



**DEVELOPMENTAL SPECIFICATIONS  
FOR  
PARTIAL REMOVAL OF EXISTING BRIDGE DECK USING HYDRODEMOLITION**

**Effective Date  
October 17, 2023**

**THE STANDARD SPECIFICATIONS, SERIES 2023, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE DEVELOPMENTAL SPECIFICATIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.**

**23031.01 DESCRIPTION.**

This specification consists of bridge deck preparation using hydrodemolition for removal of sound concrete to a minimum depth of removal as shown on the plans, and for selective removal of unsound concrete at variable depths to provide a rough, bondable surface. Final surface roughness profile of 1/8 inch or greater is required, equivalent to International Concrete Repair Institute (ICRI) CSP 7 or greater.

**23031.02 QUALIFICATIONS.**

Operation of the hydrodemolition equipment shall be performed and supervised by an operator trained and certified by the equipment manufacturer and having a minimum of two years of experience with the equipment being used.

**23031.03 CONSTRUCTION.**

**A. General.**

1. Mill the complete bridge deck surface before hydrodemolition begins. Milling depth shall be between 1/4 inch (minimum) and 1/2 inch (maximum).
2. Contractor is to ensure all water run-off and debris associated with hydrodemolition and cleaning is contained within the work area and collected for disposal.
3. Clean potable water shall be provided for high pressure removals and the excess water reclaimed using vacuum methods of collection, then filtered and reused as much as practical.
4. Disposal of excess water, run-off, and debris shall meet all applicable federal, state, and local regulations.
5. HMA patch material shall be removed prior to hydrodemolition. Concrete patch material can remain if determined to be sound.
6. All areas of Class B deck repair identified in the plans are to be removed and repaired prior to starting hydrodemolition operations.

## **B. Equipment.**

1. At least 10 working days before start of work, submit to the Engineer 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 in a single pass. Hydrodemolition shall not begin until the Engineer has provided approval of the Method Statement.
2. 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.
3. Equipment shall be a 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.
4. The equipment shall be capable of cleaning rust and concrete particles from all exposed reinforcing steel.
5. The machine shall have forward and backward motion that can move the water jet transversely across the concrete surface.
6. 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.

## **C. Calibration.**

1. Prior to the commencement of the removal operation with hydrodemolition, the equipment shall be calibrated on two sections designated by the engineer to demonstrate the equipment, personnel and methods of operation can produce results satisfactory to the Engineer.
2. The trial sections will be approximately 100 square feet each, consisting of one section of sound concrete then one section of deteriorated concrete. The calibration shall not include any areas of existing overlay or patch material. Document the following initial settings:
  - Water Pressure Gauge (13,000 PSI minimum).
  - Water usage (Anticipated 55 gallons per minute, minimum).
  - Machine Staging Control (Step).
  - Nozzle Size.
  - Nozzle Speed (Travel).
3. After the initial test on sound concrete, to achieve adequate depth of removal and surface roughness profile, the equipment shall then be moved to the deteriorated area to verify that initial settings will fully remove unsound concrete within the designated area.
4. The initial settings may need to be adjusted within the established above, to achieve total removal of unsound concrete. Document the final equipment settings resulting from the calibration process.
5. Calibration of the hydrodemolition equipment shall be conducted for every day of operation and, if necessary, re-calibrated to ensure removal of known areas of delaminated concrete as well as to guard against excessive removal of sound concrete.

**D. Wastewater Disposal**

1. The wastewater generated by all hydrodemolition and cleaning processes shall become the property of the Contractor and shall be contained, collected, and disposed of at a facility properly permitted to accept hydrodemolition wastewater.
2. Prevent wastewater generated by hydrodemolition and cleaning from entering surface waters, storm sewers, floodplains, wetlands, and railroad right-of-way.
3. At least 30 days prior to the beginning of the work, submit to the Engineer details for a collection and disposal plan.
  - a. Define how the wastewater will be contained, stored, and disposed of.
  - b. Define the process for preventing wastewater from leaving the deck surface including through deteriorated joints, deck drains, and holes in the deck.
  - c. Define method for creating a watertight seal at the hole when removals blow completely through the deck.
4. For circumstances indicating surface water contamination caused by wastewater, the stop the hydrodemolition equipment and notify the Engineer.

**E. Traffic Considerations.**

1. Traffic shall be allowed to operate through the project site as shown on the project plans.
2. Provide shielding, as necessary, to ensure containment of all dislodged concrete and water spray within the removal area to protect the traveling public from flying debris both on and under the work site during hydrodemolition and cleaning.
3. If nighttime work is approved by the Engineer, provide adequate lighting as required for nighttime removal.
4. Care should be taken to avoid any hazardous glare in the direction of oncoming traffic.

**F. Hydrodemolition.**

1. After calibration of the equipment, conduct concrete removal by hydrodemolition on the bridge deck.
2. Verify the removal settings as necessary.
3. Document the equipment settings and provide to the Engineer.
4. Remove sound concrete to the depth shown in the plans to achieve a rough and bondable surface.
5. In areas of concrete girders and diaphragms, do not remove concrete below the bottom of the slab, unless otherwise called for in the plans.
6. Repair all reinforcing steel damaged or replace at the Contractor's expense.
7. Prevent damage to existing reinforcing that has been exposed and do not allow equipment on exposed bars that have been left unsupported by the removal process.
8. Hand powered or mechanically driven chipping tools (15 pounds maximum), operated in accordance with [Article 2413.03](#) of the Standard Specifications, may be used in areas that are inaccessible to the self-propelled or hand operated hydrodemolition equipment such as

adjacent to the gutterline. These removals shall be considered incidental to the hydrodemolition bid item.

9. If removal blows completely through the bridge deck, immediately stop the equipment, plug the hole, and notify the Engineer.

**G. Additional Removal.**

1. After concrete bridge deck removal by hydrodemolition has been completed for the construction phase, the deck will undergo sounding to assure that all unsound concrete has been removed.
  - a. Sound the bridge deck for delamination in accordance with ASTM D4580 and mark the areas of deteriorated concrete to be removed as directed by the Engineer.
  - b. There shall be no standing/ponding water present during sounding.
  - c. Perform subsequent soundings and remove additional concrete as required to ensure that all delaminated and debonded concrete has been removed.
2. Perform additional concrete removal by hand chipping and/or hydrodemolition.
3. Where reinforcing steel is exposed and the concrete and the steel are no longer bonded, remove any concrete to clear at least 3/4 inch around the exposed bars.
4. Un-bonded bars shall be determined by the Engineer. More than one-half of the bar perimeter may be exposed and still be determined to be bonded.
5. Take extreme care to ensure that no damage is done to any reinforcing bars exposed during the removal process. Any damage done shall be repaired as approved by the Engineer at no additional cost to the Contracting Authority.

**H. Full Depth Repair.**

Where the deck is sound for less than half of its original depth, remove the concrete full depth (designated as Class B repair) except for limited areas as determined by the Engineer. The work shall be paid for separately.

**I. Final Cleaning Prior to Overlay Placement.**

1. **Vacuuming.**
  - a. Vacuum debris and water immediately after any hydrodemolition work.
  - b. Equipment shall be equipped with dust control devices and shall be capable of removing wet debris and water in the same pass.
  - c. Equipment shall be capable of washing the deck with pressurized water during the vacuum operation to dislodge all debris and slurry from the bridge deck surface.
  - d. Complete cleaning before debris and slurry can dry on the bridge deck surface.
2. **Sandblasting or Water Blasting.**
  - a. After completion of the hydrodemolition and additional removals, but not more than 24 hours prior to the placement of the overlay, sandblast or water blast (at 7500 psi minimum) the entire deck to expose fine and coarse aggregates and to remove laitance from the surface.
  - b. Thoroughly clean the exposed reinforcing steel and the concrete under and around the exposed steel by sandblasting or water blasting.
  - c. Clean the surface using compressed air to remove all dust, chips, and water.
  - d. Air lines for sand blasting and compressed air cleaning shall be equipped with oil traps.

**23031.04 METHOD OF MEASUREMENT.**

Measurement of Partial Removal of Existing Bridge Deck Using Hydrodemolition will be the quantity shown in the contract documents in square yards.

**23031.05 BASIS OF PAYMENT.**

Payment will be for the contract unit price of Partial Removal of Existing Bridge Deck Using Hydrodemolition. Payment is full compensation for furnishing all work, materials, water, and equipment required to prepare the bridge deck for overlay including milling and subsequent remaining removal by hydrodemolition including removal and disposal of debris and effluents, vacuuming, shielding, water quality control, and hand chipping of areas adjacent to the gutterline and other areas inaccessible to the milling or hydrodemolition equipment.