

KEYHOLE POTHOLE EXCAVATION AND BACKFILL

1.00 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 potholing.
- B. Quality control field inspection and testing requirements including frequency shall be in accordance with Contracting Agency requirements.

DEFINITIONS

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

1.01 MATERIALS

GENERAL

- A. The material and placement requirements in the pipe zone and final backfill area shall be in accordance with Chapter 20 – Construction for Utilities & Structures.
- 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 materials shall securely bond the undamaged keyhole core to the pavement and shall completely fill the annular space at the joint.
 - 3. The bonding materials 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 Engineer approved equal.

TABLE 1 - BONDING MATERIAL PROPERTIES

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

1.02 CONSTRUCTION

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. No keyhole cores shall be drilled within 2-feet of an existing contraction, construction, or control joint. Full depth patches shall be used in these areas.
- C. No keyhole cores shall be drilled within the approach pavement of a bridge or box culvert structures.
- D. Unless otherwise approved by the City’s Project Manager, 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 6-inches thick.
- E. In the event of a misaligned keyhole with the underground facility, a second overlapping core may be drilled provided there is at least 1/3 overlap and BOTH cores are drilled consecutively. This method is not applicable to existing restored cores that may be present in the surface. If the second keyhole is also misaligned, then a conventional full depth patch will be required for restoration.
- F. Coring shall be performed with a keyhole coring saw.
- G. 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.
- H. Soils within potholes shall be removed by air/hydro-excavation methods to expose utilities. The zone of soil removal shall remain essentially within a vertical plane extending below the edges of the removed pavement.
- I. The Contractor shall remove all unsuitable materials from the site.

POTHOLE BACKFILL AND COMPACTION

- A. The backfilling of each zone shall be completed in accordance with Chapter 20 – Construction for Utilities & Structures, unless otherwise approved by the City's Project Manager.
- B. In lieu of compacted soil backfill the contractor may elect to use, with City's Project Manager's approval, Flowable Fill, Coarse Aggregate, Fine Aggregate, or approved equal meeting City of Lincoln Specifications.
- C. Pneumatic compaction equipment (pneumatic rammers or equivalent) shall be used for compaction of the backfill material. The size of the compactor shall not exceed 2/3 of the diameter of the cored keyhole.
- D. Jetting or hydro-flushing of the backfill shall not be permitted. Care shall be taken to ensure that the utility is properly bedded with material of an approved density or in accordance with these Standard Specifications. The initial 12 inches of backfill above the top of the pipe shall be carefully placed to protect the pipe bedding from further backfilling operations. Backfill shall be mechanically compacted to a minimum density of ninety-five percent (95%) of the maximum dry density of the material as determined by AASHTO Method T-99. The moisture content of the soils shall be between two percent (2%) below and four percent (4%) above the optimum moisture content as determined by the above test.

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 City's Project Manager, the Contractor shall reinstate the bonded keyhole core within 24 hours of cutting the pavement. Openings within public access or openings allowed to be left open greater than 24 hours shall be covered with a steel road plate capable of supporting traffic loads without movement or racking.
- 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 straight edge and the surface of the pavement in any direction of the surface of the keyhole core.

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.

- 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
 - 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 disposed of off-site. The pavement at damaged keyhole core locations shall have a permanent full-depth patch installed by the Contractor in accordance with the City of Lincoln [Standard Specifications](#) and [Standard Plans](#) including but not limited to: [LSP 642](#), [LSP 670](#), and the Approved Special Provision for [Pavement Repair](#).

1.03 BASIS OF PAYMENT

MEASUREMENT

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 for which direct payment is being made

PAYMENT

Unless otherwise specified, Payment for Keyhole Core Repair shall be considered incidental to other items of work for which direct payment is being made.