

**S-80**                    **(2554) TRAFFIC BARRIERS**

Traffic Barriers shall be constructed in accordance with the provisions of Mn/DOT 2554 and the following:

Guardrail block-outs of composite or recycled material which meet the criteria of NCHRP 350 may be substituted for wood block-outs in the construction of Plate Beam Guardrail systems.

**S-81**                    **(2554) END TREATMENT - TANGENT TERMINAL**

This work shall consist of constructing a commercial type energy absorbing terminal in accordance with Mn/DOT 2554, the details in the Plan, as recommended by the manufacturer, as directed by the Engineer, and the following:

S-81.1                Energy Absorbing Terminal options shall be as indicated on the Plan.

S-81.2                If the Contractor chooses to install either an ET-2000 or ET-2000 PLUS Energy Absorbing Terminal, it shall be of the type manufactured by Trinity Industries, Inc., Dallas, TX.

If steel posts are to be used they shall be steel breakaway posts as specified by the manufacturer.

The adhesive object marker is sold separately from the terminal and shall be incidental to Item 2554.523 (End Treatment – Tangent Terminal) for which no direct payment will be made. The object marker to use with the ET-2000 or ET-2000 PLUS is striped yellow and black.

S-81.3                If the Contractor chooses to install an SKT-350 Sequential Kinking Terminal, the terminal shall be an SKT-350 of the type manufactured by Road Systems, Inc., Big Spring, TX.

The adhesive object marker is sold separately from the terminal and shall be incidental to Item 2554.523 (End Treatment - Tangent Terminal) for which no direct payment will be made. The object marker to use with the SK-350 is striped yellow and black.

S-81.4                The Contractor is responsible for obtaining the most current details from the manufacturer. The Contractor shall provide one copy for the Engineer.

**S-82**                    **(2554) IMPACT ATTENUATOR BARRELS**

This work shall consist of furnishing and installing commercial type inertial barrier systems in accordance with the applicable provisions of Mn/DOT 2554, and the following:

The barrier shall be of a type as indicated on the Qualified Product List. The Qualified Product List can be found on the Mn/DOT Office of Traffic, Safety & Operations website. The Contractor will not be allowed to mix modules, only one barrel system will be allowed at a given location.

S-82.1                **MATERIALS**

(A)                Inertial barriers shall consist of barrel-type modules complete with parts for proper retention of predetermined sand content and tight fitting covers.

(B)                Sand for filling the modules shall be reasonably dry and mixed with a minimum of 5% by weight of sodium chloride.

**S-82.2**      CONSTRUCTION REQUIREMENTS

(A)      The modules shall be placed at the location shown in the Plan and as directed by the Engineer in accordance with the manufacturer's recommendations, all to the satisfaction of the Engineer. The Contractor is responsible for obtaining the most current details from the manufacturer. The Contractor shall provide one copy for the Engineer.

(B)      The Contractor shall maintain a sufficient supply of replacement modules on hand during the course of this Contract to maintain or replace the installations. The Contractor shall replace any modules which get damaged within as short a time period as possible, and shall supply to the Engineer three names of Contractor personnel who can be contacted in case of damage occurring during non-work hours.

**S-82.3**      MEASUREMENT AND PAYMENT

Measurement will be made by the number of attenuator barrels furnished, installed, maintained and removed as specified. Payment for attenuator barrels will be made under Item 2554.602 (Impact Attenuator Barrels) at the Contract bid price per each, which shall be compensation in full for all costs relative to furnishing, installing, maintaining, and removing the barrels complete in place as specified.

**S-83**      (2554) RELOCATE IMPACT ATTENUATOR BARRELS

This work shall consist of relocating impact attenuator barrels within the Project limits as directed by the Engineer, and the following:

S-83.1      The relocated impact attenuator barrels shall be filled with the proper sand content in accordance with the manufacturer's recommendations.

S-83.2      When impact attenuator has to be removed from the Project roadways, but will be needed again in a later phase of the work, the Engineer may direct that it be stockpiled on or near the Project site. When this is done, payment will be made under Item 2554.602 (Relocate Impact Attenuator Barrels). Payment will be made once for removing the attenuator from the roadway and placing it in the stockpile; and again for removing it from the stockpile and installing it on the roadway.

S-83.3      Measurement will be made by the number of impact attenuator barrels relocated. Payment will be made under Item 2554.602 (Relocate Impact Attenuator Barrels) at the Contract bid price per each, which shall be payment in full for all costs incidental thereto.

**S-84**      (2554) T-BARRIER BRIDGE CONNECTION DESIGN 8318

This work shall consist of furnishing and installing guardrail anchorage plates to concrete bridge rails, in accordance with Mn/DOT 2554, Standard Plate No. 8318C, and the following:

Measurement will be made by the number of anchorage plates furnished and installed as specified. Payment will be made under Item 2554.602 (T-Barrier Bridge Connection Design 8318) at the Contract bid price per each, which shall be payment in full for all costs involved.

**S-85**                    **(2554) IMPACT ATTENUATOR**

This work shall consist of furnishing and installing two (2) Impact Attenuators in locations as shown in the Plan. This work shall be performed in accordance with the applicable Mn/DOT Standard Specifications and the following:

S-85.1                    Furnish and install a complete Impact Attenuator Assembly at the following two locations as shown in the Plan.

1.            Centerline LOR2-NB35W 145+89 40'RT at B.N.S.F. Bridge No. 27999.
2.            Centerline LOR2-NB35W 148+31 40'RT at Broadway Bridge No. 27886.

S-85.2                    The Impact Attenuator shall be on the Mn/DOT Approved Product List for Temporary Crash Attenuators. The list is found on the Mn/DOT website at <http://www.dot.state.mn.us/trafficeng/products/MnDOTapprovedproductlist.xls>. It shall be the responsibility of the Contractor to obtain all required details to install these systems.

S-85.3                    The Contractor shall choose an Impact Attenuator that fits the site specific requirements for the Project.

S-85.4                    The Contractor shall construct an Impact Attenuator concrete mounting pad as required by the particular manufacturer of the impact attenuator chosen and provided.

S-85.5                    After Impact Attenuator installation, the Contractor shall construct 4 inch thick Concrete Walk between the curbs and around the mounting pad, within the defined 100 linear foot installation area as shown in the Plan. Payment for the impact attenuator includes all materials and all labor necessary to construct the Concrete Walk within the impact attenuator installation area.

S-85.6                    Measurement will be made by the number of impact attenuators furnished and installed as specified. Payment will be made under Item 2554.615 (Impact Attenuator) at the Contract bid price per assembly, which shall be compensation in full for all costs relative thereto.

**S-86**                    **(2563) RAISED PAVEMENT MARKERS TEMPORARY (TRPMS)**

This work shall consist of constructing temporary raised pavement markers and the selected mounting system, placing the marker on the roadway, and removing the marker in accordance with the specification TEMPORARY RAISED PAVEMENT MARKERS (TRPM) and the following:

S-86.1                    The specification TEMPORARY RAISED PAVEMENT MARKERS (TRPM) can be accessed on the Mn/DOT Office of Traffic, Security, and Operation website.

S-86.2                    TRPMs will be measured by the number of markers installed. Payment will be made under Item 2563.602 (Raised Pavement Marker Temporary) at the Contract bid price per each.

**S-87            (2563) MEDIAN BARRIER DELINEATOR**

This work shall consist of furnishing, installing and maintaining barrier delineators on median barriers in accordance with the provisions of Mn/DOT 2564, the details shown in the Plans, and the following:

S-87.1            The reflectors shall be one of the following (200 X 114 mm [7-7/8 X 4-1/2 inch] in size) or an approved equal, or a substitute barrier at a closer spacing, as directed by the Engineer:

- (A)     Davidson Portable Concrete Barrier Marker  
Davidson Plastic Co.  
18726 East Valley Hwy.  
Kent, Washington 98032
  
- (B)     Guardrail and Barrier Delineator, 965, Simsonite  
Signals Products Division, Amerace Corp.  
7542 North Natchez Avenue  
Niles, IL 60648.
  
- (C)     Reflexite Barrier Mount Delineator  
Reflexite Corp.  
315 South Street, P.O. Box 1628  
New Britain, Conn. 06050
  
- (D)     Duraflex Flexx 2020 Barrier Delineator  
Duraflex Corp.  
297 Margaret King Ave.  
Ringwood, N.J. 07456

S-87.2            Measurement will be made by the number of barrier delineators furnished and installed as specified. Payment will be made under Item 2563.602 (Median Barrier Delineator) at the Contract bid price per each, which shall be payment in full for all costs involved.

**S-88            (2563) PORTABLE CHANGEABLE MESSAGE SIGN**

The Contractor shall furnish, install, maintain and remove Portable Changeable Message Signs in accordance with Contract provisions, as directed by the Engineer and the following:

S-88.1            The Contractor shall provide five (5) working Portable Changeable Message Signs dedicated to the Project and located on the jobsite at all times for the life of the Contract.

S-88.2            The Portable Changeable Message Signs shall be trailer mounted three line, DOT signs with eight characters per line with a character height of 450 mm [18 inches] as approved by the Engineer.

S-88.3            (PCMS) Type C Trailer Mounted Message Signs will be permitted. It is imperative that the Contractor continually operate each PCMS at maximum legibility. Many factors, such as mechanical problems, insufficient charging, incorrect intensity settings, or other factors can degrade performance. If at any time the Contractor fails to operate a Portable Changeable Message Sign at maximum legibility, as determined by the Engineer, the Contractor will be charged \$250/hour until the problem is corrected.

S-88.4            If the Contractor fails to provide five working (5) PCMS's at any time on the jobsite, the Contractor will be charged \$250/hour for each PCMS that is missing until such time that all PCMS's are provided.

S-88.5 The changeable message signs shall be placed and operational within 1 hour after notification by the Engineer. If the Contractor fails to have the PCMSs operational in this timeframe they **will be charged \$250/hour until the PCMS is operational to the satisfaction of the Engineer.** Multiple mobilizations of the changeable message signs will be required and shall be incidental to providing the signs. The changeable message signs shall be subject to approval of the Engineer. All maintenance and repair as required will be considered incidental to the Contract price for the respective item.

S-88.6 Except as authorized by the Engineer, the message sign shall be stored off the shoulder when not in use. In the event the Engineer allows the message board to remain on the shoulder the message sign shall be delineated with a minimum of three (3) retroreflective drums or weighted channelizers, or as determined by the Engineer.

S-88.7 Measurement will be made of the number of individual Portable Changeable Message Signs provided. All such work associated with furnishing, installing, maintaining and removing the Portable Changeable Message Signs shall be construed to be included in the payment for each PCMS.

If it is determined that additional PCMS's are necessary beyond the number specified, the Contractor will be compensated for the additional PCMS's in accordance with Section S-9.9 (MAINTENANCE OF TRAFFIC AND TRAFFIC CONTROL) of these Special Provisions

S-88.8 Payment for Portable Changeable Message Signs furnished and installed, as directed by the Engineer, will be made under Item 2563.602 (Portable Changeable Message Sign) at the Contract bid price per each according to the following schedule:

- (1) When 5 percent of the Contract amount is earned, 50 percent of the amount bid for each Portable Changeable Message Sign will be paid.
- (2) When 10 percent, or more, of the Contract amount is earned, an additional 25 percent of the amount bid for each Portable Changeable Message Sign will be paid.
- (3) When 50 percent, or more, of the Contract amount is earned, an additional 20 percent of the amount bid for each Portable Changeable Message Sign will be paid.
- (4) The remaining 5 percent bid for each Portable Changeable Message Sign will be paid when all work has been completed and accepted.

The payment for each PCMS shall be compensation in full for all costs incidental thereto, including but not limited to furnishing and installing the signs with appropriate message, maintaining the signs, revising the messages as directed by the Engineer, and removing the signs at the direction of the Engineer. The Portable Changeable Message Signs shall remain the property of the Contractor.

**S-89 (2571) PLANT INSTALLATION**

The provisions of Mn/DOT 2571 are supplemented and/or modified with the following:

S-89.1 The third paragraph in Mn/DOT 2571.1 Description, is revised to read as follows:

The Contractor shall comply with the current edition of the "Inspection and Contract Administration Manual for Mn/DOT Landscape Projects," published by the Mn/DOT Landscape Architecture Unit, as the minimum and maximum criteria and standard for all operations.

- S-89.2 Mn/DOT 2571.2A2(d) under Plant Stock Documentation, is revised to read as follows:
- (d) All plant material shipped from out-of-state nursery vendors subject to applicable state and federal quarantines, (including but not limited to Emerald Ash Borer, Gypsy Moth and Japanese Beetle) must be accompanied by current documentation certifying that all plants shipped are free from regulated pests. To determine if Minnesota vendors are subject to quarantines, call the MDA Supervisor of the Nursery Inspection and Export Certification Unit at 651-201-6388.
- S-89.3 The third sentence in Mn/DOT 2571.2A3 Substitutions, is revised to read as follows:
- The list of nursery stock suppliers can be found in the current edition of the "Inspection and Contract Administration Manual for Mn/DOT Landscape Projects."
- S-89.4 The last sentence in Mn/DOT 2571.2C1 Soil Additives, is revised to read as follows:
- If the Engineer approves such soil additives and if the Contractor incorporates the additives into the work, the Contractor will receive compensation based upon the submitted information as determined by the Engineer.
- S-89.5 Mn/DOT 2571.2C1i Biological Soil and Root Hormones and Inoculants, is hereby deleted and replaced with the following:
- C1i Biological Soil and Root Hormones and Inoculants  
Refer to 3896.
- S-89.6 Mn/DOT 2571.2C1j Porous Ceramics and Hydrophilic Polymers, is hereby deleted and replaced with the following:
- C1j Porous Ceramics and Hydrophilic Polymers  
Refer to 3896.
- S-89.7 Mn/DOT 2571.2C1k Fertilizer, is hereby deleted and replaced with the following:
- C1k Fertilizer  
Refer to 3881.
- S-89.8 Mn/DOT 2571.2C4 Rodent Protection, is revised to read as follows:
- Rodent protection consists of either (Option 1) galvanized wire mesh or (Option 2) high density polyethylene in accordance with the Standard Planting Details unless directed otherwise by the Engineer.
- S-89.9 The first sentence of Mn/DOT 2571.2C7 Staking and Guying, is revised to read as follows:
- Staking and guying shall be as shown in the Plan and in accordance with the Standard Planting Details unless directed otherwise by the Engineer.
- S-89.10 The first sentence in Mn/DOT 2571.2C8 Seedling Tree Shelters, is revised to read as follows:
- Shelters for seedling trees shall be from the approved list that is on file with the Mn/DOT Landscape Architecture Unit.

- S-89.11 The first paragraph of Mn/DOT 2571.3A General, is revised to read as follows:
- A Mn/DOT Certified Landscape Specialist shall be on the Project site at all times to perform or directly supervise the plant installation and establishment, together with all other incidental work. The certification is obtained by completing a 1-day Mn/DOT Landscape Project Installation, Inspection, and Administration training class and passing a take-home test provided by the Mn/DOT Landscape Architecture Unit. The certification is valid for 3 years. At least one owner or operations manager of the general contracting firm shall hold a valid Mn/DOT Certified Landscape Specialist certification. The landscape subcontracting firm must also hold valid Mn/DOT Certified Landscape Specialist certification. The Contractor shall provide experienced crews working under the direct supervision of the certified specialist. Work performed without direct on-site supervision by a Mn/DOT Certified Landscape Specialist shall be considered unauthorized work.
- S-89.12 The last paragraph in Mn/DOT 2571.3A1a Preparatory Work, is revised to read as follows:
- The Contractor shall obtain the Engineer's approval before moving equipment and supplies (including mulch and other incidental items) to the Project site and prior to performing any work on the site.
- S-89.13 The last sentence in Mn/DOT 2571.3A1e Plant Establishment Period, is revised to read as follows:
- Establishment operations shall prevent rutting or include repair of rutting and other damage that may lead to soil erosion and weed infestation.
- S-89.14 Mn/DOT 2571.3A2b under Plant Layout, is revised to read as follows:
- b. So that trees remain outside of the safety clear zones, safety sight corners, and sight lines, all in accordance with the Plan and as directed by the Engineer.
- S-89.15 The following is added to the end of the second paragraph of Mn/DOT 2571.3A4 Start of Operations:
- Work performed otherwise shall be considered unauthorized work.
- S-89.16 The first sentence in the third paragraph of Mn/DOT 2571.3A5 Notices by Contractor, is revised to read as follows:
- The Contractor shall give the notice in writing unless otherwise directed by the Engineer.
- S-89.17 Mn/DOT 2571.3B1 Weed Control and Cultivation, is hereby deleted and replaced with the following:
- B1 Weed Control and Cultivation  
The Contractor shall use the following method.
- S-89.18 Mn/DOT 2571.3B1a Method 1 - Herbicide Application, is hereby deleted and replaced with the following:
- B1a Herbicide Application  
Herbicide application may begin in spring or fall and shall be applied to actively growing vegetation. Before cultivating isolated plant locations and plant beds, the Contractor shall kill turf and weed growth within the areas that will receive mulch in accordance with the following steps.

- Step 1. The Contractor shall demonstrate proper methods and equipment in a competence test for this operation as specified in 2571.3B3. Work performed otherwise shall be considered unauthorized work.
- Step 2. Mow existing vegetation to no less than 75 mm (**3 inches**) at least one week prior to any herbicide spraying. Remove the cuttings. The vegetation shall be allowed to re-grow to a height of at least 100 mm (**4 inches**) and no more than 200 mm (**8 inches**) prior to applying the herbicide.
- Step 3. At least 3 days prior to the proposed application date, submit labels of all intended herbicides and a copy of a valid pesticide applicator license (Categories A and J) to the Engineer for review and approval.
- Step 4. Spray any regrowth and kill all vegetation (top growth and roots) using a non-selective, non-residual post emergence herbicide containing 41% glyphosate as the active ingredient. Personnel licensed by the Minnesota Department of Agriculture and experienced in the use of chemical pesticides shall perform the work in accordance with the manufacturer's recommendations. The herbicide shall be applied to dry foliage on actively growing vegetation. The application shall be made in August or September preceding fall or spring planting, or in May if August or September application is not possible. If precipitation occurs within 6 hours after spraying, the Contractor shall respray. Additional herbicides may be applied on a prescriptive basis if approved by the Engineer.
- Step 5. Prior to placing any specified soil additives, deep cultivate the planting holes and beds by thoroughly loosening the soil to a minimum depth of 300 mm (**12 inches**), as measured from the existing grade elevation of the soil. Operations (in this step and the following step) shall not result in soil compaction due to excessively wet soil conditions (field capacity or wetter) or improper methods. Use of a spading machine shall be required to loosen and till the soil while minimizing soil compaction. The Contractor shall demonstrate proper methods and equipment in a competence test for this operation as specified in 2571.3B3.
- Step 6. Unless otherwise specified, add soil additives and thoroughly incorporate them into the previously deep-cultivated soil to a minimum depth of 300 mm (**12 inches**), as measured from the finished grade elevation of the soil. The equipment and methods shall be in conformance with 2571.3B3 (Competence Test).
- Step 7. Use a compaction tester to verify that planting areas have been loosened to less than 1400 kPa (**200 psi**) at the initial minimum cultivation depth of 300 mm (**12 inches**) plus the depth of added soil additives
- Step 8. Beds that are left open constitute exposed soil. Temporary erosion control measures must be applied in accordance with 1717.2A2. Type 6 wood chip used as temporary erosion control shall not be used as final planting mulch if it is contaminated with soil.

S-89.19

Mn/DOT 2571.3B1b Method 2 - Cultivate-Fallow-Disk, is hereby deleted in its entirety.



S-89.20 The first sentence in the second paragraph of Mn/DOT 2571.3E Pruning – Top Growth and Roots, is revised to read as follows:

When pruning any woody vegetation, the Contractor shall use good horticultural practices, as shown in the current edition of the "Inspection and Contract Administration Manual for Mn/DOT Landscape Projects".

S-89.21 The third sentence in the second to last paragraph of Mn/DOT 2571.3F1 General, is revised to read as follows:

Plants with less than 100 mm (4 inches) of excess soil over the root flare may be accepted if the excess soil can be removed without damaging the plant. Plants shall be installed plumb and set so that after installation and backfill consolidation, the bottom of the root flare is at the finished soil elevation, as shown in the Plan and the current edition of the "Inspection and Contract Administration Manual for Mn/DOT Landscape Projects."

S-89.22 The second paragraph of Mn/DOT 2571.3F2 Balled and Burlapped Stock, is revised to read as follows:

If desired or necessary, staking and guying may be used to provide additional support for the stem and root ball in accordance with the Standard Planting Detail. In the case of trees, especially conifers, with light textured soil balls and/or exposure to high winds, steep slopes, and wet soils, it is recommended that the Contractor install staking and guying prior to removing the twine, wire baskets, burlap, and nails. Plants with broken soil balls shall be rejected. Staking and guying shall be installed in accordance with 2571.3J1.

S-89.23 Mn/DOT 2571.3F6(c) under Seedling Stock, is revised to read as follows:

- (c) Set the root collar to the depth shown in the Plan and current edition of the "Inspection and Contract Administration Manual for Mn/DOT Landscape Projects."

S-89.24 Mn/DOT 2571.3F6(f) under Seedling Stock, is revised to read as follows:

- (f) Protect seedlings with seedling tree shelters according to the Plan and Standard Planting Details.

S-89.25 Mn/DOT 2571.3F7 Preparing Planting Holes and Planting Beds by Plant Type, is hereby deleted and replaced with the following:

- F7 Vine Planting Locations (Preparing Planting Holes and Beds)  
The Contractor shall use the Herbicide Application Method (2571.3B1a) to control undesirable turf and weed growth. Spray to kill a continuous area 600mm (2 feet) wide that extends 1.5 m (5 feet) beyond the terminal vines. For each vine, loosen the soil to the Planting Hole Dimensions specified in the Plan. A dead turf strip shall remain between prepared planting holes. Mulch to continuously cover all sprayed and loosened areas along the planted side of walls

S-89.26 Mn/DOT 2571.3J2 Rodent Protection, is revised to read as follows:

The Contractor shall place rodent protection around all deciduous, pine, and larch trees in accordance with the Plan and Standard Planting Details unless specified otherwise.

S-89.27 Mn/DOT 2571.3N Acceptance of Work, is revised to read as follows:

For acceptance at full payment, plants shall meet all requirements including the criteria listed in the current edition of the "Inspection and Contract Administration Manual for Mn/DOT Landscape Projects," published by the Mn/DOT Landscape Architecture Unit. The plants shall be healthy, vigorous, and structurally sound.

**S-90 (2573) STORM WATER MANAGEMENT**

The provisions of Mn/DOT 2573 are supplemented and/or modified with the following:

S-90.1 The second paragraph of Mn/DOT 2573.3A1 Erosion Control Supervisor, is revised to read as follows:

The Erosion Control Supervisor shall be a responsible employee of the prime Contractor and/or duly authorized by the prime Contractor to represent the prime Contractor on all matters pertaining to the NPDES construction stormwater permit compliance. The Erosion Control Supervisor shall have authority over all Contractor operations which influence NPDES permit compliance including grading, excavation, bridge construction, culvert installation, utility work, clearing/grubbing, and any other operation that increases the erosion potential on the Project. In addition, the Erosion Control Supervisor shall be available to be on the Project within 24 hours at all times from initial disturbance to final stabilization as well as perform the following duties:

S-90.2 Mn/DOT 2573.5 Basis of Payment, is revised to read as follows:

Payment for storm water management and sediment control items will be compensation in full for all labor, materials, equipment, and other incidentals necessary to complete the work as specified, including the costs of maintenance and removal as required by the Contract. The Contractor will receive compensation at the appropriate Contract prices, or in the absence of a Contract bid price, according to the following unit prices, or in the absence of a Contract price and unit price, as Extra Work. The provisions of 1903 are modified to the extent that the Department will not make a price adjustment in the event of increased or decreased quantities of temporary erosion control items.

**S-91 (2573) STORM DRAIN INLET PROTECTION**

This work consists of constructing inlet protection in accordance with Mn/DOT 2573, the Plan details, and the following:

S-91.1 The majority of inlet protection required shall consist of filter bag inserts as detailed on Sheet No. 51 of the Plan. These are needed to capture the debris from pavement rehabilitation work such as sawing and grinding concrete.

S-91.2 Measurement will be made by the number of storm drain inlets properly protected over the life of the Contract without regard to the various types or number of devices used at each storm drain inlet. Payment will be made under Item 2573.530 (Storm Drain Inlet Protection) at the Contract bid price per each, which shall be compensation in full for all costs incidental thereto.

**S-92 (2575) RAPID STABILIZATION SPECIFICATIONS**

This work shall consist of operations necessary to rapidly stabilize small critical areas, to prevent off site sedimentation and/or to comply with permit requirements. The work may be performed at any time during the Contract and will be conducted on small areas that may or may not be accessible with normal equipment. This work shall be done in accordance with the applicable Mn/DOT Standard Specifications, the details shown in the Plan, and the following:

**S-92.1 BASIS OF PAYMENT**

In the absence of a Contract bid price, the Department will pay the following unit prices for Rapidly Stabilizing Small Scattered Critical Areas directly abutting Waters of the State during rough grading and as required in the NPDES permit. These unit prices shall be construed to include mobilizations for this activity.

Rapid Stabilization	Pre-Approve Prices	
Method 1	\$900/ha ( <b>\$400/acre</b> )	Approved price reflects small quantities. Quantities installed per Project visit are assumed to require approximately 0.4 to 0.8 ha [ <b>1 to 2 acres</b> ] of coverage.
Method 2	\$1235/ha ( <b>\$500/acre</b> )	Approved price reflects small quantities. Quantities installed per Project visit are assumed to require approximately 0.4 to 0.8 ha [ <b>1 to 2 acres</b> ] of coverage.
Method 3	\$86/m <sup>3</sup> ( <b>\$325/M gallon</b> )	Approved price reflects small quantities. Quantities installed per Project visit are assumed to require approximately 11.4 to 34 m <sup>3</sup> [ <b>3000 to 9000 gallons</b> ] of product slurry.
Method 4	\$3.00/m <sup>2</sup> ( <b>\$2.50/SY</b> )	Approved price reflects small quantities. Quantities installed per Project visit are assumed to require approximately 150 to 650 m <sup>2</sup> [ <b>200 to 800 SY</b> ] of coverage.
Method 5	\$48.60/metric ton ( <b>\$45/ton</b> )	Approved price reflects small quantities. Quantities installed per Project visit are assumed to require approximately 9 to 18 metric tons [ <b>10 to 20 tons</b> ] of riprap.

**S-93 (2582) PERMANENT PAVEMENT MARKINGS**

The provisions of Mn/DOT 2582 are hereby modified and/or supplemented with the following:

S-93.1 The provisions of Mn/DOT 2582.2 are hereby deleted and replaced with the following:

<b>A</b>	<b>Preformed Plastic Markings for Permanent Traffic Lane Delineation and Legends .....</b>	<b>3354</b>
<b>B</b>	<b>Epoxy Resin Pavement Markings (Free of Toxic Heavy Metals) .....</b>	<b>3590</b>
<b>C</b>	<b>High Solids Water-Based Traffic Paint .....</b>	<b>3591</b>
<b>D</b>	<b>Drop-On Glass Beads .....</b>	<b>3592</b>

Qualified materials can be found on Mn/DOT's Qualified Products List on the Office of Traffic, Security and Operations website. Other materials may be used on a provisional basis as detailed in the QPL process and as approved by the Engineer. Type of material used will be as specified by Contract Documents.

S-93.2 The following is hereby added to Mn/DOT 2582.3B, Application:

Any pavement markings to be grooved in shall be placed in accordance with manufacturer's instructions.

S-93.3 The provisions of Mn/DOT 2582.5 are hereby deleted and replaced with the following:

**2582.5 BASIS OF PAYMENT**

Payment for pavement markings installed at Contract prices per unit of material shall be compensation in full for all costs incurred in materials, traffic control, installation, surface preparation, use of primers, in accordance to Contract documents or as approved by the Engineer.

Item No.	Item	Unit
2582.501	Pavement Message (1) (2).....	Each
2582.502	___ mm (___ inch) width (3) (4) (2) .....	meter ( <b>linear foot</b> )
2582.503	Crosswalks (2).....	square meter ( <b>square foot</b> )
(1)	Specify Message	
(2)	Specify Material	
(3)	Specified Type of Line (Solid, Broken or Dotted)	
(4)	Specify Color	

**S-94 (3101) PORTLAND CEMENT**

Mn/DOT 3101 is hereby deleted and replaced with the following:

Cement shall be from certified sources only. Portland cement furnished under this Specification shall conform to AASHTO M 85 for the type specified except as herein modified:

- 1) Fineness shall be measured by the Air permeability test.

**Fineness, specific surface  
 Air permeability test  
 (all cement types except Type III):**

	<b>Square Meter per Kilogram</b>
Average value, min.....	360.0
Min. value, any one sample .....	340.0
Average value, max .....	420.0
Max. value, any one sample .....	440.0

The average value shall be determined on the last five samples from a source.

- 2) When the specifications require that low alkali cement be used, the total alkalis in the portland cement ( $\text{Na}_2\text{O} + 0.658 \text{K}_2\text{O}$ ) shall not exceed 0.60 percent. The total alkalis in the cementitious material shall not exceed  $3.0 \text{ kg/m}^3$  [**5.0 pounds per cubic yard**].
- 3) A maximum of 5.0% limestone by mass (**weight**) may be interground with the cement provided that the chemical and physical requirements are met. Only intergrind limestone that is naturally occurring, consisting of at least 70% by mass of one or more of the mineral forms of calcium carbonate. Calculate and report the limestone content in portland cement on the Test Mill Report as described in ASTM C 150, Annex A1. Include the  $\text{CO}_2$  content of the portland cement on the Test Mill Report. Determine the  $\text{CO}_2$  content in accordance with ASTM C 114. When any quantity of limestone is added, report the  $\text{C}_3\text{S}$  as calculated in ASTM C 150, Annex A1, using the actual  $\text{CO}_2$  value.
- 4) All delivery invoices shall include a standardized Cement Certification Statement which is as follows: **(insert company name) certifies that the cement produced at (insert plant and location) conforms to AASHTO and Mn/DOT Specifications for Type (insert Type) cement.** The change of source or color, or both, of cement on a Project shall not be permitted without the written approval of the Concrete Engineer.

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**(3103) PORTLAND-POZZOLAN CEMENT**

Mn/DOT 3103 is hereby deleted and replaced with the following:

Portland-Pozzolan cement shall be from certified sources only. Portland-Pozzolan cement furnished under this Specification shall conform to AASHTO M 240, Type IS, Type I(SM), Type IP, Type I(PM), Type IP-A or any other portland-pozzolan cement as approved by the Concrete Engineer, except as modified by the following:

- (1) The fly ash constituent of the interground cement shall not exceed 20 percent.
- (2) The fly ash constituent of blended cement shall not exceed 15 percent.
- (3) The ground granulated blast furnace slag constituent of the interground cement shall not exceed 35 percent.
- (4) The ground granulated blast furnace slag constituent of blended cement shall not exceed 35 percent.

All delivery invoices shall include a standardized Cement Certification Statement which is as follows: (insert company name) certifies that the cement produced at (insert plant and location) conforms to AASHTO and Mn/DOT Specifications for Type (insert Type) cement. The change of source or color, or both, of cement on a Project will not be permitted without the written approval of the Concrete Engineer.

S-96

**(3138) AGGREGATE FOR SURFACE AND BASE COURSES**

The provisions of Mn/DOT 3138 are hereby modified as follows:

S-96.1  
follows:

The second paragraph of Mn/DOT 3138.2B Gradation Tables 3138-1 and 2, is revised to read as

If Class 7 is substituted for Classes 1, 3, 4, 5, or 6, it shall meet the gradation requirements of the substituted class (Table 3138-1); except that, for Class 5 and 6, up to 5 percent by mass (**weight**) of the total composite mixture may exceed 25.0 mm (**1 inch**) sieve but 100 percent must pass the 37.5 mm (**1.5 inch**) sieve. Surfacing aggregate mixtures containing salvaged materials shall meet the gradation requirements of the materials specified in the Plan. All gradations will be run on the composite mixture before extraction of the bituminous material.

S-96.2 TABLE 3138-1 in Mn/DOT 3138.2B Gradation Tables 3138-1 and 2, is hereby deleted and replaced with the following:

**TABLE 3138-1**  
**BASE AND SURFACING AGGREGATE**  
**Total Percent Passing**

Sieve Size	Class 1 (A)	Class 2	Class 3 (A)	Class 4 (A)	Class 5 (A) (B)	Class 6 (A) (B)
75 mm (3 inches)	--	--	--	--	--	--
50 mm (2 inches)	--	--	100	100	--	--
37.5 mm (1½ inches)	--	--	--	--	--	--
25.0 mm (1 inch)	--	--	--	--	100	100
19.0 mm (¾ inch)	100	100	--	--	90-100	90-100
9.5 mm (3/8 inch)	65-95	65-90	--	--	50-90	50-85
4.75 mm (No. 4)	40-85	35-70	35-100	35-100	35-80	35-70
2.00 mm (No. 10)	25-70	25-45	20-100	20-100	20-65	20-55
425 µm (No. 40)	10-45	12-30	5-50	5-35	10-35	10-30
75 µm (No. 200)	8.0-15.0	5.0-13.0	5.0-10.0	4.0-10.0	3.0-10.0	3.0-7.0

- (A) When salvaged materials are substituted for another class of aggregate, it shall meet the gradation requirements of the class being replaced except as amended in 3138.2 B.
- (B) The gradation requirements for aggregates containing 60% or more crushed quarry rock may be amended with the concurrence of the Project Engineer and the Grading and Base Engineer.

S-96.3 The fifth paragraph of Mn/DOT 3138.3 Sampling and Testing, is revised to read as follows:

The stockpile shall be sampled at the rate of one field gradation test per 1,000 metric tons (tons) of aggregate used on the Project.

**S-97 (3236) REINFORCED CONCRETE PIPE**

The provisions of Mn/DOT 3236 are modified and/or supplemented with the following:

S-97.1 Manufacturers of reinforced concrete pipe may produce an alternate "offset joint" on the spigot end of the pipe. This type of offset joint is to be used with the profile or prelubricated pipe seal systems. See Mn/DOT Standard Plate 3006.

S-97.2 The first paragraph of Mn/DOT 3236.2A3 is hereby deleted and replaced with the following:

Cement substitutions as addressed in 2461.3D are hereby modified as follows to allow:

- (a) 30 percent Class F or Class C fly ash by weight
- (b) 35 percent ground granulated blast furnace slag by weight
- (c) 35 percent substitution with a combination of ground granulated blast furnace slag and Type F or Type C fly ash by weight

All other provisions of 2461.3D shall apply. The use of admixtures shall conform to 2461.3E.

**S-98** **(3302) DOWEL BARS**

Mn/DOT 3302 is hereby deleted and replaced with the following:

Dowel bars shall be fabricated from Grade 40 or 60 steel in accordance with AASHTO M31, M42 or M53 and be epoxy coated in conformance with AASHTO M284. The ends of the dowel bars may be epoxy coated at the discretion of the fabricator. Application of epoxy coating shall be made in a fusion bonded epoxy coating plant that has been granted "Certification" by the Concrete Reinforcing Steel Institute, or an organization approved by the Materials Engineer.

The plant's quality control office shall maintain documentation containing the data required by certification. This documentation shall contain test data and measurements taken at times and locations approved by the Engineer, ensuring that monitoring, by personnel not directly involved in production, is sufficient for compliance with approved procedures.

All dowel bars shall be stored and protected in accordance with 2472.

Shearing will be permitted provided the coating is not damaged and subject to permissible deformation. Any deformation larger than true shape shall not exceed 1 mm (**0.04 inch**) increase in diameter or thickness and shall not extend more than 10 mm (**0.40 inch**) from the dowel end.

**S-99** **(3376) FENCE WIRE**

The provisions of Mn/DOT 3376 are modified and/or supplemented with the following:

S-99.1 The last paragraph of Mn/DOT 3376.2A Barbed Wire, is hereby revised to read as follows:

Aluminum coated steel barbed wire shall conform to ASTM A 121, Type I or II.

S-99.2 The second paragraph of Mn/DOT 3376.2B Woven Wire, is hereby revised to read as follows:

Aluminum coated steel woven wire shall conform to ASTM A 116, for the size and construction specified.

**S-100** **(3401) FLANGED CHANNEL SIGN POSTS**

The provisions of Mn/DOT 3401 are hereby modified and/or supplemented with the following:

S-100.1 The last sentence of Mn/DOT 3401.2A Material, is hereby revised to read as follows:

The steel shall conform to the mechanical requirements of ASTM A 499, Grade 420 (**60**) and to the chemical requirements of ASTM A 1 for rails having nominal mass of 45 kg per m [**91 pounds per yard**] of length or heavier.

S-100.2 Mn/DOT 3401.2C Mass, is hereby deleted and the following substituted therefore:

**C Mass (Weight)**

The nominal mass (weight) of the posts shall be as specified in the Plans, 3.0, 3.7, 4.1, 4.5, or 6.0 kg/m (2.0, 2.5, 2.75, 3.0, or 4.0 pounds per foot) of length, before punching and exclusive of galvanizing, anchor plates, and other attachments. A variation up to 5 percent under the specified mass (weight) will be permitted.

S-100.3 Table 3401-1 is hereby deleted and the following substituted therefore:

<b>TABLE 3401-1</b>					
<b>NOMINAL DIMENSIONS</b>					
<b>Mass per Unit of Length</b>	<b>3.0 kg (2.0 pound)</b>	<b>3.7 kg (2.5 pound)</b>	<b>4.1 kg (2.75 pound)</b>	<b>4.5 kg (3.0 pound)</b>	<b>6.0 kg (4.0 pound)</b>
Wide overall across front	76 mm (3 inches)	76 mm (3 inches)	76 mm (3 inches)	83 mm (3¼ inches)	89 mm (3½ inches)
back surface	25 mm (1 inch)	25 mm (1 inch)	25 mm (1 inch)	32 mm (1¼ inches)	32 mm (1¼ inches)
flanges (bearing surface)	13 mm (½ inch)	13 mm (½ inch)	13 mm (½ inch)	16 mm (⅝ inch)	19 mm (¾ inch)
Depth overall, front to back	35 mm (1⅜ inches)	35 mm (1⅜ inches)	38 mm (1½ inches)	38 mm (1½ inches)	43 mm (1.7 inch)
Thickness of Metal, Flanges & Back	3 mm (1/8 inch)	3 mm (1/8 inch)	5 mm (3/16 inch)	4 mm (0.16 inch)	5 mm (0.20 inch)
Sides	3 mm (1/10 inch)	3 mm (1/8 inch)	3 mm (1/8 inch)	4 mm (0.15 inch)	4 mm (0.15 inch)

NOTE: Dimension requirements are for flat flange sections.

**S-101 (3590) EPOXY RESIN PAVEMENT MARKINGS (FREE OF TOXIC HEAVY METALS)**

The provisions of Mn/DOT 3590.3 are hereby deleted and replaced with the following:

**3590.3 SPECIFIC REQUIREMENTS**

**A Epoxy Resin Material**

The material shall be composed of epoxy resins and pigments only. No solvents are to be given off to the environment upon application to a pavement surface.

The composition shall be within the tolerance permitted for the product tested and approved by Mn/DOT. Type II material shall be completely free of TMPTA (Tri-Methylol Propane Tri-Acrylate) and other multi-functional monomers.

All materials shall be free of lead, cadmium, mercury, hexavalent chromium and other toxic heavy metals as defined by the United States Environmental Protection Agency.



**Color:**

The color of the white epoxy shall be a pure flat white, free of tints. The color of the yellow epoxy shall closely match Color Number 33538 of Federal Standard 595 and shall conform to the following CIE Chromaticity limits using illuminant "C":

x | 0.470 | 0.485 | 0.520 | 0.480  
y | 0.440 | 0.460 | 0.450 | 0.420

Daylight Directional Reflectance (Y), white, minimum 83  
Daylight Directional Reflectance (Y), yellow, minimum 50

**Testing will be according to:**

Daylight Directional Reflectance..... ASTM D 2805  
Color..... ASTM D 2805

**Adhesion Capabilities:**

When the adhesion of the material to portland cement concrete (the concrete shall have a minimum of 2 070 kPa [300 psi.] tensile strength) is tested according to American Concrete Institute Committee 403 testing procedure, the failure of the system must take place in the concrete. The concrete shall be 32°C [90°F] when the material is applied, after which the material shall be allowed to cure for 72 hours at 23 ± 2°C [73 ± 36° F].

**Abrasion Resistance:**

When the abrasion resistance of the material is tested according to ASTM C 501 with a CS-17 wheel under a load of 1000 grams for 1000 cycles, the wear index shall be no greater than 82. (The wear index is the weight in milligrams that is abraded from the sample under the test conditions).

**Hardness:**

The Type D durometer hardness of the material shall be not less than 75 nor more than 90 when tested according to ASTM D2240 after the material has cured for 72 hours at 23 ± 2°C [73 ± 36° F].

**Tensile Strength:**

The tensile strength of the material, when tested according to ASTM D 638, shall not be less than 41 370 kPa [6,000 psi.] after 72 hours cure at 23 ± 2°C [73 ± 36° F].

**Compressive Strength:**

The compressive strength of the material, when tested according to ASTM D 695, shall not be less than 82,700 kPa [12,000 psi.] after 72 hours cure at 23±2°C [73 ± 36° F].

**Thickness:**

The epoxy pavement marking wet film thicknesses shall be a minimum of 380 µm [15 mil] on all pavement surfaces. For the Spec 2360 SUPERPAVE wearing courses the epoxy pavement marking wet film thicknesses shall be increase from a minimum of 380 µm [15 mil] to a minimum thickness of 508 µm [20 mil] wet film.

**B Glass Beads**

Glass beads shall meet the requirements of AASHTO M247, Type I, and:

- a. Coatings -- the beads shall be treated according to the manufacturers recommendations and meet the requirements of Section 4.4.2 of M247, and
- b. Roundness-- the beads shall have a roundness of at least 80%.

For 380 µm [15 mil] applications, glass beads shall be applied at a rate of at least 3.0 kg/L [25 pounds per gallon]. A greater bead application rate may be necessary for meeting the performance criteria (minimum levels of retroreflectivity). This will require contractors to consult with all the material manufacturers.

Time to No-Track:

Type I material shall be in "no-tracking" condition in 15 minutes or less and within 45 minutes for Type II material. The "no-tracking" condition shall be determined on an application of specified thickness to the pavement and covered with glass beads at the rate of at least 3.0 kg/L [25 pounds per gallon]. The lines for this test shall be applied with striping equipment operated so as to have the material at manufacturer's recommended application temperature. This maximum "no-tracking" time shall not be exceeded when the pavement temperature varies from 10 to 49° C [50 to 120° F] and under all humidity conditions, providing the pavement is dry. The no-tracking time shall be determined by passing over the line with a passenger car or pickup truck at a speed of 40 to 55 km/hr [25 to 35 mph] in a simulated passing maneuver. A line showing no visual deposition of the material to the pavement surface when viewed from a distance of 15 m [50 feet] shall be considered as showing "no-tracking" and conforming to this requirement for time to "no-track."

**S-102            (3591) HIGH SOLIDS WATER BASED TRAFFIC PAINT**

The following is hereby added to Mn/DOT 3591.2 C:

- C5            Glass beads shall be applied immediately after application of a paint line at a rate of 960 gram per Liter (8 pounds per gallon). Beads shall be evenly distributed on pavement. All material shall be placed in a workmanlike manner, which shall result in a clearly defined line that has been adequately reflectorized with glass beads.

**S-103            (3592) DROP-ON GLASS BEADS**

The provisions of Mn/DOT 3592.3 are hereby deleted and replaced with the following:

**3592.3            SPECIFIC REQUIREMENTS**

Glass beads shall meet the requirements of AASHTO M247, Type I, "standard gradation" except the beads will have a minimum of 80 percent true spheres. The dual treated beads will meet the moisture resistant requirements of AASHTO M 247 Section 4.4.2 and pass the adherence treatment Dansyl Chloride Test. The moisture resistant silicone treated beads will meet AASHTO M 247 Section 4.2.2.

**S-104            (3721) PREFORMED ELASTOMERIC COMPRESSION JOINT SEALS FOR CONCRETE**

The provisions of Mn/DOT 3721 are hereby modified with the following:

- S-104.1            The following is hereby inserted into Mn/DOT 3721.2A3 after Compression-Deflection Characteristics:

17.5 mm (11/16 inch) Seal:	
Force @ 14 mm,	0.70 N/mm min.....Mn/DOT Method (C)
Force @ 0.55 inch pounds/linear inch	[4 min].....Mn/DOT Method (C)
Force @ 10 mm,	3.50 N/mm max. ....Mn/DOT Method (C)
Force @ 0.40 inch pounds/linear inch	[20 max].....Mn/DOT Method (C)

S-104.2 Table 3721-2 is hereby deleted from Mn/DOT 3721.3C3 and replaced with the following:

**TABLE 3721-2  
 SPECIFIED SPECIMEN SIZE AND TEST DEFLECTIONS**

<b>Nominal Width of Seal mm (inches)</b>	<b>Column A Specimen Length ± 5 mm (± 0.2 inch)</b>	<b>Column B Test Width for Min. Pressure mm (inches)</b>	<b>Column C Test Width for Max. Pressure mm (inches)</b>
17.5 mm <b>(11/16 inch)</b>	100 mm <b>(4 inch)</b>	14mm <b>(0.55 inch)</b>	10 mm <b>(0.40 inch)</b>
20 mm <b>(13/16 inch)</b>	100 mm <b>(4 inch)</b>	16.5mm <b>(0.65 inch)</b>	10 mm <b>(0.41 inch)</b>
32 mm <b>(1-1/4 inch)</b>	100 mm <b>(4 inch)</b>	25.0 mm <b>(1.00 inch)</b>	11 mm <b>(0.44 inch)</b>
50 mm <b>(2 inch)</b>	150 mm <b>(6 inch)</b>	41.0 mm <b>(1.62 inch)</b>	17 mm <b>(0.69 inch)</b>
90 mm <b>(3-1/2 inch)</b>	150 mm <b>(6 inch)</b>	75.0 mm <b>(3.00 inch)</b>	35 mm <b>(1.38 inch)</b>

**S-105 (3861) PLANT STOCK**

The provisions of Mn/DOT 3861 are supplemented and/or modified with the following:

S-105.1 The third to last paragraph of Mn/DOT 3861.3 Sampling and Inspection, is revised to read as follows:

During the spring planting season, coniferous plants that have candled out (put out new growth) while being stored in a holding bin may be planted, however, coniferous plants that are dug after candling out will be rejected. Coniferous trees not fully branched from bottom to top will be rejected. Only coniferous trees with buds or new growth at the terminal ends of branches shall be accepted, provided the tree meets the dimensional requirements defined in the current edition of the "Inspection and Contract Administration Manual for Mn/DOT Landscape Projects". Sheared or previously de-budded conifers may have enlarged trunk growth that is out of balance with a typical transplanted root system that is now too small. Therefore, previously sheared or de-budded coniferous trees will be subject to the minimum trunk caliper to root ball size relationship for deciduous trees as defined in the current edition of the "Inspection and Contract Administration Manual for Mn/DOT Landscape Projects". Pine trees shall have a terminal leader bud and terminal leaders shorter than 500 mm (**18 inches**) in length. A new central leader must be trained in conifers delivered with multiple or missing leaders.

**S-106 (3876) SEED**

The provisions of Mn/DOT 3876 are supplemented and/or modified with the following:

S-106.1 The first sentence in the first paragraph of Mn/DOT 3876.2A General Requirements, is revised to read as follows:

All seed shall conform to the latest seed law of the State, including those governing labeling and weed seed tolerances. Tolerances for Germination and Purity, as determined by the Department of Agriculture, shall only apply to seed that has been previously tested and approved by the Department of Agriculture as a seed lot.

S-106.2 The second to last paragraph of Mn/DOT 3876.2A General Requirements, is revised to read as follows:

All native grass, sedge, rush and forb seed shall be either origin certified or wild-type. Origin Certified Seed, designated as MCIA yellow tag species shall be used in all native seed mixes (mixes numbered 300 and above). Wild type may be substituted for yellow tag species only by obtaining approval of the Engineer and the Erosion Control Engineering Unit from the Office of Environmental Services. Wild type and named varieties of native species listed in Table 3876-1 may be used in 100 and 200 series seed mixtures. Origin shall be clearly identified on the seed label for all seed, including native forbs.

**S-107 (3889) TEMPORARY DITCH CHECKS**

The provisions of Mn/DOT 3889 are supplemented and/or modified with the following:

S-107.1 Mn/DOT 3889.2B Type 2: Bioroll, is revised to read as follows:

Type 2 ditch checks shall consist of 3897 Filter Log Type; Straw Bioroll or Wood Fiber Bioroll.

S-107.2 Mn/DOT 3889.2C Type 3: Bioroll Blanket System, is revised to read as follows:

Type 3 ditch checks shall consist of two components; Filter Log Type; Straw Bioroll or Wood Fiber Bioroll in accordance with 3897, staked on top of a Category 3, specification 3885 erosion control blanket. The blanket shall form a minimum width of 3.7 m (12 feet) perpendicular to the ditch gradient.

**S-108 (3891) STORM DRAIN INLET PROTECTION**

The provisions of Mn/DOT 3891 are supplemented and/or modified with the following:

S-108.1 Mn/DOT 3891.3A Rock Log, is revised to read as follows:

Rock logs shall meet the requirements of 3897.2 Filter Log Type Rock Log.

S-108.2 Mn/DOT 3891.3B Compost Log, is revised to read as follows:

Compost logs shall meet the requirements of 3897.2 Filter Log Type Compost Log

**S-109 FINAL ESTIMATE AND FINAL PAYMENT**

The following provisions shall apply to preparation of the Final Estimate and execution of Final Payment under this Contract:

S-109.1 FINAL ESTIMATE

State Law provides that the final estimate will be made within 90 days after completion of all work required under this Contract. If, however, the total value of the Contract exceeds \$2,000,000.00, the 90 day requirement will not apply and the time allowed for making such final estimate shall be 180 days after the work under this Contract has been, in all things, completed to the satisfaction of the Commissioner.

S-109.2 FINAL PAYMENT

If this Contract contains a "Disadvantage Business Enterprise or Targeted Group Business" goal, the following requirement shall apply:

"Before final payment is made, the Contractor shall also complete an affidavit showing the total dollar amounts of work performed by disadvantaged business enterprise (DBE) and targeted group business (TGB)."

SB-1            BRIDGE PLANS

Plans of existing structures are available at the Minnesota Dept. of Transportation, Bridge Office, 3485 Hadley Avenue N., Oakdale, MN, 55128, for review and inspection by Bidders; or electronic copies are available for viewing, printing, and downloading on the Mn/DOT Consumer Access EDMS (Electronic Document Management System). Go to: [http://dotapp3.dot.state.mn.us/cyberdocs\\_guest/Libraries/Default\\_Library/Group/GUEST/frameset.asp](http://dotapp3.dot.state.mn.us/cyberdocs_guest/Libraries/Default_Library/Group/GUEST/frameset.asp) however, the State neither warrants nor represents that existing structures conform exactly to the details shown in those Plans.

SB-2            (1508) CONSTRUCTION STAKES, LINES, AND GRADES

The provisions of Mn/DOT 1508 are supplemented as follows:

The Engineer may take profiles before any concrete removal operations begin and as s/he deems necessary after concrete removal. The Engineer will then establish a smooth profile grade across each bridge and its approaches that will provide the minimum wearing course thickness and a smooth transition to the in-place roadway.

SB-3            (1706) EMPLOYEE HEALTH AND WELFARE

The provisions of Mn/DOT 1706 are supplemented as follows:

The Contractor shall submit a plan, at the preconstruction conference, for providing all OSHA required safety equipment (safety nets, static lines, false decks, etc.) for all work areas whose working surface is 1.8 meters (**6 feet**) or more above the ground, water, or other surfaces. Submittal of this plan will in no way relieve the Contractor of his/her responsibility for providing a safe working area.

All safety equipment, in accordance with the Contractor's plan, must be in place and operable in adequate time to allow Mn/DOT personnel to perform their required inspection duties at the appropriate time. No concrete shall be placed in any areas affected by such required inspection until the inspection has been completed.

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The installation of safety lines, safety nets, or other systems whose purpose is to reduce the hazards of bridge work may require the attachment of anchorage devices to beams, girders, diaphragms, bracing or other components of the structure. Clamp type anchorage systems which do not require modification of structural members may be used provided they do not interfere with proper execution of the work; however, if the Contractor desires to use an anchorage system which requires modification of structural members, s/he shall request approval, in writing, for plan modification as provided in Mn/DOT Specifications. Requests to install systems which require field welding or drilling of primary stress carrying members of a bridge will not be approved. The Contractor shall indicate any portions of anchorage devices which will remain permanently in the structure.

On both ends of each pier cap extending 1.8 meters (**6 feet**) or more above the ground, the Contractor shall install an insert or other suitable anchorage to which safety lines can be attached. Any portion of said device extending outside the finished lines of the pier cap shall be removed unless otherwise approved by the Engineer. Any void or cavity resulting from the installation or removal of this device shall be repaired or sealed to prevent the ponding or entry of water as directed by the Engineer.

Approved anchorage systems shall be furnished, installed, and removed at no increased cost to the State for materials, fabrication, erection, or removal of the bridge component or anchorage system.

SB-4      (1709) NAVIGABLE WATERWAYS - BR. NO. 9340

All work on navigable waters shall be performed in accordance with the provisions of Mn/DOT 1709 and the following:

All work on or in navigable waters shall be subject to regulations formulated by the United States Coast Guard, Department of Transportation.

The Contractor shall prepare plans showing the location and dimensions of his/her proposed cofferdams and other temporary construction which may directly or indirectly affect navigation clearances or impede or divert steam flow, as well as his/her proposed method of furnishing, installing, operating and maintaining temporary navigation lights.

The Contractor shall forward 8 sets of prints to the Commander, (DWB), 8<sup>th</sup> Coast Guard District, 1222 Spruce Street, St. Louis, Missouri 63103 for approval. When approval has been obtained from the Coast Guard, two sets of prints with such approval noted thereon, shall be furnished to the Project Engineer.

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No work shall be started on any construction which requires approval of the above noted governmental agency until notice of approval has been furnished to the Project Engineer.

Approval by the Coast Guard of the location and dimensions of cofferdams and other temporary construction shall not in any way relieve the Contractor of his/her responsibility for providing adequate and safe construction; nor shall it in any way alter any requirements for forwarding plans of cofferdams and other temporary construction to the Project Engineer for approval as to type of construction.

All costs incurred by compliance with the above requirements will be considered to be incidental expense for which no direct compensation will be made.

SB-5            (1717) AIR, LAND AND WATER POLLUTION

The provisions of 1717 are supplemented as follows:

The Contractor's attention is hereby directed to MPCA Rule 7011.0150 as it relates to sandblasting and/or concrete removal operations (<http://www.pca.state.mn.us/index.cfm>).

Unless otherwise provided in these special provisions, construction, demolition and/or removal operations conducted over or in the vicinity of public waters shall be so controlled as to prevent materials from falling into the water. Any materials which do fall into the water, or onto areas where there is a likelihood that they will be picked up by rising water levels, shall be retrieved and stored in areas where such likelihood does not exist.

SB-6            (1803) PROSECUTION OF WORK

The work under this Contract shall be prosecuted in accordance with the provisions of Mn/DOT 1803, except as modified below:

The provisions of Mn/DOT 1803.3 are supplemented as follows:

The Contractor's attention is hereby called to the requirements for stage construction as indicated in the Plans and/or Special Provisions. The Contractor shall submit plans and schedules to the Engineer for approval detailing his/her proposed scheme and sequence of operations, including traffic channelization, flagging, protective installations, and other pertinent procedures to be employed both on and off of the structure.



No compensation, other than for plan pay items, will be made for complying with the above requirements.

SB-7            ANTI-ICING SYSTEM – BR. NO. 9340

SB-7.1        Description of Anti-icing System

The fully automated anti-icing system on Bridge No. 9340 consists of a series of 76 spray disks and spray heads, 68 of which are flush-mounted spray disks located near the center of *each* of the north-bound and south-bound roadways (34 spray disks in each direction), and spaced approximately 55 feet apart. Eight spray heads are mounted in the median barriers at the north end of the bridge, but are currently not in use. The spray disks are connected and controlled by chemical supply lines and low-voltage electrical feeds attached to the bridge superstructure. 38 valve unit/accumulator tanks, each serving two spray disks, are housed in stainless steel cabinets mounted in the open space between the median barriers. A chemical supply tank, as well as the pumps and electronics that operate the system, are in a pump house structure located just off the northwest corner of the bridge.

In addition to the embedded spray disks, a set of embedded pavement-condition sensors, each set consisting of a BOSO™ and an ARCTIS™ sensor, is located in each roadway. A roadway weather information system (RWIS) station is mounted on the outside of the west bridge railing, with a slave RWIS station mounted on the outside of the east bridge railing. Approximate locations of the sensors and RWIS stations are shown in the Plans.

The anti-icing system was furnished and installed in 1999 by Boschung Mecatronic of Switzerland. The system is maintained by Mn/DOT Metro Maintenance in consultation with Boschung America LLC, the American subsidiary of Boschung Mecatronic.

SB-7.2        Description of Work

The work for this Project consists of protection, removal and restoration of anti-icing system spray disks and sensors that are embedded in the deck surface of Bridge No. 9340. Removal of the wearing course will destroy the base of each spray disk and all deck-mounted sensors which will require replacement of those components. The work shall be performed as directed by the Engineer and in accordance with the following special provisions:

SB-7.3 Removal and Protection of Spray Disks and Sensors

Construction activities for repair of the bridge deck will impact the flush-mounted spray disks and embedded sensors. Spray disk units are detailed in the Plans (Detail A on Sheet 13 of 119 Sheets) showing all parts that make up a single unit. Prior to start of wearing course removal, the spray disk covers and the screws that attach the covers to the bases shall be removed and salvaged for later replacement. The O-rings that separate the spray disk head from the base shall also be removed, but not salvaged. The spray disk base—constructed of Delrin™ plastic—is not removable, thus, must be sacrificed during removal of the wearing course. Removal and replacement of underdeck spray disk components and sensor connections will require special equipment for access beneath the deck. Removed components and material that are not to be salvaged shall be disposed of in accordance with 2104.3C3.

A. Sequence of Operations for Spray Disk Component Removal

1. Remove and salvage spray disk covers and screws (from top of deck). O-rings shall be removed, but not salvaged.
2. Disconnect angle piece from the horizontal 1-inch dia. pressure pipe (from below the deck.)
3. Loosen fixing washer and turn the vertical 1-inch dia. pressure pipe to remove it from the connection socket (from below the deck.)
4. Salvage vertical pressure pipe, fixing washer and any other components removed, except for the angle pieces that are to be replaced (note that there are both English and Metric parts incorporated in the system so the measurement units of each part should be confirmed prior to ordering and installation). Any components destroyed during the removal shall be replaced in kind and shall be incidental to the item "RECONSTRUCT ANTI-ICING SYSTEM".

B. Disconnection and Removal of ARCTIS™ and BOSO™ Sensors

The ARCTIS™ and BOSO™ sensors shall be disconnected from the RWIS station prior to wearing course removal operations. The cables that connect the sensors to the RWIS and the sensors are not salvageable. The cables run inside of conduit connected to the underside of the bridge and can be pulled back through the conduit. No special protection of the sensor locations is necessary as new holes are to be drilled through the deck and new conduit connections made for reinstallation, however, Mn/DOT Maintenance Operations will attempt removal with Mn/DOT forces in an effort to salvage the sensors for future work. The Contractor shall work with Mr. Cal Lucas, Mn/DOT Metro Maintenance Operations, 651-775-0303, to coordinate the removal operations.

C. Protection of Embedded Spray Disk Components

After the above-noted spray disk components have been removed, the wearing course can then be removed. It is recommended that the wearing course near the spray disks be removed by milling to no more than 2½ inches deep in order to avoid damage to the connection socket. If Slab Removal Type 1 and 3 is necessary near the spray disks, care shall be exercised to prevent damage to the remaining parts. Any parts damaged shall be replaced by the Contractor at no cost to the State.

After the wearing course has been removed, the cavity for the spray disk shall be cleaned of all remaining epoxy sealing compound, foam ring and debris to the top of and within the connection socket. The 4½-inch hole should be plugged with foam or other suitable material to prevent concrete from entering the hole and the connection socket. Interface surfaces with the new wearing course that are within the cavity can be covered with a debonding material to facilitate removal of concrete for replacement of the spray disks.

D. Placement of Concrete Wearing Course

The concrete wearing course may be placed in the normal manner over the areas of the spray disks and sensors after installation of the necessary protection of the in-place spray disk components as noted above.

SB-7.4 Restoration of Spray Disks and Sensors

After the deck repair work has been completed, the spray disks and sensors shall be restored to prior operating condition. All salvaged and new components of the spray disks, including spray disk covers, connecting screws and O-rings shall be installed by the Contractor in accordance with the Plan details. Since installation of the spray disks and sensors is a specialized operation that requires precise setting of the components into the bridge deck, the Contractor shall contact Boschung America for assistance. The contact person is as follows:

Bill Gorse  
Ph: 763-658-3300  
E-mail: [wrg@boschungamerica.com](mailto:wrg@boschungamerica.com)

To provide direction and assistance for this work, Mn/DOT will require a field representative from Boschung America to be on site during, at least, the first two days of installation operations for the spray disks; and during the entire installation period for the sensors.

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Assistance in obtaining new anti-icing system components and subsequent installation is available from Mn/DOT Metro Maintenance. The contact person is as follows:

Chris Beckwith  
Ph: 651-582-1431  
E-mail: christine.beckwith@dot.state.mn.us

Prior to the start of any spray disk and sensor installation, the Contractor shall furnish to the Engineer for approval a proposed installation procedure, including source of supply of replaceable components and setting/sealing compounds.

A. Materials

Sensor brands BOSO™ and an ARCTIS™ must be used and are obtainable only from Boschung America. Cables are provided with the sensors, hence, the length of cable required—for each sensor—shall be indicated with the order.

The spray disk bases shall be replaced in kind or with an approved equal. Spray disks are not a proprietary product and may be obtained from Boschung America or fabricated by other vendors.

The O-rings shall be replaced in kind or with an approved equal. The O-rings are not a proprietary product and may also be obtained from Boschung America or other vendors. It is important to note that the O-rings are a Metric part and must be replaced with a Metric part, not the English equivalent part in order for the O-rings to function correctly.

B. Spray Disk Installation

Special installation brackets are required for precise setting of the spray disks and should be available from Boschung America. The Contractor may fabricate additional similar brackets to expedite the work.

Spray disk placement can be located after the wearing course has cured by drilling a 1-inch dia. pilot hole upwards from the bottom of the deck through the connection sockets, and in place conduits for the sensors. Then, from the top of the deck, drill a 4½ - inch dia. hole to match the in place 4½ -inch hole, and an 11-inch dia. hole through the new wearing course. The depth of the holes shall be as shown in the Plans. After the core holes are drilled, the concrete surface inside of the holes shall be thoroughly cleaned and dry prior to installation of the spray disks.

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It should be noted that the hole through the connection socket is offset 7/8 inch from the center of the spray disk. The 4½-inch core hole is centered on the connection socket.

After the cavity in the wearing course for the spray disk is completed and prior to replacing components, a foam ring shall be placed in the 4 ½-inch hole to prevent the epoxy sealing compound from entering the connection socket. A new spray disk base and the salvaged vertical pressure pipe shall be installed as shown in Detail A in the Plans. New angle pieces shall be provided to connect the horizontal and vertical pressure pipes. Any other components that may have been damaged by the Contractor in removal operations shall be replaced at no additional cost to the State.

When the vertical pressure pipe is reinstalled, it must first be attached to the spray disk base before the disk is cemented in place. Hence, it must be installed from the top of the deck to assure proper fit in the base.

An approved epoxy cement/sealing compound, such as PRODOFIX™, Thoroc IC 2250™, or approved equal, shall be placed in accordance with the manufacturer's specifications in the space surrounding the spray disk.

#### C. Sensor Installation

Sensors are to be installed in approximately the same locations as the previous sensors. The Engineer will mark the sensor locations on the new wearing course.

The Contractor shall construct cavities in the wearing course with dimensions shown in the Plans. Actual dimensions required for the sensors shall be verified in the field. Vertical sides of the cavities shall be saw-cut to the depths shown. A 1½-inch hole shall be drilled through the deck for the sensor cable for reattachment to the RWIS station. PVC conduit and fittings necessary for placement will be determined in the field by the Engineer and shall be considered as incidental items with no additional compensation. Once the sensor cable has been run to the RWIS stations, excess cable shall be cut off and removed. **Please note that the sensor cable cannot be spliced if it is kinked or cut so care shall be taken when working with it.**

Special installation brackets shall be used for precise setting of the sensors with respect to the wearing course surface. Mn/DOT does not own any of these types of brackets, however, such brackets can be obtained from Boschung America.

D. Testing the Restored Anti-icing System

Using water, all spray disk connections below the deck shall be tested by the Contractor for leakage prior to approval, by the Engineer, of the spray disk installation. Mn/DOT maintenance personnel will then perform test sprays of the system with water. Fine tuning and minor adjustments of the spray disk covers will also be performed by maintenance personnel. A representative of Boschung America will test the sensor connections and program the system for operational use.

SB-7.5 Method of Measurement

Measurement of work on the anti-icing system required to remove and replace the anti-icing system spray disks and sensors, as described above, will be measured as a single lump sum.

SB-7.6 Basis of Payment

Payment for Item No. 2100.601, "RECONSTRUCT ANTI-ICING SYSTEM", will be made at the Contract price per lump sum and shall be compensation in full for all costs of removal, disposal and restoration of the anti-icing system, as described above, including all incidentals thereto.

SB-8 (2401) CONCRETE BRIDGE CONSTRUCTION

The provisions of Mn/DOT 2401 are modified and/or supplemented with the following:

SB-8.1 Concrete Aggregate for Bridges

The provisions of 2401.2A shall apply except as modified herein:

Delete the second paragraph of 2401.2A and substitute the following therefor:

Class A or Class C coarse aggregate, as defined in 3137.2B, shall be used in all concrete for bridge superstructures, except that coarse aggregate requirements for precast concrete members fabricated under 2405 shall be as specified in 2461.2D.

SB-8.2 Joint Filler and Sealing

The provisions of 2401.3J1 are supplemented as follows:

Prior to installation of sealing materials, concrete curing shall be completed. A minimum of 7 days drying is required prior to application of sealers. Sawcut joints shall be sandblasted, blown clean, and the concrete surfaces shall be dry at the time sealer is installed.

Preformed joint shall be as detailed in the Plans and in conformance with the following requirements.

1. Bituminous felt shall comply with AASHTO M33, modified to the extent that the load required to compress the test specimen to 50 percent of its thickness before test shall be not more than 8274 kPa (**1200 psi**).
2. Cork shall comply with Mn/DOT 3702 and AASHTO M153 Type II.
3. Polystyrene shall comply with the following:

Type	Minimum Compressive Strength (5 percent deflection)	Characteristics
A	207 kPa ( <b>30 psi</b> )	Closed Cell Expanded Polystyrene
B	69 kPa ( <b>10 psi</b> )	Molded Polystyrene

Testing for compressive strength of polystyrene shall be in accordance with ASTM D 1621. The Contractor shall, if requested by the Engineer, furnish evidence that the material meets these requirements.

The quantity of preformed cork joint filler material given in the Plans is for the Contractor's convenience only. Any additional joint filler required shall be furnished by the Contractor with no additional compensation.

SB-8.3 Concrete End Posts - Br. Nos. 27873, 27874, 27879, 27879A, 27880, 27880A, 27902, 27903

This work consists of constructing new concrete end posts for the reconstructed Type F barrier railings and to provide an attachment of the plate beam guardrails to the bridge. The work shall be performed in accordance with the Plan details and the following:

A. Construction Requirements

Removal of the inplace endposts is included in Remove Concrete Curb and Railing as described in SB-11.2.

Reinforcement bar anchorages shall conform to the requirements of SB-11.9.

After construction of each of the endposts has been completed and before the guardrail is attached, the exposed concrete surfaces shall be finished in accordance with SB-8.4.

B. Method of Measurement

The concrete end posts will be measured as a single unit for each post constructed complete inplace.

C. Basis of Payment

Payment for Item No. 2401.602, "CONCRETE END POST", will be made at the Contract price per each and shall be compensation in full for all costs of constructing the end posts as described above; including excavation and backfill, concrete, reinforcement, guardrail connections, concrete finish, and all other incidentals thereto. Reinforcement bar anchorages will be paid for separately.

Work for guardrail removal, replacement, and reattachment is included in the grading portion of the Contract.

SB-8.4 Finish of Concrete - Br. Nos. 27873, 27874, 27879, 27879A, 27880, 27880A, 27902, 27903

The concrete to which the special surface finish is to be applied must be a minimum of 28 days old. All surfaces that are to receive a special surface finish shall be thoroughly flushed with clean water not more than 24 hours before commencing with the finishing.



A. Special Surface Finish

The provisions of 2401.3F2c shall apply except as modified herein:

A special surface finish will be required on the exposed concrete surfaces as designated below for the designated bridges.

The polymer surface finish system is used to provide protection to the rail surfaces from salt and other corrosive materials.

A special surface finish as described below will be required on the following formed concrete surfaces:

1. Outside surfaces of barrier railing

The finish color for all special surface finish shall match Federal Standard 595 B No. 26622 pearl gray. Paint shall be free of toxic metals and shall not contain toxic pigments.

Provide a test area, 1 meter x 1 meter (**3 foot x 3 foot**), for final color selection. The final color selection must be approved by the Engineer.

The following sentence shall be added after the fourth sentence in the second paragraph of 2401.3F2c:

The blended mixture of Mortar, bonding agent, water, and 100% acrylic paint shall produce the color specified in these Special Provisions for the project.

B. Finishing Roadway Faces and Tops of Barrier Railing

1. The roadway faces and tops of barrier railings, if conventionally formed, shall be finished in accordance with 2401.3F2d except as follows:

a) Concrete placement, form removal, and finishing operations shall be planned and executed so that the surface finishing can be started immediately after forms are removed. The roadway face forms may be removed as soon as the concrete can retain its molded shape. However, in no case shall the elapsed time between concrete placement and initial surface finishing exceed 24 hours.

b) After completion of the curing period, the roadway faces and tops of the barrier railings shall be painted with an approved acrylic paint conforming to 3584. The color of the acrylic paint shall conform to Federal Std. No. 595 B No. 26622 pearl gray. The paint shall be applied at an approximate rate of 7.4 m<sup>2</sup> per L (**300 ft<sup>2</sup> per gallon**). The painting operation may commence when the air and surface temperature is at least 10°C (**50°F**) with temperature rising, and shall be suspended when the air and surface temperature is falling and reaches 13°C (**55°F**).

2. The roadway faces and tops of barrier railings, if slipformed, shall be finished in accordance with the following:

a) The railing shall be lightly broomed immediately after passage of the slipformer.

b) The roadway face and top of the barrier railing shall be coated as described above for the conventionally formed railing.

C. Basis of Payment

Finishing of concrete surfaces, except as otherwise provided in these special provisions, special surface finish, application of topcoat, and painting are considered an incidental expense to the respective concrete mixes for this construction, and no additional compensation will be made for this work.

SB-8.5 Painted Surface Finish (Inplace) - Br. Nos. 27887, 27888

The inside face of the railings shall receive a painted surface finish. The work shall be performed in accordance with the following:

A. All concrete surfaces that are designated to receive the special surface finish shall be sandblasted prior to the ordinary surface finish to break the surface film and to remove all laitance, form release agent, dirt, and other foreign matter that may impede adhesion of the painted surface finish.

B. The faces and the top of the railings shall be painted with an approved acrylic paint conforming to 3584. The color of the acrylic paint shall match Federal Standard 595 B No. 26622 pearl gray. The paint shall be applied at an approximate rate of 7.4 m<sup>2</sup> per L (**300 ft<sup>2</sup> per gallon**). The painting operation may commence when air and surface temperature is at least 10°C (**50°F**) with temperature rising, and shall be suspended when the air and surface temperature is falling and reaches 13°C (**55°F**).

- C. Measurement will be made by the area, in square feet, of railing painted.
- D. Payment will be made as Item No. 2401.618, "PAINTED SURFACE FINISH (INPLACE)", at the Contract price per square foot.

SB-9            (2402) STEEL BRIDGE CONSTRUCTION

This work shall be performed in accordance with the provisions of Mn/DOT 2402 except as modified below:

Delete the first paragraph of 2402.3D and substitute the following:

At least six weeks before starting construction of the structural steel erection falsework, the Contractor shall supply the Engineer with three copies of the detailed Plans and Specifications and two copies of the associated calculations of the proposed system for constructing the falsework. Design of the falsework shall be in accordance with AASHTO "Guide Design Specifications for Bridge Temporary Works". The Plans and Specifications shall be prepared by an Engineer, thoroughly checked by a second Engineer for completeness and accuracy, and certified by one of the aforementioned professional Engineers licensed in the State of Minnesota. The documents shall include sufficient details so that construction of the proposed system can be completed solely by reference to the Plans and Specifications. The design criteria shall be shown on the first sheet of the Plans.

Delete the first paragraph of 2402.3F and substitute the following:

Structural steel members shall be erected in a manner that will provide safety to the workers, inspectors, and the public, at all times, as well as reasonable assurance against damage to the steel members. Prior to placement of diaphragms, the primary members, such as beams and girders, shall be temporarily anchored, braced, and stabilized as they are erected so as to preclude sliding, tipping, buckling, or other movement that may otherwise occur.

If active vehicular or railroad traffic will be permitted to travel beneath beams prior to complete erection of all the beams and diaphragms in a span, the Contractor shall submit an erection plan prepared by an engineer, thoroughly checked by a second engineer for completeness and accuracy, and certified by one of the aforementioned professional engineers licensed in the State of Minnesota which details all temporary works necessary to brace and stabilize beams. Struts, bracing, tie cables, and other devices used for temporary restraint shall be of a size and strength that will ensure their adequacy. Plans shall specify the required bolt tension and number of bolts to be installed in permanent diaphragm connections and in other bracing necessary to stabilize the beams. The Contractor shall arrange the work schedule so that at least two adjacent girders will be erected (including diaphragms and bolts fully tightened) and braced in any one span before operations are suspended for the day.

The last sentence of 2402.3F, paragraph (3), is hereby modified to read as follows:

Connections for primary members, diaphragms, and other secondary members shall have a sufficient number of holes filled with erection pins and bolts so that the plates are drawn into full contact and so that the holes are properly matched prior to placing the permanent connectors.

SB-9.1      Expansion Joint Devices

The following consists of fabricating waterproof expansion devices in accordance with 2402 and installing them at the locations shown in the Plan.

A.      The Contractor shall:

1.      Furnish a single diaphragm unreinforced neoprene gland whose physical and chemical properties conform to 3721 except:
  - (a)      Do not use the requirements and test methods for the Compression-Deflection Characteristics and the Recovery Under Deflection specified in 3721.2A3 and
  - (b)      Substitute Durometer requirement of 60 plus or minus 5 for that which is shown in 3721.2A3.
2.      Make the gland 6.4 mm (**¼ inch**) thick, subject to a minimum thickness of 5.6 mm (**7/32 inch**).
3.      Submit 300 mm (**12 inches**) of seal material from each lot of material for testing if required by the Project Engineer.
4.      Furnish certified test results from the manufacturer attesting to the physical and chemical properties of the expansion joint devices in accordance with 1603. Provide copies of the test results for the Project Engineer, the Materials Engineer, and the Structural Metals Engineer.

B. The Contractor shall provide one of the devices shown below or an approved equal. The components shall be in accordance with the physical and chemical properties shown in the brochure and drawing described below except as modified by these Special Provisions.

1. "Steelflex<sup>®</sup> SSA2 Series" as manufactured by the D. S. Brown Company and as detailed in their 2004 SteelFlex Bridge Products Brochure. Use the A2R series neoprene gland. Joints shall be modified as detailed on the manufacturer's drawing dated 10-28-92: for joints with skews from 5 to 50 degrees, modify one rail by welding a 13 mm x 38 mm (½" x 1½") backer bar at locations shown on Mn/DOT Fig. 5-397.628. Backer bar lengths shall be 102 mm (4") for skews between 5 and 15 degrees, 127 mm (5") if greater than 15 but not exceeding 35 degrees and 165 mm (6½") over 35 degrees. When plow fingers are required by the plan, modify both rails as detailed.

2. "Wabo<sup>®</sup> Strip Seal" as manufactured by Watson Bowman Acme Corporation and as detailed in Wabo Strip Seal System Product Data brochure dated 2001. Use Type A (previously designated A3) steel extrusion with SE Series neoprene gland.

C. The Fabricator will be permitted to weld pre-galvanized sections of expansion device steel rail, complete with anchorages. If the steel rail is pre-galvanized, the Fabricator shall:

1. Provide roadway sections that are not less than 3 meters (10 feet) long.
2. Provide an anchorage within 229 mm (9 inches) of each end of the sections. This may require inclusion of additional anchorages.
3. Bevel abutting ends 6 mm (¼ inch) on 3 edges and de-burr the edges.
4. Prepare the surfaces to be welded as per 2471.3F2.
5. Groove weld the sections on 3 sides and take care to prevent weld metal from entering the gland groove.
6. Grind the weld smooth that is across the top of the extrusion.
7. Repair the welded surface as per 2471.3L1.

D. Unless the gland is shop installed, the Fabricator shall install filler material in the gland groove in the steel rail to protect against entry of dirt and debris. Filler material shall be installed at the fabrication shop prior to storage or transportation of completed expansion device.

E. The Contractor shall:

1. Remove filler material and clean all neoprene to steel contact areas of all dirt, oil, grease, or other contaminants before installing the neoprene gland.
2. Lightly sandblast the contact areas so as to roughen but not damage the galvanized surface just before applying the lubricant adhesive.
3. Apply lubricant adhesive on both neoprene and steel contact areas when installing the gland.
4. Install the gland with tools recommended by the manufacturer for gland installation (use of other tools is prohibited).

F. Lubricant Adhesive

The lubricant adhesive shall conform to the requirements of ASTM D 4070. The Contractor may supply one of the following brands or an approved equal.

1. Delastibond part no. 1520 as supplied by the D.S. Brown Co.
2. Prima-Lub as supplied by the Watson Bowman Acme Corp.
3. Lube Plus 4070 as manufactured by The Spray Cure Co.

G. All expansion joint cover plates on pedestrian bridges and sidewalk areas shall be raised pattern plate.

#### SB-9.2 Bolted Connections

All bolted field connections for steel bridges shall be prepared and installed using Direct Tension Indicator (DTI) washers. DTIs shall conform to the requirements of 3391 and ASTM F 959. All DTIs shall have unique markings to indicate the gap locations between the protrusions and to allow the inspector to visibly differentiate them from a standard washer after installation. DTIs shall be supplied mechanically galvanized in accordance to 3392.

Installation of fasteners shall be in accordance with the DTI manufacturer's recommendations and 2402. Installation shall also meet the requirements of AASHTO LRFD Bridge Construction Specifications, Second Edition, Article 11.5.6.4.7 Direct Tension Indicator Installation Method. A DTI manufacturer's representative shall be on-site at the beginning of the bolting operations to provide training and ensure proper installation.

Use of DTIs, as described above, shall be considered as an incidental expense to the structural steel and no direct compensation will be made therefore.

SB-10      (2404) CONCRETE WEARING COURSE FOR BRIDGES

The provisions of Mn/DOT 2404 are modified and/or supplemented with the following:

SB-10.1      Concrete Wearing Course 3U17A - Br. Nos. 9340, 27887, 27888

Delete the provisions of 2404.1 and substitute the following:

This work shall consist of constructing a portland cement concrete wearing course to a 50 mm (**2 inch**) minimum depth on an existing bridge deck slab, monolithic partial depth patches resulting from Type 1 slab removal, and concrete approach tapers.

To decrease waiting time for concrete curing at each construction stage, the Contractor *shall* provide concrete with Type III High Early Cement for the wearing course on all bridges.

Delete the first paragraph of 2404.2, delete 2404.2A in its entirety, and substitute the following:

The wearing course monolithic partial depth patches, and concrete approach tapers shall be composed of Low Slump Concrete, produced in accordance with the following:

Add the following to 2404.3A:

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Special precautions shall be taken to control and abate the dust generated by the blasting operation in accordance with MPCA Rule 7005.0550. The Contractor shall submit his/her proposed plan for dust abatement at least 14 days before the start of this work. This abatement plan shall include, but not necessarily be limited to, the following operations and procedures:

- A. The bridge and approach slabs shall be thoroughly swept prior to blasting. A power sweeper shall use the least amount of water necessary to minimize the dust from the sweeping operation.
- B. The blast wheel or blasting nozzle or nozzles shall be enclosed in a housing or directed into a housing. The housing shall have a negative air emission control system that draws the confined air and dust into an adequate filter collection system. The capacity of the exhaust system shall be sufficient to readily relieve the pressure generated within the housing by the blasting equipment. The filter collection system shall be cleaned, as necessary, to assure proper filtration. The sides and corners of the housing shall be flexible at the bottom to the extent that the bottom of the housing shall be in contact with the deck surface during all blasting operations.
- C. The housing and/or filter collection system shall be constructed, maintained, and operated so that avoidable dust emissions are eliminated.
- D. After blasting, the prepared surface shall be thoroughly hand swept or swept with a "Pickup" type power sweeper equipped with adequate dust storage capacity. All minor debris remaining after the sweeping operation shall be completely removed by airblasting. The air supply system shall be so constructed that a suitable oil trap is placed in the air supply line between the storage tank and the nozzle.

Measurement will be made by the area, in square meters (**feet**), based on the bridge roadway dimensions between gutterlines and from end of approach panel to end of approach panel.

Payment for performing this work, as described above, will be made under Item No. 2404.618, "BLASTING (SPECIAL)", at the Contract price per square foot.

Delete the last sentence of the 13th paragraph of 2404.3A and substitute the following:

Unless otherwise authorized, concrete wearing course placement shall be done in stages as determined in the field.



When Type III High Early Cement is used in the mix, the following requirements shall apply:

Delete the provisions of 2404.3C3 in its entirety and substitute the following:

As soon as possible after placement of wearing course concrete, wet burlap and insulated curing blankets (to retain heat and speed hydration) shall be placed in accordance with 2401.3G for a minimum curing period of 18 hours.

No vehicular traffic shall be permitted on the concrete wearing course during the 18-hour curing period. If the daily mean temperature has been below 60° F during this 18-hour period, additional curing time may be required by the Engineer before traffic will be permitted.

One flexural beam or cylinder shall be cast for each stage of each bridge deck wearing course and shall be tested prior to opening to traffic to determine the concrete strength. The beams shall be cured in a manner similar to the wearing course concrete. If the breaks are below 70% of the anticipated strength, the Engineer may extend the cure as may be deemed necessary.

Add the following to the first paragraph of 2404.5:

If the design batch volume of concrete for wearing courses, approach tapers, and Type 1 Removal areas, less accountable waste, exceeds the volume in  $m^3$  ( $yd^3$ ) computed as shown hereafter, payment will be made at the rate of \$216.00 per  $m^3$  (**\$165.00 per  $yd^3$** ) for the excess amount.

Volumes will be computed using specified dimensions for the wearing courses and field measurements for Type 1 Removal and taper areas. Thicknesses shall be as shown in the Plans.

Delete the second paragraph of 2404.5 and substitute the following:

Payment for concrete wearing course will be made as Item No. 2404.618, "CONCRETE WEARING COURSE (3U17A) 2 in.", at the Contract price per square foot.

SB-10.2 Roadway Finish of Bridge Slabs - Br. Nos. 9340, 27887, 27888

Delete the 3<sup>rd</sup> paragraph of 2401.3F3b(3) and the 15<sup>th</sup> paragraph of 2404.3A and substitute the following:

Special care shall be taken in finishing roadway surfaces in the vicinity of expansion devices and other locations where breaks in continuity occur to ensure a smooth riding surface.

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After the concrete has been consolidated, screeded, floated, and carpet dragged, curing shall be applied as soon as possible.

Upon completion of curing, a surface smoothness check will be made on the roadway surface. The final surface shall meet the tolerance requirements of 2404.3A. Surface areas not meeting the specified tolerances shall be corrected by removal and replacement or by grinding the high spots to the extent directed by the Engineer prior to beginning surface texturing operations. Nonconforming areas that are not satisfactorily corrected shall be subject to 1503 and 1512.

After completion of work required to meet surface tolerance, the Contractor shall texture the roadway surface, including the bridge decks and the adjacent approach panels, in a longitudinal direction by planing the hardened concrete. The entire surface area of the roadway except the area within 500 mm (**20 inches**) of the curb shall be planed to a uniform texture. The surface shall have a finished texture with the width of the grooves between 2.5 mm (**1/10 inch**) and 3.3 mm (**1/8 inch**) at a distance of between 2.0 mm (**5/64 inch**) and 3.0 mm (**1/8 inch**) apart. The grooves shall not be less than 0.8 mm (**1/32 inch**) or more than 3.0 mm (**1/8 inch**) in depth. The actual textured surface in any selected 0.5 meter (**1.5 feet**) by 30 meter (**100 foot**) longitudinal strip shall not be less than 98% of the surface area.

During planing operations, joints must be adequately protected against damage and special care shall be taken to avoid damage to expansion devices. Planing shall be done in a manner that will provide a smooth riding surface at expansion joints and at the ends of the concrete wearing course. After completion of the planing, the permissible surface deviation will be 3 mm (**1/8 inch**) in 3 meters (**10 feet**) measured with a straightedge laid longitudinally and 3 mm (**1/8 inch**) in 1 meter (**3 feet**) measured transversely at right angles to the centerline of roadway.

Residue and excess water resulting from the planing and texturing operation shall be removed by vacuuming. Excess water shall not be permitted to either flow across lanes occupied by traffic or flow into drainage facilities.

Planed areas not meeting requirements may, at the Engineer's option, be replaced, re-planed or left as is and accepted for payment subject to a price reduction of \$2.70 per square meter (**25 cents per square foot**) but, in all cases, positive surface drainage shall be provided.

Measurement will be made to the nearest square foot of concrete area planed and textured based on surface area. Payment will be made under Item 2401.618, "BRIDGE DECK PLANING", at the Contract bid price per square foot, which shall be compensation in full for all costs relative to the specified texture planing.

SB-11      (2433) STRUCTURE RENOVATION

The provisions of Mn/DOT 2433 are modified and/or supplemented with the following:

SB-11.1      Remove Concrete Wearing Course – Br. Nos. 9340, 27887, 27888

This work consists of removal and disposal of the in-place concrete wearing course as shown in the Plans for these bridges. For Bridge No. 9340, remove the in-place wearing course to a depth of 2". For Bridge Nos. 27887 and 27888, remove the full thickness of the in-place wearing course to a minimum depth of 1½". The removals on Bridge Nos. 27887 and 27888 can be stopped within 9" of the gutterline to permit an area to place screed rails for the overlay paving machine. No specific method of removal is stated, however removal methods shall conform to the applicable requirements of SB-11.4.

A.      Structure Removals

In-place concrete and other materials shall be removed from the bridges, as shown and indicated in the Plans. All materials removed shall be disposed of in accordance with Mn/DOT 2104.3C3.

The in-place expansion joint devices are to be removed, and their removal is included in Item No. 2433.603, "Reconstruct Expansion Joint Type \_\_\_\_".

No concrete removal, except for the areas of full removal of the concrete wearing course shall be performed until the removal limits have been designated by the Engineer.

B.      Method of Measurement

Measurement of wearing course removal will be by area, in square feet, based on the dimensions shown and noted in the Plans for removal.

C.      Basis of Payment

Payment for Item No. 2433.505, "REMOVE CONCRETE WEARING COURSE", will be made at the Contract price per square foot, and shall be compensation in full for all costs of performing all of the work described above, including sawcutting.

SB-11.2 Remove Concrete Curb and Rail - Br. Nos. 27873, 27874, 27879, 27879A, 27880, 27880A, 27902, 27903

This work consists of removal and disposal of the in-place concrete railing, portions of the in-place curb, and designated in-place end posts. The work shall be performed in accordance with the applicable provisions of Mn/DOT 2433, the Plans, as directed by the Engineer, and the following:

A. Construction Requirements

1. No concrete removal shall be performed until the removal limits and cutlines have been designated by the Engineer.
2. Removal of concrete shall be restricted to methods that, in the Engineer's judgment, will not damage the structure
3. Full-depth saw-cuts shall be made at cutlines where the concrete surface will be exposed in the final structure, as indicated in the Plans. Two-inch minimum partial-depth saw cuts shall be made at the cut-line at the top of the curb where the cut surface will be encased in the new barrier railing concrete. It is intended that the in-place transverse curb ties be cut through with this saw-cut.
4. During concrete removal operations of the curb and rail, the Contractor may leave all or part of the bars in-place or may choose to cut off the exposed reinforcement bars, except that loose bars shall be removed. Exposed bars that remain shall be cleaned by sandblasting to remove loose rust and mill scale.
5. If the Contractor chooses to cut off the in-place reinforcement bars, he shall replace those bars with drilled-in anchorages at a maximum spacing of 2'-0" both front and back.
6. After removal operations have been completed, the removal areas shall be cleaned of all remaining loose concrete by sandblasting. Spent sand and debris shall be removed by airblasting.
7. Exposed saw-cut surfaces on the outside faces of the curbs shall be sand blasted to clean and etch the surface, then coated entirely with an epoxy paint. The color of the paint shall resemble, as closely as possible, the pearl gray color of the paint for the barrier railing. Care shall be taken to ensure that cut ends of reinforcement bars receive a full-thickness coating.
8. All materials removed from the bridge shall be disposed of in accordance with 2104.3C3.

B. Method of Measurement

Measurement of the railing and curb removals will be by the linear feet of railing and curb removed.

C. Basis of Payment

Payment for Item No. 2433.506, "REMOVE CONCRETE CURB AND RAIL", will be made at the Contract price per linear foot and shall be compensation in full for all costs of removing and disposing of the curb, railing, end posts, and loose reinforcement bars, and epoxy coating of the saw-cut concrete surfaces.

SB-11.3 Remove Loose Concrete - Br. Nos. 27879, 27879A

This work consists of removing delaminated and spalling concrete on the median copings under the bridge. The unsound concrete shall be removed from the copings over the traffic lanes beneath the bridge. The work shall be performed in accordance with the applicable provisions of Mn/DOT 2433, the Plans, as directed by the Engineer, and the following:

No concrete removal shall be performed until the removal limits have been designated by the Engineer.

Removal of the concrete shall be restricted to methods that, in the Engineer's judgment, will not damage the structure.

After removal operations have been completed, the removal areas shall be cleaned of all remaining loose concrete by sandblasting. Spent sand and debris shall be removed by airblasting.

All materials removed from the bridge shall be disposed of in accordance with 2104.3C3.

The concrete in the removal areas shall not be repaired. Exposed reinforcement shall be coated with an approved product to prevent corrosion.

Payment for Item No. 2433.618, "REMOVE LOOSE CONCRETE", will be made at the Contract price per square foot of concrete removed, and shall be compensation in full for all costs of performing the work described above.

SB-11.4      Remove Slab

This work shall consist of the removal and disposal of all patches and areas of delaminated or unsound concrete in accordance with the following requirements and as directed by the Engineer:

A.      Construction Requirements

Removal and disposal shall be restricted to methods which, in the Engineer's judgment, will not damage the structure. In addition, the following restrictions are placed on power equipment:

1.      Scarifying shall be done with power equipment which has previously demonstrated satisfactory performance on the type of work for which it is to be used. The Contractor may, if permitted by the Engineer, use newly developed power equipment on a performance basis, but s/he shall discontinue such usage if so directed by the Engineer.
2.      Jack-hammers heavier than a nominal 13.6 kg (**30 pound**) class shall not be used for Type 1 removal; except that the Engineer may permit the use of up to 27.2 kg (**60 pounds**) hammers, by individual operators on a performance basis, but will order discontinuance of their use if s/he determines that the heavier hammers are creating additional delamination, or that they are not being used with proper discretion.
3.      Pointed bits for power hammers will not be permitted except in areas where full depth removal is specifically authorized.
4.      Power hammers heavier than a nominal 6.8 kg (**15 pound**) class shall not be used for removal below the top layer of reinforcing bars unless full depth removal is designated by the Engineer.

After removal operations are completed, the removal area shall be cleaned of all remaining loose concrete by sandblasting. Exposed reinforcing bars shall be cleaned by sandblasting to remove loose rust and Mill scale. Tightly adherent rust and Mill scale may remain on the surface. Spent sand and debris shall be removed by airblasting.

All deck reinforcement steel shall be left in place as it was before concrete removal, unless otherwise ordered by the Engineer. All reinforcement bars damaged by the Contractor's operations shall be replaced, as directed by the Engineer, at the Contractor's expense.

All damage to other portions of the structure which are to remain in place which is due to the Contractor's operations shall also be repaired at the Contractor's expense.

No removal shall be performed in any area until the perimeters for removal in that area have been outlined by the Engineer for that type of removal.

All materials removed shall be disposed of in accordance with Mn/DOT 2104.3C.

B. Remove Slab, Type 1

This work shall be performed in accordance with the requirements of section A above and shall consist of removal and disposal of portions of the bridge roadway surface to the depth of the top of the (top) (bottom) bars in the top mat of reinforcement. (In extensive areas of Type 1 removal, this removal will be considered to be accomplished when 80% of these bars are exposed in any 9 m<sup>2</sup> (100 ft<sup>2</sup>) area.) The Engineer may require additional removal of deteriorated concrete below the top of these bars but only to the extent that the additional removal can be performed by sandblasting.

C. Remove Slab, Type 3

This work shall be performed in accordance with the requirements of Section A above and shall consist of the removal and disposal of that portion of the bridge roadway slab which the Engineer specifically designates for full depth removal after Type 1 removal has been performed.

The Engineer may, as an alternate, permit removal to a depth of 19 mm ( $\frac{3}{4}$  inch) below the bottom of the transverse bar in the top mat of reinforcement. This alternate will be allowed only if the concrete below this 19 mm ( $\frac{3}{4}$  inch) depth is and remains sound, as determined by the Engineer. If the partial depth removal alternate is used, payment for patching will be made in accordance with the provisions for partial depth slab patching.

D. Measurement

Measurement of each type of slab removal will be based only on that area, in m<sup>2</sup> (ft<sup>2</sup>), designated by the Engineer for removal. Areas of Type (2 and) 3 removal will not be subtracted from areas of Type 1 removal. Areas of Type 4 removal will be measured for that Type only.

E. Payment

Payment will be made as Item No. 2433.505, "REMOVE SLAB TYPE         ", at the contract price per m<sup>2</sup> (ft<sup>2</sup>) for each. Removal of concrete below the defined limits of Type 1 removal, which may occur during the course of the Type 1 removal and subsequent sandblasting, will be considered as included in the unit price bid for Type 1 removal.

SB-11.5 Full Depth Slab Patching

This work shall consist of furnishing, placing, finishing, and curing concrete for full depth patches in the bridge roadway slab, and shall be performed in accordance with Mn/DOT 2401 and the following:

The patching concrete shall be Mix No. 3Y33 high early strength with the maximum dosage of approved water reducer as permitted by the Department's Concrete Manual.

The patching concrete shall be bonded to the in-place concrete with the same bonding grout used for placement of the concrete wearing course.

The grout shall be brushed or scrubbed into the in-place concrete immediately prior to placement of patching concrete.

The concrete shall be struck off at the approximate level of the surrounding concrete, unless otherwise directed by the Engineer, and internally vibrated. The upper limit of full depth patching shall be raised to coincide with the approximate lower limit of the wearing course in extensive areas of full depth removal, as determined by the Engineer. The surface of the full depth patches shall be roughened, grooved, or serrated to the extent, and by methods and equipment, approved by the Engineer.

Full depth concrete patches shall be wet cured, in accordance with 2401.3G, until the concrete has reached 45% of the anticipated compressive strength. All strength gain percentages shall be derived from the strength gain chart in Table 2401-1. The Engineer may allow control cylinders to be used to determine required strength gain, but in no case shall any curing be considered completed in less than 72 hours.

The area of full depth patching will be field measured and will include only those areas specifically designated or authorized for full depth slab patching. Full depth patching of areas of the roadway slab where full depth removal was not designated or authorized by the Engineer will not be measured for payment.

Payment will be made as Item No. 2401.618, "STRUCTURAL CONCRETE, 3Y33 SPECIAL", at the Contract price per m<sup>2</sup> (ft<sup>2</sup>), complete in place, and shall include all necessary slab forming.

SB-11.6 Partial Depth Slab Patching

This work shall consist of furnishing, placing, finishing and curing concrete for partial depth patches that result from the Contractor's use of the partial depth removal alternate for Type 3 slab removal, or from Type 1 removals or other areas with a depth 50 mm (**2 inches**) or more below the surrounding concrete. This work shall be performed in accordance with Mn/DOT 2401 and the following:



The patching concrete shall be Mix No. 3Y37 with the maximum dosage of approved water reducer as permitted by the Department's Concrete Manual.

The patching concrete shall be bonded to the in-place concrete with the same bonding grout used for placement of the concrete wearing course.

The grout shall be brushed or scrubbed into the in-place concrete immediately prior to placement of patching concrete.

The concrete shall be struck off at the approximate level of the surrounding concrete and internally vibrated. The surface of the patches shall be roughened, grooved, or serrated to the extent, and by methods and equipment, approved by the Engineer.

The patches shall be wet cured, in accordance with 2401.3G, for at least 24 hours and then allowed to air dry for at least 4 hours before the wearing course is placed in that area.

Furnishing, placing, finishing, and curing the concrete for partial depth patches that result from the Contractor's use of the partial depth removal alternate for Type 3 slab removal, will be considered an incidental expense for which no direct compensation will be made.

Payment for furnishing, placing, finishing, and curing the concrete for Type 1 patches that are prefilled before wearing course placement will be made at the set price of \$53.82 per square meter (**\$5 per square foot**), complete in place.

SB-11.7      Reconstruct Expansion Joints

This work shall consist of providing all labor, materials, and equipment required to reconstruct the expansion joint openings as indicated in the Plans and in accordance with Mn/DOT 2401 and the following:

Concrete removal and disposal shall be in accordance with the requirements of SB-11.4 "Remove Slab" unless otherwise directed by the Engineer.

All in-place joint material or joint forming materials, and all other incompressible materials that would impede the subsequent expansion device from performing throughout the full anticipated range of movement, shall be completely removed.

New concrete shall be Mix No. 3Y33 high early strength.

The new concrete shall be bonded to the in-place concrete with the same bonding grout used for placement of the concrete wearing course.

The grout shall be brushed or scrubbed into the in-place concrete immediately prior to placement of new concrete.

New concrete shall be wet cured, in accordance with 2401.3G, until the concrete has reached 45% of the anticipated compressive strength. When high early strength concrete is used, as soon as possible after placement of the concrete, wet burlap and insulated curing blankets (to retain heat and speed hydration) shall be placed in accordance with 2401.3G for a minimum curing period of 18 hours.

Expansion joint reconstruction will be measured by length, in linear meters (**feet**), based on the distance along the centerline of the joint opening from edge of slab to edge of slab.

Payment for Item No. 2433.603, "RECONSTRUCT EXPANSION JOINT TYPE       ", at the contract price per linear foot shall be compensation in full for performing all work described above, including all slab forming and reinforcement bars required.

SB-11.8 Grease Expansion Bearing Assemblies - Br. Nos. 27879, 27879A

This work shall consist of jacking the bridge and cleaning and greasing the lubricated bronze sliding expansion bearings at the abutments.

The Contractor shall jack the bridge uniformly about 13 mm ( $\frac{1}{2}$  inch) to permit the cleaning and greasing of the bearings. Jacking to provide access for greasing shall be accomplished in a manner that will not damage the structure or any utility conduits crossing the expansion joint openings. The work shall be done with the expansion device cover plates removed (and before the wearing course is placed.) The Contractor shall submit his/her proposed jacking scheme to the Engineer for his/her review and approval.

On bearings having grease zerks, the Contractor shall jack to relieve pressure on the sliding surfaces and then apply grease using a grease gun.

Grease shall be an approved high pressure type that is effective over the full range of expected temperatures and resistant to chemical action.

Each bearing greased will be paid for under Item No. 2433.602, "GREASE EXPANSION BEARING ASSEMBLIES", at the Contract price per each.

SB-11.9 Grouted Anchorages

This work consists of placing grouted reinforcement bar anchorages at the interface of the new F barrier and end posts and the adjacent surface of the removal areas.

A. Construction Requirements

Each anchorage shall consist of drilling and grouting a reinforcement bar into the in-place concrete. The holes for the anchorages shall be drilled to the diameter and depth given in the Plans. Grout shall be a type formulated for this usage and approved by the Engineer.

B. Method of Measurement

Measurement will be by the single unit for each acceptable anchorage installed. Anchorages installed that are not shown in the Plans or ordered by the Engineer will not be measured for payment.

C. Basis of Payment

Payment for Item No. 2433.516, "ANCHORAGES TYPE REINFORCEMENT BARS", at the Contract price per each shall be compensation in full for all costs of furnishing, placing, and grouting the reinforcement bars complete in-place.

SB-11.10 Reconstruct Concrete End Post – Br. Nos. 27887, 27888

This work shall consist of reconstructing the deteriorated concrete end posts located on Bridge Nos. 27887 and 27888 as indicated in the Plans, as directed by the Engineer, and in accordance with Mn/DOT 2401 and the following:

The Contractor shall remove the end posts as shown in the Plans. The removal area shall be cleaned of all remaining loose concrete by sandblasting. The in-place reinforcing bars shall be removed, except for the dowels. The dowels shall be cleaned by sandblasting to remove concrete, loose rust, and mill scale. Dowels that have lost 50 percent of their section to rust, as determined by the Engineer, shall be augmented with a new bar. Additional new anchorages, as shown in the Plans, shall also be used. Spent sand and debris shall be removed by airblasting. All material removed shall be disposed of in accordance with Mn/DOT 2104.3C.

The Contractor shall recast the entire end posts, including guardrail connections at the locations indicated in the Plans.

New concrete shall be Mix No. 3Y46.

The new concrete shall be bonded to the in-place concrete with the same bonding grout used for deck patching. The grout shall be brushed or scrubbed into the in-place concrete immediately prior to placement of new concrete.

Payment for Item No. 2433.602, "RECONSTRUCT CONCRETE END POST", at the Contract price per each, shall be compensation in full for performing all work described above, including all forming, reinforcement, excavation and backfill, and all work incidental thereto. Payment for new anchorages is included in Item No. 2433.516, "ANCHORAGES TYPE REINFORCEMENT BARS".

SB-11.11 Reconstruct Expansion Bearings - Br. No. 27902

This work shall consist of replacing the lubricated expansion bearing assemblies at the abutments with elastomeric bearing pads, as shown in the Plans. The work shall be performed in accordance with the applicable requirements of Mn/DOT 2433, as directed by the Engineer, and the following:

A. Materials

Bearing pad manufacture shall comply with the applicable requirements of 3741.

B. Construction Requirements

1. Jacking

The Contractor shall jack the bridge a sufficient amount, so that the bolts running through the beam and bearing assembly are unloaded and can be removed. All beams across the full width of each half of the bridge at each abutment shall be jacked simultaneously and uniformly to prevent excessive stress in the diaphragms.

Before any work is started, the Contractor shall submit his proposed jacking scheme, including number and capacity of jacks, to the Engineer for review and approval.

2. Removal of Inplace Bearings

All bearing materials between the concrete bridge seat and the beam sole plate shall be removed and disposed of. Anchor bolts shall be cut off flush with the surface of the concrete. If flame cutting is used, any remaining portion of any bolt that extends above the surface of the concrete shall be ground flush. Cut ends of anchor bolts shall be coated with a gray epoxy paint to prevent rusting.

3. Preparation of Surfaces

The surfaces of the beam bottom flanges or sole plates that will be in contact with the new bearing plates shall be sandblasted to remove loose rust and dirt. Sandblasting shall not damage the galvanized or painted surfaces of the beam flanges or sole plates. Damaged surfaces shall be painted with an approved primer.

Concrete surfaces that will be in contact with the new bearing pads shall be cleaned of loose particles, deteriorated concrete and dirt by sandblasting and air blasting. Depression left by removal of concrete shall be filled with an approved concrete patching compound and made smooth and level with the surrounding concrete.

4. Setting of Bearing Pad and Bearing Plate

After the bearing surfaces of the in-place bridge have been prepared to the satisfaction of the Engineer, the elastomeric pads shall be carefully installed so that the pads will be in alignment with the centerlines of abutment bearings and centerlines of the beams.

5. Disposal of Materials

All material removed for construction of the bearing assemblies shall be disposed of in accordance with 2104.3C.

6. Damage Repair

Any damage as a result of these operations, in the judgment of the Engineer, to all portions of the bridge that will remain in place shall be repaired at the Contractor's expense.

C. Method of Measurement

Measurement will be by the single unit for each expansion bearing assembly reconstructed.

D. Basis of Payment

Payment for Item No. 2433.602, "RECONSTRUCT EXPANSION BEARINGS", will be made at the Contract price per each and shall be compensation in full for all of the work described above, including all incidentals thereto.

SB-11.12 Reconstruct Concrete Curb - Br. Nos. 9340, 27873

This work consists of reconstructing portions of the concrete curb on Bridge No. 9340 and portions of the median curb on Bridge No. 27873. These operations shall be accomplished in accordance with the provisions of Mn/DOT 2401 and the following:

A) Concrete Removals

Deteriorated concrete of the curb is to be removed by equipment and methods approved by the Engineer. Removals are to extend along the length of curb designated by the Engineer for reconstruction.

Removals shall proceed beyond the front face vertical and longitudinal reinforcement so as to provide at least  $\frac{3}{4}$ " clearance around the periphery of the bar. Additional removal depth may be required until sound concrete is encountered.

The outside face of the removal shall be nearly vertical.

After removal operations are complete the removal areas shall be cleaned of all remaining loose concrete by sandblasting. Exposed reinforcing bars shall be cleaned of all rust and concrete by sandblasting so as to provide a tight surface but not necessarily to white metal.

B) Construction Requirements

Longitudinal reinforcement which has lost 50 percent of section to rust, as determined by the Engineer, shall be augmented with a new bar.

New concrete shall be Mix No. 3Y46 with the maximum amount of approved water reducer as permitted by the Mn/DOT Concrete Manual. Areas of repair shall be formed in an approved manner.

Concrete shall be consolidated with "pencil thin" internal vibrators.

Exposed surfaces of concrete shall be kept continuously moist for at least 24 hours.

Bond grout will be required.

C) Measurement and Payment

Payment for Item No. 2433.603, "RECONSTRUCT CURB", will be made at the Contract price for the linear feet of curb reconstructed, which shall be compensation in full for performing all work described above.

SB-11.13 Rout and Seal Cracks - Br. No. 27902

This work shall consist of cleaning, routing and sealing cracks in the approach panels as shown in the Plans, and proper disposal of all waste material produced from these operations. This work shall be performed in accordance with the applicable requirements of Mn/DOT 2301, as directed by the Engineer, and the following:

Saw, or rout, and seal cracks, or those portions of cracks, between 1/8" and 1 1/4" wide with hot pour sealant per MnDOT 3723. Use backer rod as required by Plan Detail.

Cracks shall be filled to 1/8" below the pavement surface plus or minus 1/16". Any overfilling will require removal and replacement by the Contractor at no cost to the State.

The areas to be repaired shall be clearly marked and approved by the Engineer prior to any removals.

Measurement and payment shall be made at the Contract price bid per linear foot for Item No. 2433.603, "ROUT AND SEAL CRACKS."

SB-11.14 Reconstruct Concrete Median – Br. No. 9340

This work shall consist of reconstructing a portion of the concrete median located at the end of Bridge No. 9340 as indicated in the Plans, as directed by the Engineer, and in accordance with Mn/DOT 2401 and the following:

The Contractor shall remove a portion of the median as shown in the Plans. The removal area shall be cleaned of all remaining loose concrete by sandblasting. The in-place reinforcing bars shall be removed, except for the dowels. The in-place dowels that are not completely exposed shall be straightened and cleaned by sandblasting to remove concrete, loose rust, and mill scale. Dowels that have lost 50 percent of their section to rust, as determined by the Engineer, shall be augmented with a new bar. Spent sand and debris shall be removed by airblasting. All material removed shall be disposed of in accordance with Mn/DOT 2104.3C.

The Contractor shall construct the median as indicated in the Plans. New concrete shall be Mix No. 3Y46.

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The new concrete shall be bonded to the in-place concrete with the same bonding grout used for deck patching. The grout shall be brushed or scrubbed into the in-place concrete immediately prior to placement of new concrete.

Payment for Item No. 2433.603, "RECONSTRUCT CONCRETE MEDIAN", at the Contract price per linear foot, shall be compensation in full for performing all work described above, including all forming and reinforcement required and all work incidental thereto.

SB-11.15      Clean and Seal Deck Joints - Br. Nos. 27873, 27874, 27879, 27879A, 27880, 27880A, 27902, 27903

This work shall consist of cleaning out the deck joints at the ends of the bridges and over the piers as shown in the Plans by sandblasting or other approved methods, and re-sealing these same joints per MnDOT 3723.

All materials removed shall be disposed of in accordance with Mn/DOT 2104.3C.

The method of cleaning and sealing of these joints shall be demonstrated to the Engineer on the first joint repaired, and shall be subject to methods approved by the Engineer.

Measurement and payment shall be made at the Contract price bid per linear foot for Item No. 2433.603, "CLEAN AND SEAL DECK JOINTS."

SB-11.16      Clean and Seal Joints Type 1 - Br. Nos. 9340, 27873, 27874, 27879, 27879A, 27880, 27880A, 27902, 27903

This work shall consist of cleaning out the joints in the bridge approaches as shown in the Plans by sandblasting or other approved methods, and re-sealing these same joints per MnDOT 3723.

All materials removed shall be disposed of in accordance with Mn/DOT 2104.3C.

The method of cleaning and sealing of these joints shall be demonstrated to the Engineer on the first joint repaired, and shall be subject to methods approved by the Engineer.

Measurement and payment shall be made at the Contract price bid per linear foot for Item No. 2433.603, "CLEAN AND SEAL JOINTS TYPE 1."



SB-11.17 Clean and Seal Median Joint - Br. Nos. 27879, 27879A

This work consists of cleaning and resealing the open median joint on Bridge No. 27879 and the open joint between Bridge No. 27879 and Bridge No. 27879A. The work shall be performed in accordance with the following:

A. Materials

Joint sealant shall be a rapid-cure, 100 percent silicone, self-leveling, two-part formulation, and cold-applied. Acid cure sealants are not acceptable. Silicone sealant shall be compatible with the substrate to which it is applied. Sealant shall meet the requirements given in Table 1 of this section.

Rapid-cure is defined as developing sufficient integrity within 8 hours to accommodate both thermal and/or vertical moments due to traffic loading.

Sealant shall be delivered to the job site in the manufacturer's original sealed container. Each container shall be marked with the manufacturer's name and lot number. Each lot number shall be accompanied by the manufacturer's certification stating that the sealant meets the requirements of these special provisions as given in Table 1.

**TABLE 1**

**RAPID-CURE, SILICONE JOINT SEALANT**

As supplied:

<b>TEST</b>	<b>LIMIT</b>	<b>TEST METHOD</b>
Extrusion rate (grams/minute)	200-550	MIL S 8802

As installed: At 77 °F and 50% RH - after 48 hours cure time

TEST	LIMIT	TEST METHOD
Skin-over time (minutes, maximum)	20	See attached example
Joint elongation (% minimum)	600	ASTM D 3583 (1) (2)
Joint modulus, psi (at 100% elongation)	3 - 12	ASTM D 3583 (1) (2)
(1) Section 14 modified - pull rate (2" minimum) and joint size (2) Joint size = ½" x ½" x 2"		

Backer rod shall be a closed-cell, non-gassing polyethylene foam material of circular cross-section for cold-applied sealants only. The uncompressed diameter of the rod shall be, at least, one and one-half times greater than the width of the joint.

**B. Construction Requirements**

**1. Cleaning of Joint**

Prior to sealing, remove all in-place forming and sealing material. Clean the concrete substrate by sandblasting to remove oil, grease, dirt and other foreign matter. Remove loose particles with dry oil-free compressed air.

**2. Installation of Foam Backer Rod**

Install the foam backer rod in the joint opening to the depth shown in the Plans, or so that the thickness of the sealant will be approximately one-half the width of the joint. After installation the joint shall be cleaned with dry oil-free compressed air being careful not to force the backer rod further down into the joint opening.

**3. Application of Sealant**

Prior to application of the sealing material the depth of the backer rod shall be checked at a minimum of three places per 12 feet of joint, and adjusted as necessary to achieve the proper sealant thickness and recess.

Install the rapid-cure, silicone joint sealant in accordance with the manufacturer's instructions.

C. Method of Measurement

Measurement of cleaning and sealing the median joint will be by length, in linear feet, based on the end to end length of the median between ends of the bridge deck.

D. Basis of Payment

Payment for Item No. 2433.603, "CLEAN AND SEAL MEDIAN JOINT", will be made at the Contract price per linear foot and shall be compensation in full for performing all of the work described above, including all incidentals thereto.

SB-11.18 Reseal Joint Type E8 - Br. Nos. 9340, 27873, 27874, 27879, 27879A, 27880, 27880A, 27887, 27888, 27902, 27903

This work shall consist of providing all labor, materials, and equipment required to reconstruct the pavement E8 joints as indicated in the Plans, as directed by the Engineer, and in accordance with Mn/DOT 2401 and the following:

The preformed material utilized for sealing the E8 expansion joints shall be one of the following or an approved equal:

(A) "Pressure-Relief<sup>®</sup> (Ceramar<sup>®</sup>)" as marketed by the W.R. Meadows, Inc., P.O. Box 338, Hampshire, IL 60140. [www.wrmeadows.com](http://www.wrmeadows.com)

(B) "EVA-SEAL<sup>®</sup>" manufactured by E-Poxy Engineered Materials, LLC, 10 Broadway, Albany, NY 12202. [www.e-poxy.com](http://www.e-poxy.com)

E-8 Pressure relief joint material shall be installed in accordance with the manufacturer's recommendations and as follows:

(A) Expansion joint filler material used for a 4 inch pressure relief joint consists of a preformed foam product having minimum dimensions of 4.5 inches in width (may be laminated) and 8 inches in depth. Each section shall have a minimum length of 10 feet. When the concrete depth is greater than the depth of the pressure relief material, fill the void below the material with polystyrene. The material shall be installed under compression with a lubricant adhesive applied to the concrete contact surfaces.

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(B) Saw or form the joints 4 inches wide by the full-depth of the slab. Inspect to assure that the inside walls of the joint have been sandblasted, are dry, smooth and free of debris and loose particles. Apply tape to the top 1 inch of the inside walls to prevent the lubricant adhesive from contaminating the concrete bonding surfaces of the subsequently placed hot pour joint sealer.

(C) Paint the inside walls of the joint with lubricant adhesive at the rate of approximately 1 gallon per 50 lineal feet of joint.

(D) Pinch the bottom of the material together and push down into the joint. Walk the material down into the joint; use a sledgehammer and a 2X4 if necessary. When butting two pieces together, paint the ends with lubricant adhesive.

(E) Install the foam relief joint material so that the top surface is depressed to a depth of approximately 7/8 inch below the concrete surface. After proper installation, remove the tape and fill the void on top of the foam material with approximately 1/2 inch of Mn/DOT 3723 or 3725 hot pour joint sealer to a level of 3/8 inch  $\pm$  1/4 inch below the surface. The hot joint sealer should only slightly melt into the foam pressure relief joint material. To prevent excessive melting of the joint material, place the hot-pour sealer at the lower end of the temperature specification. Check for correct temperature by placing hot pour sealer on a sample of waste foam material.

Pavement joint reconstruction will be measured by length, in feet, based on the distance along the centerline of the joint opening from gutterline to gutterline.

Payment for Item No. 2433.603, "RESEAL JOINT TYPE E8", at the Contract price per linear foot shall be compensation in full for performing all work described above and including any work incidental thereto.

SB-11.19 Reseal Slope Paving Joints - Br. Nos. 9340, 27873, 27874, 27879, 27879A, 27880, 27880A, 27887, 27888, 27902, 27903

This work consists of resealing the joint between the top of the slope paving and the front face of the abutments. The work shall be performed in accordance with the Plans and the following requirements:

A. Materials

Flashing for sealing the joints shall consist of a 9-inch (minimum) wide strip of membrane consisting of rubberized asphalt, with adhesive integrally bonded to polyethylene sheeting, or approved equal. Place material as shown in the Plans in accordance with manufacturer's recommendations. Foam rod stock shall be preformed, compressible, resilient, non-waxing, non-absorbent extruded strips of flexible material either open or closed-cell polyethylene foam.

B. Construction Requirements

Reseal the joints by 1) cutting down or by removing entirely, the projecting joint filler, 2) adding foam rod stock joint filler, and 3) covering the opening with flashing and sealant. If open gaps, in the judgment of the Engineer, are present between the slope paving and the sidewalls (at the front face of the abutments) these gaps shall be sealed in a like manner. Disposal of removed materials shall be in accordance with 2104.3C3.

C. Method of Measurement

Measurement will be by length in linear feet measured along the front face of the abutment from at the top of the slope paving.

D. Basis of Payment

Payment for Item No. 2433.603, "RESEAL SLOPE PAVING JOINTS", will be made at the Contract price per linear foot and shall be compensation in full for all costs of performing all of the work described above, including all incidentals thereto.

SB-11.20 Reconstruct Paving Bracket – Br. No. 9340

This work consists of reconstructing portions of the paving brackets and tops of the abutment parapets on Bridge No. 9340. These operations shall be accomplished in accordance with the provisions of Mn/DOT 2401 and the following:

A) Concrete Removals

After portions of the in-place slab and approach panels are removed for reconstruction of the expansion joints, deteriorated concrete on the paving brackets and tops of the abutment parapets is to be removed by equipment and methods approved by the Engineer. Removals are to extend along the length of the abutments as designated by the Engineer for reconstruction.

Removals shall proceed beyond the front face vertical and longitudinal reinforcement so as to provide at least  $\frac{3}{4}$ " clearance around the periphery of the bar. Additional removal depth may be required until sound concrete is encountered.

After removal operations are complete, the removal areas shall be cleaned of all remaining loose concrete by sandblasting. Exposed reinforcing bars shall be cleaned of all rust and concrete by sandblasting so as to provide a tight surface but not necessarily to white metal.

B) Construction Requirements

Reinforcement that has lost 50 percent of section to rust, as determined by the Engineer, shall be augmented with a new bar.

New concrete shall be Mix No. 3Y43. Areas of repair shall be formed in an approved manner.

Concrete shall be consolidated with "pencil thin" internal vibrators.

Exposed surfaces of concrete shall be kept continuously moist for at least 24 hours.

Bond grout will be required.

C) Measurement and Payment

Payment for Item No. 2433.603, "RECONSTRUCT PAVING BRACKET", will be made at the Contract price for the linear feet of paving bracket reconstructed, which shall be compensation in full for performing all work described above except for the removal of the portions of the in-place slab and approach panels necessary for the reconstruction of the expansion joints.

SB-11.21 Seal Bridge Deck Cracks - Br. Nos. 27873, 27874, 27879, 27879A, 27880, 27880A, 27887, 27888, 27893, 27902, 27903

This work consists of sealing cracks in the existing low-slump concrete overlay and the joints between the overlay stages on the bridge decks and on the approach panels. For Bridge No. 27893, this work shall only be done on the south approach panels. This work shall be performed in accordance with the applicable requirements of Mn/DOT 2433, the Plans, as directed by the Engineer, and the following:

Material for crack sealing shall be a two-part epoxy penetrant sealer formulated for this purpose and approved by the Engineer.

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Cracks narrower than 0.008", in the judgment of the Engineer, will not be sealed.

Before application of the sealer, the cracks shall be cleaned of all loose and foreign material by air blasting. Grease and oil shall be cleaned from the cracks by light sandblasting. Cracks shall be dry before the sealer is applied.

Application shall be performed with a device designed for two-part epoxy sealer application. Pressure injection is not required. The sealer shall flow into the crack and shall form a strip approximately one-half inch wide on the overlay surface. Sealer application rate is estimated to be about 450 linear feet of crack per gallon of material. Sealer shall be fully cured before subjecting the surface to vehicle or foot traffic.

A. Method of Measurement

Sealing cracks in the concrete bridge decks will be measured by volume in gallons of epoxy penetrant sealer applied to the cracks that have been designated by the Engineer to be sealed. Cracks sealed by the Contractor that have not been designated by the Engineer will not be included for payment.

B. Basis of Payment

Payment for Item No. 2433.606, "SEAL BRIDGE DECK CRACKS", will be made at the Contract price per gallon and shall be compensation in full for all costs of sealing the cracks in the concrete overlay, as described above, including removal of loose material and/or water, and all incidentals thereto.

SB-11.22 Mill and Patch Bridge Roadway Slab - Br. Nos. 27873, 27874, 27879, 27879A, 27880, 27880A, 27893, 27902, 27903

This work consists of a combination of milling the concrete deck from the top surface of the concrete wearing course to the top of the top mat of reinforcement and patching the removed area of the bridge roadway slab so designated or authorized by the Engineer for this work. This work shall include unsound areas in the approach panels. For Bridge No. 27893, this work shall only be done on the south approach panels. The work is to be performed only on the portions of the bridge deck where the entire overlay is *not* removed and replaced. The work shall be performed in accordance with Mn/DOT 2401 and 2404, and the following:

A. Milling

Milling shall be performed in accordance with the requirements of Remove Slab, Type 1 as described under SB-11.4B. Prior to removal of concrete, cutlines placed by the Engineer on the wearing course shall be saw-cut to a ½-inch depth. A tapered edge for the removal areas may also be used as approved by the Engineer.

B. Patching

Patching concrete shall be Mix No. 3U17A mixed, placed and cured in accordance with the requirements of 2404 and SB-10.1. To decrease waiting time for concrete curing at each construction stage, the Contractor shall provide Mix No. 3U17A Special with Type III High Early cement.

The patching concrete shall be bonded to the in-place concrete with bonding grout that conforms to 2404.2C. Grout shall be brushed or scrubbed into the in-place concrete immediately prior to placement of patching concrete.

The patching concrete shall be internally vibrated and struck off at the level of the top of the surrounding concrete wearing course, unless otherwise directed by the Engineer. The roadway surface of all concrete patches shall be roughened, grooved, or serrated to the extent, and by methods and equipment, approved by the Engineer. Curing of the concrete patches shall begin immediately after completion of the finishing operations.

C. Type 3 Removal and Patching

If, after the initial concrete has been milled and the area cleaned, the Engineer determines that additional removal is necessary, that work shall be performed under the requirements of SB-11.4C, "Remove Slab, Type 3." Compensation for removal and patching will be made under the requirements of SB-11.4C, "Remove Slab, Type 3," and SB-11.5, "Full Depth Slab Patching" respectively.

D. Method of Measurement

Mill and Patch will be measured by area in square feet, which will be field-measured and will include only those areas specifically designated or authorized for this work. If this work is performed on areas of the roadway slab not designated or authorized by the Engineer, those areas will not be measured for payment.

E. Basis of Payment

Payment for Item No. 2433.618, "MILL AND PATCH CONCRETE SURFACE", will be made at the Contract price per square foot and shall be compensation in full for all costs of performing all of the work described above with concrete patches complete in-place.



SB-12 CONCRETE SURFACE REPAIR - BR. NOS. 27874, 27879, 27879A, 27880, 27880A, 27902

SB-12.1 Description of Work

This work consists of repairing--by the *dry-mix shotcrete* process--deteriorated concrete surface areas of the deck slab copings. The *dry-mix* process consists of a dry mixture of Portland cement and aggregates conveyed through a hose and mixed with water at the nozzle as it is pneumatically projected onto a concrete surface.

The Contractor shall provide all labor, materials and equipment to perform the following work:

- A. Determine the extent of concrete deterioration--within the areas to be repaired as shown in the Plans and as directed by the Engineer--by tapping the concrete surface to locate all unsound concrete. No removals or repairs will be permitted until the unsound areas have been marked by the Contractor and approved by the Engineer.
- B. Remove and dispose of all spalled and deteriorated concrete.
- C. Prepare exposed concrete and reinforcement bar surfaces by sandblasting or high-pressure water blasting.
- D. Furnish and place new reinforcing steel as necessary.
- E. Furnish, apply, finish and cure shotcrete, or other approved alternate materials for repair.
- F. Provide a quality control program.

The work shall be performed in accordance with the applicable provisions of Mn/DOT 2433, the Plans, as directed by the Engineer, and the following:

SB-12.2 Alternates

As an alternate to the dry-mix shotcrete process, the Contractor may elect to use the wet-mix process. If this alternate is chosen, the Contractor shall submit to the Engineer for review and approval, a plan showing application if different from the dry-mix process, and necessary revisions to SB-12.6, SB-12.7, and SB-12.10.

The Contractor may propose an alternate method of repair that provides the same or better concrete strength, durability, resistance to abrasion and chloride penetration, and limited shrinkage as the shotcrete method. Any alternate must be approved by the Engineer prior to use on the Project.

SB-12.3 Shotcrete Specifications

Shotcreting shall conform to all applicable requirements of "Specification for Shotcrete (ACI 506.2-95)" and as referenced herein to "Guide to Shotcrete (ACI 506R-90)" contained in the latest edition of the ACI Guide to Concrete Practice, Part 5 published by the American Concrete Institute (ACI); and the following special provisions:

SB-12.4 Submittals for Shotcreting Operations

At least 10 days prior to commencement of shotcreting operations, the Contractor shall submit the following written documentation:

A. Qualifications of Shotcrete Work Crew

The shotcrete crew foreman shall have had at least five years experience in shotcrete repair work on projects of similar size and character. Provide five references of those responsible for supervision of similar projects. Include name, address and telephone number of references who will testify to the successful completion of these projects by the shotcrete crew foreman.

Nozzle operators shall have successfully completed three projects of similar size and character. Provide three references of those responsible for supervision of these projects. Nozzle operators shall also pass a test, described in SB-12.9 demonstrating their competence.

B. A description of the equipment proposed for use in the mixing application shotcrete and a description of the proposed method of application.

C. Details of proposed shotcrete mixture(s), including proportions and means of supply and test results of compressive strength of laboratory-prepared cylinders for mix designs proposed by the Contractor.

D. A description of the proposed curing procedures and protection to be provided to shotcrete.

E. A description of the proposed quality control testing program. Testing of shotcrete work shall be in accordance with the requirements of ACI 506.2.1.6 Quality Assurance, or as otherwise specified.

**The Contractor shall note the time required for this testing and approval process in developing his/her schedule. Tests shall be carried out at curing temperatures expected to be encountered in the field.**

SB-12.5      Materials

- A.      Portland cement shall conform to 3101, Type I, air entrained per 2461.4A4b.
- B.      Water shall conform to 3906.
- C.      Fine aggregate shall be natural siliceous and consisting of hard, clean, strong, durable and uncoated particles, conforming to the requirements of ASTM C 33. Gradation shall be even from fine to coarse and shall be within the following limits:

<u>Sieve Size</u>	<u>Percent Passing</u>
9.50 mm (3/3 inch)	100
4.75 mm (#4)	95-100
2.36 mm (#8)	80-100
1.18 mm (#16)	55-85
600 µm (#30)	25-60
300 µm (#50)	10-30
150 µm (#100)	2-10

D.      No admixtures, except air-entraining admixtures, shall be added to the shotcrete *without* approval of the Engineer. Admixtures shall contain no chlorides or other materials corrosive to steel or materials that may cause other detrimental effects such as cracking or spalling. A documented history of demonstrated satisfactory performance in a mix of similar proportions shall be submitted to the Engineer.

E.      Reinforcement shall conform to 3301 and/or 3303. Epoxy coated or galvanized material may be used, but is not required. Inserts for steel fabric shall be galvanized and of adequate length and strength to resist a 2250-pound pull-out force.

F.      Handling and Storage of Materials

All dry shotcrete material shall be handled, transported and stored with adequate provisions for the prevention of absorption of moisture. Ambient temperatures shall be maintained in a temperature range of 40° to 85° F.

SB-12.6      Shotcrete Proportioning

The Contractor shall be responsible for shotcrete mixture proportioning. The following information shall be submitted to the Engineer for review and approval per SB-12.4.

- A. An easily identifiable mix designation, number or code.
- B. Batch quantities of fine aggregate, coarse aggregate, cement, expected water demand (to include all water from moisture in aggregates, and water added in the pre-moisturizer and at the nozzle) and all other shotcrete ingredients, in lbs/ft.<sup>3</sup>, based on saturated surface-dry aggregates.
- C. Aggregate Source, Gradation, Relative Bulk Density and Absorption.

Shotcrete shall be proportioned to meet the following minimum performance requirements:

TEST DESCRIPTION	TEST METHOD	AGE (Days)	SPECIFIED REQUIREMENT
Min. Compressive Strength (psi)	ASTM C 39	7	4000
	ASTM C 42	28	5000
Max. Boiled Absorption, %	ASTM C 642	7	8
Max Volume of Permeable Voids, %		7	17

Allowances shall be made for the shooting orientation and rebound in shotcrete mixture proportioning.

#### SB-12.7 Supply and Equipment

- A. Batching, Mixing and Supply

Dry-mix shotcrete shall be batched, mixed and supplied as dry-bagged premix material packaged in small bags of approximately 66 pounds each. Dry-bagged premixed shotcrete materials shall be produced in conformance with the pertinent requirements of ASTM C 387. In particular, all aggregates shall be dried to a moisture content of less than 0.1% by mass, based on oven drying at 220° to 230° F.

- B. Shotcrete Placing Equipment

Shotcrete supply equipment shall be capable of discharging the dry-mix shotcrete materials without segregation.

Dry-bagged premixed shotcrete materials shall be pre-dampened to provide a consistent moisture content in the range of 3% to 5% by mass in a pre-dampener, prior to discharge into the shotcrete gun. Discharge of completely dry materials into the shotcrete gun will not be permitted, unless satisfactory performance is demonstrated in the test panel per SB-12.9.

The mixing and pre-dampening units shall be capable of producing a shotcrete mixture with a uniform moisture content, such that the nozzle operator is not required to repeatedly adjust the water content at the nozzle water ring.

The delivery equipment (gun) shall be capable of discharging a continuous, smooth stream of uniformly mixed material into the delivery hose.

The discharge nozzle shall be equipped with a manually operated perforated water feed ring inside the nozzle. The water valve shall be capable of ready adjustment to vary the quantity of water and shall be convenient to the nozzle operator.

Water pressure at the discharge nozzle shall be sufficiently greater than the operating air pressure so that the water is intimately mixed with the pre-dampened shotcrete materials. If the line water pressure is inadequate, a water booster pump shall be introduced into the water line to provide a steady, non-pulsating water pressure.

The Contractor shall supply a clean, dry air supply, capable of maintaining sufficient nozzle velocity for all parts of the work. The air supply shall contain a moisture and oil trap to prevent contamination of the shotcrete.

SB-12.8 Preparation for Shotcreting

A. Surface Preparation of Concrete

The Engineer will locate and outline all loose, spalled and deteriorated concrete to be removed. Care shall be exercised to not damage areas of sound concrete or reinforcing steel during concrete removal operations. Unless specifically directed by the Engineer, depth of removal shall not exceed 4 inches.

Concrete removal shall be accomplished using one or more of the following methods:

1. Chipping with hand picks, chisels or light duty jackhammers not to exceed 15 pounds;
2. Scarifiers, scabblers or other suitable mechanical means; and/or

3. High-pressure (14,500 to 40,000 psi) water jetting.

If sound concrete is encountered before existing reinforcing steel is exposed, the surface shall be prepared and repaired without further removal of concrete. When corroded reinforcing steel is exposed, concrete removal shall continue until there is a minimum one-inch clearance around the exposed corroded reinforcing bar. Care shall be taken to not damage bond to adjacent non-exposed reinforcing steel during the concrete removal process.

The perimeter of all areas where concrete is removed shall be tapered at an approximate 45° angle, except that the outer edges of all chipped areas shall be sawcut to a minimum depth of 1/2-inch to prevent feather edging, unless otherwise approved by the Engineer.

After all deteriorated concrete has been removed; the repair surface to receive shotcrete shall be prepared by sandblasting or high-pressure (14,500 to 40,000 psi) water jetting. The repair surface shall have an adequate surface roughness determined as three peak-to-valley measurements of 3/16 inch.

Sandblasting or high-pressure water jetting shall remove all fractured surface concrete and all traces of any unsound material or contaminants such as oil, grease, dirt, or any materials which could interfere with the bond of freshly placed shotcrete.

Cleaned areas shall have shotcrete applied within 48 hours, or shall be reblasted.

All material removed shall be disposed of in accordance with the requirements of 2104.3C.

B. Reinforcement

All inplace reinforcement exposed during surface preparation shall be cleaned by sandblasting to remove all loose rust and concrete, but not necessarily to white metal. Remove remaining dust and loose concrete with compressed air or high-pressure water jetting.

Inplace reinforcement displaying deep pitting or loss of more than 20% of cross-sectional area shall be augmented with additional reinforcement as shown in the Plans and as directed by the Engineer. Loose reinforcement shall be removed and replaced with equal size bars. Minimum lap splice length of all replacement and new reinforcement shall be 12 inches. In the case of lapped splices, bars shall not be bundled, but shall be placed such that the minimum spacing around each bar is three times the maximum aggregate size or 1 inch, whichever is larger, to allow for proper encapsulation with shotcrete.

Steel fabric shall be provided at each repair area larger than 1 square foot if the depth of the repair exceeds  $2\frac{3}{4}$  inches from the original surface of the member to be repaired. Sheets of adjoining fabric shall be lapped by at least one and one-half spaces at all intersections. Minimum shotcrete cover on steel fabric shall be 2 inches. Fabric shall be fastened to preset anchors or existing reinforcing using 1/16-inch or heavier gauge tie wire on a grid not more than 12 inches square. Any given area where anchors are used shall have minimum of four anchors. Large knots of tie wire that could result in sand pockets and voids during shotcreting shall be avoided. The minimum clearance between reinforcing bars and steel fabric shall be  $\frac{3}{4}$  inch.

C. Alignment Control and Cover

Alignment control shall be implemented to establish control to ensure that the minimum specified shotcrete thickness and reinforcement cover are maintained. Alignment control shall be accomplished by means of shooting wires, guide strips, depth gauges or forms. The proposed means of alignment control shall be submitted to the Engineer for review and approval. Shooting wires (ground wires) shall consist of high-strength steel wire (piano wire) kept taut during shotcreting. Shooting wires shall be removed after completion of shotcreting and screeding operations.

Guide strips and forms shall be of such dimensions and installation configuration so as to not impede the production of uniform, dense, properly consolidated shotcrete. Installations conducive to the formation of sand pockets shall not be used.

SB-12.9 Quality Assurance and Quality Control Testing

A. Quality Control Testing

The Contractor shall establish and maintain a quality control program for the shotcrete work. Such a program shall include, but not be limited to the following:

1. Maintenance of test records for all quality control operations;
2. Wash-out testing of dry-bagged premix materials to check cementitious content and aggregate gradation.
3. Physical testing of the hardened shotcrete.

B. Preconstruction Trials

The Contractor shall implement a preconstruction trial to enable the Engineer to evaluate conformance of the proposed materials, shotcrete mixture, equipment and crew to the Project specifications. Acceptance of the preconstruction trial results by the Engineer is required prior to performance of any work on the Project.

C. Construction Testing

A single construction test panel for the copings shall be shot by *each* nozzle operator. The panel(s) shall be shot in the same position as the repair work being done. Test panel(s) shall be produced in accordance with the requirements of ASTM C 1140, but shall have minimum dimensions of 18 inches x 18 inches x 4 inches deep. Panels shall be constructed of wood and sealed plywood, with 45° sloped edge forms to permit escape of rebound. Construction test panel(s) shall contain no reinforcement or embedments. The panel(s) shall be cored or cut to provide three compression test specimens as described below.

Construction test panel(s) shall be stored, handled and cured in accordance with 2461.4A5.

Compressive strength test specimens shall be either:

1. 3-inch diameter cores with length/diameter ratios preferably 2:1 and not less than 1:1, or
2. 3-inch cubes.

Compressive strength tests shall be conducted in accordance with ASTM C 42. Measured compressive strengths shall be corrected to equivalent 2:1 cores, using the core correction factors in C 42.

The mean compressive strength for a set of three cores shall equal or exceed  $f'_c$ . Specimens for boiled absorption and permeable voids testing to ASTM C 642 shall be 3-inch cubes, or extracted 3-inch diameter cores at least 4 inches long. Three specimens shall be tested at age 7 days after shooting.

SB-12.10 Shotcrete Application

All areas prepared for shotcrete repair must be inspected and approved by the Engineer prior to application of any shotcrete.

Shotcrete shall be applied in accordance with good practice as detailed in Chapter 8 of ACI 506R. Application requirements of Section 8.5 of ACI 506R shall apply. Whenever possible, shotcrete shall be applied to the full thickness in a single layer.



The concrete substrate shall be saturated the day before shotcreting and then re-wetted prior to shooting. At least one hour prior to application of shotcrete, all surfaces to be shotcreted shall be flushed with water. Wetted surfaces shall be allowed to dry back to a saturated-surface-dry condition prior to application of shotcrete. If necessary, a blowpipe shall be used to facilitate removal of surface water. Only oil-free compressed air shall be used in the blowpipe. In the event a work stoppage longer than two hours takes place on any shotcrete layer prior to the time it has been built up to required thickness, the surface shall be re-wetted prior to continuing. No shotcrete shall be applied to a dry surface or to a surface with free surface water.

Care shall be exercised to protect adjacent surfaces from build-up of rebound and overspray. Rebound will not be permitted in the completed work. Hardened rebound and hardened overspray shall be removed prior to application of additional shotcrete using sandblasting, chipping hammers, high-pressure water blasting or other suitable techniques.

The water ring in the nozzle shall be carefully monitored for any signs of blockage of individual water spray holes. If non-uniform wetting of discharged shotcrete becomes apparent, shooting shall be stopped, and the water ring cleaned or other appropriate corrective actions taken.

The delivery equipment shall be thoroughly cleaned at the end of each shift. Any build-up of coatings in the delivery hose and nozzle liner shall be removed.

Shotcrete nozzling shall follow acceptable shooting practice, as detailed in Section 8.5 of ACI 506R. In particular,

- (a) The nozzle shall be generally operated at a distance of 1.5 to 5 feet from the receiving surface and shall be orientated at right angles to the receiving surface, except as required to fill corners, cover edges and encase large diameter reinforcement bars.
- (b) The combination of air pressure at the nozzle, moisture content of the shotcrete and the distance of the nozzle from the receiving surface shall be optimized to achieve maximum compaction of the shotcrete.
- (c) **Care shall be taken while encasing reinforcement and steel fabric to keep the front face of the reinforcement clean during shooting operations so that shotcrete builds up from behind to encase the reinforcement and prevent voids and sand pockets from forming.**
- (d) Accumulations of rebound and overspray shall be continuously removed by the blowpipe operator in advance of the deposition of new shotcrete. Rebound material shall not be used.

Shotcrete shall not be applied during periods of rain or high wind, which could interfere with the shotcrete stream unless suitable protective covers, enclosures or wind breaks are installed.

Nozzle operators shall bring the shotcrete to an even plane and to well-formed corners by working up to ground wires or other guides, using a lower-than-normal placing velocity.

#### SB-12.11 Shotcrete Finishing

The surface of the shotcrete shall be built up slightly and trimmed to the final surface by cutting with the leading edge of a sharp trowel. Any imperfections shall be floated using a rubber float. Work done to the finished surface shall be limited to correcting imperfections caused by cutting with the trowel.

Final finishing shall be accomplished by using a wood float for a preliminary finish, with the final finish using a rubber float.

All shotcrete and overspray shall be trimmed back from adjacent non-prepared concrete surfaces. The edges of all shotcrete repairs shall have minimum square saw-cut edge 5/8 inch deep and shotcrete shall be finished up to this edge. Feather-edging of shotcrete will not be allowed.

The final shotcrete surface shall not vary more than 3/8-inch from a straight line in the longitudinal direction. Transitions on all surfaces shall be smooth and no abrupt. Changes or sharp edges will be permitted to remain. The Contractor may use diamond grinding to bring the hardened surface into tolerance, but the ground surface must not result in an objectionable appearance after final surface finishing, as determined by the Engineer.

#### SB-12.12 Concrete Curing and Protection

On completion of finishing of a repaired area, shotcrete shall be immediately be prevented from drying out by fogging or wetting. Once shotcrete has attained final set, it shall be kept continuously moist for a minimum period of 3 days. Moist curing shall be accomplished using one or more of the following procedures:

- A. Wrapping the elements in wet burlap, which has been presoaked in water for 24 hours prior to installation. Wrapping the wet burlap in plastic is useful for retarding the rate of drying of the burlap.
- B. Installation of sprinklers, soaker hoses or other devices, which keep the shotcrete surface continuously, wet. The use of intermittent wetting procedures, which allow the shotcrete to undergo wetting and drying during the curing period, will not be allowed.

- C. Apply an approved curing compound.

SB-12.13 Hot and Cold Weather Protection

The general requirements for hot and cold weather concreting, detailed in ACI 305R and ACI 306R, shall also apply to shotcrete remedial work, except that the maximum temperature of the shotcrete shall not exceed 95° F.

If the prevailing ambient conditions are such that the shotcrete develops plastic shrinkage and/or early drying shrinkage cracking, shotcrete application shall be terminated.

The Contractor shall:

- A. Reschedule the work to a time when more favorable ambient conditions prevail; and/or
- B. Adopt corrective measures, such as installation of sun-screens, windbreaks, surface evaporation retardants or fogging devices to protect the work.

Shotcrete application shall be terminated if the ambient temperature rises above 85° F, unless the Contractor adopts special hot weather shotcreting procedures, which are approved by the Engineer.

The temperature of the applied shotcrete shall be preferably in the range of 50° to 68° F, but not outside the range of 40° to 95° F. Cooler mix temperatures are preferred during hot weather shotcreting operations and warmer mix temperatures during cold weather shotcreting.

SB-12.14 Shotcrete Acceptance

Shotcrete that does not conform to these special provisions may be rejected either during the shotcrete application process; or on the basis of tests on the test panels or completed work.

Deficiencies observed during the shotcrete application process, such as, but not limited to:

- a) failure to properly control and remove build-up of overspray and rebound;
- b) incomplete encasement of or incomplete consolidation around reinforcement bars, steel fabric or anchors;
- c) incorporation of sand lenses, excessive voids, delaminations, sags, rebound, and sloughing; or

- d) failure to apply shotcrete to the required line and grade tolerance

shall constitute cause for rejection of the plastic shotcrete. If plastic shotcrete is rejected, the Contractor shall stop the work and take all measures necessary to correct deficiencies. All remedial work to correct deficiencies shall, whenever possible, be made while the shotcrete is still plastic.

Shotcrete that is determined by the Engineer to be defective or non-conforming to the Project specifications based on evaluation of cores from the finished shotcrete, shall be repaired or removed and replaced by the Contractor at no cost to the Department. Repairs of non-conforming shotcrete are subject to the same testing, evaluation and acceptance criteria as the original repair shotcrete.

#### SB-12.15 Shotcrete Repair

Shotcrete that is identified as being non-conforming while still plastic shall be removed using spades, scrapers or other suitable mechanical devices. High-pressure water jetting may be used, subject to acceptable disposal of the removed shotcrete and slurry.

Hardened shotcrete that is identified as being non-conforming shall be removed using the same basic procedures used for removal of deteriorated concrete. Care shall be taken to avoid damage to reinforcement, steel fabric or anchors. Any embedments damaged during the shotcrete removal process shall be replaced at no cost to the Department.

Repair shotcrete shall be placed, finished, cured and protected in the same manner specified for all shotcrete work. The Contractor shall bear the costs of all repair and tests for non-conforming shotcrete.

#### SB-12.16 Method of Measurement

Measurement will be by area in square feet of concrete surface repaired by the shotcrete method that is shown in the Plans and other areas that have been specifically designated and/or approved by the Engineer for repair by this method. Work outside of these designated areas will not be measured for payment.

#### SB-12.17 Basis of Payment

Payment for Item No. 2433.618, "CONCRETE SURFACE REPAIR", will be made at the Contract price per square foot and shall be compensation in full for all costs of repairing the designated deteriorated concrete surfaces on the copings as described herein, including new reinforcement and all incidentals thereto.

SB-13      (2461) STRUCTURAL CONCRETE

The provisions of 2461 shall apply except as modified herein.

Add the following to Item (c) in the fourth paragraph of 2461.3B2:

The minimum cementitious content for bridge deck concrete shall be 362 kg per m<sup>3</sup>  
(611 pounds per yd<sup>3</sup>).

SB-14      (2471) STRUCTURAL METALS

The provisions of Mn/DOT 2471 are modified and/or supplemented with the following:

Delete the fourth paragraph of 2471.3A2 and substitute the following:

The Contractor/Fabricator performing coating application must demonstrate qualification by obtaining the AISC Sophisticated Paint Endorsement (SPE), the SSPS QP Certification, or a Quality Control Plan (QCP) that is acceptable to the Engineer.

Add the following as 2471.3G1:

G1      Fracture Critical Welder Qualifications  
Fracture Critical Welder Qualifications shall be in accordance with AASHTO/AWS D1.5-Bridge Welding Code. Annual requalification shall be based upon acceptable radiographic test results of either a production groove weld or test plate. If a welder is requalified by test, a WPS written in accordance with the requirements of D1.5, shall be used and the test plate shall be as shown in Figure 5.24. The WPS shall be included in the Fabricators QCP.

Add the following to 2471.3N1:

Work that is not performed in accordance with the suppliers approved QCP shall be subject to rejection in accordance with 1512.

SB-15      (3385) ANCHOR RODS

The provisions of 3385 shall apply except as modified below:

Add the following to 3385.2:

Anchorage supplied under this specification must be pre approved by the Mn/DOT Laboratory and the certification from the Mn/DOT Laboratory must not be more than one year old. The Contractor must furnish the Engineer a copy of the Mn/DOT approval letter for the source, size and grade of anchorages specified in the plans and also a certification stating that anchor bolts of the size and grade specified were manufactured and tested in accordance with ASTM F 1554 (e.g. heat analysis and heat number, tensile tests, zinc coating weight and thickness, etc.).

SB-16      (3391) FASTENERS

Delete the contents of 3391.2B and substitute the following:

Bolts shall meet ASTM A 325, Type 1 (for painted applications) or Type 3 (for unpainted weathering steel applications). Bolts shall have sufficient grip length to expose one thread beyond outside nut surface. ASTM A 325 bolts may be retightened once after having been fully tightened. Bolts larger than those defined by ASTM A 325 shall meet ASTM A 354, Grade BC.

Nuts shall meet ASTM A 563. Nuts shall be heavy hex and meet either Grade C or DH (for painted applications) and either Grade C3 or DH3 (for unpainted weathering steel applications).

Washers shall be hardened steel and shall meet ASTM F 436, Type 1 (for painted applications) or Type 3 (for unpainted weathering steel applications).

Bolts, Nuts, and Washers which are completely installed before application of the prime coat shall be uncoated "black" bolts and shall receive the same paint coatings as the structural steel. Fasteners which are field installed after the application of the prime coat to the structural steel shall be supplied mechanically galvanized according to ASTM B 695 Class 50 requirements.

At the time of installation of fasteners, all nuts, regardless of their specified finish, shall be lubricated with a lubricant of contrasting color as per ASTM A 563 Supplementary requirements S1, S2, and S3.

SB-17      (3741) ELASTOMERIC BEARING PADS

The provisions of 3741 shall apply except as modified below:

Replace the first sentence in 3741.2A with the following:

The elastomeric portion of the bearing pads shall be in accordance with AASHTO M251-04. The material shall be 100% virgin crystallization resistant polychloroprene (neoprene), low temperature Grade 4.

Delete all of 3741.2B1 except for the last paragraph.

**DIVISION SL**

**SL-1 (1802) QUALIFICATION OF WORKERS**

The provisions of Mn/DOT Specification 1802 are hereby supplemented with the following:

Signal and Lighting Certification will be required for all Contractors, Supervisors or Foreman involved in the field installation of the Traffic Signal and/or Lighting portion of this Project. Signal and Lighting Certification, Level II, is available through the Mn/DOT Technical Certification Program. Questions regarding certification or past certification may be directed to Technical Certification Coordinator at telephone (651) 297-7195.

**SL-2 (2104) REMOVING MISCELLANEOUS STRUCTURES**

This work shall consist of removing or salvaging miscellaneous structures in accordance with the provisions of Mn/DOT 2104 and the following:

Salvaged items shall be stored and protected from damage by the contractor until ready for reinstallation or delivery to storage. Any damage resulting from the Contractor's operations shall be repaired or replaced like in kind or better to that condition existing prior to the salvage operation.

**SL-2.1 CONSTRUCTION REQUIREMENTS**

**A Remove Conduit System**

Item 2104.501 (Remove Conduit System) shall consist of removing the in place conduit and cables as indicated in the Plan. Removed conduit shall become the property of the Contractor.

**B Remove Light Standard Base**

Item 2104.509 (Remove Light Standard Base) shall consist of removing the in place light standard bases as indicated in the Plan. All holes remaining from the removal of the light standard base must be backfilled in accordance with Mn/DOT 2545.3C.

**C Remove Luminaire**

Item 2104.509 (Remove Luminaire) shall consist of removing the in place luminaires, lamps, and ballasts located on the in place light standards as indicated in the Plan. Removed luminaires shall become the property of the Contractor.



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**D Remove Lighting Unit**

Item 2104.509 (Remove Lighting Unit) shall consist of removing the in place lighting units as shown in the Plan. The lighting unit includes pole, mast arm, luminaire, lamp and transformer base. Wiring to removed lighting units shall be disconnected from any lighting units remaining in place. Removed lighting units shall become the property of the Contractor.

**E Remove Equipment Pad**

Item 2104.509 (Remove Equipment Pad) shall consist of removing the equipment pads as indicated in the Plan. All holes remaining from the removal of the equipment pad must be backfilled in accordance with Mn/DOT 2545.3C.

**F Remove Light Fixture**

Item 2104.509 (Remove Light Fixture) shall consist of removing the underpass lighting fixtures as indicated in the Plan. Removed light fixtures shall become the property of the Contractor.

**G Remove Handhole**

Item 2104.509 (Remove Handhole) shall consist of removing the handholes as indicated in the Plan. Removed handholes shall become the property of the Contractor.

**H Salvage Service Cabinet**

Item 2104.523 (Salvage Service Cabinet) shall consist of salvaging the in place service cabinet as indicated in the Plan. Salvaged service cabinet shall be delivered to storage location as specified herein, or as directed by the Engineer. Any damage to the salvaged materials resulting from the hauling operation shall be repaired and replaced at the Contractor's expense.

**SL-3 (2104) HAUL SALVAGED MATERIAL**

This work shall consist of loading and hauling materials designated for salvage and storage in accordance with the provisions of Mn/DOT 2104 and the following:

Salvaged materials shall be disassembled as directed by the Engineer and shall be delivered to the Department at the Electrical Services Section (ESS), 6000 Minnehaha Avenue, St. Paul, MN., 55111. The Contractor shall notify Mr. Mike Schroeder (612-725-2749) of Mn/DOT Electrical Services Section at least three (3) normal working days in advance of the time the Contractor intends to deliver the salvaged materials. **THE ENGINEER SHALL BE NOTIFIED IN ADVANCE OF NOTIFICATION TO MR. SCHROEDER.**

Any damage to the salvaged materials resulting from the hauling operation shall be

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repaired and replaced at the Contractor's expense.

**The Contractor shall obtain a salvaged material receipt from the Mn/DOT Central Electrical Inventory Center indicating that Mn/DOT has received the salvaged material. The Contractor shall give the project Engineer a copy of this receipt for the permanent project records.**

All hauling of salvaged materials to the Department at the location specified herein shall be paid for under Item No. 2104.601 (HAUL SALVAGED MATERIAL) at the contract LUMP SUM price which shall be payment in full for all costs relative to hauling the materials to, and depositing the materials, at the location specified herein.

**SL-4 (2545) ELECTRIC LIGHTING SYSTEMS**

This work shall consist of furnishing labor, equipment, and materials for construction of an electric lighting system in accordance with the applicable provisions of Mn/DOT 2471, Mn/DOT 2545, the National Electric Code, the Plans, and the following:

**SL-4.1 GENERAL**

**A "As Built Plans"**

The Contractor shall furnish "as built Plans" that contain any **changes** in the following:

- Cable locations.
- Conduit locations.
- Light pole locations.
- Feedpoint locations.

The "as built Plans" shall be in a form that is satisfactory to the Engineer. The Contractor furnished "as built Plans" shall be considered incidental work and no direct payment will be made.

The three (3) copies shall be distributed by the Engineer as follows:

1. Mn/DOT Metro Electrical Services Maintenance Unit
2. Mn/DOT Metro District Traffic Lighting Design Engineer
3. Mn/DOT Metro District Traffic Lighting Inspector

**SL-4.2 MATERIALS**

**A Conduit**

The Contractor shall furnish and install either rigid steel conduit (R.S.C.) or non-metallic

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conduit (N.M.C.) at the locations indicated in the Plans. The size of the conduit shall be as indicated in the Plan. All conduit shall be in accordance with the following:

**1. Rigid Steel Conduit (R.S.C.):**

Shall be in accordance with Mn/DOT 3801.

**2. Non-Metallic Conduit:**

Shall be in accordance with Mn/DOT 3803, except as follows:

1. Shall be High Density Polyethylene (HDPE) continuous length conduit, shall be U.L. listed for underground use, and shall meet the requirements of ASTM F 2160 and UL 651B.
2. Shall be Schedule 80 conduit and fittings for all installations. All conduit fittings shall be appropriate for use with HDPE continuous length conduit.
3. Shall be capable of being installed by plowing, trenching, or directional boring methods.
4. Shall be either "GREY" or "RED" in color.
5. Shall be marked on the outside of conduit indicating manufacturer's name, size of conduit, HDPE, ASTM F 2160, UL Listing, and any other markings required by the N.E.C.
6. Shall have smooth interior and exterior surfaces.
7. Before the cables and conductors are installed, non-metallic conduit bell ends (**appropriately sized for the HDPE type conduit**) shall be installed to prevent damage to the cables and conductors

The Contractor shall, prior to procurement, furnish to MnDOT for approval, two 4 foot samples (sample shall include all required conduit markings) of the HDPE continuous type conduit that the Contractor proposes to install. Contractor must also submit description of proposed installation process.

All conduit from concrete foundations to the nearest handhole shall be rigid non-metallic conduit (N.M.C.). **HDPE continuous length conduit is not allowed for use between concrete foundations and the nearest handhole.**

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**B Luminaire Wire Holder**

The Contractor shall furnish and install a wire holder that supports the luminaire cable/conductors within the end of the luminaire slipfitter near the connection point of the luminaire.

Mn/DOT approved Wire Holders are listed on the Office of Traffic, Safety, and Operations (OTSO) WEB site under the Lighting Qualified Products List.

<http://www.dot.state.mn.us/trafficeng/designtools/index.html>

**C Extended Life Lamps**

Mn/DOT approved Extended Life Lamps are listed on the Office of Traffic, Safety, and Operations (OTSO) WEB site under the Lighting Qualified Products List.

<http://www.dot.state.mn.us/trafficeng/designtools/index.html>

**D Splices**

Splices shall be in accordance with the provisions of Mn/DOT 2545.3G4. When above ground splices are allowed, the Contractor may substitute approved wire splice connectors for the specified "split bolt" connector:

Mn/DOT approved Split Bolt replacement insulated wire splice connector blocks are listed on the Office of Traffic, Safety, and Operations (OTSO) WEB site under the Lighting Qualified Products List.

<http://www.dot.state.mn.us/trafficeng/designtools/index.html>

**E Above Ground Wiring**

Above ground wiring in roadway lighting standards shall be in accordance with Mn/DOT 2545.3G3. Fuse holders shall be of the breakaway type.

Mn/DOT approved Fuse Holders are listed on the Office of Traffic, Safety, and Operations (OTSO) WEB site under the Lighting Qualified Products List.

<http://www.dot.state.mn.us/trafficeng/designtools/index.html>

**F Armored Cable 4 Cond No. 4**

The Contractor shall furnish and install 4/C #4 armored cable where indicated in the Plan in accordance with the provisions of Mn/DOT 3815.2C1 and as follows:

**All references to the inner polyvinyl chloride (PVC) jacket are hereby deleted.**

**Shall be per UL 44.**

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**Conductors shall be Class C (19 strand) soft drawn, bare copper per ASTM B 3 and ASTM B 8.**

Within 15 days after the Contract approval notice mailing date, the Contractor shall furnish evidence to the Engineer, in writing, that the orders have been placed for all cable required.

**G Light Base, Design E**

The Contractor shall furnish and install a concrete Light Base, Design E in accordance with Mn/DOT 2545.3F and Mn/DOT Standard Plate 8127B, at the locations indicated in the Plan.

**H Light Base, Design H**

The Contractor shall furnish and install a concrete Light Base, Design H in accordance with Mn/DOT 2545.3F and Mn/DOT Standard Plate 8128B, at the locations indicated in the Plan.

**I Equipment Pad B**

The Contractor shall furnish and install a complete concrete pad in accordance with Mn/DOT Standard Plate No. 8106, at the locations indicated in the Plan. The equipment pad shall be constructed in accordance with Mn/DOT 2545.3F except the concrete shall be Mix No. 3A32.

The equipment pad mentioned will be used for mounting of a lighting service cabinet. The reinforcement bars for use in the foundation shall conform to the requirements of Mn/DOT 3301.

**J Handholes**

New Handholes shall be either P.V.C. or Plastic (LLDPE). PVC handholes shall utilize steel frames and covers exclusively. Plastic (LLDPE) handholes may utilize either plastic frames and covers or metal frames and covers.

**PLASTIC (LLDPE) FRAMES AND COVERS SHALL NOT BE USED IN SIDEWALK AREAS.**

Mn/DOT approved handholes are listed on the Office of Traffic, Safety, and Operations (OTSO) WEB site under the Qualified Products List for Traffic Signals:

<http://www.dot.state.mn.us/trafficeng/designtools/index.html>

**K Underpass Lighting Fixture, Type L**

The Contractor shall furnish and install an Underpass Lighting Fixture Type L. An Underpass Lighting Fixture Type L shall consist of furnishing and installing a complete 250 watt high pressure sodium type underpass lighting fixture. The underpass lighting Fixtures shall be multivolt, with integral constant wattage ballast, glass refractor and guard, shall be in accordance

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with the detail shown in the Plan, and shall include all miscellaneous equipment required for a complete installation.

The underpass luminaire shall consist of a rear die-cast back housing which encloses the ballast, starter board, lamp socket, and reflector; and a refractor frame assembly. The back housing shall be finished with a black polyester powder paint coating. The refractor frame shall be anodized etched aluminum, painted brown. Gasketing material shall be of the molded T-type attached to the refractor frame assembly.

Each fixture shall be capable of starting and operating satisfactorily with an ambient (tunnel air) temperature of -40 degrees Fahrenheit and a wind velocity of 24 km per hour.

The underpass luminaire shall have a main beam angle between 70 and 81 degrees vertically and between 20 and 25 degrees laterally. The underpass luminaire shall be as indicated in the Plan.

Mn/DOT approved Underpass Fixtures Type L are listed on the Office of Traffic, Safety, and Operations (OTSO) WEB site under the Lighting Qualified Products List.

<http://www.dot.state.mn.us/trafficeng/designtools/index.html>

**L      Lighting Unit, Type 9-40**

The Contractor shall furnish and install a Lighting Unit, Type 9-40. Each Lighting Unit, Type 9-40 shall be in accordance with the applicable provisions of Mn/DOT 2545.2R. The light standard shall be breakaway, shall be designed for one inch anchor bolts in a four bolt cluster as shown in Mn/DOT Standard Plate No. 8127, shall be in accordance with the details shown in the Plan, shall have a 40 foot nominal luminaire mounting height, and shall have a nine (9) foot davit type mast arm.

The Cobra Head Luminaires shall be as indicated on the Plan. The luminaires shall have a regulated or constant wattage ballast and shall conform to the requirements of Mn/DOT 2545.2F, and Mn/DOT 3810.

Mn/DOT approved Cobra Head Luminaires are listed on the Office of Traffic, Safety, and Operations (OTSO) WEB site under the Lighting Qualified Products List.

<http://www.dot.state.mn.us/trafficeng/designtools/index.html>

All luminaires must have a date of installation (month and year) marked with a black oil based paint marker inside the luminaire housing.

All lamps supplied must have the date of installation (month and year) etched on the lamp socket base.

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**M      Lighting Unit, Type 9-49**

The Contractor shall furnish and install a Lighting Unit, Type 9-49. Each Lighting Unit, Type 9-49 shall be in accordance with the applicable provisions of Mn/DOT 2545.2R. The light standard shall be breakaway, designed for 1¼ inch anchor bolts in a four (4) bolt cluster as shown in Mn/DOT standard Plate No. 8128, shall be fabricated from stainless steel or aluminum, shall be in accordance with the detail shown in the Plan, shall have a 49 foot nominal luminaire mounting height, and shall have a 9 foot davit type mast arm.

Light standards fabricated from stainless steel shall be high base type. Light standards fabricated from aluminum shall be transformer base type.

Doors in the base of single mast arm units shall be at 180 degrees counterclockwise from the mast arm except where specified in the Plan.

The Cobra Head Luminaires shall be as indicated on the Plan. The luminaires shall have a regulated or constant wattage ballast and shall conform to the requirements of Mn/DOT 2545.2F, and Mn/DOT 3810.

Luminaires furnished must have a minimum of five (5) years warranty.

Mn/DOT approved Cobra Head Luminaires are listed on the Office of Traffic, Safety, and Operations (OTSO) WEB site under the Lighting Qualified Products List.

<http://www.dot.state.mn.us/trafficeng/designtools/index.html>

All luminaires must have a date of installation (month and year) marked with a black oil based paint marker inside the luminaire housing.

All lamps supplied must have the date of installation (month and year) etched or marked with a black oil based paint marker on the lamp socket base.

**N      Lighting Unit, Type 9D-49**

The Contractor shall furnish and install a Lighting Unit, Type 9D-49. Each Lighting Unit, Type 9D-49 shall be in accordance with 2545.2R. The light standard shall be breakaway, designed for one inch anchor bolts in a four bolt cluster as shown in Mn/DOT Standard Plate No. 8127B, shall be in accordance with the details shown in the Plan, and shall have a 49 foot nominal luminaire mounting height.

The Cobra Head Luminaires shall be as indicated on the Plan. The luminaires shall have a regulated or constant wattage ballast and shall conform to the requirements of Mn/DOT 2545.2F, and Mn/DOT 3810.

Mn/DOT approved Cobra Head Luminaires are listed on the Office of Traffic, Safety, and

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Operations (OTSO) WEB site under the Lighting Qualified Products List.  
<http://www.dot.state.mn.us/trafficeng/designtools/index.html>

All luminaires must have a date of installation (month and year) marked with a black oil based paint marker inside the luminaire housing.

Doors in the base of twin mast arm units shall be at 0 degrees with one of the mast arms and all doors shall face the same direction.

All lamps supplied must have the date of installation (month and year) etched or marked with a black oil based paint marker on the lamp socket base.

#### **SL-4.3 CONSTRUCTION REQUIREMENTS**

##### **A Light Standard Installation, Design E and H**

The Contractor shall install light standards in accordance with Mn/DOT 2545.3H and as follows:

**Where leveling nuts are used, the leveling and top nuts shall both be securely tightened against the light standard base plate. Where shims are used the top nuts shall be securely tightened against the light standard base plate. The leveling nuts and top nuts shall be tightened as follows:**

- **the nuts shall be lubricated and torqued to minimum 125 ft-lbs. for 1 inch diameter anchorages.**
- **the nuts shall be lubricated and torqued to minimum 240 ft-lbs. for 1 ¼ inch diameter anchorages.**

##### **B Light Standard or Light Unit Numbering and Service Cabinet Numbering**

The Contractor shall number the light standards or light units (underpass luminaires, tunnel luminaires, special luminaires, etc.) and service cabinets in accordance with Mn/DOT 2545.3P.

Light standards shall be numbered with the complete feed point numbers and letters placed above the pole number regardless if complete numbering is shown in the Plan.

Light Standard Numbering shall consist of the entire feed point designation with the pole number placed below.

The Contractor shall also verify that the light standards and/or light units to be reinstalled are correctly numbered and if not the Contractor shall number the light standards and/or light units in accordance with Mn/DOT 2545.3P.



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Mn/DOT approved Labels are listed on the Office of Traffic, Safety, and Operations (OTSO) WEB site under the Lighting Qualified Products List.

<http://www.dot.state.mn.us/trafficeng/designtools/index.html>

Letters and numbers shall have a minimum stroke width of 0.35 inches.

**C Wiring in Light Standard Concrete Bases**

The Contractor shall install conduits in light standard concrete foundations in accordance with the provisions of Mn/DOT 2545.3G. Approximately 2 feet of slack cable shall be left in each light standard base.

**D Install Salvaged Lighting Service Cabinet**

The Contractor shall install the lighting service cabinet salvaged from the project, on equipment pad B and at the location shown in the Plan and/or as designated by the Engineer. The Contractor shall be required to coordinate with the power company to reconnect power to the service cabinet.

All components of the service cabinet shall be installed in a workable first class condition and shall include all miscellaneous hardware required for a complete service cabinet installation.

**E Final Inspection**

The contractor shall contact the Metro Traffic Lighting Inspector when the lighting system is ready for final inspection. As-built plan sheets, either redlined or corrected sheets will be required including any changes to the plan and should be given to the Metro Traffic Lighting Inspector prior to final inspection approval.

Metropolitan District Traffic Lighting Inspector:

Paul Babin  
Minnesota Department of Transportation  
Metropolitan District  
Traffic Engineering Section  
1500 West County Road B-2  
Roseville, MN 55113  
651-755-8697

The Contractor shall correct deficiencies in the lighting system before the Final Acceptance of the project.

The contract warranty period for the lighting system will commence on the date that Mn/DOT's

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Representative signed the completed lighting inspection punch list.

**SL-4.4 MEASUREMENTS AND PAYMENTS**

**A Install Service Cabinet**

Installing a Lighting Service Cabinet, Type L1 (including all required mounting hardware) as specified herein, at the location indicated in the Plan, will each be measured as an integral unit complete in place and will be paid for separately under Item No. 2545.602 (INSTALL SERVICE CABINET) at the Contract price per EACH, which price shall be compensation in full for all costs incidental thereto.

THIS ITEM INCLUDES THE FOLLOWING:

1. Installing service cabinet on concrete foundation.
2. All required mounting hardware.
3. Making all field wiring connections.
4. Number the service cabinet with decals (as specified in Mn/DOT 2545) and in accordance with the numbering indicated in the Contract.
5. Label branch circuit breakers as specified in Mn/DOT 3850.
6. Sealing around cabinet base.
7. Painting service cabinet (if required).
8. Bonding and grounding materials and connections.
9. Miscellaneous items required for complete installation.

**B Handhole**

Furnishing and installing a P.V.C. handhole with a metal frame and cover as specified herein at the location indicated in the Plan will be measured as an integral unit complete in place and will be paid for under Item No. 2545.602 (HANDHOLE) at the Contract price per EACH, which price shall be compensation in full for all costs incidental thereto.

THIS ITEM INCLUDES THE FOLLOWING:

1. P.V.C. handhole with metal frame and cover.
2. Excavation and backfill.
3. Handhole installation.
4. Compacted aggregate drain bed.
5. Patching inside handhole sidewalls with material compatible caulking compound or other compatible sealing material after handhole and conduit installation
6. Miscellaneous concrete removal and replacement, as required, to furnish and install the PVC handhole
7. Restoration as directed by the Engineer.
8. Bonding and grounding materials and connections.

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9. Other items incidental to a complete meter socket installation.

**C Liquidtight Flexible Conduit**

Furnishing and installing liquidtight flexible conduit as specified herein at the locations indicated in the Plan will be paid for under Item No. 2545.603 (LIQUIDTIGHT FLEXIBLE CONDUIT) at the Contract price per LIN. FT., which price shall be compensation in full for all costs incidental thereto.

**DIVISION SS**

**SS-1 (1802) QUALIFICATION OF WORKERS**

The provisions of Mn/DOT Specification 1802 are hereby supplemented with the following:

Signal and Lighting Certification will be required for all Contractors, Supervisors or Foreman involved in the field installation of the Traffic Signal and/or Lighting portion of this Project. Signal and Lighting Certification, Level II, is available through the Mn/DOT Technical Certification Program. Questions regarding certification or past certification may be directed to Technical Certification Specialist at telephone (612) 297-7195.

**SS-2 (2565) LOOP DETECTORS**

This work shall consist of furnishing, installing, and making operational new loop detectors due to milling and roadway construction in accordance with the applicable provisions of Mn/DOT 2565; with the current edition of the National Electrical Code; with the Plan; as directed by the Engineer; and as follows:

**SS-2.1 GENERAL**

- A.** The intersection layouts indicating the loop detectors that will be affected are included in the Plan.
- B.** Before commencing the work, the Contractor shall contact the City of Minneapolis representative, Dave Prehall, Electrical Foreman, (621-673-5520), to co-ordinate loop placement and inspection.

**SS-2.2 MATERIALS**

**A. Roadway Loop Detector Conductors**

Roadway loop detector conductors shall be in accordance with the provisions of Mn/DOT 3815.2B2(b).

**B. Loop Detector Splices**

The Contractor shall use a **3M Company DBR 6 Kit** for splices.

**THE CONTRACTOR SHALL INSTALL LOOP DETECTOR SPLICES ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS.**

**C. Loop Detector Sealant Material**

The following loop detector sealants have been tested and approved:

1. 3M "Detector Loop Sealant".
2. ChemRex, Inc. "Thoroc Gold Label Flex 1P".
3. Chemque, Inc. "Q-Seal 290, Polyurethane Detector Loop Sealant".
4. Dow Corning "890-SL Silicone Joint Sealant".

No other loop detector sealants have been approved at this time.

**THE CONTRACTOR SHALL INSTALL SEALANT MATERIAL ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS.**

**SS-2.3 CONSTRUCTION REQUIREMENTS**

**A. General**

The Contractor shall, before commencing milling and /or construction operations, sever the loop detector conductors from the loop detector lead-in cable at the splice in the adjacent handhole of the affected loop detectors. **The Contractor shall notify City of Minneapolis representative, Dave Prehall, Electrical Foreman, (621-673-5520) before severing the detector conductors from the lead-in cable.**

**ALL LOOPS DETECTORS SHALL BE SPLICED AND MADE OPERATIONAL WITHIN ONE (1) DAY AFTER THE LOOP DETECTOR INSTALLATION.**

**B. Loop Detector Installation**

1. Non-Metallic Conduit Installation

The Contractor shall install loop detectors in accordance with the "PREFORMED NON-METALLIC CONDUIT (NMC) LOOP DETECTOR DETAILS FOR TRAFFIC CONTROL SIGNAL SYSTEM" included in the Plan; as marked by City of Minneapolis representative, **Dave Prehall, Electrical Foreman, (621-673-5520)**; and with the applicable provisions of Mn/DOT 2565.3G. NMC Loop detectors shall be spliced using an approved splice kit as specified elsewhere in these Special Provisions.

2. Saw-Cut Loop Installation

All new loop detectors shall be saw cut in the roadway where marked by the City of Minneapolis representative, **Dave Prehall, Electrical Foreman, (621-673-5520)**, and in accordance with the provisions of Mn/DOT 2565.3G, with Mn/DOT Standard Plate 8130D, with the Plan; and as follows:

- a. Where loop detectors to be installed in roadways to be surfaced with new bituminous pavement, the loop detectors shall be saw cut in the roadway and sealant material installed to the satisfaction of **Dave Prehall** before the bituminous wearing course is placed by the bituminous paving Contractor; however, **Dave Prehall** may direct the Contractor not to place the loop detectors in the roadway until pavement markings and lane striping has been determined and/or placed.
- b. Area to be saw cut shall be thoroughly cleaned by sweeping, washing, or blowing surface clear of dirt and debris. Loop detectors and loop detector lead-in will be marked on pavement by **Dave Prehall**.
- c. Loop detector saw cuts shall be a uniform depth of 65 mm (2.5 inches) +/- 6 mm (+/- 1/4 inch) and 3 mm (0.125 inches) wider than the outer diameter of the tubing. The Contractor shall avoid crossing concrete joints or cracks. However, if a concrete joint or crack must be crossed, the Contractor shall double saw cut across crack or joint to allow for expansion or shifting at point of crack. All loop corners shall be square. Corners shall be drilled with 25 mm (1 inch) to 32 mm (1 1/4 inch) diameter drill to a depth of 6 mm (1/4 inch) deeper than saw cut. Corners shall be rounded to prevent damage to the conductors or tubing.
- d. The Contractor shall furnish and install from the end of the saw-cut to the adjacent handhole a 21 mm (3/4 inch) N.M.C. (or R.S.C.) conduit for a single loop detector, or a 35 mm (1 1/4 inch) R.S.C. (or N.M.C.) conduit for 2 or more loop detectors, at a 45 degree angle where intersecting the saw cut. Top of conduit shall be reamed and installed 25 mm (1 inch) below bottom of saw cut. A conduit bushing shall be furnished and installed on the handhole end of conduit. The conduit shall be a minimum 460 mm (18 inches) from curb apron or shoulder. A conduit which crosses a lane of traffic shall be R.S.C.

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- e. All loop detector saw cuts shall be cleaned and flushed of foreign material using a combination of air and water, and dried with compressed air prior to installation of loop detector conductors. Dry sawing does not require water flushing, however, the saw cut shall be cleaned of all foreign material.
- f. Before installation of loop detector conductors, the Contractor shall install a bead of approved loop detector sealant in saw cut slot to within 160 mm (6 inches) of the conduit that runs from the end of the saw-cut to the adjacent handhole.
- g. The Contractor shall install the clean and dried loop detector conductors continuous and wound in a clockwise direction. The loop detector conductors shall be pushed to the bottom of the saw-cut with a blunt instrument to avoid damaging tubing or conductors. The Contractor shall install 13 mm (2 inch) diameter by 25 mm (1 inch) backer rod at 600 mm (2 foot) intervals to ensure that the conductors are at the bottom of the saw cut.
- h. Loop detector conductors shall be twisted 9 turns per meter (3 turns per foot) through the conduit to the handhole.
- i. Loop detector lead-in conduit shall be sealed with duct seal to prevent loop detector sealant from entering conduit.
- j. The loop detector roadway conductors and the loop detector lead-in cable conductors shall be properly prepared and cleaned before splicing.
- k. Saw-cut loop detectors shall be spliced using an approved splice kit as specified elsewhere in these Special Provisions.



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- l. Splice kits shall be installed in handholes in such a manner as to ensure that each splice kit is suspended and/or secured near the top of the handhole to the satisfaction of **Dave Prehall (placing splice kits on top of the electrical cables and conductors is NOT acceptable)**.
- m. Seal loop detector conductors with an approved loop detector sealant in accordance with the manufacturer's instructions.
- n. Each loop detector shall have 4 turns of wire.

**C. Loop Detector Splice**

The following splice procedure shall be utilized in connecting the loop lead and the lead-in conductors. This connection shall be made only in a detector handhole, signal base, or cabinet as shown on the Plan.

The electrical splice between the lead-in cable to the controller and the loop wire shall be soldered using resin core solder and provided with a watertight protective covering which covers the spliced wire, the shielding on the loop lead-ins and the end of the tubing containing the loop wires. The use of open flame to heat the wire connection will not be permitted. The Contractor shall use a soldering iron, gun, or torch equipped with a soldering tip. The splice shall be made by the following method:

1. Remove all lead-in coverings leaving 4 inches of insulated wire exposed.
2. Remove the insulation from each conductor of a pair of lead-in cable conductors and sand both copper conductors with # 400 grit sandpaper until bright.
3. Remove the insulation from the loop wires and sand both copper conductors with # 400 grit sandpaper until bright.
4. The conductors shall be connected by a soldered pigtail type splice, wrapped with waterproof tape, and encapsulated in a splice encapsulation kit.

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5. Splice kits are referred to in **SS -2.2 (B)**
6. Splices in handholes shall have the splice kit suspended vertically and secured near the top of the handhole with loop and lead-in conductors at the lower end of the kit. Splicing and placement shall be to the satisfaction of the Engineer.

Conductors for inductive loop installations shall be individually identified and banded in pairs by lane, in the handhole adjacent to the loops. The loop detector lead in conductors shall be similarly identified at the cabinet.

**D. Loop Detector Test Report**

The Contractor shall furnish to the Engineer four (4) copies of a signed and dated "Loop Detector Test Report" for each loop detector and lead in cable system furnished and installed as part of this Contract with the following information.

1. Project Numbers and Intersection location.
2. Loop Detector Number (as shown in the Plan) Dimensions of Loop Detector (Length and Width in feet) as installed, and Number of Turns of wire in Loop Detector as installed.
3. Continuity Test: Each loop detector circuit shall be tested for continuity at two (2) locations: (1) Loop detector at the handhole prior to splicing with the loop detector lead-in cable (shall have a value less than 0.5 ohms), and (2) Loop detector and lead-in cable system at the traffic signal cabinet after splicing in the handhole (shall have a value less than 5 ohms). The continuity test ohm reading at the traffic signal cabinet shall be greater than the ohm reading measured at the loop detector adjacent handhole.
4. Inductance Test: Each loop detector and lead-in cable system shall have an inductance test measured at the traffic signal cabinet. The inductance shall be in the range of from 50 to 200 microhenries, depending upon loop size, number of turns, lead-in length, etc. Field-measured inductance readings shall not vary by more than  $\pm 20$  percent from theoretical calculated inductance.

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5. **Insulation Resistance Test:** An insulation resistance test at 500 volts direct current shall be made at the traffic signal cabinet between one loop detector lead-in conductor and the "Equipment Ground Buss" in the cabinet. The insulation resistance shall have a value of not less than 100 megohms.
6. **Resonant Frequency Test:** The resonant frequency of the loop shall be determined by the use of a loop frequency tester. The resonant frequency shall remain stable when there is no vehicle activity in the area and shall not drift more than plus or minus one hertz per minute.

**NOTE:** The Continuity Test, Inductance Test, Insulation Resistance Test, and Resonant Frequency Test to be conducted at the traffic signal cabinet shall be performed before the loop detector lead-in conductors are terminated on the terminal facilities provided in the cabinet. The tests shall be performed in the presence of the Engineer and a designated City of Minneapolis Transportation and Parking Services representative.

All loop detector tests shall be made by the Contractor, at his/her own expense, to demonstrate that the materials and installation of each loop detector and lead-in cable system are in accordance with the requirements of the Plan and these Special Provisions. The tests shall be conducted in the presence of and to the satisfaction of the Engineer. The Contractor shall provide such electrical instruments, apparatus, tools, and labor as may be necessary to make the required loop detector tests on each loop detector and lead-in cable system. Such electrical instruments, apparatus, and tools shall remain the property of the Contractor after the tests are completed.

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In the event that a loop detector and/or lead-in cable system “fails,” any one of the above-mentioned loop detector tests, the Engineer may direct the Contractor to replace any part of or the entire loop detector and lead-in cable system at the Contractor’s own expense. No Supplemental Agreement will be written for replacing any part of or the entire loop detector and lead-in cable system. All of the above-mentioned loop detector tests shall be repeated and recorded for the “revised” loop detector and lead-in cable system.

Each loop detector and lead-in cable system furnished and installed as part of this Contract shall “pass” the above-mentioned loop detector tests.

A suggested format for the “Loop Detector Test Report” is shown below. A blank Test Report is included on page 14-SS.