | 20" to 25"     | 25"            | I <sub>1</sub>        | Lap Splice length for Repair Area Length L less than 6'. |
|                      | Place No. 4 Transverse Deformed Tie Bar (Tie to In Place No. 6 Longitudinal Bars)   |                     | Remove Concrete Remove Reinforcing Steel | 8.5"           | 7 1/2" | 36" | 14"            | 20" to 25"     | 25"            | I <sub>2</sub>        | Lap Splice length for Repair Area Length from 6' to 8'.  |
|                      | No. 6 Longitudinal Deformed Tie Bar In Place (Retain)                               |                     |  | 9"             | 7"     | 36" | 14"            | 20" to 25"     | 25"            | I <sub>3</sub>        | Lap Splice length for Repair Area Length 8' or longer.   |
|                      | Place No. 6 Longitudinal Deformed Tie Bar (Tie to In Place No. 6 Longitudinal Bars) |                     |  | 9.5"           | 6 1/2" | 48" | 14"            | 20" to 25"     | 25"            |                       |  |
|                      |   |                     |  | 10"            | 6 1/2" | 48" | 14"            | 20" to 25"     | 25"            |                       |  |
|                      |   |                     |  | 10.5"          | 6"     | 48" | 14"            | 20" to 25"     | 25"            |                       |  |
|                      |   |                     |  | 11"            | 6"     | 48" | 14"            | 20" to 25"     | 30"            |                       |  |



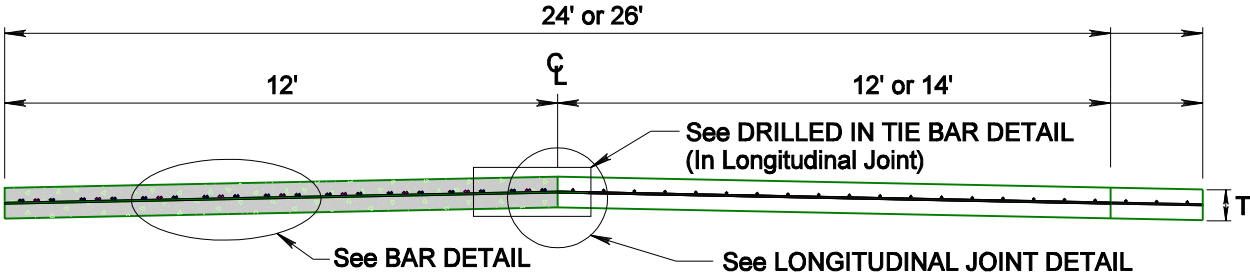
# CRC PAVEMENT REPAIR

| STATE OF SOUTH DAKOTA | PROJECT                              | SHEET | TOTAL SHEETS |
|-----------------------|--------------------------------------|-------|--------------|
|                       | 2011 YANKTON AREA CRCP & PCCP REPAIR | 24    | 24           |

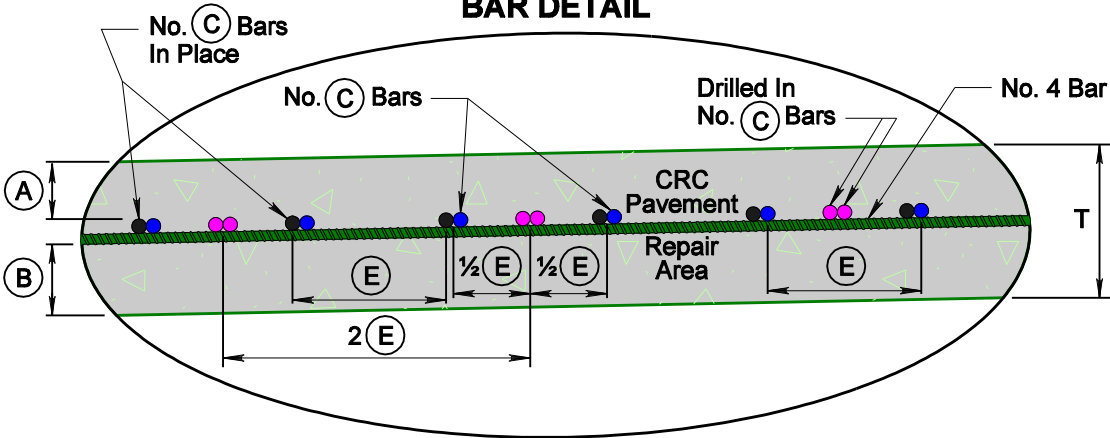
TRANSVERSE SECTION SHOWING STEEL PLACEMENT



TRANSVERSE SECTION SHOWING STEEL PLACEMENT



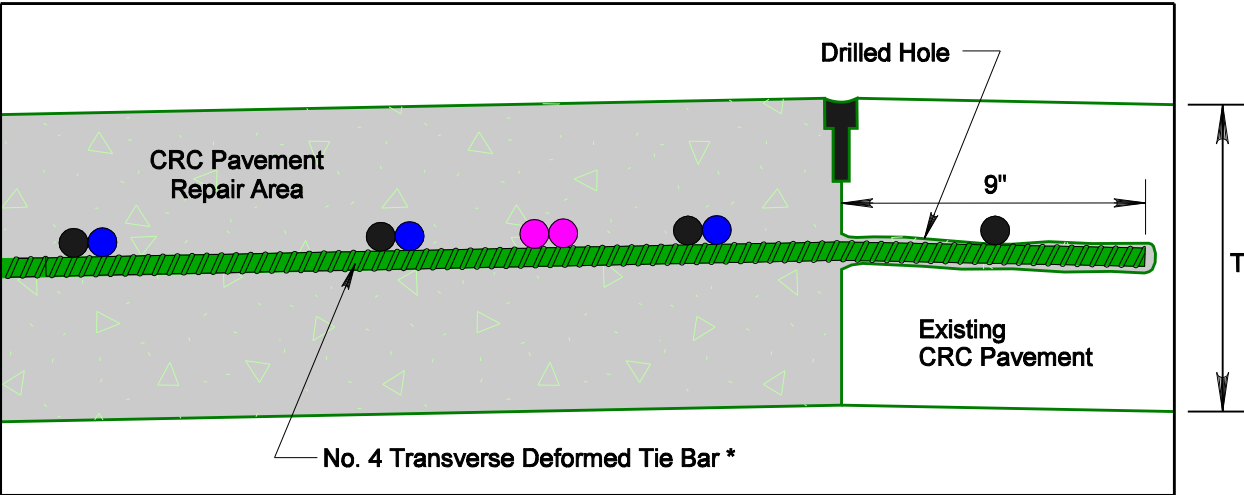
BAR DETAIL



Placement of longitudinal steel bars may vary from +1/2" to -1/2" vertically and 3/4" horizontally. Placement of transverse steel bars may vary from +1/2" to -1/2" vertically and 2" horizontally.

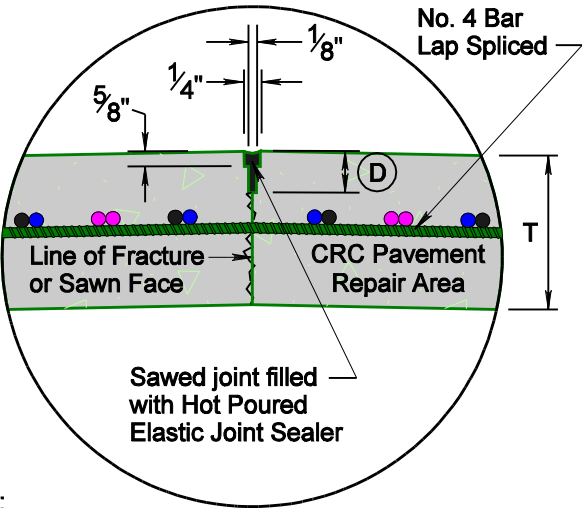
The transverse deformed steel bars will be positioned on acceptable chairs.

DRILLED IN TIE BAR DETAIL (In Longitudinal Joint)



\* Transverse Deformed Tie Bar shall be bent slightly to fit into the drilled hole

LONGITUDINAL JOINT DETAIL



| Depth of CRC (T) | (A)    | (B)    | (C) | (D)    | (E)    |
|------------------|--------|--------|-----|--------|--------|
| *8"              | 3"     | 3 3/4" | 6   | 2"     | 8"     |
| 8.5"             | 3 1/4" | 4"     | 6   | 2 1/8" | 7 1/2" |
| 9"               | 3 1/2" | 4 1/4" | 6   | 2 1/4" | 7"     |
| 9.5"             | 3 1/2" | 4 3/4" | 6   | 2 3/8" | 6 1/2" |
| 10"              | 3 1/2" | 5 1/4" | 6   | 2 1/2" | 6 1/2" |
| 10.5"            | 3 3/4" | 5 1/2" | 6   | 2 5/8" | 6"     |
| 11"              | 4"     | 5 3/8" | 7   | 2 3/4" | 6"     |
| 11.5"            | 3 1/2" | 6 7/8" | 5   | 2 7/8" | —      |
| 11.5"            | 4"     | 5 7/8" | 7   | 2 7/8" | —      |
| 12"              | 4"     | 6 3/8" | 7   | 3"     | —      |

\* Exception for I29 SBL MRM 83.8 to MRM 97.8

(A) = 3 1/4" (B) = 3 1/2"

NOTE:

Steel bars for concrete reinforcement shall conform to the requirements of Specification M31 (Grade 60) of the AASHTO Standard Specifications for Deformed Billet Steel Bars for Concrete Reinforcement.

LONGITUDINAL SECTION SHOWING STEEL PLACEMENT

DRILLED IN TIE BAR DETAIL (In Transverse Joint)

