

SECTION 215

KEYHOLE POTHOLE EXCAVATION AND BACKFILL

DESCRIPTION

215.01.01 GENERAL

- A. This specification covers the requirements for keyhole coring, vacuum excavation, backfilling, and reinstatement of the keyhole core in asphalt or concrete pavements to allow for underground utility repairs and underground exploratory potholing.
- B. Quality control field inspection and testing requirements including frequency shall be in accordance with Contracting Agency requirements.

215.01.02 DEFINITIONS

- A. **Keyhole coring:** The operation of coring a circular hole through the roadway pavement using diamond core drilling equipment.

MATERIALS

215.02.01 GENERAL

- A. The material and placement requirements in the pipe zone and final backfill area shall be in accordance with Section 208, "Trench Excavation and Backfill."
- B. Pavement keyhole cores removed shall either be removed from the work site or stored in a safe and secure on-site location. The cores shall be made readily available for restoring the pavement after backfilling is complete and approved.
- C. **Bonding Agent:** The bonding agent shall be a single component cementitious, rapid hardening, high strength, waterproof bonding agent conforming to the physical properties shown in Table 1.
 - 1. The bonding material shall be impervious to water penetration at the joint after application.
 - 2. The bonding material shall securely bond the undamaged keyhole core to the pavement and shall completely fill the annular space at the joint.
 - 3. The bonding material shall, within 30 minutes at an ambient temperature of 70 degrees Fahrenheit, allow the core to support an equivalent traffic load condition of at least three (3) times the AASHTO H-25 standard.
 - 4. The bonding material shall be Utilibond, manufactured by Utilicor Technologies, Inc., or an Engineer approved equal.

Table 1**Bonding Material Properties**

Property	ASTM Test Method	Requirements
Bond Strength (Slant Shear), psi (70 degrees F., 30 minute cure)	C882	200 min.
Compressive Strength, psi (70 degrees F., 60 minute cure)	C109	1500 min.

CONSTRUCTION**215.03.01 POTHOLE EXCAVATION, GENERAL**

- A. The vertical alignment of the keyhole coring shall be perpendicular to the horizon, and the cutting shall extend to the full depth of the existing pavement section.
- B. Unless otherwise approved by the Engineer, keyhole cores shall not be greater than 24-inches in diameter. Adjacent cores shall not be closer than 3 feet from each other (edge to edge), shall not contain a joint or any pavement cracks greater than 1/8-inch wide, and shall not be performed in pavements where the section is less than 4-inches thick.
- C. Coring shall be performed with a keyhole coring saw.
- D. The Contractor shall place a temporary mark on the keyhole core prior to cutting to insure that the removed section is replaced in the same orientation as originally found in the pavement.
- E. Soils within potholes shall be removed by air/vacuum extraction methods to expose utilities. The zone of soil removal shall remain essentially within a vertical plane extending below the edges of the removed pavement.
- F. The Contractor shall remove all materials excavated from the site.

215.03.02 POTHOLE BACKFILL AND COMPACTION

- A. The backfilling of each zone shall be completed in accordance with Section 208, "Trench Excavation and Backfill." Unless otherwise approved by the Engineer, the backfill material shall be placed in maximum 10-inch loose lifts.
- B. Backfill compaction quality shall be determined by use of a compression wave amplitude monitoring device manufactured specifically for the purpose of measuring soil compaction. This device shall measure the compression wave amplitude as compaction progresses using below-grade disposable piezoelectric transducer wave sensors and an above-grade electronic monitor. The device shall signal the operator of successful compaction when

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- the compaction wave amplitude becomes asymptotic to continued compaction effort for each lift.
- C. Backfill soil shall be placed with a moisture content within three percent of optimum moisture content. Moisture content shall be determined in accordance with AASHTO T217.
 - D. Place a disposable compaction sensor at the bottom of the first loose lift. A new sensor shall be placed for every 48-inches of compacted fill depth. Remove backfill soil and sensor if the disposable sensor fails during compaction and repeat repairs with a new sensor.
 - E. Mechanical compaction on each lift shall be continued until the electronic monitor signals that compaction is complete. A new lift shall not be placed until a positive signal has been received. Remove backfill soil and sensor if the monitor does not give a positive compaction signal after repeated compaction work.

215.03.03 PAVEMENT RESTORATION

- A. The surface cut by keyhole coring restored to its original condition with the reinstated core flush with and in the original orientation as the existing surface, matching existing pavement surface appearance.
- B. Excess bonding material shall be removed from the restored surface. A patched appearance shall be avoided in surface restoration wherever possible.
- C. Unless otherwise approved by the Engineer, the Contractor shall reinstate the bonded keyhole core within 24 hours of cutting the pavement. Openings allowed to be left open greater than 24 hours shall be covered with an approved steel road plate capable of supporting traffic loads, and in accordance with Subsection 208.03.21, "Cutting and Restoring Street Surfacing."
- D. **Surface Tolerances:** The reinstated core shall be flush and level with the adjacent pavement. Gaps attributable to the positioning of the core shall be less than 1/16-inch between the bottom of a minimum 3-foot long straightedge and the surface of the pavement in any direction on the surface of the keyhole core.

215.03.04 DEFICIENCIES

- A. Where the keyhole core is found to be fractured or defective upon removal, or becomes damaged after removal and prior to reinstatement, the core shall not be used to restore the pavement. The pavement at damaged keyhole core locations shall be cut and a permanent patch shall be installed in accordance with Subsection 208.03.21, "Cutting and Restoring Street Surfacing."
- B. A keyhole core shall be considered unacceptable when one of the following conditions exist:
 1. The keyhole core contains any vertical cracks wider than 1/8-inch extending full depth through the core; or
 2. Any deteriorated piece of the keyhole core is larger than ten percent of the overall area of the core; or

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3. Two or more successive layers of pavement in the keyhole core become horizontally delaminated and cannot be re-bonded to each other with the bonding material.
- C. All keyhole cores that are damaged or do not meet the surface tolerances shall be removed, and the Contractor shall cut and install a permanent patch in accordance with Subsection 208.03.21, "Cutting and Restoring Street Surfacing."

METHOD OF MEASUREMENT

215.04.01 MEASUREMENT

- A. Unless otherwise specified, the quantity of Keyhole Core repair will not be measured for payment, but shall be considered incidental to other items of work.

BASIS OF PAYMENT

215.05.01 PAYMENT

- A. Payment for Keyhole Core Repair will be made only when required in the Special Provisions.