Section 202 of the Standard Specifications is hereby revised for this project to include the following:

**DESCRIPTION**

This work consists of total bridge deck surface preparation over the entire top surface of the bridge deck using hydrodemolition for removal of sound concrete to a constant minimum depth, as shown on the plans, and for selective removal of unsound concrete at variable depths to provide a rough, bondable surface.

**QUALIFICATIONS**

At least 10 working days before start of work, the Contractor shall submit written documentation proving experience with at least ten successful and verifiable projects similar in size and scope to this work within the last three years. Work shall be performed under the immediate control of a supervising person experienced in this type of work. The supervising person shall have supervised five verifiable projects of similar magnitude and type. The supervising person shall be present during all operations. The hydrodemolition system shall be operated by an operator trained and certified by the equipment manufacturer and having a minimum of two years of experience with the machinery used for the performance of the hydrodemolition.

The documentation for the Contractor, supervising person, and operator shall include the following:

1. Years of Experience with hydrodemolition of bridge decks
2. Project names and construction dates
3. List of bridges and deck areas
4. Reference name and contact information for owner representatives
5. Certification by equipment manufacturer as applicable

**CONSTRUCTION REQUIREMENTS**

(a) *Hydrodemolition Equipment.* The hydrodemolition equipment shall consist of a water supply system, a high pressure water pumping system, a demolition unit, and a vacuum system capable of quickly removing all debris generated by the demolition unit and water supply system. The equipment shall be a computerized, self-propelled robotic machine that utilizes a high pressure water jet stream capable of selectively removing the unsound concrete and the sound concrete to the minimum depth specified, and attaining pressures in the range of 13,000 to 20,000 PSI. It shall be capable of cleaning rust and concrete particles from all exposed reinforcing steel. The machine shall have forward and backward motion that is capable of moving the water jet transversely across the concrete surface.

The equipment shall be capable of removing all unsound concrete at variable depths and all sound concrete to the depth of removal specified in the plans. All removal shall be achieved in a single pass.

At least 10 working days before start of work, the Contractor shall submit a Method Statement including a list of all equipment to be used in the hydrodemolition process and certification from the manufacturer that the hydrodemolition equipment is intended for use on bridge decks and can complete the work as described herein in a single pass. Hydrodemolition shall not begin until written approval of these documents is received from the Engineer.

(b) *Calibration.* The hydrodemolition equipment shall be calibrated on an area of sound concrete having dimensions of seven feet by seven feet, as designated by the Engineer to demonstrate the desired surface removal and roughness. The hydrodemolition equipment shall then be moved to a second area (seven feet by
seven feet) that is unsound, as designated by the Engineer, to demonstrate the ability to selectively remove all unsound concrete without damaging the adjacent sound concrete during the initial pass and providing a rough and bondable surface.

A qualified Manufacturer’s representative shall be present on the project site during the calibration and the hydrodemolition surface preparation operation. If the equipment does not demonstrate the ability to produce the desired results, as deemed by the Engineer, the equipment shall be removed from the project site and other equipment shall be provided by the Contractor for calibration and demonstration. No additional contract time or compensation will be allowed for re-mobilization and the re-calibration process if required.

The hydrodemolition total bridge deck surface preparation may begin after the Engineer has approved the calibration and has confirmed the equipment and its associated settings remove the sound concrete to the depth shown on the plans while simultaneously removing unsound concrete.

When the designated level of removal is attained, the settings shall be recorded and maintained throughout the hydrodemolition operation. The calibration procedure specified shall be required on each structure, each time hydrodemolition is performed. The minimum depth of removal shall be checked and readings documented every 30 feet along the cutting path, and if necessary, the equipment re-calibrated to insure the minimum removal of sound concrete to achieve the desired roughness for bond, as approved.

(c) Special Traffic Considerations. Removal operations shall be conducted so that the traveling public is protected, and so that interference with the traveling public using the structure is minimized. When called for on the plans, traffic shall continue to operate in at least one lane on the structure during construction. Hydrodemolition shall not impede or interfere with traffic being maintained in the vicinity of the work. The Contractor shall provide shielding, as necessary, to insure containment of all dislodged concrete and water spray within the removal area in order to protect the traveling public from flying debris both on and under the work site. If nighttime work is approved by the Engineer, the Contractor shall provide adequate lighting as required for nighttime removal. Care should be taken to avoid any hazardous glare in the direction of oncoming traffic.

(d) Hydrodemolition. The Contractor shall apply hydrodemolition to the entire bridge deck. All unsound concrete as shown on the plans or as directed by the Engineer shall be removed. Sound concrete shall be removed to the depth shown on the plans to achieve a rough and bondable surface, as approved. In areas of concrete girders and diaphragms, concrete shall not be removed below the bottom of the slab, unless otherwise called for on the plans.

Potable water shall be used for hydrodemolition and shall be provided by the Contractor. It is the Contractor’s responsibility to contact and make the appropriate arrangements with the proper water company for use of water.

All debris resulting from hydrodemolition shall be completely removed and disposed of outside the project limits in accordance with all applicable regulations. Cleaning of the hydrodemolition debris shall be performed with a vacuum system equipped with fugitive dust control devices capable of removing wet debris and water all in the same pass. The deck shall then be blown dry with filtered, oil-free compressed air to remove excess water. Cleaning shall be done in a timely manner, before debris and water are allowed to dry on the deck surface. This operation shall leave a clean surface suitable for immediate repair. Debris which is allowed to re-settle or to re-adhere to the surface of sound concrete shall be carefully removed by the Contractor at no additional expense to the Department.
The Contractor shall take all steps necessary to prevent cutting or otherwise damaging reinforcing steel, including any vertical stirrups, and/or structural steel including welded shear connectors projecting into the bridge deck. All bars or shear connectors damaged by the Contractor's operations shall be repaired or replaced at the Contractor's expense with no allowance for contract time extension.

The Department will pay for the replacement of any bar that has lost more than 25 percent of its cross-sectional area due to deterioration as approved by the Engineer. Replacement shall be made by lap splicing as shown in the plans, on each side of the deterioration, with new bars of the same size. New reinforcing bars shall have a minimum of 1-inch clearance around each bar.

Where the bond between exposed reinforcing steel and sound concrete has not been compromised, the clearance requirement around the existing reinforcing steel will be waived. Partially exposed reinforcing will be acceptable.

If at any time during the progress of the work the Engineer determines that the equipment is not working properly or compromising the integrity of the structure, the work shall stop and adjustments shall be made to correct the problem at the Contractor’s expense. Prior to making repairs, the Contractor shall submit a methods statement describing the corrections or repairs to be made to the equipment. Repair work shall not begin until approval has been received from the Engineer.

(e) **Deck Blowout.** If removal blows completely through the bridge deck (blowout), the Contractor shall immediately stop the equipment, prevent the flow of water through the hole with sandbags or other approved methods, and notify the Engineer.

(f) **Containment.** The Contractor shall be fully responsible to prevent debris and effluent from falling into rivers, streams, waterways, pedestrian areas, traffic areas, or railroad tracks. The Contractor shall provide secondary containment below the bridge to protect these areas and the river bottom outside of the active channel, from debris and effluent that escapes from the removal process. All captured material shall become the property of the Contractor for off-site disposal. The Contractor shall provide a Method Statement to describe and show details of the containment. The Method Statement shall be provided to the Engineer, for review and comment four weeks prior to starting Hydrodemolition work. All penalties resulting from debris contamination shall be at the Contractor’s expense.

The Contractor shall take necessary precautions during hydrodemolition to prevent damage to the remaining structure and adjacent property as a result of runoff. All deck drains shall be temporarily blocked, and water shall be prevented from running over or leaking through the existing bridge deck joints.

The Contractor shall control dust and run-off in accordance with applicable governmental agencies. The Contractor is responsible for the proper disposal of all material removed, including but not limited to, material collected by vacuuming the deck.

(g) **Water Quality Control.** Water quality control shall conform to subsection 107.25. The Contractor shall be responsible for all labor, materials, equipment and supervision necessary to treat the hydrodemolition wastewater to meet the State and local discharge requirements, including but not limited to:

1. Transportation, treatment, and disposal of hydrodemolition wastewater including all temporary drains, piping, pumps, filters, debris and effluent containment, containment tanks, etc., for a complete and operational system.
2. Reduction of the PH level of the wastewater per State regulations.
3. Reduction of the total suspended solids per State regulations.

The Contractor shall be responsible for compliance with all environmental laws and regulations regarding the discharge of water into the environment. Specific details shall be provided by the Contractor showing the method of water and debris collection, filtering, treatment and legal disposal. The Contractor is responsible for the disposal of all concrete debris and securing any applicable permits which may be required.

At no time shall the hydrodemolition runoff water or any debris be permitted to enter a waterway of the State of Colorado. The Contractor shall adhere to subsection 107.25.

(h) Limitations on Equipment Staging. The Contractor shall take steps to prevent damage to existing reinforcing steel and shall not place wheels from heavy equipment, such as vacuum trucks, on deck areas where the top layer of slab reinforcement has been left unsupported by the hydrodemolition process. Equipment shall be operated at speeds and in a manner that will not cause damage to girders and portions of the deck that are to remain. Vehicles other than approved construction equipment shall not be permitted on those sections of the deck where hydrodemolition is being performed or has been performed.

(i) Other Demolition. Hand held high pressure wands or 15 pound maximum jackhammers operated at no more than a 45 degree angle from horizontal shall be used in areas that are inaccessible to the hydrodemolition equipment or for preparing deck repair areas that require minor trim work to remove remaining unsound concrete. Jackhammers can be started in the vertical position, but shall be immediately positioned as described above for concrete removal.

(j) Sounding. After hydrodemolition and appropriate cleaning, sounding shall be performed once the deck is clean, dry and frost free. The Contractor shall sound the bridge deck for delamination in accordance with ASTM D4580. The Contractor shall mark the areas of deteriorated concrete to be removed as directed by the Engineer.

(k) Removal of Remaining Unsound Material. Where existing patches have deboned, or previous unsound overlay material is found below the top mat of reinforcing steel, that material shall be removed with the use of pneumatic hammers or hydrodemolition. Sound bonded patches may remain. Any loose or deteriorated concrete that remains after Hydrodemolition shall be removed to sound concrete. Class 3 removal shall be performed as required and as defined in the plans.

(l) Final Cleaning Prior to Placement of New Concrete. This work shall all be performed in conjunction with the installation of the Bridge Deck Overlay. After completion of hydrodemolition and associated clean-up of debris, but not more than 12 hours prior to the placement of the overlay, the entire deck surface shall be thoroughly cleaned by either abrasive blasting or high pressure water blasting (7500 psi minimum). All horizontal and vertical surfaces to which the overlay is to bond, including exposed reinforcing steel, shall be blasted clean. Upon cleaning, the deck surface shall be thoroughly saturated to the point that the surface does not dry out, and any excess water shall be removed with compressed air. Clean polyethylene sheeting shall then be used to cover the deck completely until such time as the overlay is poured. If the deck is allowed to dry out it shall be re-blasted at the Contractor’s expense. No ponding of water is allowed.
Removal of Portions of Present Structure (Class 2) (Hydrodemolition) will not be measured, but will be the accepted quantities specified in the plans, removed to the required depths specified on the plans and these provisions.

**BASIS OF PAYMENT**

The accepted quantities will be paid for at the contract unit price.

Payment will be made under:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Removal of Portions of Present Structure (Class 2) (Hydrodemolition)</td>
<td>Square Yards</td>
</tr>
</tbody>
</table>

Payment for Removal of Portions of Present Structure (Class 2) (Hydrodemolition) will be full compensation for all work, materials, and equipment required to prepare the bridge deck for overlay including removal and disposal of debris and effluents, vacuuming, shielding, water quality control, and jack hammering as needed.

Class 3 removal as defined in the plans will be paid for as Removal of Portions of Present Structure Class 3. Containment of debris and effluent will not be paid for separately, but shall be included in the work.

All water required for hydrodemolition will not be measured and paid for separately but shall be included in the work.

Payment for the new reinforcement steel will be made in accordance with Section 602. Payment for the Mechanical splice will be as the weight of reinforcing steel for the designated lap splice for that bar size.

Traffic control will be measured and paid for in accordance with Section 630.

**INSTRUCTIONS TO DESIGNERS** (delete instructions and symbols from final draft):

Use this project special provision when hydrodemolition is required or optional to remove the top portions of a bridge deck. This method of hydrodemolition is called “Deep Cut” because, at a minimum, the top half of the bridge deck is removed, and classified as Class 2 Deck Removal/Repair.

Use Concrete Class DT (Deck Topping) to replace the bridge deck material removed by this method.

Use Revision of Section 202 Removal of Asphalt Mat (Planing) (Special) to remove the top ½” of the deck surface deck. This is required prior to the hydrodemolition process and reduces the water pressure required for hydrodemolition.

This is an aggressive and invasive form of removal and should be discussed with the Region and Staff Bridge prior to including in a repair project.

Special consideration should be given to any bridge with post-tensioning.

**PERMANENT CHANGES TO PROJECT DATED SPECIAL PROVISIONS**

**REVISION OF SECTION** 202 REMOVAL OF PORTIONS OF PRESENT STRUCTURE (CLASS 2) (Hydrodemolition)
1/14/19          BPM Cons.          Initial Website Issue