

DIVISION SB
Special Provisions

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BRIDGE PLANS

The plans for this project, consisting of the sheets tabulated below, were approved by the State Bridge Engineer.

<u>BRIDGE NO.</u>	<u>TOTAL SHEETS</u>	<u>SHEET NO.</u>	<u>DATE OF APPROVAL</u>
L3275	30	1-30	

New or revised sheets were approved as listed below:

<u>BRIDGE NO.</u>	<u>SHEET NO.</u>	<u>DATE OF APPROVAL</u>

I hereby certify that the Special Provisions for bridge construction (Division SB) contained in this Proposal were prepared by me or under my direct supervision, and that I am a duly licensed Professional Engineer under the laws of the State of Minnesota.



 Jon W. Siiter

Date: May 31, 2019 Lic. No. 25128

SB-1 SCOPE OF PROJECT

SB-1.1 Description of Bridge

Bridge No. L3275, constructed in 1909, is a National Register-listed historic bridge. The bridge consists of a 140-foot-long single-span Camelback through truss supported on concrete abutments on assumed spread footings. Bridge No. L3275 formerly carried Canada Avenue over the Cannon River but was closed to traffic in 2009 following construction of a new bridge and re-alignment of Canada Avenue. The bridge has undergone various rehabilitations including repainting of the truss in 1976, replacement of the southwest abutment corner and wingwall in 1983, and the replacement of the southeast abutment corner and wingwall in 2014.

SB-1.2 Description of Work

This contract encompasses rehabilitation activities for Bridge No. L3275, and approach work limited to 10 feet beyond each end of the bridge deck. Work beyond these limits for future trail connections will be conducted by others under separate contracts.

In general, this Contract consists of rehabilitation and reconstruction of the existing concrete abutments, placement of riprap at the front faces of the abutments and wingwalls, replacement of the existing bridge bearings, fabrication of new steel components integrated into the truss, floor system and railing replacement, partial excavation and restoration of approach embankments, and the construction of a new cast-in-place concrete deck with stay-in-place corrugated-metal forming.

SB-1.3 Historic Monitoring and Coordination

Reconstruction and restoration work must follow the applicable portions of the Secretary of the Interior's (SOI) Standards for Rehabilitation in order to preserve the historic fabric of the structure yet provide safety and load capacity measures in accordance with the current LRFD Bridge Design Specifications.

Bidders are advised that significant coordination and cooperation will be required between the Contractor, Owner and other associated parties during the execution of this Project. During the course of this Contract, the Project Engineer will monitor the work to assure ongoing compliance with the Secretary of the Interior's Standards for the Treatment of Historic Properties and may contract with a cultural resources representative (e.g., Mn/DOT Cultural Resources Unit (CRU) representative, historic engineer, historic architect or historian) to conduct periodic monitoring.

SB-1.4 Bridge Plans and Reference Drawings

Plans of the existing structure are not available. Portions of the structure shown on the plan which are currently buried are drawn at assumed geometrics. Conditions encountered upon excavation of the structure may vary from shown in plans.

SB-1.5 Site Visit

Prior to the assigned letting date of the Project, bidders are strongly encouraged to visit the bridge site to examine the existing condition of the site, assess site constraints and to generally acquaint themselves with the proposed work.

SB-2 (1404) MAINTENANCE OF TRAFFIC, (1707) PUBLIC SAFETY, AND (2563) TRAFFIC CONTROL

The Contractor shall perform work in accordance with 1404, "Maintenance of Traffic," 1502, "Plans and Working Drawings," and 1707, "Public Convenience and Safety," provisions except as modified below:

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The Contractor shall furnish, install, maintain, and remove all traffic control devices required to provide safe movement of vehicular and/or pedestrian traffic adjacent to the work zone during the life of the Contract from the start of Contract operations to the final completion thereof. The Engineer will have the right to modify the requirements for traffic control as deemed necessary due to existing field conditions.

Traffic control devices include, but are not limited to, barricades, warning signs, trailers, flashers, cones, drums, pavement markings and flaggers as required and sufficient barricade weights to maintain barricade stability.

The Contractor shall furnish names, addresses, and phone numbers of at least three (3) individuals responsible for the placement and maintenance of traffic control devices. At least one of these individuals shall be "on call" 24 hours per day, seven days per week during the times any traffic control devices, furnished and installed by the Contractor, are in place. The required information shall be submitted to the Engineer at the Pre-construction Conference. The Township clerk will distribute the contact information to the appropriate Engineering, Police, and Fire Departments.

The Contractor shall, at the pre-construction conference, designate a Work Zone Safety Coordinator who shall be responsible for safety and traffic control management in the Project work zone. The Work Zone Safety Coordinator shall be either an employee of the Contractor such as a superintendent or a foreman, or an employee of a firm which has a subcontract for overall work zone safety and traffic control management for the Project. The responsibilities of the Work Zone Safety Coordinator shall include, but not be limited to:

- Coordinating all work zone traffic control operations of the Project, including those of the Contractor, subcontractors and suppliers.
- Establishing contact with local school district, government, law enforcement, and emergency response agencies affected by construction before work begins.
- Maintaining a record of all known crashes within a work zone. This record should include all available information, such as: time of day, probable cause, location, pictures, sketches, weather conditions, interferences to traffic, etc. These records shall be made available to the Engineer upon request.

The Contractor shall inspect, on a daily basis, all traffic control devices, which the Contractor has furnished and installed, and verify that the devices are placed in accordance with the Traffic Control Layouts, these Special Provisions, and/or the MN MUTCD. Any discrepancy between the placement and the required placement shall be immediately corrected. The person performing the inspection shall be required to make a daily log. This log shall also include the date and time any changes in the stages, phases, or portions thereof go into effect. The log shall identify the location and verify that the devices are placed as directed or corrected in accordance with the Plan. All entries in the log shall include the date and time of the entry and be signed by the person making the inspection. The Engineer reserves the right to request copies of the logs as he deems necessary.

A. Measurement and Payment

No measurement will be made of the various Items that constitute Traffic Control, but all such work will be construed to be included in the single Lump Sum payment under Item 2563.601 "Traffic Control".

SB-3 (1513) RESTRICTIONS ON MOVEMENT AND STORAGE OF HEAVY LOADS AND EQUIPMENT

The Contractor shall haul Materials and move and store equipment in accordance with the Highway Traffic Regulation Act and applicable provisions of Minnesota Rules when using public Roads or completed Structures, base courses, and pavements within the Project that are open to traffic and becoming a part of the permanent improvement.

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The Contractor shall comply with legal load restrictions and with special restrictions required by the Contract when hauling or storing Materials and moving or storing equipment on Structures, completed Subgrades, base courses, and pavements within the Project, under construction or completed but not yet open to traffic.

The Contractor shall complete and place a cab card in each vehicle used for hauling bituminous mixture, aggregate, batch concrete, and grading material (including borrow and excess) before starting work. This cab card shall identify the truck or tractor and trailer by Minnesota or prorated license number and shall contain the tare, maximum allowable legal gross mass, supporting information, and the signature of the owner. The Contractor shall make the card available to the Engineer upon request. The Contract Unit Prices include Contractor-related costs in providing, verifying, and spot checking the cab card information, including weighing empty and loaded trucks on certified commercial scales.

The Contractor shall not operate equipment mounted on crawler tracks or steel-tired wheels on or across concrete or bituminous surfaces (excluding bituminous surfaces of the remnants of Old Canada Avenue).

When construction operations require crossing an existing pavement, Bridges, or completed portions of the Pavement Structure with otherwise prohibited equipment or loads, the Contractor shall submit methods or load distribution or bridging in writing and obtain the Engineer's written approval. This approval does not relieve the Contractor of responsibility for any damages to the work.

As detailed in the Bridge Plan, restrictions on loading of the bridge are as follows:

Construction Loading:

1. Do not store materials or stockpiles on the bridge during any phase of the construction.
2. During repair work to the gusset plates the maximum weight of a construction vehicle on the bridge is not to exceed 10,000 lbs including the payload. Only one construction vehicle is permitted on the bridge during gusset plate repair work.
3. After the completion of all gusset plate repair work the maximum weight of a construction vehicle is not to exceed 20,000 lbs including the payload. Only one construction vehicle is permitted on the bridge after the completion of the gusset plate repair work.
4. Construction loads on the bridge after the deck has cured shall not exceeded the design live load.
5. Additional loading configurations and sequences may be submitted by the Contractor to the engineer for approval see special provisions.

If intended loading will exceed the above defined limits, the Contractor shall submit the proposed loads and structural analysis of the deck, floor system, truss and truss gusset plates certified by a Professional Engineer to the Bridge Engineer for the Bridge Engineer's review within a minimum of 14 calendar days before placement of loads.

Use caution when operating equipment on the existing deck, due to its deteriorated condition.

The Contractor will not be relieved of liability for damages resulting from the operation and movement of construction equipment because of the issuance of a special permit, or by adherence to any other restrictions imposed.

SB-4 (1706) EMPLOYEE HEALTH AND WELFARE

The provisions of 1706, "Employee Health and Welfare," are supplemented as follows:

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

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All safety equipment, in accordance with the Contractor's plan, must be in place and operable in adequate time to allow Township personnel or representatives to perform their required inspection duties at the appropriate time. Don't place concrete in any areas affected by such required inspection until the inspection has been completed.

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; if using an anchorage system which requires modification of structural members, request approval, in writing, for plan modifications as provided in MnDOT 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.

The Contractor shall furnish, install and remove approved anchorage systems at no increased cost to the Township for materials, fabrication, erection, or removal of the bridge component or anchorage system.

Paint systems on Bridge No. L3275 contain lead. Protect worker health and safety if operations result in removal or detachment of paint from metal surfaces.

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

The provisions of 1717, "Air, Land, and Water Pollution," are supplemented as follows:

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

The Contractor shall contain waste materials on the project site and provide for their handling, storage, transportation and disposal in accordance with all pertinent environmental regulations and MnDOT criteria. The Contractor shall document the storage, transfer and disposal of waste materials in accordance with the MnDOT Environmental Stewardship publication titled "MnDOT Steel Structure Paint Removal Program for Contractors", a current copy of which is available at <http://www.dot.state.mn.us/environment/regulatedmaterials/contractors.html>. Waste materials are defined as paint overspray and drippings, used paint pails, rags, spent solvents, cleaning solutions, and other related debris from cleaning operations including spent abrasive materials or paint chips. Painting, and all work associated therewith, shall be so conducted as to preclude waste materials from falling upon the ground or water.

It is the responsibility of the Contractor to provide the following safeguards at all times during cleaning and painting operations. All safeguards shall be in place and operable before cleaning and painting operations begin.

1. Primary safeguards such as containment (curtains and floor coverings), together with adequate structural support such as scaffolding or rope nets, shall be utilized to contain waste materials in the work area. Catchment systems shall be emptied as often as necessary to maintain their structural integrity.
2. Safeguards such as floating booms, mats of absorbent material, skimmers, or similar systems shall be placed in streams to avoid nuisance conditions in the stream caused by cleaning or painting operations.
3. Locked storage of cleaning and painting materials to prevent access by vandals.

Suspend cleaning and painting operations during periods when unfavorable weather conditions may reduce the effectiveness of the above noted safeguards. In situations where use of some of the safeguards listed are not feasible, other innovative safeguards shall be employed. Emphasis shall be placed on containment of waste materials rather than placing reliance on safeguards such as booms, straw dams, skimmers, or absorbent mats.

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These shall be considered backup systems to guard against water pollution which may result from the failure of primary safeguards.

Materials such as paint chips and abrasives which are readily recoverable from bridge decks or stream banks, empty paint pails, and rags and debris from cleaning operations shall be disposed of in a proper manner. Paint chips and spent abrasives shall be removed from the bridge deck on a daily basis and in an approved manner. Recoverable abrasives and paint chips from blasting operations may be recycled, but the ultimate disposal shall be to an appropriate waste facility. Spent aqueous cleaning solutions shall be discharged to a recognized sewage collection and treatment system. Spent solvents and cans or pails containing waste paint shall be taken to an incinerator approved by the MPCA for disposal, or to an MPCA approved hazardous waste storage area.

In the event of an accidental loss of painting or cleaning materials or debris into public waters, the Contractor shall take immediate action to recover the lost materials, and the incident shall be promptly reported by telephone to the State Duty Officer at 1 800 422 0798 followed by a written report addressed to MPCA, Water Quality Division, Compliance and Enforcement Section, 520 Lafayette Road, St. Paul, Minnesota, 55155.

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 (1807) FAILURE TO COMPLETE THE WORK ON TIME

The provisions of 1807.1, "Assessment of Liquidated Damages," are supplemented as follows:

See requirements for *Methods for Paint Removal and Waste Disposal of Lead Paint* as indicated in these special provisions SB-15.

The Contractor is subject to a daily charge for failure to submit documentation of the testing and disposal of hazardous and non-hazardous waste as required under these special provisions. A \$150.00 monetary deduction per calendar day, per shipment will be assessed and the amount deducted from any monies due the Contractor, until all work is complete to the satisfaction of the Engineer.

The monetary deduction as set forth above may apply equally, separately and may be assessed concurrently with other damages as described in these special provisions and the Standard Specifications for Construction.

SB-7 (2104) REMOVALS & SALVAGED ITEMS

Removals shall be performed in accordance with the provisions of 2104, except as modified below:

All items designated for removal shall remain the property of the Contractor, be removed from the project site, and be disposed of at a site selected by the Contractor.

Measurement and payment for the removal and disposal of such materials will be made only for those items of removal work specifically included for payment as such in the Proposal and as listed in the Plans. The removal of any unforeseen obstruction requiring in the opinion of the Engineer, equipment or handling substantially different from that employed in excavation operations, will be paid for as Extra work as provided in Mn/DOT 1403.

All structures removed in accordance with this 2104 bid item shall also be disposed of in accordance with the Dakota County Solid Waste Management Ordinance No. 110 (<https://www.co.dakota.mn.us/notices/Pages/county-ordinance-110.aspx>).

See SB-12.3 for treated wood disposal requirements.

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SB-8 REMOVAL OF ASBESTOS AND REGULATED WASTE (BRIDGE)

Remove and dispose of any regulated waste found on existing bridges or from the utilities located on the bridge in accordance with the applicable MnDOT Standard Specifications and the following:

The Contractor will be responsible for the required pre-demolition asbestos and regulated waste assessments and report preparation for the existing bridges prior to removal. The assessments are to provide a framework for compliance with applicable demolition and disposal requirements regulated by the Minnesota Pollution Control Agency (MPCA) and the Minnesota Department of Health. Regulated wastes anticipated to be encountered is a lead-based paint system on the truss and treated timber curbs/rub rails along the bridge deck edge. A copy of the required MPCA form is available on the following website: <https://www.pca.state.mn.us/sites/default/files/w-sw4-21.pdf>. The work, as outlined in this paragraph, will be included for payment under Item No. 2021.501 "Mobilization."

If, during the course of removal or renovation of utility or bridge, additional asbestos materials or regulated wastes other than that noted above are encountered, notify the MnDOT Project Engineer to suspend work and furnish a documented inspection and evaluation by a MnDOT approved certified MDH contractor prior to resuming work. The work, as outlined in this paragraph, will be paid for as Extra Work and compensated as such in accordance with the provisions of Mn/DOT 1403.

Dispose of all asbestos and/or regulated waste in accordance with MnDOT's manual. Only those listed in this manual as pre-approved for asbestos and/or regulated waste will be allowed to work on this project. Use MnDOT approved companies for testing, waste transport and disposal as provided and described in MnDOT's manual "*Asbestos and Regulated Waste Manual For Structure Demolition Or Relocations for Construction Projects*" available on the following website: <http://www.dot.state.mn.us/environment/buildingbridge/index.html>. Contact Mark Vogel at 651.366.3630 or Jackie Klein at 651.366.3637, Office of Environmental Stewardship, 651.366.3630, with any questions regarding the manual.

A pre-activity meeting will be conducted to outline the action items to the satisfaction of the Engineer prior to removing any regulated materials and any bridge renovation or demolition activities.

All material shall be removed, identified, and disposed of in accordance with Section S-1701 (LAWS TO BE OBSERVED (BRIDGE)) of these Special Provisions. Permission to begin the regulated waste removals, with the exception of material needed for hazardous and regulated waste assessment or testing, will not be granted until the Engineer has copies of all required notices.

Permission to proceed with the demolition or renovation of bridges will not be granted until the Engineer has received copies of all required notifications as indicated in Section S-1701 (LAWS TO BE OBSERVED (BRIDGE)) of these Special Provisions.

Notify any utility owners at least three (3) days prior to the removal of any regulated waste which may affect the utility, allowing the utility owner time to have a representative on site.

SB-9 (2401) CONCRETE BRIDGE CONSTRUCTION

The provisions of 2401, "Concrete Bridge Construction," are supplemented as follows

SB-9.1 Finish of Concrete Surfaces

Provide an Ordinary Surface Finish to all formed concrete surfaces. Do not apply paint, curing compound, bonding agents or any other material which will alter the natural color of the unfinished concrete.

A. Ordinary Surface Finish

Delete the third paragraph of 2401.3.F.2a "Ordinary Surface Finish," and replace with the following:

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Remove only fins and projections which are loose or in excess of the projections created from the Board Formed Concrete Texture. Minor fins and projections caused by the Contractor's forms need not be removed unless they detract from the Board Formed Concrete Texture.

B. Basis of Payment

Finishing of concrete surfaces, except as otherwise provided in these special provisions, are considered an incidental expense to items 2433.607 "Historic Concrete (3B52) and 2433.618 "Historic Concrete Surface Repair," and no additional compensation will be made for this work.

SB-9.2 Corrugated Metal Stay-In-Place Deck Forms and Bridge Slab Placement

The proposed bridge deck is to be constructed using corrugated metal stay-in-place forms to match the existing/original deck design.

A. Materials

1. Forms:
The corrugated metal forms shall be manufactured with a 2 2/3" pitch x 1/2" depth corrugation pattern with a 14" radius and minimum section lengths of 18'-0", unless otherwise approved by the Engineer.
2. Coating:
The corrugated metal forms shall be fabricated from steel coils that have been hot-dip coated in a bath of zinc (galvanized) meeting AASHTO M218 and ASTM 929 material specification.
3. Thickness:
The corrugated metal forms shall have a minimum thickness of 0.109" (12-gage).
4. Connections:
The corrugation overlaps on the same section of form shall be lapped and connected with stitch circumferential welds. Welds shall be placed at a frequency so handling of the form stays intact during shipping and installation. Each weld shall be touched up with approved AASHTO weld repair paint. All welds shall be placed on the upper portion of the section (surface to be buried in the concrete deck). Any paint touch-up on the exposed surface of the forms shall match the galvanized surface in color and sheen or have an additional coating applied to provide an inconspicuous paint repair.
5. Welded lifting lugs shall be placed on the crown of the pipe to facilitate handling long lengths of the form, if required.

B. Design & Submittals

Forming Design and Placement Submittal

Delete 2401.3.B.2, "Design of Falsework and Forms," and replace with the following:

At least six weeks before starting construction of the bridge deck stay-in-place forming, 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 Corrugated Metal Stay-In-Place Deck Forms. Design the stay-in-place forms in accordance with the current AASHTO "LRFD Bridge Design Specifications" and the current NCSPA "Corrugated Steel Pipe Design Manual". Ensure the plans and specifications are 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. Include sufficient details so that construction of the proposed system can be completed solely by reference to the plans and Specifications. Show the design criteria on the first sheet of the plans.

As a minimum, stay-in-place forming plans must contain the following:

- Show all design-controlling dimensions, including existing floor beam geometry and location and proposed stringer and diaphragm geometry and locations.
- Indicate the size of forming material geometrics and section lengths.
- Locations and lengths of proposed laps of forming sections
- Connections/Details for contractor-proposed system to secure the forming system during concrete placement.
- Sealing methods of the circumferential seams of the corrugated metal forms and the form-to-stringer interface at the bottom of the arch form to contain deck concrete
- Embedment of ends of stay-in-place forms into the ends of the bridge deck
- Show the location and method by which the forming will be adjusted to final layout location and elevations.
- The forming plans must include a superstructure placing diagram showing the proposed concrete placing sequence and/or the direction of pour, whichever one is applicable, and the location of all construction joints.

Add the following to 2401.3.B.4:

It is not permitted to place the concrete for the bridge deck until (1) plans and Specifications meeting the above requirements have been provided to the Engineer; (2) the engineer who has certified plans and specifications for the falsework and forms has inspected the falsework after erection; and (3) the engineer inspecting the as-constructed falsework certifies in writing that all details are approved.

Material Submittal:

A sample of the product shall be made and approved by the Engineer of record prior to manufacturing the entire order. This sample shall include a stitch weld with repair coating paints.

C. Installation of Forms

The corrugated metal forms shall be placed in the field with at least two corrugation overlaps. Field laps shall be positioned at floorbeam locations, unless otherwise approved by the Engineer. Prior to placement of concrete in the forms, a method for securing the forms, either permanently or temporarily must be proposed by the Contractor and approved by the Engineer which does not affect the visual appearance of the forming system or cause weakening or damage to the structural steel members to remain. Methods should be used to prevent any loss of concrete between the circumferential seams of the corrugated metal forms. An acrylic latex caulk or construction tape shall be used to prevent loss of concrete between the forms at the seam overlap. An expandable foam or other means should be used to prevent loss of concrete at the bottom of the arch form. Promptly clean any mortar, concrete or slurry that leaks through the forms onto any painted or galvanized steel surfaces.

D. Method of Measurement and Basis of Payment

Furnishing, installing, and sealing the stay-in-place corrugated metal forms is included for payment under item 2401.518 "Bridge Slab Concrete (3Y42-M)," and no additional measurement or compensation will be made for this work.

SB-9.3 Structure Excavation

The item Structure Excavation shall include all excavation, sheeting and shoring (except temporary structural support, see SP-10), dewatering and/or other protection, preparation of foundation, and placing of backfill necessary for bridge abutment/wingwall rehabilitation, and approach treatment construction as shown in the Bridge Plans. This item shall also include placing erosion control and performing turf establishment as described later in this section. It shall also include the disposal of any surplus material. The work shall be performed in accordance with 2105, 2451, 2401 and all other applicable sections.

Erosion control, restoration and turf establishment for all disturbed areas within the project construction limits shall include the following:

- Category 3N Erosion Control Blanket (MnDOT 2575, 3885)
 - Approximately 675 square yards
- 4 inches of Common Topsoil Borrow (MnDOT 2575, 3877)
 - Approximately 75 cubic yards
- Seed Mixture 33-261 (MnDOT 2575, 3876) applied at 35 pounds/acre
 - Approximately 5 pounds
- Type 4 Fertilizer (MnDOT 2575, 3881) applied at 150 pounds/acre of seeded area
 - Approximately 21 pounds

No measurement will be made of the excavated or backfill material or for any temporary shoring (except temporary structural support), erosion control and vegetation restoration of disturbed areas within construction limits, and other miscellaneous excavation or embankment work required to facilitate the rehabilitation of the bridge. All work performed as specified above will be considered to be included in a single lump sum for which payment is made under Item No. 2401.601, "Structure Excavation".

For purposes of partial payments, the portion of the lump sum Structure Excavation at each substructure unit will be defined as follows:

Bridge No. L3275	South Abutment - 50%
	North Abutment - 50%

SB-9.3.1 Select Granular Borrow Mod 7%

The provisions of MnDOT 2105 AND 2451 shall apply on this project and the following:

Maximum particle size shall not exceed 3”.

Select granular materials shall be carefully placed adjacent to the structure to reduce potential damage to the joint waterproofing. For backfilling of the bridge, the entire backfill shall be compacted in accordance with the “Quality Compaction” described in 2105.3F.

Performing the compaction, as specified above, will be considered an incidental expense for which no direct compensation will be made.

SB-9.3.2 AGGREGATE SURFACING

Aggregate surfacing shall be constructed in accordance with the provision of MnDOT 2118 except as modified below:

Aggregate shall conform to the requirements of MnDOT 3138 and will be sampled, tested and inspected by the Township at any time prior to being permanently incorporated into the work.

Compaction of all aggregate surfacing within the structure and approach walls to the limits shown in the plans shall be obtained by the “Quality Compaction” described in 2105.3F.

SB-9.4 Slope Preparation

The provisions of MnDOT 2401 shall apply and as supplemented below:

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The Contractor shall regrade and reshape existing slopes, dress the slopes to the lines, grades and limits noted in the Plan, and in accordance with the applicable provisions.

All existing trees are to remain to the extent possible. **Any trees determined to require removal** shall be included with this item. Removal of any trees and grubbing of stumps within the construction limits of the project shall be included under Item No. 2401.601 "Slope Preparation."

The Contractor shall blend new berm slopes to the natural channel and shoreline slopes at the outer limits of this work.

Payment for Item No. 2401.601 "Slope Preparation" at the Contract price per lump sum shall be compensation in full for performing all of the work described above. Excavation for placement of riprap and filter material is not included in this item and will be paid for under the provisions of 2511.

For purposes of partial payment, the following payment schedule will be used:

South Abutment Slopes/Channel	50%
North Abutment Slopes/Channel	50%

SB-9.5 Concrete Curing and Protection

Curing of the reinforced concrete deck shall be performed using conventional wet curing per MnDOT 2401.3.G.6.b. The use of a Poly-Alpha Methylstyrene (AMS) Membrane Curing Compound containing white solids will not be permitted.

SB-9.6 Protection of New Concrete Against Vibration

The provisions of 2401.3.G, "Concrete Curing and Protection," are supplemented as follows:

Delete 2401.3.G (5) and replace with the following:

- (5) Vibration exceeding a specific limit;

Add the following as 2401.3.G.7, "Protection of New Concrete Against Vibration":

Do not subject freshly placed concrete to excessive vibration and shock waves during the curing period until it has reached a 2,000 psi minimum compressive strength for structural concrete and lower-strength classes of concrete.

After the first 5 hours from the time the concrete has been placed and consolidated, keep all vibration producing operations at a safe horizontal distance from the freshly placed concrete by following either the Primary or Alternate method. Plant cast concrete is not subject to these requirements.

E. Primary Method - Prescriptive Safe Distance Method

After the concrete has been placed and consolidated, keep all vibration producing operations at a safe distance from the freshly placed concrete as follows:

Minimum Compressive Strength, f'c	Safe Horizontal Distance		
	Equipment Class L	Equipment Class M	Equipment Class H
< 1,000 psi	10 feet	75 feet	125 feet
1,000 to < 1,400 psi	10 feet	30 feet	50 feet
1,400 to 2,000 psi	10 feet	15 feet	25 feet

Equipment Class L (Low Vibration) includes small rubber tire construction equipment like backhoes under 50,000 pounds, concrete placing equipment, and legal highway vehicles if such equipment travels at speeds of:

- ≤ 5 mph on relatively smooth roadway surface or
- ≤ 3 mph on rough roadway surface (i.e., with potholes)

Equipment Class M (Medium Vibration) includes tracked dozers under 85,000 pounds, track vehicles, trucks (unless excluded above), hand-operated jack hammers, cranes, auger drill rig, caisson drilling, vibratory compacting rollers under 30,000 pounds, and grab hammers.

Equipment Class H (High Vibration) includes pile drivers, vibratory hammers, machine-operated impact tools, pavement breakers, and other large pieces of equipment.

After the concrete has reached the minimum compressive strength specified above, the safe horizontal distance restrictions would no longer apply.

F. Alternate Method - Monitoring Safe Distance Method

Monitor the vibration producing operations in order to decrease the safe horizontal distance requirements of the Prescriptive Safe Distance Method. Monitor all construction operations that produce vibration or shock waves in the vicinity of freshly placed concrete with monitoring equipment sensitive enough to detect a minimum peak partial velocity (PPV) of 0.01 in/sec. Place monitoring devices on or adjacent to the freshly placed concrete when the measurements are taken. During the time subsequent to the concrete placement, cease all vibration or shock producing operations in the vicinity of the newly placed concrete when monitoring equipment detects excessive vibration and shock waves defined as exceeding the following PPV's:

Minimum Compressive Strength, f'c	Maximum PPV
< 1,000 psi	0.01 in/sec
1,000 to < 1,400 psi	1.0 in/sec
1,400 to 2,000 psi	2.0 in/sec

After the concrete has reached a minimum compressive strength specified above, the safe horizontal distance restrictions would no longer apply.

SB-9.7 Structural Concrete – High Performance Concrete Bridge Decks (Contractor Concrete Mix Designs)

Delete the contents of 2401.2.A, "Concrete," and replace with the following:

For Bridge No. L3275 design a **3YHPC-M** concrete mixture that will minimize cracking. Perform the work in accordance with the applicable requirements of MnDOT 2401, "Concrete Bridge Construction," 2461, "Structural Concrete," and the following:

2.A.1 Fine Aggregate Requirements

Provide fine aggregates complying with quality requirements of 3126.2.D, "Deleterious Material," 3126.2.E, "Organic Impurities," and 3126.2.F, "Structural Strength."

2.A.1.a Fine Aggregate Alkali Silica Reactivity (ASR) Requirements

The Department will routinely test fine aggregate sources for alkali silica reactivity (ASR) in accordance with the following:

1. Multiple sources of certified Portland cement in accordance with ASTM C1260 MnDOT Modified; and
2. Multiple combinations of certified Portland cement and supplementary cementitious materials in accordance with ASTM C1567 MnDOT Modified.

The Concrete Engineer, in conjunction with the Engineer, will review the 14-day fine aggregate expansion test results to determine the acceptability of the proposed fine aggregate and cement combination in accordance with the following:

1. For fine aggregate and cement combinations previously tested by the Department, the Concrete Engineer will use the average of all 14-day unmitigated test results for an individual source to determine necessary mitigation in accordance with Table HPC-1.
2. If the previously tested proposed fine aggregate and cement combination requires less mitigation than the average 14-day unmitigated test result, the Concrete Engineer will allow mitigation at the lesser rate in accordance with Table HPC-1.
3. Alkali silica reactivity (ASR) ASTM C1260 and ASTM C1567 test results are available on the MnDOT Concrete Engineering Unit website.

Table HPC-1 Fine Aggregate ASR Mitigation Requirements							
14-day Fine Aggregate Unmitigated Expansion Limits	Class F Fly Ash	Class C Fly Ash	Slag	Slag/Class F Fly Ash	Slag/Class C Fly Ash	IS(20)/Class F Fly Ash	IS(20)/Class C Fly Ash
≤ 0.150	No mitigation required						
>0.150 - 0.200	Minimum 20%	Minimum 20%	35%	20% Slag with a minimum of 15% Class F fly ash	20% Slag and 20% Class C fly ash	Type IS(20) with a minimum of 15% Class F	Type IS(20) with a minimum of 15% Class C
> 0.200 – 0.300	Minimum 20%	Minimum 30%	35%				
> 0.300	The Department will reject the fine aggregate						

The Contractor may use 100% Portland cement for High Early Concrete, provided no mitigation is required for the fine aggregate in accordance with Table HPC-1. If mitigation is required, the Contractor is required to use a minimum of 15% of any supplementary cementitious material when designing High Early Concrete.

The Concrete Engineer may reject the fine aggregate if mortar bar specimens exhibit an indication of external or internal distress not represented by the expansion results. The Concrete Engineer will make the final acceptance of the aggregate.

2.A.2 Intermediate Aggregate Requirements

Provide intermediate aggregates complying with the quality requirements of 3137.2.D.2, "Coarse Aggregate for Bridge Superstructure," except as modified in Table HPC-2. If the intermediate aggregate is from the same source as the ¾ inch- fraction, the aggregate quality is determined based upon the composite of the ¾ inch- and intermediate aggregate.

The Concrete Engineer classifies intermediate aggregate in accordance with Table HPC-2.

Table HPC-2 Intermediate Aggregate for Use in Concrete			
If the gradation meets the following:	Classify material type as:	Gradation Test Procedures	Quality Test Requirements
100% passing the 1/2" and ≤90% passing #4	Intermediate Aggregate	Coarse Aggregate (+4 Portion)	Spec. 3137.2.D.2 except 3137.2.D.2(i) modified to maximum 40% carbonate
		Fine Aggregate (-4 Portion)	Shale in Sand (-4 Portion)
100% passing the 1/2" and >90% passing #4	Intermediate Aggregate	Fine Aggregate (Minimum 1000 g sample)	Shale Content Test by AASHTO T113 MnDOT Modified (+4 Portion)
			Shale in Sand (-4 Portion)
100% passing the 3/8" and ≤90% passing #4	Coarse Sand	Fine Aggregate	Shale Content Test by AASHTO T113 MnDOT Modified (+4 Portion)
			Shale in Sand (-4 Portion)

For any intermediate aggregate size not previously tested by the Department, the Concrete Engineer reserves the right to test for alkali silica reactivity, in accordance with ASTM C1260, prior to allowing incorporation into the concrete mix design.

2.A.3 Coarse Aggregate Requirements

Provide Class A, B or C coarse aggregate meeting the quality requirements in accordance with 3137.2.D.2, "Coarse Aggregate for Bridge Superstructure."

When providing Class B aggregate, the maximum absorption percent by weight is 1.10%.

2.A.3.a Coarse Aggregate Alkali Silica Reactivity (ASR) Requirements

When using coarse aggregate identified as quartzite or gneiss, the Concrete Engineer will review ASTM C1293 testing to determine the necessary ASR mitigation requirements in accordance with Table HPC-3.

ASR ASTM C1293 test results are available on the MnDOT Concrete Engineering Unit website.

Table HPC-3 Coarse Aggregate ASR Mitigation Requirements*							
ASTM C1293 Expansion Results	Class F Fly Ash	Class C Fly Ash	Slag	Slag/Class F Fly Ash	Slag/Class C Fly Ash	IS(20)/Class F Fly Ash	IS(20)/Class C Fly Ash
≤ 0.040	No mitigation required						
>0.040	Minimum 30%	Not Allowed	35%	20% Slag with a minimum of 15% Class F fly ash	20% Slag and 20% Class C fly ash	Type IS(20) with a minimum of 15% Class F	Type IS(20) with a minimum of 15% Class C
* The Engineer will allow the Contractor to substitute a portion of the minimum required supplementary cementitious material with up to 5% silica fume by weight for mitigation purposes.							

2.A.4 Cementitious Materials

Provide only cementitious materials from the Approved/Qualified Products List.

2.A.4.a Cement

Use Type I or Type I/II cement complying with Specification 3101, "Portland Cement," or blended cement in accordance with Specification 3103, "Blended Hydraulic Cement."

1. Total alkalis (Na₂Oe) no greater than 0.60 percent in the Portland cement, and
2. Total alkalis (Na₂Oe) no greater than 3.0 lb per yd³ of concrete resulting from the Portland cement.

2.A.4.b Fly Ash

Use fly ash conforming with Specification 3115, "Fly Ash for use in Portland Cement." The Concrete Engineer defines Class F fly ash for the purposes of ASR mitigation as having a maximum CaO content of 18.0%.

2.A.4.c Ground Granulated Blast Furnace Slag

Use ground granulated blast furnace slag conforming to Specification 3102, "Ground Granulated Blast-Furnace Slag."

2.A.4.d Silica Fume

Use silica fume conforming to ASTM C1240.

2.A.4.e Ternary Mixes

Ternary mixes are defined as Portland cement and two other supplementary cementitious materials, or blended cement and one other supplementary cementitious material with a maximum replacement of 40% by weight.

2.A.5 Additional Ingredients

Combine and blend as required.

2.A.5.a Allowable Admixtures

Use any of the following admixtures on the MnDOT Approved/Qualified Products as listed under "Concrete Admixtures A-S":

1. Type A, Water Reducing Admixture,
2. Type B, Retarding Admixture,
3. Type C, Accelerating Admixture,
4. Type D, Water Reducing and Retarding Admixture,
5. Type F, High Range Water Reducing Admixture, and
6. Type S, Specific Performance Based Admixture

Obtain a written statement from the manufacturer of the admixtures verifying:

1. Compatibility of the combination of materials, and
2. Manufacturer recommended sequence of incorporating the admixtures into the concrete.

The manufacturer will further designate a technical representative to dispense the admixture products.

Utilize the technical representative in an advisory capacity and have them report to the Contractor any operations or procedures which are considered as detrimental to the integrity of the placement. Verify with the Engineer whether the Manufacturer's technical representative's presence is required during the concrete placement.

2.A.5.b Fiber Reinforcement

Furnish only one of the materials listed on the Department's Approved/Qualified Product List (A/QPL) for Concrete Products, "Nonmetallic Fibers," (www.dot.state.mn.us/products). Provide fibers at a dosage as prescribed on the A/QPL per the manufacturer. Incorporate the fibers into the mix design in accordance with the applicable requirements of 2401, "Concrete Bridge Construction," and 2461, "Structural Concrete" and the following:

2.A.5.b (1) Materials

Supply Type III fibers in accordance with ASTM C1116. A minimum dosage rate of 4 lbs/cy is required. The fibers on the A/QPL are a combination of micro and macro non-metallic fibers to provide crack control and improve the long-term performance of the bridge decks. The stated manufacturer purpose of the non-metallic fibers is for controlling plastic shrinkage cracks in concrete (micro fibers) and to provide increased residual flexural strength in the concrete (macro fibers). Single component macro fibers conforming to the requirements of table HPC-4 may be submitted for approval by the Engineer.

2.A.5.b (2) Acceptance and Testing

Test Fiber-reinforced concrete for the following hardened properties in accordance with the Table HPC-4:

Table HPC-4 Required Hardened Fiber-Reinforced Concrete Properties		
Test	Requirement	Test Method
Equivalent Flexural Strength Ratio ($R^D_{T,150}$)	Minimum of 25%	ASTM C1609
Crack Reduction Ratio (CRR)	Minimum reduction >85%	ASTM C1579

Test beam specimens when the concrete strength is between 3500 and 4500 psi. In all cases the trial placement with the contractor-designed mix will be required to demonstrate slump, air loss, and workability with the Contractor's mix design.

2.A.5.b (3) Dosage and Documentation

Supply a written statement from the manufacturer of the fibers verifying the compatibility of the combination of materials and the sequence in which they are combined, to the Engineer prior to using it in this project.

2.A.5.b (4) Application Requirements

Mix non-metallic fiber reinforcement in concrete mixer in accordance with mixing time and speed of ASTM C94, "Standard Specification for Ready-Mixed Concrete" to ensure uniform distribution and random orientation of fibers throughout concrete. Notify the Engineer in writing of the dedicated personnel for this task and the procedures for distributing fibers.

The following fiber addition methods are acceptable on all jobs:

1. Open bag and distribute fibers on aggregate belt at ready-mix concrete plant;
2. Open bag, break apart any fiber clumps, and introduce fibers into ready-mix concrete truck in a well-distributed manner (i.e., "chicken feed")

Any alternate methods to add fibers to the concrete mix must be submitted for acceptance by the Engineer and be demonstrated by a successful trial placement. Allowing bags to dissolve in the ready-mix concrete trucks will not be allowed. Balling of fibers is defined as a 2 inch diameter or greater conglomerate of fibers at the point of placement. Any balling more prevalent than 1 location in 20 CYDs will be considered a failed trial placement. Ensure the manufacturer’s technical representative is available by phone or in person to troubleshoot fiber inclusion into the mix during the trial placement and bridge deck placement.

2.A.6 Concrete Mix Design Requirements

Submit the concrete mixes using the appropriate MnDOT Contractor Mix Design Submittal Workbook available on the Department’s website at least 21 calendar days before the initial concrete placement. For mix design calculations, the Engineer, in conjunction with the Concrete Engineer, will provide specific gravity and absorption data.

The Concrete Engineer, in conjunction with the Engineer, will review the mix design submittal for compliance with the contract.

2.A.6.a Concrete Mix Design Requirements

Design and produce 3YHPC-M or 3YHPC-S concrete mixes based on an absolute volume of 27.0 ft³ in accordance with the Table HPC-4 and the following requirements:

Table HPC-5 High Performance Bridge Deck Concrete Mix Design Requirements								
Concrete Grade	Mix Number *	Intended Use	w/c ratio	Target Air Content	Maximum %SCM (Fly Ash/Slag/Silica Fume/Ternary)	Slump Range †, inches	Minimum Compressive Strength, f’c (28-day)	3137 Spec.
HPC	3YHPC-M	Bridge Deck – Monolithic	0.42-0.45	6.5%	30/35/5/40	1 - 4	4000 psi	2.D.2
	3YHPC-S	Bridge – Structural Slab						
* Provide a Job Mix Formula in accordance with 2401.2.A.7. Use any good standard practice to develop a job mix formula and gradation working range by using procedures such as but not limited to 8-18, 8-20 gradation control, Shilstone process, FHWA 0.45 power chart or any other performance related gradation control to produce a workable and pumpable concrete mixture meeting all the requirements of this contract. The individual limits of each SCM shall apply to ternary mixtures. † Keep the consistency of the concrete uniform during entire placement. Where fibers are used as specified in this specification the slump range may be adjusted to 1 – 5 inches.								

2.A.6.b Required Preliminary Testing

Prior to placement of any 3YHPC-M or 3YHPC-S Concrete, the Engineer will require preliminary batching and testing of the concrete mix design.

Submit the concrete mixes using the appropriate MnDOT Contractor Mix Design Submittal Workbook available on the Department’s website at least 14 calendar days prior to the beginning of preliminary laboratory mixing and testing of the proposed mix designs. Any changes or adjustments to the material or mix design require a new Contractor mix design submittal. For mix design calculations, the Engineer, in conjunction with the Concrete Engineer, will provide specific gravity and absorption data.

The Concrete Engineer, in conjunction with the Engineer, will review the mix design submittal for compliance with the contract.

Test the concrete for the following hardened concrete properties in accordance with Table HPC-5:

Table HPC-6 Required Hardened Concrete Properties for Mixes 3YHPC-M and 3YHPC-S		
Test	Requirement	Test Method
Required Strength (Average of 3 cylinders)	4000 psi at 28 days	ASTM C31
Rapid Chloride Permeability	≤ 2500 coulombs at 28 days (For Preliminary Approval) ≤ 1500 coulombs at 56 days	ASTM C1202
Freeze-Thaw Durability	Greater than 90% at 300 cycles	ASTM C666 Procedure A
Shrinkage	No greater than 0.040 percent at 28 days	ASTM C157
Scaling	Visual rating not greater than 1 at 50 cycles	ASTM C672

The Engineer will allow the maturity method for subsequent strength determination. Perform all maturity testing in accordance with ASTM C1074 and the MnDOT Concrete Manual.

If a mix is approved, the Concrete Engineer will consider the mix design and testing as acceptable for a period of 5 years provided the actual concrete mixed and placed in the field meets the Contract Requirements. The Concrete Engineer will not require new testing within that 5-year period as long as all the constituents (including the aggregates) of the proposed mix design are the same as the original mix design.

The Engineer determines final acceptance of concrete for payment based on satisfactory field placement and performance.

2.A.7 Job Mix Formula

A Job Mix Formula (JMF) contains the following:

1. Proportions for each aggregate fraction,
2. Individual gradations for each aggregate fraction, and
3. Composite gradation of the combined aggregates including working ranges on each sieve in accordance with Table HPC-7.

Table HPC-7 Job Mix Formula Working Range	
Sieve Sizes	Working Range, %*
1 inch and larger	±5
¾ inch	±5
½ inch	±5
⅜ inch	±5
No. 4	±5
No. 8	±4
No. 16	±4
No. 30	±4
No. 50	±3
No.100	±2
No. 200	≤ 1.6
* Working range limits of the composite gradation based on a moving average of 4 tests (N=4).	

2.A.7.a Verification of JMF

Prior to beginning placements of bridge deck concrete, perform gradation testing to ensure current materials comply with the approved JMF. Perform gradation testing in accordance with the Schedule of Materials Control.

1. Take samples at the belt leading to the weigh hopper or other locations close to the incorporation of the work as approved by the Engineer.
2. Add fill-in sieves as needed during the testing process to prevent overloading.

The Producer and Engineer will test and record the individual gradation results using the Concrete Aggregate Worksheet.

1. Using the JMF Moving Average Summary Worksheet, calculate the moving average of Producer aggregate gradation test results during production.
2. The Engineer will randomly verify Producer combined aggregate gradation results as defined in the Schedule of Materials Control.

If, during production, the approved JMF falls outside of the allowable working range immediately sample and test additional gradation and continue production.

2.A.7.b JMF Adjustment

If it is determined that the current aggregates do not meet the approved JMF, submit a new mix design including JMF to the Concrete Engineer in accordance with 2401.2.A.7 (of this SP).

2.A.7.c JMF Acceptance

The Engineer will make monetary adjustments for the quantity of bridge deck concrete represented by the JMF Working Range failure, from the failing test to the next passing test, at a minimum rate of \$500.00 or \$5.00 per cubic yard, whichever is greater.

2.A.8 Laboratory batching, testing requirements and submittals:

To determine the characteristics of the Contractor proposed mix design, the Concrete Engineer will require the Contractor to prepare test batches and do laboratory testing. Conduct all batching and testing of concrete at a **single** AMRL certified laboratory using the exact materials proposed in the mix design.

Lab testing requirements:

1. Slump and air content at <5 minutes, 15 minutes, and 30 minutes after the completion of mixing,
2. Compressive strength (Make cylinders in accordance with AASHTO T126 and tested in accordance with AASHTO T22) at 1, 3, 7, 28, 56 days (sets of 3),
3. Hardened air content (ASTM C457) at a minimum of 7 days,
4. Rapid chloride permeability (ASTM C1202) at 28 days and 56 days (2 specimens for 28 day test and 2 test specimens for 56 day test (Take 2 specimens from each batch of a 2 batch mix)),
5. Concrete Durability (ASTM C666, Procedure A) at 300 cycles, and
6. Concrete Shrinkage (ASTM C157) at 28 days.

The Contractor is required to contact the MnDOT Concrete Engineering Unit a minimum of 2-days prior to any mixing so that a MnDOT representative can observe the process. This same 2-day notification is required prior to any physical testing on hardened concrete samples. Additionally, retain any hardened concrete test specimens for a minimum of 90 days and make available for MnDOT to examine.

Perform all testing for plastic concrete after all admixtures additions to the concrete mixture.

After completion of the laboratory testing specified herein and, at least, 15 working days prior to the trial placement, submit the laboratory test data to the MnDOT for review and acceptance.

Include the following information in the laboratory reports of the design mixes:

1. Exact batch weights and properties of all ingredients used and all aggregate gradations;
2. Slump and air content;
3. Cylinder identification, including mix designation;

4. Date and time of cylinder preparation;
5. Date and time cylinder specimen was tested;
6. Compressive strength of each cylinder specimen at 1, 3, 7, 28, and 56 day (sets of 3);
7. A graphic plot of age, from 0 to 56 days, vs. strength for each mix design;
8. Hardened air content at a minimum of 7 days;
9. Rapid chloride permeability at 28 days and 56 days;
10. Concrete Durability at 300 cycles; and
11. Concrete Shrinkage at 28 days.

2.A.9 Prior to Actual Bridge Deck Placement

2.A.9.a Trial Placement

A minimum of 14 calendar days prior to the actual placement of the bridge deck slab concrete, successfully complete a separate trial placement utilizing a minimum of two (2) - 10 yd³ loads.

The Engineer may allow the incorporation of the concrete for trial batches into the bridge footings, abutments or end diaphragms. The Contractor may also choose to incorporate the trial batches into residential /commercial construction in the immediate vicinity of the project. In any case, the Engineer will require mixing, transporting, and placing the concrete using the same methods as the actual placement of the bridge deck.

If the concrete is incorporated into the permanent work, the Engineer will test the plastic concrete in accordance with the Schedule of Materials Control. The Engineer may require additional trial batches if the concrete delivered to the project does not comply with the plastic concrete requirements of the Contract.

The Engineer will waive a trial placement, at the contractor's request, provided the contractor submits a history of at least three successful bridge deck placements in the last 5 years using the same mix design and similar pumping or placement configuration.

The concrete mix design, laboratory batching and mixing, and the trial placement is incidental to the concrete furnished and placed.

Use the same materials, same supplier, and same supplier's manufacturing plant, and proportions in the permanent work as in the trial placement. Strength requirements specified for each mix are applicable to the cylinder tests taken during the production work.

2.A.9.b Slab Placement and Curing Plan

At least 14 calendar days prior to slab placement, provide a slab placement and curing plan for each bridge to the Engineer for approval. Include the following information in the placement and curing plan:

1. Anticipated concrete delivery rates
2. Estimated start and finish time
3. Material, labor and equipment proposed for placing, finishing, and curing including placement of wet burlap, soaker hose, or other system to maintain the deck in a moist condition during the curing period
4. Number of work bridges proposed for use
5. Number of people responsible for the various tasks and
6. Bulkheading methods and materials proposed for use if the Contractor cannot maintain the proposed concrete placement rates.

For full depth monolithic decks, the finishing machine will consist of a cylindrical finisher mated with horizontal adjustable augers, both of which are mounted on a transversely moving carriage unless otherwise approved by the State Bridge Construction Engineer.

A 10 ft modified straight-edge is required for full-depth decks prior to carpet dragging regardless of whether texture planing is specified for the final ride surface. Float slab in accordance with MnDOT Construction Manual 5-393.358 to ensure the final surface does not vary by greater than 1/8 inch within a 10 ft straightedge laid longitudinally on the final surface. This surface tolerance includes areas near expansion devices and other breaks in the continuity of the bridge slab.

Proj. No.
Bridge No. L3275
Waterford Township

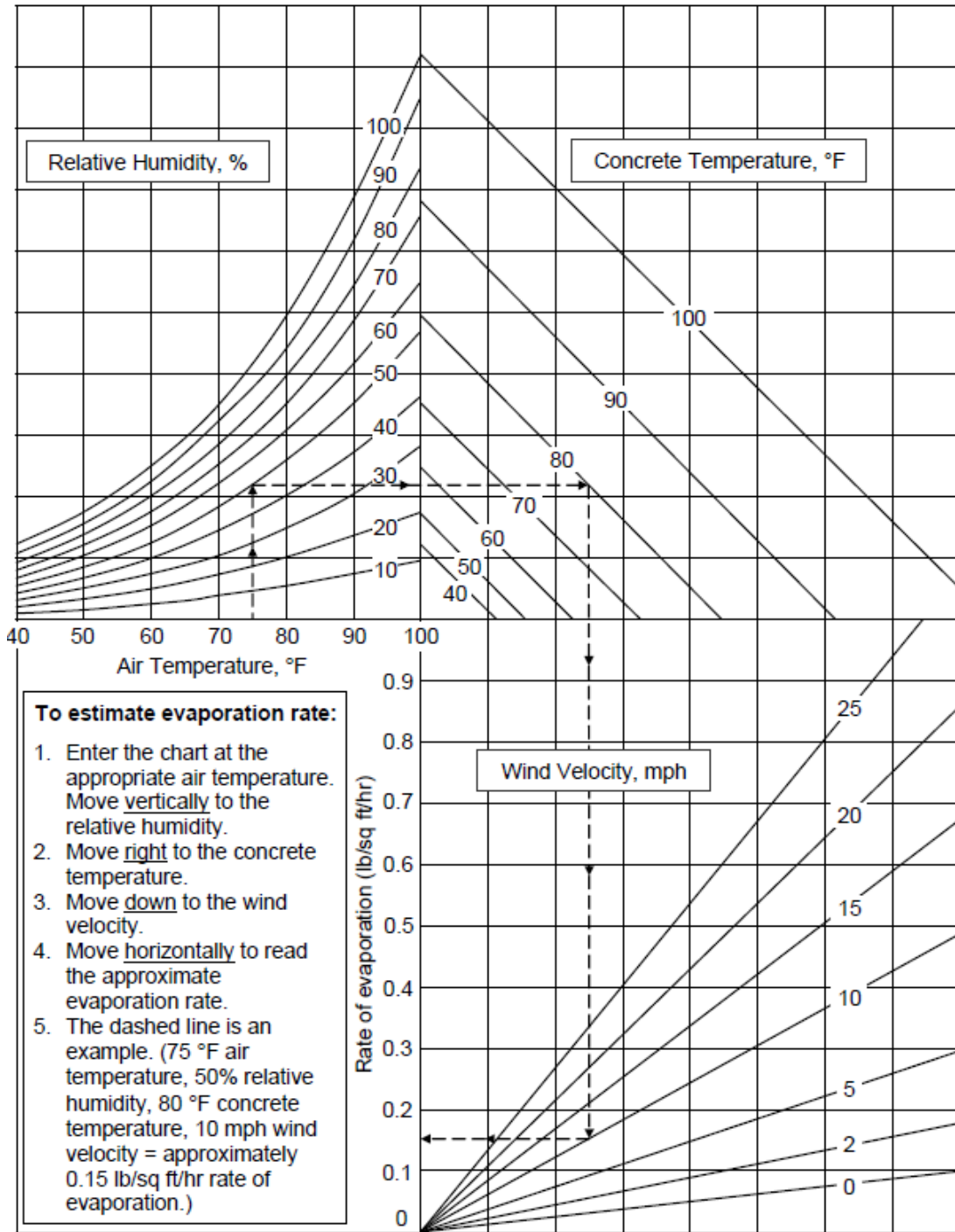
Attend a pre-placement meeting 2 days to 4 days before the slab placement to review the information and details provided in the placement and curing plan. The following project personnel are required to attend the pre-placement meeting:

1. Contractor
2. Engineer
3. Concrete supplier and
4. If required by the Engineer, the concrete pump supplier.

2.A.9.c Three (3) Hours Prior to Beginning Bridge Deck Concrete Placement

The Engineer requires the Contractor to comply with all of the following conditions prior to allowing the Contractor to begin the bridge deck concrete placement:

1. Provide a forecast to the Engineer three (3) hours before placement. The Engineer will review the forecast for the following:
 - a. No forecasted precipitation two (2) hours prior to the scheduled placement duration, nor up to two (2) hours after the anticipated completion of the placement, and
 - b. Less than 30% chance of precipitation for the entire placement window and
2. Only if the combination of air temperature, relative humidity, concrete temperature and wind velocity produces an evaporation rate of less than 0.20 pounds per square foot of surface area per hour, according Figure HPC-1:



¹ Based on ACI 305 R, "Hot Weather Concreting"

FIGURE HPC-1

A. Method of Measurement

If measuring bridge slab concrete by area, the Engineer will measure the bridge slab by surface area based on the dimensions shown on the plans. The Engineer will not deduct the surface area of expansion devices or other miscellaneous appurtenances.

B. Basis of Payment

Payment for Item No. 2401.618 "BRIDGE SLAB CONCRETE (3YHPC-M)" will be made at the Contract price per square foot and shall be compensation in full for all costs of forming, placing, finishing, curing, crack sealing, and all associated incidentals necessary to construct the bridge deck and diaphragms as detailed in the Plans in accordance with these specifications.

SB-9.7.1 Concrete Curing and Protection

Delete the 16th paragraph through 18th paragraphs of 2401.3.G, "Concrete Curing and Protection," and replace with the following:

2.A.9.d Actual Bridge Deck Placement and Curing Requirements

In addition to the requirements set forth in 2461.3.G.4, "Field Adjustments," if any adjustments are necessary on site, comply with the following:

1. The Engineer will only allow the addition of admixtures originally incorporated into the mix, except Viscosity Modifying Admixture (VMA) is allowed to adjust slump even if they were not used in the original testing
2. The Engineer will allow a maximum of 1 gal of water additions per yd³ of concrete on site provided additional water is available to add per the Certificate of Compliance, including any water necessary to dilute admixtures and
3. Mix the load a minimum of 5 minutes or 50 revolutions after any additions.

The Engineer will not allow finishing aids or evaporation retarders for use in finishing of the concrete.

The Contractor is fully responsible for curing methods. Comply with the following curing methods unless other methods are approved by the Engineer in writing.

Table HPC-8 Required Curing Method Based on Final Bridge Deck Surface		
Bridge Deck Type	Final Bridge Deck Surface	Required Curing Method
Bridge structural slab curing (3YHPC-S)	Low Slump Wearing Course	Conventional wet curing after carpet drag
Bridge deck slab curing for full-depth decks (3YHPC-M)	Epoxy Chip Seal Wearing Course or Premixed Polymer Wearing Course	Conventional wet curing after carpet drag
	Bridge Deck Planing	Conventional wet curing after carpet drag.
	Tined Texturing*	Conventional wet curing after tine texturing AMS curing Compound after wet cure period
	Finished Sidewalk or Trail Portion of Deck (without separate pour above)*	Conventional wet curing after applying transverse broom finish AMS curing Compound after wet cure period
Apply conventional wet curing to bridge slabs following the finishing machine or air screed. * Prevent marring of broomed finish or tined textured surface by careful placement of wet curing.		

Use conventional wet curing consisting of pre-wetted burlap covered with white plastic sheeting in accordance with the following:

1. Place the burlap to cover 100 percent of the deck area without visible openings
2. Place the wet curing within 30 min after the finishing machine completes the final strike-off of the concrete surface
3. If the Contractor fails to place the wet curing within 30 min, the Department will monetarily deduct \$500 for every 5 min period, or any portion thereof, after the initial time period until the Contractor places the wet curing as approved by the Engineer, the Department may assess the deduction more than once
4. Keep the slab surface continuously wet for an initial curing period of at least 7 calendar days
5. Use a work bridge to follow the finish machine and
6. Provide an additional center rail on wide bridges, if necessary.

Where marring of the broomed finish or tined texturing surface finish is a concern, the Engineer may authorize curing as follows:

1. Apply a membrane curing compound meeting the requirements of 3754, "Poly-Alpha Methylstyrene (AMS) Membrane Curing Compound"
2. Apply curing compound using approved power-operated spray equipment
3. Provide a uniform, solid white, opaque coverage of membrane cure material on exposed concrete surfaces (equal to a white sheet of paper)
4. Place the membrane cure within 30 minutes of concrete placement unless otherwise directed by the Engineer
5. Provide curing compound for moisture retention until the placement of a conventional wet curing
6. Apply conventional wet curing when walking on the concrete will not produce imprints deeper than $\frac{1}{16}$ inch
7. Keep the deck slab surface continuously wet for an initial curing period of at least 7 calendar days including weekends, holidays, or both if these fall within the 7-calendar-day curing period
8. The Engineer will not allow placement of membrane curing compound on any concrete surface that expects future placement of additional concrete on that surface and
9. If the Contractor fails to meet these requirements, the Department may reduce the contract unit price for the concrete item in accordance with 1512, "Conformity with Contract Documents."

SB-9.7.2 Crack Sealing

Delete the contents of 2401.3.1.2, "Crack Sealing," and replace with the following:

The Contractor is fully responsible for crack sealing all cracks in accordance with table 2401-5.

Table 2401-9 Crack Sealing Requirements Based on Final Bridge Deck Surface		
Bridge Deck Type	Final Bridge Deck Surface	Crack Sealing Requirements
Bridge structural slab *	Low Slump Wearing Course	Seal cracks in accordance with SB-9.7.2.2
Bridge deck slab for full-depth decks	Epoxy Chip Seal Wearing Course or Premixed Polymer Wearing Course	See wearing course special provision
	Bridge Deck Texture Planing	Seal cracks per workflow following this table – Figure 1
	Tined Texturing	Seal cracks per workflow following this table – Figure 1
	Finished Sidewalk or Trail Portion of Deck (without separate pour above)	Seal cracks per workflow following this table – Figure 1
<p>* Shotblast the surface in preparation for low slump wearing course. Prior to placing the low slump wearing course, the Engineer will visually inspect the bridge structural slab, and will mark cracks that require sealing appearing on the top surface. Control the application of the crack sealer such that the maximum width of crack sealant does <u>not exceed 1 inch</u>. If exceeding the permitted width of 1 inch, remove excess by means of surface grinding to prevent debonding of concrete wearing course. The Engineer requires the sealer to cure completely prior to pre-wetting of the deck, as required for placement of a low slump concrete wearing course.</p>		

Use the following workflow chart for crack sealing of finished roadway, trail and sidewalk surfaces on bridges. Incorporate the referenced special provisions.

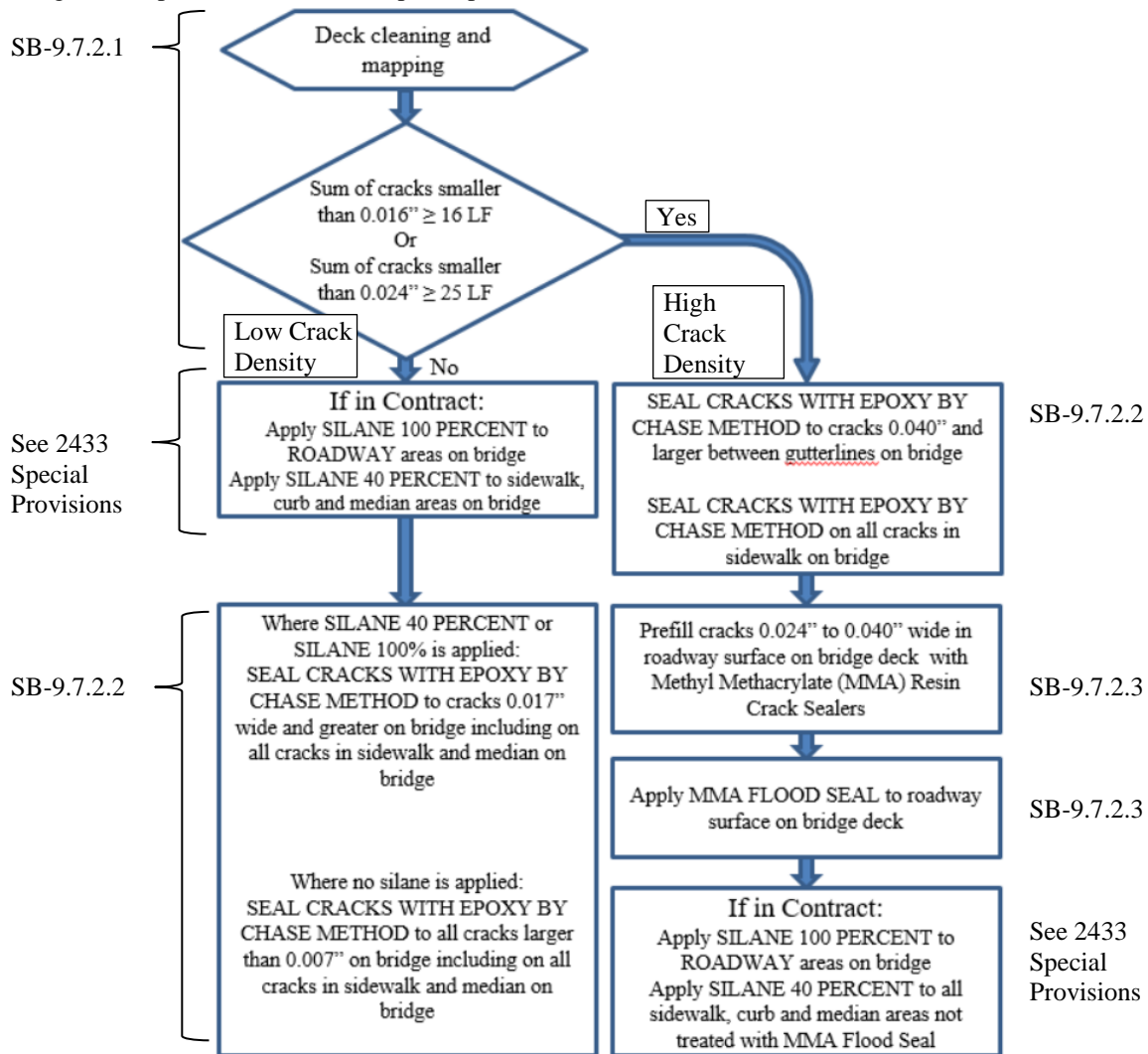


Figure 1: Workflow diagram and decision diagram for crack sealing in horizontal surfaces.

Determine crack density after clearing and cleaning the roadway and sidewalk surfaces in accordance with SB-9.7.2.1

SB-9.7.2.1 Deck Cleaning and Mapping Cracks

A. Description

This consists of cleaning the bridge deck and sidewalk for evaluation of crack density in advance of the actual crack sealing operations. Any grinding or Bridge Deck Planing should occur in advance of this phase. Where timing is the surface texture on new bridge surfaces, AMS curing compound may be present. Crack sealing will not require removal of the curing compound for cracks less than 0.017 inches wide unless treating surfaces are more than one year old.

B. Construction

The contractor is required to:

1. Fabricate crack mapping frames or otherwise produce a grid on the deck surface for mapping cracks at selected locations;
2. Provide 5 crack comparator gages, per bridge, conforming to standard crack widths of ACI 224R-01 (American Concrete Institute) (See sample gage below);
3. Produce crack mapping records; and
4. Summarize measured crack data in two designated areas per bridge to the Engineer. Based on observed crack density, a sealing treatment per contract requirements will be authorized by the Engineer.

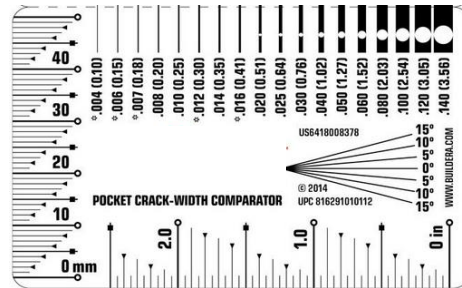


Image of an acceptable crack comparator gage (not scalable)

Remove all dirt, loose aggregate and other deleterious materials on bridge deck, approach panels, bridge joints, and sidewalks. Bridge joint cleaning may require hand-operated equipment such as blowers and power washers to thoroughly clean. Dispose of any loose material removed from swept and cleaned areas in accordance with 2104.3.C.3, "Concrete and Masonry Structures".

C. Evaluation

The Engineer will locate two areas to represent the general cracking condition of the deck. Power wash representative areas and then during the deck drying process utilize frames with stringlines at 1 foot grids or otherwise produce a grid to map cracks within areas as follows:

1. A 72 SF area in a 12-foot longitudinal by 6 foot transverse area near midspan; and
2. A 72 SF area 6 foot in width located between 24-ft and 12-ft from center of a pier (if multiple spans).

The above locations are general guidelines and actual locations will be selected by the Engineer but in all cases will be in a driving lane to capture crack density. Where varying crack levels exist within a 200-foot or longer bridge, crack evaluation may be performed at 50-foot intervals to substantiate a switch in crack sealing treatments. An illustrative example (without color – colorized version available upon request) of crack mapping locations is shown below:

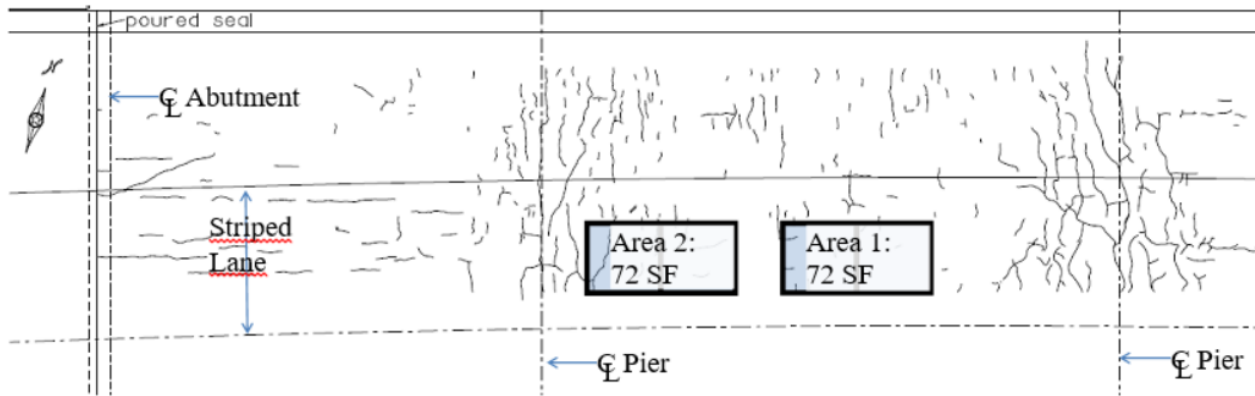


Figure 2: Illustration of crack mapping areas that will be used to characterize general cracking condition of the bridge deck surface.

Record crack frequency and the crack size range according to the following table.

Crack Classification	Crack Width	Pen Color
A1	< 0.010 in.	Black
A2	0.010 in. – 0.016 in.	Red
B1	0.017 in. – 0.024 in.	Green
B2	≥ 0.025 in.	Blue

Record mapping on grid-lined engineering paper demarked with 1 inch squares and tenth inch increments, where one inch paper scale represents one foot measurement on bridge deck surface. Record with clarity the general crack path in the appropriate color from the table above. Map cracks with an accuracy of +/- 6-inches for path and using the largest portion of the crack shadow as the size. Re-evaluate crack size on bridge deck every 2 feet when mapping and determine corresponding color of pen for recording. A sample crack map will be furnished on request.

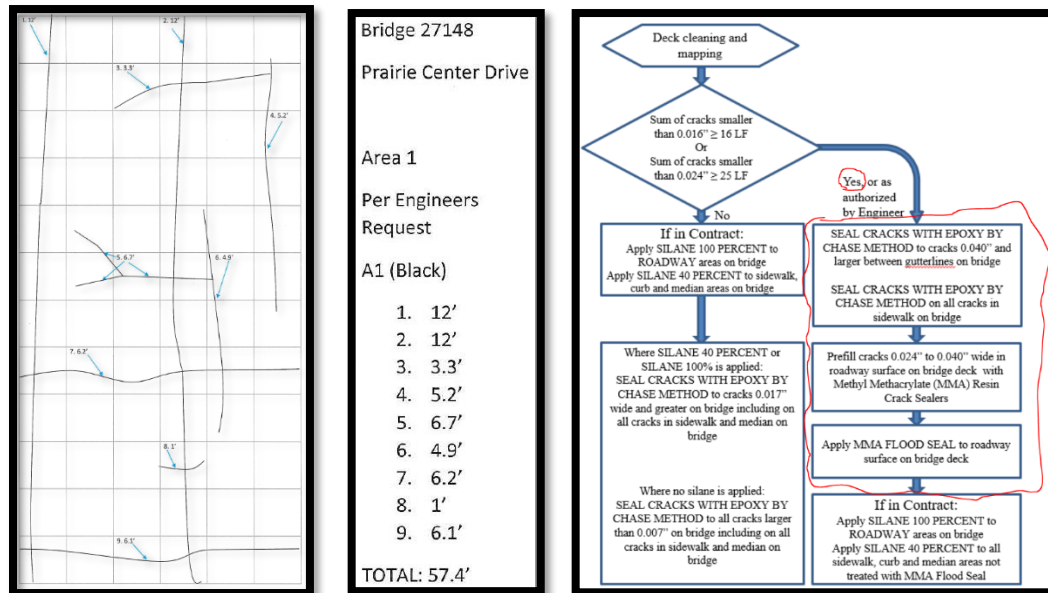


Figure 3: Crack mapping example for one 72-SF area and resultant sealing decision.

D. Crack Sealing Authorization

Compute length of cracks in each crack classification category to the nearest tenth of a foot. Compute cumulative length of crack (e.g., A1, A1+A2, A1+A2+B1, A1+A2+B1+B2). Present crack mapping records and crack lengths to the Engineer at least two business days prior to performing any bridge deck sealing. The Engineer will review the length of cracks based on interpretation of the submitted crack maps. Follow the workflow Figure 1 in for determination of sealing method:

- SB-9.7.2.2 Seal Cracks with Epoxy by Chase Method
- SB-9.7.2.3 MMA Flood Seal

SB-9.7.2.2 Seal Cracks with Epoxy by Chase Method

A. Description of Work

This specification covers crack sealing to:

1. Structural slabs and that will receive a concrete wearing course.
2. Bridge Deck Slabs (Monolithic decks) with low crack density (See Flow Chart – Figure 1).
3. Concrete wearing course with low crack density (See Flow Chart – Figure 1)

The contractor is responsible for sealing all cracks 0.010 inches and larger, at no cost to the Department. Cracks smaller than 0.010 inches, as measured at the crack's widest segment, on finished roadway surfaces and sidewalks will not require sealing.

When applied on finished concrete roadway surfaces, apply epoxy in a width not exceeding 3 inches.

When applied on a structural slab which is to receive a concrete wearing course, apply epoxy in a cured width not exceeding 1 inch.

B. Materials

Furnish only one of the materials listed on the Department's Approved/Qualified Product List for Bridge Products, "Bridge Surface and Crack Sealers," (www.dot.state.mn.us/products/bridge). A product may be selected from either the "High Elongation Epoxy Crack Sealers" or "High Strength Epoxy Crack Sealers" categories. Apply in accordance with the requirements listed on the approved products list, except that when applied under a concrete wearing course only one application pass is required.

C. Surface Preparation and Application

1. When applied on final roadway surface:

Do not apply crack sealants to concrete surfaces less than three (3) weeks old. No greater than three (3) weeks prior to application:

- a. Perform a visual inspection of the roadway surface, and sidewalk where applicable. Locate and mark all cracks appearing on the top surface visible from 5 ft above deck surface, and as directed by the Engineer.
- b. Within 1½ inches of the cracks, sandblast, shotblast, vapor blast, or waterblast to remove curing compound and other contaminants that would impede the adhesion of the sealant. Provide shielding as necessary to prevent dust or debris from striking vehicular traffic. Collect all debris and other material removed from the surface and cracks, and dispose of it in accordance with applicable federal, state, and local regulations;
- c. Air dry a wet deck for a minimum of twenty-four (24) hours before applying the sealer;

- d. Immediately before applying the sealer direct a 125 psi air blast, from a compressor unit with a minimum pressure of 365 ft³ / min., over the cracks to be sealed to remove dust and debris. Provide shielding as necessary to prevent dust or debris from striking vehicular traffic. Use a suitable oil trap between the air supply and nozzle. Use ASTM D4285 "Standard Test Method for Indicating Oil or Water in Compressed Air" to ensure the compressed air is oil and moisture free;
- (1) Have the Engineer approve the prepared surface prior to applying the sealer (Hold Point);
 - (2) Seal the entire length of all cracks 0.010 inches or greater in width as measured at its widest segment.

Protect all expansion joints and prevent the crack sealant from contacting the strip seal glands. Protect all striping and traffic markings from marring, sealant application and reduction in reflective properties. Replace any striping and traffic markings that are marred by sealant, at no cost to the Department.

Fill cracks with an approved crack sealer following the manufacturer's recommendations, and as otherwise directed by the Engineer. Where traffic is to be placed on crack sealer before curing is complete, broadcast to refusal oven dried 30 grit or similar sand into wet, uncured resin. If a subsequent treatment will be applied that would be affected by the sand. Cleaning unbonded sand or grit will be not be paid for separately but be considered incidental to surface preparation requirements for the subsequent treatments. Remove excess sand that causes concern for traction or braking from bridge deck including deck joints, as directed by the Engineer.

2. When applied to structural slab prior to placing new wearing course:

Supplement 2404.3.C, "Deck Preparation," with the following:

After shotblasting the surface, perform a visual inspection of the roadway surface. Locate all cracks appearing on the top surface, and as directed by the Engineer. Fill all located cracks with an approved crack sealer following the manufacturer's recommendations, and as otherwise directed by the Engineer. Ensure the sealer is cured prior to preceding pre-wetting of the deck, as required for placement of a low slump concrete wearing course.

Control the application of the crack sealer such that the maximum width of crack sealant does not exceed 1 inch. If exceeding the permitted width of 1 inch, remove excess by means of surface grinding to prevent debonding of concrete wearing course. Air dry a wet deck for a minimum of twenty-four (24) hours before applying the sealer. Have the Engineer accept the prepared surface prior to applying the sealer.

D. Weather Limitations

Do not apply sealer materials during wet weather conditions or if adverse weather conditions are anticipated within three (3) hours of the completion of sealer application.

1. Provide a National Weather Service (www.weather.gov) forecast to the Engineer three (3) hours before placement. The Engineer will review the forecast for the following:
 - a. No forecasted precipitation two (2) hours prior to the scheduled placement duration, nor up to two (2) hours after the anticipated completion of the placement.
 - b. Less than 30% chance of precipitation for the entire placement window.

Do not mix or apply any of these products at temperatures lower or higher than those specified in their product literature. Apply the crack seal at the coolest time of the day within these limitations.

SB-9.7.2.3 Methyl Methacrylate (MMA) Flood Seal

A. Description of Work

This work consists of furnishing and applying a protective MMA sealer, as authorized by the Engineer. Do not apply crack sealants to concrete surfaces less than three (3) weeks old. Where AMS curing compound is present on the roadway surface, shotblasting the areas to be sealed is required as incidental to the work.

B. General

1. Sealing Large Cracks (0.040 inches or greater)

Prior to MMA Flood Seal application, seal cracks greater than 0.040 inches with approved epoxy.

2. Prefill Cracks (0.024 inch to 0.040 inch width)

Ahead of the MMA flood sealant placement, prefill cracks 0.024 inch to 0.040 inches wide with same sealer as used in flood seal or a pre-promoted version of the sealer. Where sealant soaks-in/withdraws from top of crack, place fine grade abrasive sand (20/40 abrasive) in crack and reapply MMA sealant to seal to top of crack. When sealant has not retreated after gel time, the crack is considered prefilled. Do not fill crack with sand beyond top of concrete surface.

3. MMA Application

Apply an approved MMA to bridge deck between gutterlines. At least 14 calendar days before the start of the work, provide the Engineer with the sealer Manufacturer's written instructions for application and use.

C. Materials

1. Epoxy

Furnish only one of the materials listed on the Department's Approved/Qualified Product List for Bridge Products, "Bridge Surface and Crack Sealers," (www.dot.state.mn.us/products/bridge). A product may be selected from either the "High Elongation Epoxy Crack Sealers" or "High Strength Epoxy Crack Sealers" categories (www.dot.state.mn.us/products/bridge). Apply in accordance with the requirements listed on the approved products list, except that when applied under a concrete wearing course only one application pass is required.

2. MMA Sealant

Furnish only one of the materials on the Department's Approved/Qualified Product Lists for Bridge Products, Bridge Surface and Crack Sealers, "Methacrylate Resin Crack Sealers" (www.dot.state.mn.us/products/bridge).

3. Broadcast Sand

Provide a commercial quality dry blast sand meeting the following:

- a. 95% passing the No. 8 sieve; and
- b. 95% retained on the No. 20 sieve.

4. Fine Grade Sand

Provide fine grade abrasive sand for (20/40 abrasive) prefilling large cracks unable to be prefilled with sealant alone.

Submit sand material data to the Engineer for review and address all written comments. Submit storage and use plan to the Engineer documenting procedures for maintaining dry sand and within gradation requirements above.

D. Surface Preparation

1. Where AMS curing compound is present on the roadway surface, shotblasting the areas to be sealed is required as incidental to the work. Clean all areas to be sealed by removing dirt, dust, oil, grease, curing compounds, laitance, or other contaminants that would prevent adhesion and crack penetration of the sealant;
2. Collect all debris and other material removed from the surface and cracks, and dispose of it in accordance with applicable federal, state, and local regulations;
3. Perform a visual inspection of the roadway surface. Locate and mark all cracks greater than 0.024 inch appearing on the top for prefilling;
4. Immediately before applying the sealer direct a 125 psi air blast, from a compressor unit with a minimum pressure of 365 ft³ / min., over the entire surface to remove all dust and debris paying special attention to carefully clean all deck cracks. Use a suitable oil trap between the air supply and nozzle. Use ASTM D4285 "Standard Test Method for Indicating Oil or Water in Compressed Air" to ensure the compressed air is oil and moisture free;
5. Provide shielding as necessary to prevent dust or debris from striking vehicular traffic;
6. Air dry a wet deck for a minimum of seventy-two (72) hours before applying the sealer; and
7. Have the Engineer accept the prepared surface prior to applying the sealer (Hold point).

E. Sealant Manufacturer Support

A technical representative from the sealer manufacturer must be present during first application. The need for manufacturer's representative may be waived if the contractor provides evidence and reference contacts for work involving at least 5 bridges treated with the same products and within the last two years. Contractor experience record in no way relieves the contractor from applying in accordance with this specification and as recommended by the manufacturer.

Prior to application of the sealant, hold a meeting with the Manufacturer's Representative, the Engineer, and the Contractor to discuss all necessary safety precautions and application considerations. The manufacturer's representative must be available to answer all safety and installation questions.

F. Weather Limitations

Do not apply sealer materials during wet weather conditions or if adverse weather conditions are anticipated within twelve (12) hours of the completion of sealer application.

1. Provide a National Weather Service (www.weather.gov) forecast to the Engineer three (3) hours before placement. The Engineer will review the forecast for the following:
 - a. No forecasted precipitation two (2) hours prior to the scheduled placement duration, nor up to twelve (12) hours after the anticipated completion of the placement.
 - b. Less than 30% chance of precipitation for the entire placement window.

Do not mix or apply any of these products at temperatures lower or higher than those specified in their product literature. Apply the crack seal at the coolest time of the day within these limitations.

G. MMA Flood Seal Application

Do not apply crack sealants to concrete surfaces less than 3 weeks old. Application by spray methods will not be permitted during windy conditions, if the Engineer predicts unsatisfactory results.

Do not thin or alter the MMA crack sealer unless specifically required in the Manufacturer's instructions.

Mix the sealer before and during its use as recommended by the Manufacturer. Distribute the sealant as a flood coat in a gravity-fed process by broom, roller, or with a spray bar near the surface so the spray pattern and coverage rates are reasonably uniform to the satisfaction of the Engineer. Apply the sealant at a minimum rate of 90 ft² / gal unless a lower dosage is recommended by the manufacture in writing and accepted by the Engineer.

Protect all expansion joints and prevent the crack sealant from contacting the strip seal glands. Protect all striping and traffic markings from marring, sealant application and reduction in reflective properties. Replace any striping and traffic markings that are marred by sealant, at no cost to the Department.

Prior to completion of gel time of the flood seal (within 15 minutes) and before broadcasting sand, broom uncured sealant in the direction of tining or deck grooves to promote maintenance of the deck texture for traction.

Broadcast sand to refusal into uncured resin to create traction and absorb sealant that is not penetrating into cracks. Broadcast approved sand into the wet, uncured resin no sooner than 20 minutes after applying resin but within gel time of product. Apply approved sand at a minimum rate of 250 lbs. per 1000 square feet.

Allow the sealant to dry/cure according to the Manufacturer's instructions. Do not allow vehicular traffic onto the treated areas until the sealer has dried/cured and the treated surfaces provide safe skid resistance and traction. Remove non-adhered sand from bridge deck and joints by power sweeping the deck and vacuuming the joints. Traffic or equipment will be allowed on the sealed deck after the Engineer has determined:

1. The treated deck surface is tack-free and non-oily;
2. The sand cover adheres and resists brushing by hand;
3. Excess sand and absorbent material has been removed; and
4. No sealant material will be tracked beyond limits of treatment by traffic

H. Method of Measurement

Measurement will be made to the nearest square foot of concrete area sealed as designated by the Engineer.

I. Basis of Payment

The Department will share in the increased cost of flood coat application by executing a Change Order to compensate the Contractor according to the following rates:

1. For full-depth (Monolithic) decks, the amount of \$0.50 per square foot of deck area sealed by MMA Flood Seal (methyl methacrylate).
2. For concrete wearing courses, the amount of \$0.75 per square foot of deck area sealed by MMA Flood Seal (methyl methacrylate).

The above compensation rates are compensation in full for all costs of furnishing and applying the sealer to the bridge decks, as described above, including surface preparation, traffic control, and all incidentals thereto. Cleanup of excess sand in joints and on bridge deck will not be paid for separately. Restoration of damaged or marred striping will be considered incidental to the above work.

SB-10 TEMPORARY STRUCTURAL SUPPORT

A. Scope of Work

This Work consists of design, fabrication, erection and removal of jacking and shoring (temporary structural support or restraints, scaffolding, temporary works, floating platforms and rigging) to temporarily support or provide stability to any portion or component of Bridge No. L3275 for purposes of completing abutment repairs and bearing replacements. Temporary support includes any bracing, restraints or additional structural supports required due to wind loads on any temporary containment required during the removal of existing coatings and

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painting operations. Temporary support will also be construed to include any method of moving a truss span from its existing location for the purpose of completing repairs. It is anticipated that the truss will need to be not only supported but jacked several inches to complete repairs and replacements. Only one end of the bridge shall be suspended at a time, unless approved by the Engineer.

Perform this Work in accordance with the applicable provisions of 2402, the Plans and these Special Provisions.

The Contractor's proposed means and methods and procedures will provide adequate safety to site personnel during truss repair operations.

The Contractor is hereby notified that the existing truss gusset plates are not capable of supporting full construction loads. See SB-3 for restrictions on construction loading.

The review and acceptance by the Engineer of any and all aspects of the Contractor's submittals will in no way relieve the Contractor of full responsibility for adequacy or inadequacy of the shoring. Do not rely on the review or approval of the Engineer to determine the adequacy or inadequacy of the shoring. The Contractor is solely responsible for the adequacy or inadequacy of the shoring.

B. General

Shoring is construed to mean those elements and processes that provide temporary support of Bridge No. L3275 during the repair of the abutments, replacement of the truss bearings, stringer and deck replacement, and repair of the truss gusset plates (if proposed by Contractor). Shoring includes sheeting, jacking, scaffolding in addition to all structural elements such as columns, beams, stringers, spreaders, rigging as well as foundation elements such as piles and footings associated with temporary support of construction.

Working drawings are construed to mean general and detailed plans, shop drawings or drawings used in the field for purposes of construction of shoring, temporary bridge relocation and repositioning of each truss span that are the product, either direct or indirect, of the shoring designer.

C. Working Drawings and Calculations

Supply the Engineer with four copies of the working drawings, specifications and associated design calculations of the proposed shoring at least six (6) weeks before starting work on those portions of the bridge to be supported by, or with, shoring. The working drawings, specifications and associated design calculations will 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 will contain sufficient details so that construction of the proposed system(s) can be completed solely by reference to the working drawings, plans and specifications.

The Contractor is advised that Minnesota Board of Architecture, Engineering, Land Surveying, Landscape Architecture & Interior Design enforces State statutes related to the practice of engineering. The Contractor and his or her agents and sub-contractors engaging in the practice of engineering shall conform to State statutes as interpreted by the Board. Contractor personnel, agent or sub-contractors that are required to be licensed as a professional engineer, shall submit a copy of the license, or license renewal notice card.

The design, specifications, construction, erection, working drawings and certification of shoring shall comply with the publications listed below. The more conservative or stringent of the citations shall control.

- AASHTO'S Construction Handbook for Bridge Temporary Works (1995)
- MnDOT Bridge Construction Manual
- AASHTO'S Guide Design Specifications for Bridge Temporary Works
- AASHTO's Manual for Bridge Evaluation

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The Contractor will make his/her own determination as to the magnitude of actual loads to be placed on the shoring and on the existing truss. The Contractor will adjust the applied loads (live, dead, wind, etc.) used for the design of shoring to reflect his/her means and methods of temporary support. To assist in this determination, the total weights of the existing bridge elements (truss, floor system and deck) are approximated as follows:

- Floor System Stringers & Channels – approx. 26 kips
- Floorbeams – approx. 6 kips
- Railings – approx. 5 kips
- Bituminous/Concrete Deck – approx. 292 kips (excluding stringers)
- Truss Components – approx. 59 kips

The shoring design, certification, working drawings and specifications will be prepared by the Contractor or the Contractor's agent, thoroughly checked, backchecked and reconciled for completeness and accuracy. All calculations will be submitted on 8 ½ x 11-inch sheets, bound and indexed with pages consecutively numbered. Each page of the calculations will bear the handwritten annotation of the initials of the maker and the checker and dates of origin, checking, and backchecking activities.

As a minimum, shoring working drawings will contain the following:

- (1) The size of all members (load supporting or otherwise) and all transverse and longitudinal bracing. Connection details for load supporting members will be included.
- (2) All design-controlling dimensions will be shown, including beam length and spacing; post location and spacing; overall height of shoring bents; vertical distance between connectors in diagonal bracing; and similar dimensions that are critical to the design.
- (3) The location and method by which the shoring will be adjusted to provide truss support will be shown.
- (4) Any equipment used to temporarily relocate the truss and any loads placed on the truss due to the contractor's relocation operations.

Show the design criteria on the first sheet of the working drawings. At a minimum, the design criteria will detail, to the satisfaction of the Engineer, the following:

- (1) The governing codes, standards and specifications
- (2) The method of design used and associated factors of safety and load factors
- (3) Design loads including dead load, construction live load, wind load, thermal loads and lateral earth loads.
- (4) Load Combinations
- (5) Material Properties
- (6) Allowable stresses in temporary shoring members and existing truss members.

As a minimum, shoring calculations will contain the following:

- (1) Anticipated design loads in all proposed structural members.
- (2) Anticipated design loads in all existing truss members of Bridge No. L3275 for each phase of the Contractor's operation.
- (3) Design checks showing the adequacy of the proposed shoring members.
- (4) Design checks showing that allowable design stresses will not be exceeded in the existing truss members of Bridge No. L3275 that are to remain in-place during each phase of the Contractor's operation.

Review and approve all submittals prior to delivery to the Engineer for compliance with:

- (1) His/her means and methods of construction
- (2) Materials to be used
- (3) Design Assumptions
- (4) Schedule
- (5) The capabilities of the Contractor's personnel to adequately construct the shoring

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The Contractor's review of the submittal will be evidenced by signature and date of review and stamp or annotation to this effect on the first page or sheet of the submittal. Any submittal not bearing said signature and stamp or annotation will be returned without exception.

Submit all working drawings on sheets that are in an 11 x 17 size. Other size drawings will not be accepted. Submit five (5) unbound sets of drawings to the Engineer. One copy of the drawings will be returned to the Contractor annotated with the Engineer's comments. The Contractor will then either make the necessary distribution prints or resubmit five copies of the drawings with the revisions noted by the Engineer. Provide the Engineer with five copies of drawings and design calculations, accepted (returned as: accepted, no exceptions taken, make corrections noted, or receipt noted) by the Engineer within seven (7) calendar days of return to the Contractor. Provide two (2) sets of accepted working drawings and three (3) sets of unbound working drawings.

Do not use or otherwise load shoring until;

- (1) Working drawings, specifications and calculations meeting the above requirements have been provided to the Engineer in accordance with these Special Provisions.
- (2) The individual who has certified the design, working drawings and specifications for the shoring has field inspected the shoring after erection/construction.
- (3) The individual who designed the shoring has certified in writing that the as constructed shoring as a whole, and in detail, conforms with his/her design intentions, working drawings and specifications.

D. Construction Manual

At least six (6) weeks prior to commencing repair operations, the Contractor will submit proposals to the Engineer for approval of the means, methods and procedures of:

- (1) Lifting, jacking, moving or otherwise supporting the existing truss.
- (2) Removal of existing fasteners and the method for retaining existing connection geometry.
- (3) Bolt hole forming operations at gusset plate replacement and member repair locations.

This submittal will be in the form of a "Construction Manual". The manual will be a combination of drawings, calculations, text and tables in 11 x 17 or 8 ½ x 11 size. Provide five (5) copies of each submittal. One copy will be returned to the Contractor with the Engineer's comments. The Contractor will then either make the necessary distribution prints or resubmit five (5) revised copies of the submittal with the revisions noted by the Engineer as required.

The Construction Manual will include, but not be limited to the following:

- (1) Sequencing of structure removals, bearing replacements, abutment repairs, gusset plate repairs, floor system installation, deck construction and painting.
- (2) Positioning, use, and sequencing of shoring, cofferdams temporary work platforms, containment systems, jacking and rigging.
- (3) Positioning, use, and sequencing of erection equipment such as cranes, tugs, barges, pontoons, and barge mounted cranes.
- (4) A detailed step-by-step sequence or procedure for the removal and reinstallation/replacement of bearings, bracing connections, gusset plates, floor system and associated fasteners.

E. Measurement and Payment

The Engineer will measure Temporary Structural Support as a single lump sum. No measurement will be made of individual elements.

Payment for Item No. 2433.601 "TEMPORARY STRUCTURAL SUPPORT" at the Contract price per lump sum will be compensation in full for all associated work including design, fabrication, transportation, adjustments, labor, material, shoring removal and disposal, submittals and shoring maintenance as described above, including all incidentals thereto.

1. When all design, working drawings and manual submittals have been submitted and approved by the Engineer; ten percent (10%) of the amount bid for "TEMPORARY STRUCTURAL SUPPORT" will be paid.
2. When all the truss support shoring has been delivered, assembled and certified by the designer as completed in accordance with his/her design and drawings fifty percent (50%) of the amount bid for "TEMPORARY STRUCTURAL SUPPORT" will be paid. This partial sum may be paid in installments prorated on the number of sets of support mechanisms erected in the initial position relative to the total number of sets of form support mechanisms to be used on the Project.
3. Upon final completion of all temporary support work associated with this item, any amount bid for "TEMPORARY STRUCTURAL SUPPORT" not previously paid, will be paid.

The total sum of payments under this item will not exceed the price bid for "TEMPORARY STRUCTURAL SUPPORT", regardless of the need to re-mobilize, redesign or modify shoring for any reason. Additionally, the total sum of payment under this item will not exceed the price bid for "TEMPORARY STRUCTURAL SUPPORT" regardless of the Engineer requiring additional repairs.

SB-11 (2402) STEEL BRIDGE CONSTRUCTION

The provisions of 2402, "Steel Bridge Construction," are supplemented with the following:

SB-11.1 Metal Railing ("Duplex Coated" using Hot-dipped Galvanizing and Paint Coating)

Furnish, coat, and install metal railing, including all anchorages and fittings, in accordance with the applicable provisions of 2402, "Steel Bridge Construction," 2433, "Structure Renovation," 2471, "Structural Metals," 2478, "Organic Zinc-Rich Paint System," ASTM D6386," the plans and the following. The Contractor and the sub-contractors are responsible for communicating all applicable specifications, special provisions, standards, and requirements to all subcontractors.

A. Engineer

Engineer, as used herein, when relating to shop fabrication and coatings, shall mean the Department's Bridge Engineer.

B. Materials

Ensure all materials conform to the plan details. All steel will comply with 3309, "High-Strength Low-Alloy Structural Steel." Ensure bolts, nuts and washers meet 3391, "Fasteners," and galvanize in accordance with 3392, "Galvanized Hardware," or electroplate in accordance with ASTM B633, Type III, SC 4. Bolts for the connection of the approach rail posts to the concrete footings will be ASTM A325 threaded rod. Galvanize and apply organic zinc-rich topcoat (duplex coating) to all steel members in the shop prior to delivery to the site, excluding stainless steel wire rope and fittings, in accordance with 2478 and these Special Provisions.

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Cables (Wire Rope) and Fittings

Provide 7x19 stainless steel cables complying with ASTM A492, Type 316 with mill finish. Fabricate wire rope fittings from stainless steel Type 316 with the capability to sustain, without failure, a load equal to the minimum breaking strength of the wire rope with which they are used. All fittings shall be tamper resistant.

Provide UV-resistant, HDPE, wire rope grommets at all posts in which the cables pass through to prevent abrasion.

Install and tension cables to at least 1000 pounds with no visible sags or deformations in accordance with cable fitting manufacturer's recommendations.

C. Anchorages

Except when part of a proprietary anchorage assembly, ensure threaded rods and bolts meet the requirements of 3385, "Anchor Rods," and 3391, "Fasteners," respectively.

Ensure bolt heads and/or nuts for cast-in-place type anchorages are in contact with the adjacent surface and torqued to

- 1/2 in [13 mm] diameter = 30 ft pounds [41 Nm]
 - 5/8 in [16 mm] diameter = 60 ft pounds [81 Nm]
 - 3/4 in [19 mm] diameter and larger = 80 ft pounds [108 Nm]
- unless a different torque is recommended by the manufacturer.

Install bolts connecting railing posts to the steel fascia stringer and truss lower chord in accordance with SB-11.2 "Bolted Connections".

D. Fabrication and Inspection Requirements

Fabricator shall supply QA/QC documentation verifying that all fabricated railing components are within the necessary tolerances for proper fit up and installation of the railing, including measurements between railing base plates that indicate that the as fabricated base plate hole locations are within 1/8 inch (3 mm) of the specified plan dimensions, based on the plan specified rail post spacing.

Fabricate all metal railing in accordance with 2471, "Structural Metals," the plan, and the welding code AWS D1.1-Structural Welding Code-Steel. Submit Welding Procedure Specifications (WPSs) to the Engineer for approval prior to the start of fabrication.

Prior to fabrication, submit a Quality Control Plan (QCP) and fabrication drawings that are acceptable to the Engineer. Any work started prior to receiving approved drawings WPSs, and a QCP, is subject to 1512, "Unacceptable and Unauthorized Work". Also give the Engineer at least 5 working days' notice prior to beginning work so that Quality Assurance (QA) inspection may be provided.

The Engineer will inspect all metal railing. The purpose of the inspection(s) is to establish compliance with the Contract Documents. The shop inspection(s) is not intended to supplement or replace the Contractor's own Quality Control (QC). The Contractor is ultimately responsible for the correction of errors and faulty workmanship or for the replacement of nonconforming materials.

Mark all metal railing components during fabrication with individual piece marks. Identify the marking and its location on the Shop Drawings. Identify the proper location on the bridge for all piece marks on an Erection Drawings [with Shop Drawing submittal]. All markings should not be readily visible to the public when the railing is in the installed position. Ensure all piece marks are durable markings which will be readily visible after galvanizing [e.g. welded numbers/letters with 3/4 inch height]. Ensure markings represent good workmanship as to not degrade the aesthetics of the product. For standard post/rail designs, mark post pieces near the bottom of the post [near the base plate or connection plate] on the exterior post side and mark railing panels on the bottom side of the bottom rail. For special rail designs, mark railing panels and posts in locations which are underneath or toward the exterior of the bridge in locations which minimize their view. Identify/tag bundled pieces, prior to

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shipping/storage, with the following identification information: individual piece marks included in bundle, bridge and/or project number(s), fabricator name.

The Department QA shop inspections are not intended to supplement or replace the Fabricator's Quality Control (QC). The Contractor is ultimately responsible for the correction of errors and faulty workmanship or for the replacement of nonconforming materials.

The Fabricator will visually inspect all parts of the fabrication and have the inspections documented by QC personnel. The Fabricator will ensure that the rail meets a straightness tolerance of 1/8 in in 10 ft. The Fabricator will perform and document any Nondestructive Testing required by the Contract Documents using an ASNT-TC-1A Level II qualified inspector.

Document parts found to be in nonconformance by using a Nonconformance Report form (NCR), and describe in detail the fabrication error and the proposed repair procedure(s) in accordance with the QCP. Repair(s) performed are subject to the written approval of the Engineer.

E. Galvanizing Requirements performed by the Galvanizing Applicator

Galvanize all railing material in accordance with 3394, "Galvanized Structural Shapes," after fabrication and then paint (Duplex Coat) using the methods described in this document.

Pre-Galvanized Procedure(s):

1. Calibrate dry film thickness gauges in accordance with SSPC-PA 2-Measurement of Dry Coating Thickness with Magnetic Gauges.
2. Prepare all fabricated material surfaces by abrasive blast cleaning to a minimum of SSPC-SP 6/NACE No. 3-Commercial Blast Cleaning prior to galvanizing.
3. Purchase Order(s) shall identify which specific items are to be duplex coated and which materials to be galvanized are reactive (e.g. 3309, "High-Strength Low-Alloy Structural Steel," etc.).

Galvanizing Procedure(s):

Galvanize per 3394, "Galvanized Structural Shapes," ASTM D6386, and this specification. All products supplied using this specification have higher aesthetic expectations than standard galvanized products. Produce the final product to comply with its intended use as an "architectural" railing with heightened aesthetics and/or visual qualities.

1. Process all metal railing to be galvanized utilizing a "dry" kettle. Preflux the metal railing prior to the galvanizing bath using an aqueous tank of zinc chloride/ammonium chloride. Do not use a "top flux" blanket on the molten zinc bath.
2. Air cool the metal railing to ambient temperature before handling for shipment and/or storage. Do not quench the metal railing or apply any post-galvanizing treatments.
3. Lumps, projections, globules, high spots, drip lines, heavy deposits, blisters, black and bare areas, blisters, flux deposits, thin spots, dross inclusions, etc., are considered unacceptable. Repair unacceptable zinc coatings in accordance with the Galvanizer's approved QM. Zinc, which will interfere with the "intended use of the product", will not be permitted.
4. Repair galvanized material that does not meet the requirements of this specification, ASTM D6386, and/or 3394, "Galvanized Structural Shapes," in accordance with the Galvanizer's QM.
5. Store galvanized metal railing in a manner that will prevent the formation of "white-rust" or wet storage staining. "White rust" or staining of the galvanize coating is not acceptable.

6. The Galvanizer shall provide the Engineer with all galvanizing process-related Quality Control documents which demonstrate compliance to this specification and referenced specifications prior to shipment of the galvanized product.
7. The Galvanizer will ensure the metal railings meet a straightness tolerance of $\frac{1}{8}$ inch in 10 ft prior to any subsequent coating applications.
8. It is the Galvanizer's responsibility to provide the Engineer with advanced notification of at least 5 working days of intent to galvanize so that the Engineer can perform a QA audit.

F. Coating Requirements performed by the Paint Coating Applicator

This portion of the specification documents specific criteria that paint coated components must conform to in order to meet the quality and intent of the finished product.

Apply the paint intermediate and top coats using the applicable provisions of 2478, "Organic Zinc-Rich Paint System." Do not use the primer coat on galvanized surfaces unless approved in the QM repair procedure.

1. Perform preparation of galvanized surfaces prior to application of paint in accordance with SSPC SP16 "Brush-off Blast Cleaning of Non-Ferrous Metals," and ASTM D6386, "Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting."

Inspect brush-off blasted surfaces for fins or tears, or any surface that shows that the galvanized coating has been damaged. Repair damaged areas using approved procedures in accordance with the applicator's QM. Repair surface of insufficient galvanize coating Dry Film Thickness (DFT) readings using the approved painting applicator's QM repair procedure.

The QAI or Engineer will inspect the surface preparation as it is done, after its completion, or review the QM documentation, or any combination of the three. Notify the QAI or the Engineer at least 5 working days before beginning surface preparation.

Two finish coats will be used on the railings. For the truss railing, match the color of the finish coat to AMS-STD-595A No 26293, with a semi-gloss finish. For the approach railings, match the color of the finish coat to AMS-STD-595A No. 26173, with a semi-gloss finish.

1. Coat all sweep blasted galvanized railing with the subsequent coat(s) within the time frame defined in ASTM D6386, Sect. 5.4.1, or within the same 8-hour shift, maintaining manufacturer defined control and environmental conditions. The painting applicator's QC personnel shall document that all parameters were followed.
2. Apply all coating material in accordance with the contract documents and the manufacturer's Product Data Sheet (PDS) and application guides for the material and system specified.
3. Ensure coating material(s) meet the requirements of 3520, "Zinc-Rich Paint Systems" and that the color of the intermediate coat presents a distinct contrast from other applied coatings.
4. Accomplish QC inspections of coated products with an observer with normal color vision in a "well lighted" area during each coating phase and prior to final acceptance.

Well-lighted: A minimum of 50-foot candles (fc), with 200-foot candles recommended. Use a light meter capable of reading in fc to verify the adequacy of the lighting and ensure a record is kept.

Handling and Shipping by the Paint Coating Applicator of Duplex Coated Metal Railing:

DO NOT move or handle the coated metal railing until the coating dries as defined in the Product Data Sheet of the manufacturer of the paint coating. The paint Applicator will document the environmental conditions related to the time it takes to define cure, in the QC form. Protect completed metal railing during handling and shipping to eliminate damage to the coating.

Any damaged coated surfaces, identified through either Quality Control or Quality Assurance inspections as being unacceptable, either after the application of the paint coating or during handling of the coated components, is subject to the provisions of 1512, "Unacceptable and Unauthorized Work". Also refer to section H.

Storage of Coated Metal Railings:

Store all completed coated metal railing in accordance with 1606, "Storage of Materials," and the following:

Provide the Engineer with advance notification of at least 5 working days of intent to ship, so that the Engineer can perform a QA audit prior to shipping.

G. Construction Requirements

All hardware, fasteners, anchorage nut, washer, and threaded rod stick out, used to install metal railings in the field will be required to be field coated after installation per 2478.3.H, "Fasteners." Care is to be taken when coating the fasteners that the coating appears seamless with the shop-applied topcoat.

Provide the Engineer with a QA/QC plan that will be used to ensure that the cast-in-place anchorages are installed in the correct location using templates or other means ensuring that the exposed threads of the anchorages will not be damaged or contaminated and that the anchorages will not be displaced or allowed to move during concrete placement.

If cast-in-place anchorages have been installed in the forms, but prior to placing the barrier concrete, the Contractor shall provide written documentation verifying that all of the anchorages are within the necessary tolerances to place the tubular railing without modifying the railing base plate configuration.

Adjust the steel posts to obtain the grade and alignment as shown in the plans using the following method:

Shim the steel posts with galvanized steel shims or washers to the proper grade and alignment, not to exceed $\frac{1}{4}$ inch of shim height. Before attaching the nuts, **coat the entire surface between the base plate and concrete rail with an approved "Silicone Joint Sealant," as found on the Department's Approved Products website.** Tighten the anchor rod nuts (as per section "C"-Anchorages) and neatly smooth the caulk around the perimeter of the railpost base plate.



Ground all metal railings. Install all electrical grounding in accordance with the applicable provisions of 2557, "Fencing," and the National Electrical Code. Clamp or braze the ground wires to the grounding device, then practicably route and attach to the nearest rail by clamping, brazing, or any other approved means that will provide a permanent positive connection. If rail has non-continuous sections, use a #6 AWG solid copper wire to connect adjacent railing panels.

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If the bridge does not include exposed electrical equipment, then ground the rails at points directly below or adjacent to the railing at all abutment corners. Ensure the grounding system consists of a #6 AWG solid copper wire connected to the railing which in turn is connected to a copper coated steel rod having a nominal diameter of $5/8$ inch or more and a minimum length of 8 ft installed to an elevation approximately flush with the ground surface.

If the bridge includes exposed electrical equipment, such as roadway lighting, traffic signals, variable message signs, surveillance cameras, or ramp metering, then bond the railing grounding system to the exposed electrical equipment grounding system. Refer to the electrical plans and electrical special provisions for details regarding bonding multiple electrical grounding systems.

H. Coating Repairs

H.1 Shop (prior to receiving at job site)

Any damaged coated surfaces, identified by the Engineer as being unacceptable is subject to the provisions of 1512, "Unacceptable and Unauthorized Work", and will be replaced or repaired. Submit a Non-conformance repair plan to the Engineer for acceptance. Once accepted in writing by the Engineer, perform repairs using the accepted methods and procedures authorized by the Engineer.

Coating damage is classified in two extent types:

Type 1 – damage is any type of abrasion that caused a surface imperfection not exposing the galvanized surface or exposes an area of galvanized surface that is smaller than 1 square inch in size. This damage may be repaired in the shop using an accepted Non-conformance repair plan as stated above (i.e. abrade the damaged area and apply an intermediate and finish coat per 2478, "Organic Zinc-Rich Paint System." (**Note: Alkyd Enamels will not be allowed as a repair. Aerosol spray paint is not an acceptable repair procedure.**)

Type 2 – damage is any type of surface imperfection that exposes the galvanized surface larger than 1 square inch and/or exposed base metal in an area larger than $1/2$ square inch. Repair this damage in the shop using an accepted Non-conformance repair plan.

H.2 Field (once received at the job site)

Any damaged coated surfaces, identified by the Project Engineer as being unacceptable is subject to the provisions of 1512, "Unacceptable and Unauthorized Work", and will be replaced or repaired. Submit a Non-conformance repair plan to the Project Engineer for acceptance. Once accepted in writing by the Project Engineer, perform repairs using the accepted methods and procedures authorized by the Project Engineer.

Coating damage is classified in two extent types:

Type 1 – damage is any type of abrasion that caused a surface imperfection not exposing the galvanized surface or exposes an area of galvanized surface that is less than 1 square inch in size. This damage may be repaired in the field or the shop using an accepted Non-conformance repair plan as stated above (i.e. abrade the damaged area and apply an intermediate and finish coat per 2478, "Organic Zinc-Rich Paint System." (**Note: Alkyd Enamels will not be allowed as a repair. Aerosol spray paint is not an acceptable repair procedure.**)

Type 2 – damage is any type of surface imperfection that exposes the galvanized surface larger than 1 square inch and/or exposed base metal in an area larger than $1/2$ square inch. Remove sections of damaged rail from the site and repair in the Paint Applicator's application facility. (Repair the damaged area utilizing an accepted NCR.)

I. Method of Measurement

Unless otherwise shown on the plans, the measurement will be the length based on the sum of the lengths of the various sections as shown on the plans and as measured at the base of the rail.

J. Basis of Payment

Duplex Coating

Payment for Item No. 2402.503 "Metal Railing Type Special" will be made at the contract price per foot and shall be compensation in full for all costs of fabrication, surface preparation, galvanizing, brush blasting of galvanized surface, painting, delivery, cables, couplers, tensioning, and installation, as described above.

SB-11.2 Bolted Connections

A. Description of Work

Provide and install bolts of a size and type as specified in the Plans in accordance with 3391 and these special provisions. Install bolts with the bolt head oriented as shown or specified in the Plans. When no orientation is shown or specified, and where possible, orient button head fasteners such that the most public face of the connection displays the button head.

B. Storage of Fastener Components

Protect fastener components from dirt and moisture in closed containers at the site of installation. Only as many fastener components as are anticipated to be installed during the work shift shall be taken from protected storage. Return fastener components that are not incorporated into the work to protected storage at the end of the work shift.

C. Fastener Types

Provide bolt assemblies identified as button head bolts (B.H.B.) with a round (button or dome) head meeting the requirements of ASTM A325.

Provide bolts identified as heavy hex head bolts (H.H.B.) meeting the requirements of ASTM A325.

Do not use DTI washers in any railing elements above the top of the deck elevation.

Provide bolts identified as countersunk bolts (C.S.B.) with a slotted head meeting the requirements of ASTM A307 and conforming to ANSI 18.5. Mechanically bolt assemblies in accordance with ASTM B695, Class 50, Type 1. Galvanize all other bolts and hardware in accordance with 3391.

D. Installation

Delete the last paragraph of section 2402.3.B.2, "High Strength Fasteners," and add the following:

Before fasteners are delivered to the bridge site, provide documentation of rotational capacity (ROCAP) testing in accordance with ASTM F3125, Supplementary Requirement S4, "Rotational Capacity Testing". The fasteners must be received in packages that match the fastener assembly combination as tested. If documentation of ROCAP testing is not received; then perform this testing in the field prior to installation.

Before installation, ensure that the fastener condition has not changed due to weathering, mixture of tested assembly lots, or other reasons. In the event that changes have occurred, the Engineer will require re-qualification using ROCAP testing in the field for a minimum of three fastener assemblies of each combination to be used in permanent bolting.

Add the following to 2402.3.G.2.c:

Where bolts connect to the flanges of channels, provide washers with a tapered/beveled 1 to 6 ratio conforming to ASTM F436. Install tapered/beveled washers between the bolt head and the inside face of the channel flange.

Add the following to section 2402.3.G.2.c, "Installation":

G.2.c(5) Quality Management for Installation

Develop a Quality Control plan that includes at a minimum the following items:

1. Materials tracking process for components of fastener assemblies (bolts, nuts, washers, etc.);
2. Procedure for tracking when permanent bolts were installed and when final tensioning occurred;
3. Record keeping of final tensioning and DTI readings;
4. Develop a snugging and tensioning sequence for each connection detail;
5. Develop a procedure that ensures the Contractor's Quality Manager Staff will verify the fastener installation plans were followed;
6. Lists the Contractor's staff that will be performing the work using the precision bolting system tools. Include details of relevant training, experience, or both for each individual; and
7. Develop a procedure Pre-Installation Verification (PIV) tests for each lot shipped to the project site prior to installation of the permanent bolt assemblies.

Additional ROCAP and PIV tests are required whenever the condition of the fasteners is in question by the Engineer or the condition changes from when the initial ROCAP or PIV tests were performed. In the event field ROCAP testing is required, follow the procedure described in Annex A2 of ASTM F3125.

Submit Quality Control plan to Engineer at least four weeks before the start of steel erection.

Delete the first paragraph of 2402.3.G.2.c(1) and replace with the following:

Do not install fasteners that have accumulated rust or dirt

Add the following after the third paragraph of section 2402.3.G.2.c(1), "Bolt Tension":

Perform Pre-Installation Verification (PIV) testing on all bolted connections requiring the use of Direct Tension Indicator (DTI) washers. DTIs will be required as indicated elsewhere in this Proposal. To enable more accurate bolt tensioning, the Contractor may propose precision bolting systems. A precision bolting system is defined as the use of tools that have been calibrated to produce repeatable results in conjunction with an installation plan that addresses snugging and tensioning of a connection.

Provide the Engineer with a detailed job-specific fastener installation plan at least four weeks before the start of steel erection. The plan will include PIV testing in accordance with the Research Council on Structural Connections (RCSC), "Specification for Structural Joints Using High-Strength Bolts" (<http://www.boltcouncil.org>). PIV testing requires the use of a properly calibrated hydraulic load cell (i.e. Skidmore-Wilhelm) in order to verify the following in the field prior to permanent bolting:

1. Ensuring the bolt crew is familiar with tightening procedures;
2. Ensuring tools and equipment are capable of performing adequately;
3. Ensuring structural bolting assemblies (including lubrication) are in suitable condition for proper bolting procedure and achieving needed results; and
4. Expanding a greater range of acceptance criteria [2402.3 G.2.d(3)] when utilized with precision bolting systems for snugging and final tightening, respectively.

For bolts that are too short to utilize a calibrated hydraulic load cell, calibrated DTIs will be used as a load cell. Once the DTIs have been calibrated, test the fastener assembly in a steel plate of similar thickness to that used in the permanent condition. Refer to the previously referenced RCSC Specification for more detail, except only one calibrated DTI needs to be used in the fastener assembly for each PIV test.

Perform PIV testing on at least three complete fastener assemblies of each combinations of diameter, length, grade, and lot to be used in the work. PIV testing must be performed no earlier than two weeks prior to permanent bolting. The fastener installation plan will be updated with the results from the PIV testing. The hydraulic load cell must have been calibrated within one year of the date of use in order to be used for PIV testing.

Add the following to 2402.3.G.2.c(3) "Direct Tension Indicator (DTI) Tightening":

Install fasteners in accordance with the DTI manufacturer's recommendations and 2402, "Steel Bridge Construction," as well as the requirements of AASHTO LRFD Bridge Construction Specifications, Third Edition, Article 11.5.6.4.7 Direct Tension Indicator Installation Method. Ensure a DTI manufacturer's representative is on-site at the beginning of the bolting operations to provide training and ensure proper installation.

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

Add the following to the end of section 2402.3.G.2.d(3), "Inspection Procedure for Direct Tension Indicators (DTI)":

Use the following procedure for inspection when bolting operations utilize PIV testing and precision bolting systems:

1. Verify bolting operations were performed in accordance with the job-specific fastener installation plan;
2. An initial visual inspection of the DTIs after the bolts are snug tight. Remove and replace DTIs with more than half of the protrusions completely crushed during snugging operations and recalibrate snugging procedure; and
3. After final tightening, randomly select 10 percent of the DTIs, but not less than 2 DTIs, in each connection to inspect in accordance with the job-specific fastener installation plan. The appropriate feeler gauge should be refused in at least half of the spaces between DTI protrusions.

SB-11.3 REPLACE RIVETS

A. Description

This work shall consist of removing existing rivets for purposes of completing truss repairs (at gusset plate repair locations and fastener strengthening locations) and as directed by the Engineer, replacing with A325 High Strength Button Head Bolts and preparing and touch up painting the bolt and adjacent surface as detailed herein and in the plans.

B. Materials

Provide fasteners per 3391, SB-11.2 and the Plans. All materials shall be as noted in the drawings and in accordance with the applicable provisions of 2471. Touch up paint repair work and materials shall be in accordance with the specifications herein for "Organic Zinc-Rich Paint System".

C. Construction Requirements

Remove rivet or bolt heads by means of metal grinding or hydraulic/mechanical rivet removal tool, allowing adequate time between grinding operations such that the temperature of the rivet does not exceed 400 degrees Fahrenheit.

Ream holes to proper dimensions to accept new bolts as indicated in the Plan.

Do not remove rivet or bolt heads with the use of a torch unless it can be demonstrated to be done without causing damage to portions of the structure which are to remain.

D. Measurement and Payment

Measurement for payment will be made per each accepted rivet removed, replaced with a high strength button head bolt and touch up paint repaired. All materials and labor necessary to perform the work per each rivet replaced and touch up paint repaired shall be included for payment in the per each price for item 2402.602 "Replace Rivet".

SB-12 STRUCTURE REMOVALS

This section covers the removal of all existing bridge related items.

Damage due to the Contractor's removal and demolition operations to any portion of the structure that is to remain in place shall be repaired to a condition to be determined by the Engineer and at the Contractor's expense.

Apply the provisions of 2442, "Removal of Existing Bridges," and the provisions of 2433, "Structure Renovation," except as supplemented below.

Dispose of materials in accordance with 1506, "Supervision by Contractor," 2104.3.C, "Removal Operations," 2442, "Removal of Existing Bridges," and the following:

SB-12.1 Remove Concrete

See SB-13.2 for requirements.

SB-12.2 Remove Structural Metals

A. Description of Work

This work consists of removal and disposal of all railing, railing connection, and floor system components (stringers, bolts, etc.), excluding the timber curb removals (see SB-12.3) and removals associated with bearing assemblies. Elements included in this work include, but are not limited to, the following:

1. Existing interior and fascia stringers
2. Existing rail angles, channels, angle posts and all associated connection angles and fasteners

B. Construction Requirements

Existing floor system lateral bracing and floorbeams shall remain in place and be protected during the removal of the existing stringers. Any additional lateral bracing of the floor system proposed by the Contractor shall be conducted by temporary means other than field welding in order to ensure stability of the truss during and after removal operations.

C. Disposal

Dispose of materials in accordance with 1506, "Supervision By Contractor," 2104.3.C, "Removal Operations," MnDOT Managing regulated materials on building and bridge projects per the Office Of Environmental Stewardship and the following:

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Furnish written information to the Engineer as to disposal of steel bridge beams and other steel bridge components coated with paint containing hazardous materials (i.e. Lead or PCB). Include method of stabilization and disposal; name, address, and telephone number of disposal site; certification that Contractor has notified disposal site of presence of the hazardous paint; acknowledgment by Contractor of OSHA requirements relating to lead or PCB; and certification that Contractor is familiar with proper handling and disposal of materials with lead or PCB based paint systems. Stabilize all hazardous paint that has been identified as peeling by coating with an approved product, as listed on the MnDOT Approved Products website www.dot.state.mn.us/products under "Lead Paint Encasement Product". Prevent the peeling paint from flaking off during demolition, or scrape and contain the peeling paint. If the coating option is used apply 16 mils of the product. Applying more than 16 mils of the product on a bridge over any water will require that the bridge have a diaper apron be attached under the bridge to contain the drips. Complete all work as per the MnDOT Office of Environmental Stewardship. The form supplied in this special provision must include the signature of the authorized Superintendent verifying that the information is correct.

D. Payment

Payment for Item No. 2433.508 "Remove Structural Metals" at the Contract price per pound will be compensation in full for the removal and disposal of the items defined in 'A' above.

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NOTIFICATION FORM ON DISPOSAL OF BRIDGE STEEL

The Contractor is required to provide certain information on disposal of bridge steel which has been painted with lead-based paint. By signing this document, the Contractor certifies that information supplied by the Contractor is correct and that the Contractor is familiar with proper handling and disposal of materials with lead-based paint. This information must be furnished to the Project Engineer a minimum of 30 calendar days prior to removal of the bridge steel from the project site. Any change in method or location of disposal would require resubmittal and a 30 calendar day notice.

MnDOT Project No. _____ Bridge No. _____

Description of Bridge Steel _____

Paint System is MnDOT Spec. _____
(Primer) (Top Coat)

Project Engineer: _____

Contractor/Subcontractor: _____
(Name, mailing address, telephone no.)

I _____
(print name of authorized representative) certify that the following information is correct:

The above bridge steel will be disposed of by the following method(s): _____
(list name,

address and telephone no. of recipient, estimated delivery date, and intended use.)

I also certify that _____
(Contractor/Subcontractor name) is familiar with
the requirements in OSHA 29 CFR 1926.62 relating to lead and PCBs, precautions to be taken when working with lead or PCB, and proper handling and disposal of materials with lead-based or PCB-based paint systems and that
_____ has been notified of the presence of lead-based or PCB-based paint.
(name of recipient)

(signature) (date)

Received by Project Engineer/Inspector: _____
(date) (signature)

cc: Project File
Office of Environmental Stewardship

SB-12.3 Remove Concrete Bridge Deck and Curbs

A. Description of Work

This work consists of removing the existing concrete deck, corrugated metal deck forms, and treated timber curb/rub rail as designated in the Plan and by the Engineer for removal in accordance with 2433, "Structure Renovation," the plan, and the following:

B. Construction Requirements

Existing floor system lateral bracing and floorbeams shall remain in place and be protected during the removal of the existing concrete bridge deck. Any additional lateral bracing of the floor system proposed by the Contractor shall be conducted by temporary means other than field welding in order to ensure stability of the truss during and after removal operations.

At the beginning of the work, demonstrate proposed method of removal in the presence of the Engineer. If the Engineer determines that continued use of the method could result in damage to structural members that are to be reused, change the removal method to one that will preclude such damage. In addition, individual workers must be qualified to do the work and are required to use reasonable care so they do not cause damage to the said structural members. In no case use wrecking balls, Whiphammer[®] machines, or other similar devices for concrete removal.

The Engineer may permit the use of up to 60 pound jackhammers by individual operators, provided they demonstrate their ability to operate the hammers without damaging the beams.

Damage due to the operations to portions of the structure that are to remain in place shall be repaired at the Contractor's expense.

Dispose of all materials removed in accordance with 2104.3.C, "Removal Operations".

C. Disposal

The Contractor is required to dispose of treated wood. The provisions of MnDOT 2104 are supplemented with the following:

The Contractor can elect to reuse the treated wood for its original intended purpose. The Contractor shall furnish a completed Transfer of Ownership form to the Engineer prior to removing any treated wood from the Project limits. The Transfer of Ownership form is available at the following website:
<http://www.dot.state.mn.us/environment/buildingbridge/disposal.html>.

If the Contractor cannot or elects not to re-use the treated wood for its original intended purpose, but it must be disposed, the following shall apply:

(1) The Contractor shall describe the method of material pickup and the expected material condition, i.e.: specific lengths, etc. and describe the method of waste material transport and waste material disposal site.

(2) The Contractor shall dispose of all waste treated wood in a MPCA permitted Minnesota solid waste or industrial landfill or landfills listed under Landfills/Regulated Waste at <http://www.dot.state.mn.us/environment/regulatedmaterials/pdf/waste-contractors.pdf>. The Contractor shall not dispose of waste treated wood in a demolition landfill. Within 30 days after the treated wood is transported to the landfill, the Contractor shall provide the Engineer with shipping manifests, scale tickets and invoices. Shipping manifests shall include, but are not limited to, the following information: specify treated wood as the type of waste, quantity of wood, date of hauling and disposal, and location of disposal.

(3) The Contractor has the option to chip creosote treated wood on site instead of hauling it to a landfill. After the wood is chipped on site, the Contractor shall transport the chipped wood off site to a MPCA permitted incinerator that is permitted to burn creosote treated wood. Call 651.366.3630 for list of incinerators permitted to burn creosoted treated wood. This applies to creosote treated wood only.

D. Measurement and Payment

Measurement of concrete deck and curb removal will be based only on the plan area of the deck (out-to-out of fascia channels and end-to-end of slab) in square feet designated by the Engineer for removal. Additional material removed to facilitate the Contractor's operations will not be measured for payment.

Payment for Item No. 2433.618 "Remove Concrete Bridge Deck and Curbs" will be made at the Contract price per square foot and shall be compensation in full for all costs of performing described demonstration of removal methods, removal and disposal work, mobilization, and including all work incidental thereto.

SB-13 (2433) STRUCTURE RENOVATION

See SB-12 for removal requirements.

The provisions of 2433, "Structure Renovation," are supplemented with the following:

Damage due to the Contractor's repair operations to any portion of the structure that is to remain in place shall be repaired to a condition to be determined by the Engineer and at the Contractor's expense.

Field verify dimensions of existing steel and fastener spacing prior to ordering material, developing shop drawings and fabricating replacement or new steel members, connections or fasteners to ensure that the existing and new work will be properly joined. Furnish these measurements to the Engineer. Field measurements shall be conspicuously shown on the shop drawings. The cost of dimension verifications will be considered incidental to the price bid to which the verification pertains.

Following the removal of any existing steel, and prior to proceeding with any repair, the Engineer will inspect all existing steel to be reconnected to determine if additional repairs are required. If additional repairs are not required, as determined by the Engineer, the Contractor will proceed with the repair. If the Engineer determines that additional repairs are required, modify the repair as directed by the Engineer. Any modification required for a given repair will be paid for under Extra Work.

Firmly clamp together new to existing steel by temporary means other than welding during field drilling operations.

Blast clean and prime coat existing faying or contact surfaces which are exposed due to the removal of existing steel members or are to be connected to new steel members per 2433.3E(3), 2476, 2478, SB-15 and SB-16. Do not apply prime coat to a thickness greater than the manufacturer's certified thickness for a class B slip coefficient.

SB-13.1 Anchorages Type Reinf Bars

The provisions of MnDOT 2433, "Structure Renovation," 2472, "Metal Reinforcement," and 3301, "Reinforcement Bars" shall apply. Additionally, all work shall meet the requirements in the Plan, as directed by the Engineer, and as follows:

A. Description of Work

Furnish and install a drilled-in reinforcement bar adhesive anchorages of the type, shape and size specified at the interface of the existing abutments and wingwalls; the new, reconstructed abutment/wingwall elements; and at the interface between the end rail post and concrete curb on the bridge deck.

Furnish only one of the systems listed on the Department's "Approved/Qualified Products List for Bridge Products, Concrete Anchorages – Reinforcing Bar Applications," (www.dot.state.mn.us/products). Install all anchors as specified by the Manufacturer's Printed Installation Instructions (MPII). Furnish a copy of the MPII that

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the installer will use to the Project Engineer. Install in sound concrete to a depth equal to the minimum depth specified in the plan or as specified by the supplier/manufacturer, whichever is greater.

B. Submittals

Submit for approval by the Engineer the following chemical adhesive supplier's product literature or calculations to establish embedment depth. This information will demonstrate compliance with the specification:

- Name of supplier
- Full product name as given in supplier's literature
- Embedment depth as determined from supplier's literature
- Manufacturer's Printed Installation Instructions (MPII)

C. Construction Requirements

After concrete removal at abutments and wingwalls, and prior to installation of reinforcement bar anchorages, inspect, in coordination with the Engineer, the existing concrete to determine the suitability for installation of the anchorages. Modify the number, spacings and locations of anchorages, as approved by the Engineer, to achieve the required pullout resistances. Modifications to the number, spacings and locations of anchorages will not change the contract price for each anchor installed.

Size and drill the holes for anchoring the reinforcement bars into existing concrete **assuming 2500 psi. concrete.**

Adhesive anchorages consist of a deformed rebar dowel secured by an adhesive. Adhesive anchorage installers must hold current ACI-CRSI Adhesive Anchor Installer Certification credentials. Installers are required to check depth, diameter and condition of the drilled hole, clean the hole, and install the anchorage per the MPII. Record the name(s) of all certified installers on the RECORD OF CONTRACTOR/INSTALLER ACI-CRSI CERTIFICATION FORM provided in this specification. Prior to installation of anchorages on the project, meet with the Project Engineer, Inspectors, and Installers to review the installation process and requirements. At the Pre-installation meeting, submit the RECORD OF CONTRACTOR/INSTALLER ACI-CRSI CERTIFICATION FORM with a copy of each installer's ACI-CRSI Adhesive Anchor Installer Certification card and a copy of the MPII to the Project Engineer.

D. Method of Measurement

Measurement will be by the single unit of each for furnishing and installing acceptable reinforcement bar anchorages complete in place. Anchorages installed that are not shown in the Plans or ordered by the Engineer will not be measured for payment.

E. Basis of Payment

Payment will be made as Item 2433.502, "Anchorages Type Reinf Bars", at the Contract price per each and shall be compensation in full for all costs of placing the reinforcement bar anchorages complete in place.

SB-13.2 Remove Concrete & Historic Concrete (3B52)

This work shall include full-depth replacement of existing deteriorated concrete of the north and south abutments and partial-depth replacement of the south abutment face. This work shall also include preparation of test panels/samples (preconstruction trials) to achieve a repair material and end product that matches the original concrete in color, forming and finish so the repairs are as inconspicuous as possible.

The sections of the National Park Service (NPS) "Preservation Brief 15: Preservation of Historic Concrete" that discuss the Methods of Repair including "Surface Preparation", "Formwork and Molds", "Selection of Repair Materials and Mix Design" and "Matching and Repair Techniques for Historic Concrete" shall be incorporated into these special provisions. A copy of Preservation Brief 15 can be obtained from the National Park Service at the following website: <https://www.nps.gov/tps/how-to-preserve/briefs/15-concrete.htm>.

A. Materials

Reinforcing Bars: Grade 60 epoxy coated in accordance with MnDOT 3301.

Concrete repair material must be able to be integrally colored to match the in-place concrete.

Concrete materials shall conform to MnDOT 2461, Structural Concrete (3B52), as modified to be integrally colored to match the in-place concrete.

B. Submittals

Submit the following written documentation at least 10 days prior to commencement of preconstruction trials for concrete matching:

1. Qualifications of Concrete Crew

The concrete repair crew foreman shall have had at least five years' experience in form and pour repair work on projects of similar size and character including successful experience with concrete repair in accordance with the SOI Standards on historic structures. 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 crew foreman.

2. Color Pigment

Submit technical data sheet for proposed integral color pigment to be used for color matching.

3. Aggregate

Submit samples of proposed aggregate for concrete mix to match existing concrete aggregate in type, size and color.

4. Materials / Mix Design

Submittal shall meet the requirements of MnDOT 2461.2.F.2.b(3) and these special provisions. Submit proposed components (aggregate, cement, lime, pigment, etc.) and sources (pit number, manufacturers, etc.) of contractor-designed integrally colored mix design, meeting requirements of MnDOT concrete mix number 3B52.

5. Concrete Texture (board formed)

- a. A description of the proposed material to be used to create the texture and the name and location of the proposed source of form material.

- b. A drawing indicating the widths and lengths of lumber and the layout of the boards to create the desired random appearance of the texture surface with specific widths indicated where new concrete surfaces will abut to existing (original) concrete surfaces.
- c. A description of the fasteners and method of fastening the rough sawn boards to the form.

6. Concrete Curing

Submit a description of the proposed curing procedures and protection to be provided.

7. Color/Aggregate Samples and Test Panels

Submit color/aggregate samples and test panels for matching of existing color, texture, aggregate size and color, and finish (see SB-13.2.E)

Note the time required for preparation, curing, finishing and approval process in developing the Project schedule. Carry out the test panel preparation at curing temperatures expected to be encountered in the field.

The Engineer, after consultation with the cultural resources representative, will either approve or reject the Contractor's submittals within 10 calendar days after receipt of the complete submission. Repair work will not be allowed to begin, nor materials incorporated into the work until the submittal requirements are satisfied and found acceptable to the Engineer. Resubmit for approval, any changes or deviations required by the Engineer. No adjustments in Contract time will be allowed due to incomplete submittals.

C. Initial Surface Preparation

All existing concrete surfaces shall be water-blasted to break the surface film and to reveal the surface condition for determination of concrete color matching. Sandblasting will not be allowed for cleaning concrete surfaces. Pressure washing with water at a pressure of 3000 lbs. Per Square Inch at a rate of 3 to 4 gallons per minute using a fan nozzle held perpendicular to the surface at a distance of 12 inches to 24 inches shall be used. Pressure washing shall be immediately stopped and appropriate adjustments made should damage or noticeable abrasion to any original in place concrete surfaces be noted to occur.

D. Concrete Texture – Board Form

This work consists of applying a board formed texture to the concrete surfaces of the abutments and wingwalls to receive new concrete at the locations identified in the Plans.

1. **Concrete Surface Forming System**

The forming system shall produce a textured effect of sawn boards oriented horizontally on the abutment and wingwall surfaces for both full depth and partial depth concrete placement.

The board form pattern shall match the pattern of the existing north abutment surface. The pattern shall include the wood grain texture, board form widths, and variable face projection of each individual board.

The sawn boards shall be a minimum of 1 inch in thickness. Form boards shall attach easily to the forms and be removable without causing concrete surface damage. The forming system shall be designed to form surfaces conforming to the design intent of constructing wood forms from sawn lumber to create a rustic appearance in the concrete surfaces. A manufactured form liner will not be allowed as an alternate method of creating the desired formed surface.

2. **Surface Finish**

Following removal of forms, minor defects shall be finished to blend with the balance of the pattern surface. Visible vertical or horizontal seams or conspicuous form marks shall be repaired to the satisfaction of the Engineer and at the Contractor's expense.

All concrete surfaces that receive the board-formed concrete texture shall be water-blasted to break the surface film and to remove all laitance as required to complete finishing operations. Sandblasting will not be allowed for cleaning concrete surfaces, as it will reduce the specified surface texture. Pressure washing with water at a pressure of 3000 psi at a rate of three to four gallons per minute using a fan nozzle held perpendicular to the surface at a distance of one to two feet shall be used.

Completed finished surfaces shall be free of blemishes, discolorations, surface voids and conspicuous unintended form marks to the satisfaction of the Engineer. The Contractor shall correct any surface defects at his/her own cost.

3. Construction Requirements

Release agent(s) shall be verified to be compatible with the form material. It shall be non-staining and exhibit no adverse effects to the concrete surface.

Form ties shall be made of non-corrosive materials when the portion permanently embedded in the concrete is less than 1½ inch from the finished surface.

All materials shall be stored, prepared, applied, and cured according to product manufacturer directions, with special attention given to recommended temperature range.

Form ties and accessories shall be positioned in pattern joints and high points of finished wall. Openings shall be boxed using polystyrene filler materials at each tie location to facilitate form tie disengagement without excessive spalling, chipping or damaging the concrete.

Formwork shall be stripped in accordance with MnDOT standard practices after the concrete has gained sufficient strength to avoid surface damage. Finish form tie holes in accordance with 2401.3F2a using approved patching materials.

E. Preconstruction Trials

A preconstruction trial is to be performed to enable the Engineer to evaluate conformance of the proposed materials, equipment and crew to the Project specifications. Preconstruction trial work shall include the preparation of color/aggregate samples and the placement of concrete in test panels to the specific finish, forming, texture, aggregate and color requirements to match the in place historic concrete. Prepare a minimum of four (4) color/aggregate samples, minimum 6" x 6" in size, for approval by the Engineer. If not approved, prepare four (4) more samples as directed by the Engineer and at the Contractor's expense.

Upon color/aggregate selection, up to three (3) 2' x 2' test panels shall be prepared. The Contractor shall demonstrate his workmanship by completely finishing a concrete textured test panel using approved form materials; board form pattern; methods and workmanship including, but not limited to, concrete mix/color, form release agents, vibrating and form stripping practices, and ordinary surface finish. The test panel shall be unreinforced, vertically-cast and of concrete construction to determine the surface texture resulting from the Contractor's technique. The minimum size of concrete test panel shall be 4 inches thick, 2 feet wide and 2 feet high. The finished effect shall closely duplicate the desired appearance of the finished textured concrete surface. An unsatisfactory test panel shall be replaced with a newly constructed test panel at the Contractor's expense. Acceptance of the preconstruction trial results by the Engineer, after consultation with the cultural resources representative, is required prior to performance of any of the concrete removal and repair work on the Project.

F. Construction Requirements

Designated removal/saw-cutting limits of the upper portions of the abutments and wingwalls as designated in the Plans and as directed by the Engineer. Determine the extent of concrete deterioration for the south abutment face as shown in the Plans and as directed by the Engineer by tapping (sounding) 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. The Contractor shall provide access to the work area either by scaffold or

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other approved means and shall provide the Engineer with at least 96 hours' notice prior to planned removal operations. Work area access shall be provided for the entire surface of the abutments and wingwalls for sounding and inspection by the Engineer.

Perform work in accordance with the Plan details. Wire saw or saw-cut with clean lines at the approved full-depth saw cut removal limits and partial-depth removals to a depth of 1 inch with the remaining removal depth consisting of a chipped surface. Concrete removal shall be done by methods which in the Engineers judgment will not damage the underlying concrete which is to remain. Jack hammers heavier than 30-pound class shall not be used. The concrete is assumed to be unreinforced, however if reinforcement is encountered, jackhammers no greater than 15-pound class shall be used for concrete removal below reinforcing bars. Pointed bits shall not be used on power hammers.

During removal operations, the depth of removal at the south abutment face shall be determined by the condition of the underlying concrete. The minimum removal depth shall be 6 inches and should continue until sound concrete is found for anchoring the surface repair. Should sound concrete not be found with removal depths of 12 inches, the contractor shall cease removal operations and adjust proposed anchorages as directed by the Engineer.

Following concrete removal repair surfaces shall be sandblasted and blown clean with compressed air to remove loose mortar and aggregate prior to placing new concrete. The surfaces shall have an adequate surface roughness determined as three peak-to-valley measurements of 3/16 inch. Do not damage, abrade or scar exiting surfaces which are to remain. Remove by sandblasting 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 concrete.

Any existing reinforcement encountered/exposed during partial-depth removals shall be protected and preserved. Coat exposed existing bars with epoxy coating repair compound prior to placing additional reinforcement and new concrete.

Apply concrete material to cleaned areas within 48 hours, or area shall be re-blasted.

Dispose of all material removed in accordance with the requirements of 2104.3C.3.

Furnish, apply, finish and cure poured concrete. Repair shall be placed in a manner which replicates the in place, cast in place finish. Matching this finish and matching the surrounding concrete in color, texture and finish so as for the repair to be inconspicuous is considered an essential part of the work. The finishing and texturing shall be accomplished in such a way as to help conceal bond lines between the repair and adjacent existing (original) surfaces.

G. Concrete Mix Design

Contractor-designed integrally colored mix design shall meet the requirements of MnDOT concrete mix number 3B52. Mix design shall be prepared per MnDOT 2461.2.F.2.b and these special provisions.

H. Method of Measurement

Measurement for concrete removals (2433.507 "Remove Concrete") will be by the cubic yard volume of designated removal areas, field-measured following establishment of removal limits and prior to removals for full depth removals and by the average removal depth and projected square foot removal area for partial-depth removals. Measurement for placement of new concrete (2433.607 "Historic Concrete (3B52)") will be by the cubic yard volume based on the dimensions shown in the plan and acceptably repaired in accordance with the Plans and Special Provisions. No separate measurement will be made for submittals, washing (initial surface preparation), preconstruction trials or test panels, disposal, existing surface protection, sandblasting, sandblasting/coating existing reinforcing (if encountered), finishing, curing or any other items/ incidentals necessary for the complete repair.

I. Basis of Payment

Payment for concrete removals will be made under item 2433.507 "Remove Concrete", and payment for placement of new concrete will be made under item 2433.607 "Historic Concrete (3B52)" and shall be compensation in full for all costs associated with performing the removals and placements in accordance with the requirements described above.

SB-13.3 Historic Concrete Surface Repair

This work shall include replacement of existing deteriorated concrete of the north abutment and wingwalls which require partial-depth concrete removal. This work shall also include preparation of test panels/samples (preconstruction trials) to achieve a repair material and end product that matches the existing concrete in color, forming and finish so the repair work is as inconspicuous as possible.

Areas adjoining to full depth concrete replacements (2433.607 "Historic Concrete (3B52)") may be poured monolithic with the full-depth replacement as approved by the Engineer. All other repair areas shall be performed utilizing the a concrete patch material as described below unless it can be shown by the Contractor to be suitably performed utilizing an alternate placement method.

The sections of the National Park Service (NPS) "Preservation Brief 15: Preservation of Historic Concrete" that discuss the Methods of Repair including "Surface Preparation", "Formwork and Molds", "Selection of Repair Materials and Mix Design" and "Matching and Repair Techniques for Historic Concrete" shall be incorporated into these special provisions. A copy of Preservation Brief 15 can be obtained from the National Park Service at the following website: <https://www.nps.gov/tps/how-to-preserve/briefs/15-concrete.htm>.

A. Materials

Concrete patch materials for Historic Concrete Surface Repair shall be an approved concrete patching material suitable for the intended use and able to be integrally colored to match the existing concrete color.

All products shall be applied in accordance with the manufacturer's recommendations with regard to surface preparation, maximum lift thickness, addition of coarse aggregate, maximum total thickness etc.

Any repair method used shall include pre-moistening of the concrete with clean water and applying an approved bonding agent just prior to placing new patching material unless specially contradicted by product manufacturer's literature.

Placement of stock reinforcement or drilled anchors will be measured and paid for using the applicable pay items.

B. Submittals

Submit the following written documentation at least 10 days prior to commencement of preconstruction trials for concrete matching:

1. Concrete Patch Material
Submit the product data sheet for the proposed concrete repair material.
2. Color Pigment
Submit technical data sheet for proposed integral color pigment to be used for color matching.
3. Concrete Texture (board formed):
 - a. A description of the proposed material(s) to be used to create the texture and the name and location of the proposed source of board form material(s).

- b. A drawing indicating the widths and lengths of lumber and the layout of the boards to match the existing board-form texture of the adjacent original concrete surfaces.
- c. A description of the method of creating the board formed texture on the proposed repair areas, including proposed techniques to adjust surface texture to match the existing.

4. Curing

Contractor shall submit to the Engineer his “Concrete Repair Curing Plan” for approval. The “Concrete Repair Curing Plan” shall describe in detail how the required 7-day moist cure will be. It shall also describe curing materials, and specific project personnel responsibilities.

5. Preconstruction Trials

Submit color/aggregate samples and test panels for matching of existing color, texture, aggregate size and color, and finish (see SB-13.3E)

Note the time required for this testing and approval process in developing the project schedule. Carry out the test panels at curing temperatures expected to be encountered in the field.

The Engineer, after consultation with the cultural resources representative, will either approve or reject the Contractor's submittals within 10 calendar days after receipt of the complete submission. Surface repair work will not be allowed to begin, nor materials incorporated into the work until the submittal requirements are satisfied and found acceptable to the Engineer. Resubmit for approval, any changes or deviations required by the Engineer. No adjustments in Contract time will be allowed due to incomplete submittals.

C. Initial Surface Preparation

All existing concrete surfaces shall be water-blasted to break the surface film and to reveal the surface condition for determination of concrete color matching. Sandblasting will not be allowed for cleaning concrete surfaces. Pressure washing with water at a pressure of 3000 lbs. Per Square Inch at a rate of 3 to 4 gallons per minute using a fan nozzle held perpendicular to the surface at a distance of 12 inches to 24 inches shall be used. Pressure washing shall be immediately stopped and appropriate adjustments made should damage or noticeable abrasion to any original in place concrete surfaces be noted to occur.

D. Surface Texture – Board Form

This work consists of applying a board formed texture to the concrete repair surfaces of the abutments and wingwalls to receive concrete patch material at the locations identified in the Plans.

1. Concrete Patch Surface Texture Application

The surface texture application shall produce the effect of sawn boards oriented horizontally on the abutment and wingwall surfaces.

The board patterns, heights, and projection shall match the existing (original) board formed surfaces. The pattern shall include the wood grain texture, board form widths, and variable face projection of each individual board.

The sawn boards used for creating surface texture shall be a minimum of 1 inch in thickness. Method of surface texture application shall not cause concrete surface damage. The surface texture application system shall be designed to create surfaces conforming to the design intent of creating a rustic appearance in the concrete surfaces of wood forms from sawn lumber. A manufactured form liner will not be allowed as an alternate method of creating the desired textured surface.

2. Surface Finish

Following the application of surface texture, minor defects shall be finished to blend with the balance of the pattern surface. Visible vertical or horizontal seams or conspicuous form marks shall be repaired to the satisfaction of the Engineer and at the Contractor's expense.

All concrete patch surfaces that receive the surface texture shall be water-blasted to break the surface film and to remove all laitance as required to complete finishing operations. Sandblasting will not be allowed for cleaning finished surfaces, as it will reduce the specified surface texture. Pressure washing with water at a pressure of 3000 psi at a rate of three to four gallons per minute using a fan nozzle held perpendicular to the surface at a distance of one to two feet shall be used.

Completed finished surfaces shall be free of blemishes, discolorations, surface voids and conspicuous unintended form marks to the satisfaction of the Engineer. The Contractor shall correct any surface defects at his/her own cost.

3. Construction Requirements

Release agent(s) shall be verified to be compatible with the concrete patch material. It shall be non-staining and exhibit no adverse effects to the concrete patch surface.

All materials shall be stored, prepared, applied, and cured according to product manufacturer directions, with special attention given to recommended temperature range.

E. Preconstruction Trials

A preconstruction trial is to be performed to enable the Engineer to evaluate conformance of the proposed materials, equipment and crew to the Project specifications. Preconstruction trial work shall include the preparation of color/aggregate samples and placement of concrete in test panels to the specific finish, forming, texture and color requirements to match the in place historic concrete. Prepare a minimum of four (4) color/aggregate samples, minimum 6" x 6" in size, for approval by the Engineer. If not approved, prepare four (4) more samples as directed by the Engineer and at the Contractor's expense.

Upon color selection, up to three (3) 2' x 2' test panels shall be prepared. Acceptance of the preconstruction trial results by the Engineer, in consultation with the cultural resources representative, is required prior to performance of any of the concrete removal and repair work on the Project. The Contractor shall demonstrate his workmanship by completely finishing a surface textured test panel using approved texture materials; board form patterns; methods and workmanship including, but not limited to, concrete patch mix/color, form release agents, and ordinary surface finish. The test panel shall be unreinforced, vertically-cast and of concrete construction to determine the surface texture resulting from the Contractor's Technique. The minimum size of the test panel shall be 4 inches thick, 2 feet wide and 2 feet high. The finished effect shall closely duplicate the desired appearance of the finished textured concrete repair surface. An unsatisfactory test panel shall be replaced with a newly constructed test panel at the Contractor's expense.

F. Construction Requirements

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. The Contractor shall provide access to the work area either by scaffold or other approved means and shall provide the Engineer with at least 96 hours' notice prior to planned removal operations. Work area access shall be provided for the entire surface of the abutments and wingwalls for sounding and inspection by the Engineer.

Perform work in accordance with the Plan details. Saw-cut with clean lines at the approved removal limits to a depth of 1 inch, and the remaining removal depth shall be a chipped surface. Concrete removal shall be done by methods which, in the Engineer's judgment, will not damage the underlying concrete which is to remain. Jack hammers heavier than 30-pound class shall not be used. The concrete is assumed to be unreinforced, however if reinforcement is encountered, jackhammers no greater than 15-pound class shall be used for concrete removal below reinforcing bars. Pointed bits shall not be used on power hammers.

Following concrete removal, repair surfaces shall be sandblasted and blown clean with compressed air to remove loose mortar and aggregate prior to placing new concrete patch. The repair surface shall have an adequate surface roughness determined as three peak-to-valley measurements of 3/16 inch. Do not damage, abrade or scar

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existing surfaces which are to remain. Remove by sandblasting 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 concrete patch.

Dispose of all material removed in accordance with the requirements of 2104.3C.3.

Any existing reinforcement encountered/exposed during removal shall be protected and preserved. Coat exposed existing bars with epoxy coating repair compound prior to placing additional reinforcement and new concrete.

Apply concrete repair material to cleaned areas within 48 hours, or area shall be re-blasted.

All repair areas shall be properly cured immediately after placement. All repairs shall be **moist-cured** for a minimum of 7 days.

Repairs shall be placed in a manner which replicates the in place, cast-in-place finish. Matching this finish and matching the surrounding concrete in color is considered an essential part of the work. Finishing and texturing of the concrete repair shall be accomplished in such a way as to help conceal bond lines between the repair and adjacent existing (original) surfaces.

G. Method of Measurement

Measurement will be by the square foot (front face area) of concrete surface which is approved for repair and acceptably repaired in accordance with the Plans and Special Provisions. No separate measurement will be made for submittals, washing (initial surface preparation), preconstruction trials or test panels, removals, disposal, existing surface protection, sandblasting/coating existing reinforcing (if encountered), finishing, curing or any other items/ incidentals necessary for the complete repair.

H. Basis of Payment

Payment for concrete surface repair will be made under item 2433.618 "Historic Concrete Surface Repair" regardless of repair material used and shall be compensation in full for all costs associated with performing the complete repair in accordance with the requirements described above.

SB-14 (2471) STRUCTURAL METALS

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

The section of 2471.3.B.3, "Submittal for Engineer's Review and Approval," is modified with the following:

Submit shop drawings from Fabricators directly to the Engineer

The section MnDOT 2471.3.A.1.a is replaced with the following:

- (1) Bridges: Bearing Assemblies, sole plates, expansion devices, shear connectors, ballast plates, diaphragms for bridges (except curved steel bridges), pile and appurtenances, drainage systems, guardrail connections, conduit systems, and protection angles;
- (2) Metal fabricated railings and fencing (excluding standard chain link fencing);
- (3) Electric Lighting, traffic signs, and signal systems;
- (4) Pedestrian Bridges; and
- (5) Other systems or components designated by the Engineer.

The section MnDOT 2471.3C second paragraph is replaced with the following:

Before the start of work, the supplier will be qualified on MnDOT's Approved Suppliers for Fabricated Structural Metals Products list as maintained by the Structural Metals Engineer at

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<http://www.dot.state.mn.us/bridge/pdf/approvedsuppliers.pdf>, or become qualified. To become qualified, the supplier is to submit a Quality Manual (QM) to the Engineer for review and acceptance, at least 60 calendar days before beginning work. The QM is to meet the requirements of the MnDOT Supplier Qualification Standard which will be the basis for acceptance by the Engineer. Upon acceptance of the QM, a supplier is qualified and will be listed on the MnDOT Approved Suppliers for Fabricated Structural Metals Products. In addition to routine inspections, the Engineer will audit supplier with approved QM's on a biannual or annual basis or as otherwise directed by the Engineer to ensure the full implementation of the QM.

Add the following to 2471.3E1 as the first paragraph:

Steel plates and splice plates for major structural components shall be cut and fabricated so that the primary direction of rolling is parallel to the direction of the main tensile or compressive stresses.

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 METHODS FOR PAINT REMOVAL AND WASTE DISPOSAL OF LEAD PAINT

The provisions of 1717, "Air, Land, and Water Pollution," are supplemented as follows:

A. Description of Work

This work consists of containment, paint removal, and testing and disposal of waste materials associated with removal of all existing paint on the truss and floor system to remain on Bridge No. L3275. The work shall be performed in accordance with the applicable provisions of MnDOT 1717 "Air, Land, and Water Pollution," the Plans, and the following:

B. Handling and Disposal of Waste Materials

Contain waste materials on site and provide for their transportation and disposal in accordance with all pertinent environmental regulations and MnDOT criteria. Waste materials, which include but are not limited to, blasting residue (spent abrasives or paint chips), waste paint solvents, cleaning solutions, and unusable paint must be managed as hazardous waste except as described below for blasting residue. Waste disposable Personnel Protection Equipment (PPE) from blasting operations must be treated as a hazardous waste unless the Contractor provides proof that the waste is nonhazardous.

Owner responsibility for recording the Contractor's testing, waste transport and disposal processes are described in MnDOT's manual for "MnDOT Steel Structure Paint Removal Program for Contractors" available on the web at <http://www.dot.state.mn.us/environment/regulatedmaterials/paintremoval.html>.

C. Storage of Materials

At all times during cleaning and painting operations, provide locked storage of cleaning and painting materials to prevent access by unauthorized persons.

D. Loss of Paint Materials into Public Waters

In the event of accidental loss of paint, cleaning materials or debris into public waters, take immediate action to recover the lost materials and report the incident immediately by telephone to the State Duty Officer (1-800-422-0798) followed by a written report addressed to MPCA, Water Quality Division, Compliance and Enforcement Section, 520 Lafayette Road, St. Paul, Minnesota 55155.

E. Lead Paint Removal

The original paint system on Bridge No. L3275 contains lead. Precautions to protect worker health and safety are necessary since operations will result in removal or detachment of paint from metal surfaces.

1. Lead Exposure Plan

OSHA rules and regulations pertaining to Lead Exposure in Construction – 29 CFR 1926.62 – require a written plan to minimize worker exposure to lead. Furnish two copies of this plan to the Engineer. Employers are responsible for developing and implementing a worker protection program. At a minimum, the employer's worker protection program for employees exposed to lead above the Permissible Exposure Limit (PEL) should include:

- Hazard determination, including exposure assessment;
- Medical surveillance and provisions for medical removal;
- Job-specific compliance programs;
- Engineering and work practice controls;
- Respiratory protection;
- Protective clothing and equipment;
- Housekeeping;
- Hygiene facilities and practices;
- Signs;
- Employee information and training; and
- Recordkeeping.

Compliance with provisions of MPCA Rule 7025.0230-7025.0380, which are applicable to abrasive blasting and lead paint removal, is required on this project.

2. Safety Equipment for Paint System Inspectors

Provide the following items, services and information for use by each of the Township inspectors assigned to the project.

- a. Protective clothing to be worn within the enclosure(s) during abrasive blasting operations. This clothing must be available at the job site and daily laundering or disposal provided for by the Contractor.
- b. Unrestricted use of cleaning and washing facilities, including vacuums, showers, sinks, lockers, soaps or cleansers that are available for use by the Contractor's personnel.
- c. A copy of all information supplied to workers about hazards and safe working practices in lead removal areas, including all information on lead concentrations measured by the Contractor for the duration of lead removal and clean-up operations.
- d. Invitation to all meetings involving safety and health.

3. Notification to Owner/Occupants of Nearby Buildings

Provide written notice to the residents of each dwelling unit and the owner or administrator of each occupied building within 200 ft of the bridge with lead paint removal exceeding 500 ft². State in the notice that lead paint removal will occur and specify the days and hours during which lead paint removal and clean-up is anticipated. The notice must advise that children under the age of ten (10) are not permitted to enter the outdoor area within 100 ft of the bridge during the daily paint removal and clean-up operations (<http://www.dot.state.mn.us/environment/regulatedmaterials/pdf/paint/102a-notificationrequirements.pdf>).

In addition, for buildings within 100 ft of the bridge, the building owner or administrator and residents must be advised in the notice that during lead removal and clean-up (a) all doors, windows, and storm windows should be closed on the walls facing the bridge and the adjoining walls; and (b) all air conditioning units on walls facing the bridge and the adjoining walls should be turned off; and (c) take

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inside or remove from the exterior property all pets, pet houses, pet food and water bowls, children's toys and play equipment within 100 ft of the bridge should be removed or tightly covered with an impermeable material.

Give all required notices a minimum of 10 working days prior to beginning paint removal. If beginning of removal is delayed by more than five working days from the date stated in the notices, provide revised written notices prior to the original starting date for paint removal.

Restrict access to work areas during paint removal and provide warning signs at logical access points sufficiently remote from the work area to minimize possibility of accidental exposure to lead.

F. Methods for Paint Removal

As removal of the lead-based paint system is required, follow special procedures to ensure that the material, when removed from the bridge, does not contaminate the surrounding air, water and land.

Any method of paint removal which meets the requirements for surface preparation and complies with Contract requirements can be used by the Contractor. Since the removal method is selected by the Contractor, all costs of compliance with these specifications are incidental except as may be provided under payment provisions in the proposal. Owner responsibility for recording the Contractor's testing, waste transport and disposal processes are described in MnDOT's manual for "Contractor Paint Removal Operations Process" available on the Web at <http://www.dot.state.mn.us/environment/regulatedmaterials/paintremoval.html>. Contact the MnDOT Office of Environmental Stewardship if there are additional questions.

If paint is removed by use of dry abrasive blasting, the following materials are acceptable:

1. Mineral aggregate abrasive mixed with Blastox[®] (approximately 15% by weight), or in proportion as recommended by the manufacturer. The residue resulting from the use of Blastox[®] will not be removed off site until the Toxicity Characteristic Leaching Procedure (TCLP) for Resource Conservation Recovery Act (RCRA) metals renders it non-hazardous. The testing of PH shall also be included for indication of presence of Blastox[®]. Provide a Certificate of Compliance based on the Blastox[®] Supplier's Quality Control Procedure to the Engineer with every load of Blastox[®].
2. Mineral aggregate abrasive. The Contractor must manage residue resulting from these abrasives, regardless of the TCLP test, as hazardous waste.
3. Steel grit or steel shot abrasives. The Contractor must manage residue resulting from these abrasives, regardless of the TCLP test, as hazardous waste.

If recyclable steel grit or shot is used as an abrasive blasting material, provide a recovery system that is self-contained for abrasive blasting and recovery. It must be a recovery system which does not allow fugitive emissions from the recovery operation. The recovery equipment must be such that the amount of contaminants in the clean recycle abrasive is less than one percent by weight.

4. Other abrasive mixtures approved by the Engineer.

G. Containment

Method will meet or exceed the MN Rule 7025.0300 Class IV Containment.

Prior to the start of surface preparation operations, submit to the Engineer detailed plans of the proposed containment and blasting residue collection system. Utilize vacuum assisted power tool to clean the top of the top steel flanges. The submittal must also identify the method proposed for paint removal, the composition of the blast medium, and the details of the means of attachment of the containment system and painting platform to the bridge. In the event that the system is in contact with the bridge barrier railing or previously painted structural steel, the submittal must indicate the method of protecting those surfaces from any visible marring. No system which will produce stresses exceeding the allowable stresses on bridge members is allowed. Furnish calculations showing loads and stresses if requested by the Engineer. Review of the Contractor's submittal does not relieve the Contractor

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of responsibility for repairing damage to the bridge and for providing containment which prevents contamination of air, water and land.

In the event any marring or structural damage is observed, immediately modify the method of suspension and bridge protection system to the Engineer's satisfaction and at the Contractor's expense. Additionally, any damage must be corrected as directed by the Engineer at no cost to the Township.

Provide containment that will completely enclose the work area on the bridge. If dry abrasive blasting is used to remove paints, provide exhaust ventilation with a dust collector for the enclosures. Exhaust ventilation must be sufficient to maintain negative air pressure (inside air pressure must be slightly less than outside ambient air pressure) within the enclosures.

Construct enclosures to minimize the escape of blasting residue during adverse weather conditions. Provide tarpaulins composed of canvas, heavy-gauge nylon, or heavy-gauge nylon-reinforced vinyl. The tarpaulins must be free of holes and tears, be suitable for holding blasting residue and be 100% impermeable to blasting residue as rated by the manufacturer.

H. Dust Emissions

The Contractor's operations and containment must be modified if any significant dust emissions are observed by the Engineer during removal of paints. Suspend abrasive blasting operations if dust emissions are observed and during times when adverse weather conditions prevent the enclosures from effectively containing the blasting residue.

I. Waste Management, Testing and Disposal of Blasting Residue

1. Storage

Provide containers intended to hold hazardous wastes which meet the requirements in CFR 49, subp. 178.502. The containers must meet the requirements of the identification codes 1A2 (steel drum with removable head) or 1H2 (plastic drum with removable head.) The Contractor has the option to store blasting residue for transportation in roll-offs supplied by the MnDOT hazardous waste contractor.

If spent abrasive is stored temporarily, it must be stored in closed drums or roll-offs. The materials from the bridge are to remain in storage until the results of testing, as described above, have been reviewed by the Engineer and the Contractor is notified by the Engineer that s/he can proceed with disposal of the materials representing the test. Materials must be covered at all times during storage. Use methods for handling of materials during loading, unloading and transport that minimize dust emissions.

2. Disposal of Blasting Residue

Blasting residue resulting from the use of mineral aggregate abrasives mixed with Blastox[®] must be treated as hazardous waste until the residue has been tested and determined not to be hazardous waste. The Engineer will randomly sample the blasting residue twice (2) and will deliver samples from the bridge to a laboratory selected by the Contractor. The Contractor shall engage the services of a qualified independent laboratory to have the samples analyzed for the Resource Conservation Recovery Act (RCRA) metals by the Toxicity Characteristic Leaching Procedure (TCLP). Manage these residues according to test results. Furnish copies of all test results to the Engineer. **Regardless of TCLP testing results, all blasting residue must be handled as hazardous waste unless Blastox[®] is used and the residue tests render it non-hazardous.**

3. Hazardous Wastes

Classify all blasting residue as a hazardous waste, and transport and dispose of through the MnDOT hazardous waste contractor. See <http://www.dot.state.mn.us/environment/regulatedmaterials/pdf/waste-contractors.pdf> for current hazardous waste contractors.

Subject to penalty under MnDOT 1807, "Failure to Complete the Work on Time," no later than 30 calendar days after any waste is transported off site; the Contractor shall provide the following information to the Project Engineer:

- a. Type of waste shipped;
- b. Quantity of waste shipped;
- c. Date of waste shipment;
- d. Name and address of transporter;
- e. Name and location of disposal site;
- f. Final signed copies of the hazardous waste manifest and Land Disposal Restriction (LDR) form.

Disposal of waste material, such as paint pails, rags, clothing, waste oil, spent cleaning solvents, brushes, etc., with the blasting residue is prohibited.

J. Handling and Disposal of Non-hazardous Residue

The Contractor shall notify the Project Engineer of each waste disposal site. Subject to penalty under 1807, "Failure to Complete the Work on Time," within 30 calendar days of transportation of waste off site, the Contractor shall furnish to the Engineer records of disposal including, but not limited to, waste manifests which have been signed by the receiving approved landfill, scale tickets, invoices and any laboratory analysis.

Unless otherwise required in these special provisions or by the Office of Environmental Stewardship, disposal of non-hazardous residue in a MnDOT approved landfill is acceptable.

As the surface preparation work progresses, dispose of non-hazardous blasting residue, and other residue that may prove to be non-hazardous, in all MPCA permitted, lined Sanitary/Industrial landfills in Minnesota.

Disposal of waste material, such as paint pails, rags, clothing, waste oil, spent cleaning solvents, brushes, etc., with the blasting residue is prohibited.

Hauling and placement of blast-residue in accordance with appropriate specifications for designated usage is the responsibility of the Contractor. The material must be covered with tarps if hauled in an open truck to prevent loss of blast residue.

K. Method of Measurement

1. TCLP tests will be measured by each test performed.
2. Containment, collection and disposal of waste material and blasting residue will be measured by a single lump sum.

L. Basis of Payment

1. Payment for Item No. 2013.602 "TCLP TEST", will be made at the Contract price per each and shall be compensation in full for all costs of collecting, transporting and testing the blast residue samples as described above.
2. Payment for Item No. 2476.601 "LEAD SUBSTANCES COLLECTION & DISPOSAL", will be made at the Contract price per lump sum and shall be compensation in full for all costs of containing, collecting, transporting and disposing of the abrasive blasting residue whether hazardous or non-hazardous, as described above, including all work incidental thereto.

3. Except for payment for "LEAD SUBSTANCES COLLECTION & DISPOSAL" and "TCLP TEST", compliance with all of the requirements described herein shall be considered an incidental expense for which no direct compensation will be made.

SB-16 (2478) ORGANIC ZINC-RICH PAINT SYSTEM

This work consists of recoating the existing truss and floor system steel to remain on Bridge No. L3275 (Organic Zinc-Rich Paint System (Old)) following removal and disposal of the existing lead paint system, and shop-applying a three-coat paint system on the new stingers, diaphragms and gusset plates to be incorporated into the work (Organic Zinc-Rich Paint System (Shop)). The work shall be performed in accordance with the applicable provisions of MnDOT 2478, the Plans, and the following:

Delete 2478.1.A (20) and substitute the following:

Hold Point (for Field Application of Paints ONLY): Puts a hold on any further activities until an inspection is passed. Do not proceed without the written approval of the Engineer. The Township and the Contractor will use the "Start-up Checklist" and the "Daily Quality Assurance Check List" located on the www.dot.state.mn.us/bridge/construction.html site so that quality is assured.

Modify Table 2478-1, "Coating Inspection Requirements," Sublevel, "Prime, Intermediate, and Finish Coat:" changing the table to read as follows:

Verification of surface cleanliness – Examine visually within 1 h before prime painting and for Field applications include a white cloth wipe test (nothing is transferred on to the cloth surface).

Add the following to the second paragraph of 2478.3.C.1:

(10) Identify the following hold points for Township inspection and verification: Abrasive blast profile and cleanliness, stripe coat, prime coat, intermediate coat, finish coat.

Delete the third paragraph of 2478.3.C.1 and substitute the following:

Provide written records meeting all Coating Inspection Requirements to the Engineer upon request on an ongoing basis as the work is being performed. For field applications, also provide complete written records within 5 working days from when the shift was completed to receive partial payment. Provide written records meeting all Coating Inspection Requirements, in its entirety, at the completion of the job, prior to receiving final payment. The QAI or the Engineer will reject the coating system or reduce payment per 1512, "Unacceptable and Unauthorized Work," if the Contractor did not adhere to the approved QM or provided inadequate documentation of adherence to the QM. Conduct subsequent testing with the QAI for the Engineer's approval, at no additional cost to the Township, to determine compliance.

Delete the third and fourth paragraph of 2478.3.E.1 and substitute the following:

Do not start painting until the QAI or the Engineer approves the surface preparation and paint. Before applying paint, clean the surface of flash rust, dust, dirt, grease, oil, moisture, overspray, and other deleterious contaminants that will prevent the paint from adhering (hold point). For field painting applications, provide a white cloth material to the QAI for cleanliness testing.

Apply paint to produce a smooth and uniform film free of runs, drips, sags, pinholes, blisters, mudcracking, and other deleterious conditions. Apply paint in accordance with manufacturer's printed instructions except as stated in this document.

For field applications:

1. Apply paint by spray application ONLY, unless a different application method is allowed in the contract, and

2. Rollers, daubers, brushes are not allowed to be used to apply paint, unless approved by the Engineer in writing.

Delete the third and eleventh (second to last) paragraph of 2478.3.E.1 and substitute the following:

All three coats of the paint system for the stringers and gusset plates are to be applied in the shop, including contact areas with other surfaces.

Delete 2478.3.E.3 in its entirety and replace with the following:

For field application, this entire section may only be used with written permission from the Engineer.

The Contractor may apply paint by rolling, brushing, or daubers in areas unsuitable for spray painting, such as small surface areas where over-spray would be excessive, and small areas requiring paint repair.

If using brushes, manipulate the paint under the brush to provide a smooth, uniform coating over the entire surface, including corners and crevices. Perform final brush strokes horizontal and parallel to each other. Remove brush hairs on the paint surface.

The Contractor may use sheepskin or other approved daubers to paint surfaces inaccessible by spray or brush.

Delete the second paragraph of 2478.3.I and substitute the following:

Do not damage the painted steel in the shop and field during shipping, erection, and construction of the bridge and components. Do not move or handle the painted steel items until the coating dries in accordance with the manufacturer's data sheet. Use nylon straps, padded hooks, slings, or other non-metallic lifting devices to protect coated components or products during handling and loading. Use softeners and edge protection devices to protect the steel from binding chains. Provide padded hooks and slings to hoist the painted components.

Apply a full paint system to all structural steel members fabricated for the truss floor system (stringers and end diaphragm) and new gusset connection plates for Bridge No. L3275.

SB-16.1 Finish Color

Add the following to 2478.3.F.5, "Finish Coats":

The finished color must match AMS-STD-595A No. 26293 and have a semi-gloss finish.

SB-16.2 Protection of Non-Painted Surfaces

Delete the sixth paragraph of 2478.3.B, "General," and substitute the following:

The structure is aesthetically sensitive because of visibility to the public and its historic status. Protect non-painted surfaces that are adjacent to the painted surfaces from overspray. The Engineer will not allow overspray. The Engineer will visually inspect the non-painted surfaces. If the Engineer determines that there is overspray on the non-painted surfaces, then the Engineer will deem the materials as non-conforming in accordance with 1503, "Conformity with Contract Documents," and 1512, "Unacceptable and Unauthorized Work". The Engineer will direct the contractor to immediately correct the oversprayed surface and submit a written non-conformance report, containing data required by the Engineer to ensure compliance with the contract. Perform additional work as required by the Engineer at no additional cost to the Township.

SB-16.3 Removal of Soluble Salts

A. Description of Work

Remove soluble salts and test for soluble salt contamination prior to painting as detailed in this provision. Test surfaces for soluble salt contamination (e.g. chlorides and nitrates) using a prescribed procedure outlined in part A.

1. Procedure for Testing for Soluble Salt Contamination

- a. Perform the tests for soluble salt contamination after the steel surfaces have been blasted to SSPC - SP 10/NACE No. 2 "Near-White Blast Cleaning".
- b. Perform tests of the prepared surfaces at intervals defined, and in the presence of the Engineer.
 - (1) When requested by the Engineer, provide evidence that personnel who perform tests for soluble salts have been trained by the manufacturer's technical representative in the use of soluble salt test kits. They must also be able to interpret the results.
 - (2) Defined intervals consist of testing all surfaces at a rate of one test for each 3000 ft², or any part thereof. Testing must be concentrated in areas where there was coating failure, corrosion, pitting, and/or loss of section. All areas to be tested must be approved by the Engineer.
- c. Test methods and equipment used in the procedure must be selected at the contractor's discretion. All equipment and materials chosen must be reviewed and approved by the Engineer.
- d. Evaluate approval of test methods and equipment on the following basis. The method used should:
 - be a completely self-contained test kit with all materials, supplies, tools and instructions to take tests and identify results. The contractor may purchase the following test kits or an approved equal:
 - CHLOR-RID - "Chlor*Test"
 - use identifiable, consistent, factory pre-measures test extract solution.
 - be dated, or otherwise marked to provide evidence of a 1 year/12 month verifiable shelf-life of the measurement components.
 - provide for any steel surfaces, regardless of orientation.
 - provide for testing on smooth, pitted, and rough surfaces.
 - provide for taking measurements of the chloride ion in micrograms per square centimeter without using conversion charts or tables.
 - be environmentally friendly and not contain any form of mercury.
 - provide all new forms for extraction and titration for each test.
 - provide an encapsulated environment while extracting chlorides.
 - provide a factory sealed titration device for each test.
 - use the extract sampling container as the titration container.
 - allow the test results to be presented in readings in ppm and ug/cm². A ratio of 1:1 would provide a direct correlation (eg: 7ppm = 7ug/cm²)
- e. Readings greater than 7 parts per million (ppm) and/or micrograms per centimeter squared (ug/cm²) of chlorides, and 7 parts per million (ppm) and/or micrograms per centimeter squared (ug/cm²) of nitrates, per test area, require that the contaminated surfaces represented by the test be cleaned. Repeat the cleaning and retesting as necessary until satisfactory test results are obtained. All tests are to be properly labeled and sent to the MnDOT Bridge Office:

Bridge Office
c/o Bridge Construction Unit
3485 Hadley Avenue North
Oakdale, MN 55138

2. Procedure for Cleaning the Contaminated Surface

Surfaces, which have unacceptable levels of soluble salts may be cleaned by the use of sand blasting, high-pressure water washing with a soluble salt remover product (if acceptable by the Office of Environmental Stewardship), or another method acceptable to the Engineer.

B. Basis of Payment

Payment for removal of soluble salts and testing shall be considered an incidental expense to Item No. 2478.518 "Organic Zinc-Rich Paint System (Old)" for which no direct compensation will be made.

SB-16.4 Mitigation of Pack Rust

A. Description of Work

Provide all labor, equipment, and materials to remove pack rust corrosion, prime, apply a compatible penetrating sealant with corrosion inhibitors as listed on the Department's "Approved/Qualified Product List for Bridge Products, Bridge Structural Steel Coating, Three Coat Systems - Organic" (www.dot.state.mn.us/products), apply intermediate and finish coats, and caulk per 2478.3.F.5, "Finish Coats,". The Engineer will visually inspect and identify the areas of pack rust.

B. Construction Requirements

1. Remove pack rust as practical from identified crevices using manually operated or power operated descaling tools;
2. Remove rust scale from plane surfaces (hold point);
3. Notify Engineer when pack rust mitigation is considered completed and ask for approval by the Engineer to proceed to step 4, additional removal may be necessary after review;
4. Clean/prepare the surface per 2478.3.D, "Surface Preparation" (hold point);
5. Apply the zinc-rich primer stripe coat and full coat per 2478.3.E, "Application of Paint", and 2478.3.F, "Paint Coats";
6. Allow primer to cure to a point when the compatible penetrating sealant can be applied per the manufacturer (hold point);
7. Engineer will identify areas to receive the penetrating sealant;
8. Use an appropriate brush to flood apply an approved compatible penetrating sealant per the manufacturer's directions so the product flows and wicks into the crevice, more than one application may be required per the Engineer;
9. Remove/wipe excess product from the surface after flood application (hold point);
10. Apply the intermediate coat per 2478.3.E, "Application of Paint", and 2478.3.F, "Paint Coats" (hold point);
11. Apply the finish coat per 2478.3.E, "Application of Paint", and 2478.3.F, "Paint Coats" (hold point);
12. Apply an approved caulk to all faying surfaces previously identified by the Engineer preventing moisture intrusion per 2478.3.F.5, "Finish Coats."

Provide the manufacturer's literature for the approved penetrating sealer and caulk in advance of the work being done.

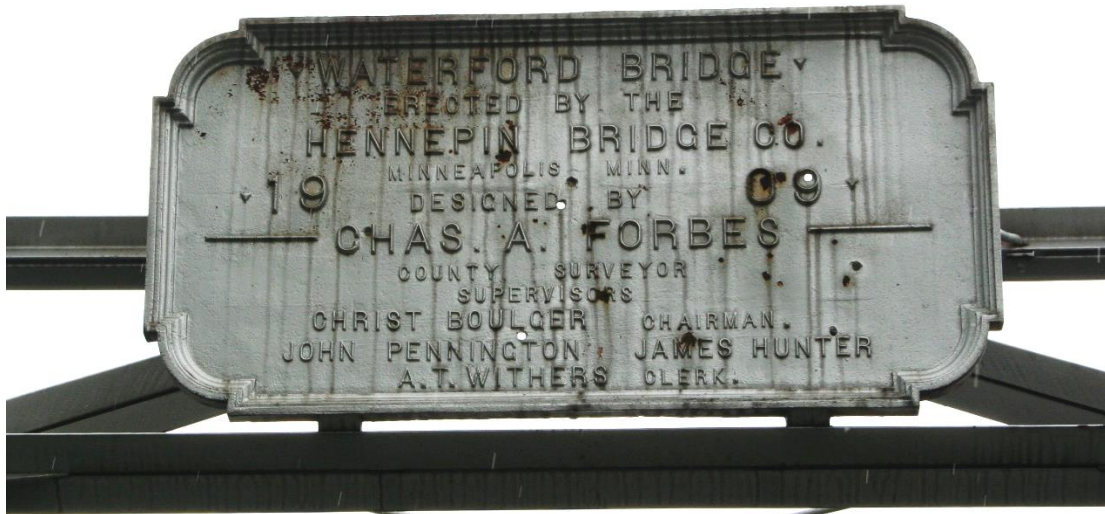
C. Basis of Payment

Payment for materials and labor required to mitigate pack rust and apply penetrating sealer shall be considered an incidental expense to Item No. 2478.518, "Organic Zinc-Rich Paint System (Old)" for which no direct compensation will be made.

SB-17 (2540) HISTORIC PLAQUE

A. Description of Work

This work consists of the cleaning and re-setting of the south bridge plaque and fabricating a new bridge plaque for placement on the north end of the bridge. The new bridge plaque shall be match cast to replicate the original bridge plaque using the south bridge plaque. A photograph of the missing north plaque to be fabricated, which is identical to the existing south plaque, is shown below. The work shall be in accordance with the applicable provisions of 2402, "Steel Bridge Construction," 2433, "Structure Renovation," 2471, "Structural Metals", the surface preparation (SB-15) and painting (SB-16) sections of these special provisions, ASTM A802, and the following.



Photograph of the North Plaque to be Replicated
(photo taken prior being vandalized/removed)

B. Materials

The bridge plaque shall meet 3321, "Gray Iron Castings." The final casting will comply with ASTM A802 Level 1. The minimum thickness of material at any location on the casting shall not be less than the existing plaque minimum thickness. Bridge plaque anchors and fasteners shall comply with 3306, "Low-Carbon Structural Steel." Fasteners shall comply with 3391 and be galvanized in accordance with 3392. Anchor rods shall meet the requirements of 3385, Type A.

C. Submittals & Fabricator Qualifications

The bridge plaque fabricator shall have a minimum of 5 years of experience performing match casting work of a nature similar to that described in the plans and these special provisions. Submit five (5) copies of the fabricator's resume to the Engineer a minimum of 8 weeks prior to commencement of the casting. The resume will be no longer than 4 pages and will provide the following:

1. Name
2. Address
3. Employment history
4. Relevant match casting experience

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5. Details of match casting experience including project name, project owner's name, project location, number and type of member match cast, and photographs of the original and newly cast members.
6. At least two work-related references, including current telephone numbers. References will be familiar with the fabricator's work experience with the use of match casting. At least one reference will be an Owner representative of a previous match casting project.

The information provided by the Contractor will be used to rate the proposed personnel on a pass/fail basis. The Engineer will provide a written acceptance, or denial, of the persons proposed for the match casting fabricator position within 10 calendar days of receipt of the complete personnel submittal. If the Contractor's proposed match casting fabricator is not accepted by the Engineer, the Contractor will, at his/her own expense and no schedule extension, propose an alternate whose verifiable relevant experience complies with the requirements of this specification.

A minimum of four (4) weeks prior to the removal of the south plaque, the contractor shall submit a written proposal for the method of performing the work under item 2540.602 "Historic Plaque" in accordance with the plans and these special provisions. The south plaque shall not be removed until the submittal has been approved. The submittal shall, at a minimum, include the following:

1. A sketch of the existing plaque, including field verified dimensions and thicknesses.
2. Proposed contractor and method for paint removal from the existing plaque and testing to ensure the existing detail of the plaque is not degraded or damaged. Note the existing plaque contains lead paint.
3. Proposed contractor and paint application method for coating the new and existing plaques.
4. Proposed method of anchoring and attaching both plaques to the truss portals in a manner similar to the existing anchoring and attachments at the south end of the bridge. To include the proposed material, finishes and sizes of all fasteners and attachments.

D. Casting Requirements

The existing plaque shall be carefully removed from the south end of the bridge and used to match cast a new plaque for the north end of the bridge. The existing plaque shall be cleaned of all existing coatings and foreign matter prior to the creation of the mold. Paint removal methods shall not abrade the existing detail of the plaque. Any artificial imperfections in the existing plaque due to bullet holes, corrosion, etc. shall not be replicated to the new plaque. If the process allows, the mold used to cast the new plaque shall be delivered to the Township following the successful installation of the new plaque.

E. Post-Casting Inspection

Prior to shipping the new bridge plaque to the Contractor, the fabricator shall send a set of high-resolution photos of the new bridge plaque, sufficient to show all sides and detailing, to the Contractor, Engineer, Cultural Resources Representative, and Owner for approval.

Prior to installation, the Engineer and Owner shall inspect the new bridge plaque for quality, similarity in likeness to the existing bridge plaque, and compliance with ASTM A802 Level 1. Any defects identified will be repaired, as approved by the Engineer, at the Contractor's expense and with no schedule extension.

F. Coating and Installation Requirements

Following approval of the new plaque, both plaques shall be cleaned per the applicable requirements of SB-15 and coated with a three-coat system as specified in MnDOT 2478 and SB-16. The plaques shall not be re-installed on the bridge portals until re-painting of the truss is complete.

The plaques shall be attached to the north and south bridge portals with the original plaque on the south portal and the new plaque on the north portal, attached in a manner similar to the existing anchoring and attachments at the south end of the bridge.

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G. Measurement and Payment

The Engineer will measure 2540.602 "Historic Plaque" as a per each item. No measurement will be made of individual elements.

Payment for Item No. 2540.602 "Historic Plaque" at the Contract price per each will be compensation in full for all labor and material associated with submittals, removals, cleaning, casting, painting and re-installing historic and replicated plaques as described above, including all incidentals thereto.

END OF DIVISION SB