



KEYHOLE CORING REQUIREMENTS UTILIZED FOR UTILITY LOCATES

SCOPE

This specification covers the requirements for keyhole coring, vacuum excavation utilizing air or water, backfilling, and reinstatement of the keyhole core in pavements, and other improved surfaces within the City of Warrensburg. Keyhole coring is required for all locates within all City streets and improved alleys. Street cuts will not be allowed unless specifically approved by the City. Authorization for any street cut request to be utilized for the purpose of locating adjacent utilities will be addressed on a case by case basis.

Bonding Material means a single component, cementitious, rapid hardening, high strength, concrete repair material, used to bond the undamaged keyhole core to the pavement from which it was originally removed.

Keyhole Excavation means the operation of coring a circular hole through the roadway pavement using diamond drilling/coring equipment to remove the asphaltic concrete or concrete courses of flexible pavement, rigid pavement, composite pavement and the removal of materials from the ground by water or air vacuum excavation method, and its disposal.

Permanent Repair means the process whereby a reinstatement completed for keyhole cutting is replaced to restore the pavement to a existing condition acceptable to the City of Warrensburg.

Permit means all keyhole coring requests for the purpose of utility locates will require a permit from the City for each keyhole core location. All applicants or it's contractor will be required to maintain a current City license.

DESIGN AND SUBMISSION REQUIREMENTS

MATERIALS

Bonding Material for Keyhole Cores Bonding material shall be impervious to water penetration at the joint after application. The bonding material is required to securely bond the undamaged keyhole core to the pavement and to fill the annular space at the joint. Specifications for the bonding material shall be submitted to the City for review and approval before a bonding material is used. The specifications

will include results of laboratory and field tests data and shall be compatible or equal to Utilibond type material distributed by Utilicor Technologies, Inc..

LOCATE DATA REQUIRED SUBMITTAL

Applicant or it's contractor will be required to submit to the City inspector, locate data for any utility located during keyhole coring within a City street. The minimum data to be submitted to the City will consist of:

- Location and size of Keyhole Core
- Type of Utility and if possible, size of utility i.e. gas main, gas service line, water main, water service line, fiber optic conduit, electrical conduit, telephone conduit, cable tv conduit, storm or sanitary sewer line, sanitary sewer lateral line.
- Depth of utility in feet and inches from the surface.

Laboratory Testing of Bonding Material Summary of Tests: Compression ASTM C109 or C39 Freeze / Thaw ASTM 666A and 666B Set Time ASTM C266 Bond Strength using Slant Shear ASTM C882 Thermal Expansion and Shrinkage ASTM C531

Field Testing of Bonding Material In testing, the bonding material shall, within 30 minutes at 70°F, reach an equivalent traffic loadable condition that is at a minimum two times greater than the AASHTO H-25 standard on simulated loading slabs prepared to yield a standard mix with a 28 day compressive strength of 5000 psi using $\frac{3}{4}$ " minus aggregates.

Unshrinkable Fill as Backfill Material Flowable fill is required for backfill material if existing fill material cannot be compacted to 95%. Flowable fill will always be required to fill any voids created by keyhole boring if in the opinion of the City inspector the subbase material under the existing pavement has been excessively undermined. The flowable fill specification will include air admixture producing between 15 to 30%, with a compression strength of >150psi and <300psi.

The supplied unshrinkable fill shall be certified by the applicant or it's contractor submitting to the city the required lab or field testing data documenting compliance to the specified material., material that does not meet the specified requirements shall be removed and replaced at the applicant or its contractor's expense. All costs associated with the removal and replacement of deficient unshrinkable fill material shall be borne by the applicant or it's contractor.

Construction Specification

Keyhole Coring pavement cuts for vacuum excavation shall not be greater than 18" in diameter. The surface cut by keyhole coring shall be restored to its original condition with the reinstated core flush with the existing surface, and with the structure of the restored surface matching existing concrete surfaces and asphaltic concrete surfaces.

In the event larger cores, up to 24" in diameter, or cores closer than 3'6" from each other, a joint or any longitudinal or transverse crack greater than 1.42" width, may be allowed at the discretion and approval of the City inspector. Cutting of existing pavements shall be performed with an approved keyhole-coring saw. The vertical alignment of the keyhole-coring saw shall be perpendicular to the horizon, and the

cutting shall be extended to the full depth of the existing structure asphalt, concrete or asphalt and concrete in a composite pavement.

Flexible Pavements Keyhole

Cores will not be permitted in flexible pavements where the asphaltic concrete is less than 4" thick. The applicant or its contractor must demonstrate to the satisfaction of the City inspector through a program of coring of the existing pavement that the pavement has a minimum of 4" thickness of asphaltic concrete. If keyhole coring cannot be accomplished due to the thickness of the existing improved surface, then standard City specifications for street cuts will apply. In addition, Keyhole cores should not be closer than 3'6" from each other, a joint or any longitudinal or transverse crack greater than 1.42" in width.

Composite Pavements Keyhole

Cores should not be closer than 3'6" from each other, a joint or any longitudinal or transverse crack greater than 1.42" in width.

Sidewalks

Applicant or it's contractor will remove an existing sidewalk panels and replace the sections per the City's specifications for all locates under sidewalks, keyhole boring will not be allowed within any City sidewalk. All sidewalk panel removals will be saw cut at joints only, exceptions will be granted for existing sidewalks without joints.

Backfilling

Materials used in backfilling keyhole excavation shall be according to the City of Warrensburg Standard Detail for Keyhole Coring. The City's Road Classification System forms the basis for determining the type of backfilling required in keyhole excavation. Unshrinkable fill shall be used within the pavement portion of the road allowance of major arterial streets, minor arterial streets, collector streets and local streets. With the authorization from the City, Granular A road rock may be used in lieu of unshrinkable fill at the discretion of the City.

Unshrinkable fill shall be used as the backfilling material on streets, alleys, and sidewalks if prior approval of other backfill materials is not approved. Unshrinkable fill should also be required where the City inspector determines that mechanical compaction devices are impractical or ineffective to adequately compact the backfill materials.

Surface Restoration with Keyhole Cores Where possible

The Applicant or its contractor must reinstate the keyhole core, complete with the bonding material immediately or within 24 hours of cutting the existing pavement unless special permission has been granted by the City inspector to extend that time period. To ensure that the keyhole core is placed in the same orientation as originally constructed, the applicant or it's contractor shall place a temporary mark such as paint or chalk to help align the keyhole core. If the core is found to be defective, the pavement

shall be reinstated with material equal to the existing material. The asphalt should be placed and mechanically compacted in uniform lifts not exceeding 1.969" loose thickness with equipment suitable for such purpose. Extra efforts will be required from the Applicant or its contractor to ensure a proper compaction at the joints between the existing pavement and new asphalt patch, and will be installed in accordance with City of Warrensburg street patch standard detail and specifications. The total thickness of the hot-mix asphalt shall match that of the existing roadway. All vertical and horizontal contact surfaces between the new and existing pavement shall be tack coated. Gaps between the existing and new asphalt must be sealed with hot rubberized asphalt.

Mitigation of Defective Keyhole Cores

Where the keyhole core is found to be fractured or defective upon removal or becomes damaged after removal and prior to reinstating the keyhole cuts, the defective or damaged core shall not be used to reinstate the pavement. A core that is fractured in the vertical plane, is considered to be defective and shall not be used to reinstate the pavement. If the keyhole core is limited to the horizontal delamination of two or more successive layers of asphalt concrete, the core, is considered to be defective. The keyhole core should be filled with new hot mix asphalt, in accordance with City Asphalt Specifications.

Temporary Condition

In the event when a keyhole cut cannot be reinstated within 24 hours of cutting, the opening shall be covered with an approved form of an appropriately-sized, circular steel road plate fitted with a collar that, when inserted into the keyhole, will prevent the hole cover from tipping, tilting, bouncing or spinning out of the hole in all kinds of the traffic conditions; or a counter-sunk steel plate set flush with the surface of the pavement and overlapping the cut by no less than 12" on all sides. The steel plate must have a non-skid surface and must provide a safe driving surface. This plate must be secured to the pavement and has sufficient thickness and strength to support the traffic without movement or bouncing. All keyhole core temporary plates must be removed, and the core repaired prior to any forecasted snow event. If a temporary plate is damaged during snow removal it will be replaced at the applicant's or it's contractor's expense, to include any City snow removal equipment repair costs incurred.

Permission must be given from City staff before the cores are left on site. If the cores are left on site, they must be kept within the road allowance and away from the pavement and not obstructing pedestrian traffic. The cores must be stored in a safe and secure place on site for not more than 72 hours. After 72 hours, the cores must be removed, and they should be stored elsewhere under the safe and secure custody of the applicant or it's contractor. The cores shall be made readily available for restoring the keyhole.

Traffic Control

The Applicant and/or its contractor shall comply with all City and State traffic control standards.

Temporary Conditions and Municipal Consent Requirements

Bicycle lanes are considered legal travel lanes herein and must be accommodated as such. Signs should be used with judicious care and proper consideration of prevailing circumstances according to the City and State traffic control standards.

Warning Signs

It shall be the duty of the applicant or its contractor or any person working, cutting, or conducting excavation in or upon any public street to establish and maintain barriers and warning devices necessary for the safety of the workers and the general public. City inspector may inspect the placement of these barriers and warning devices. When, in the judgment of the City inspector, additional barricades or warning devices are necessary, he/she shall so inform the applicant or its contractor and prompt action will apply.

Removal of Unacceptable Keyhole Cores

All keyhole cores that are damaged or do not meet the surface tolerances shall be removed and reinstalled at the Applicant or its contractor's expense. A keyhole core is considered unacceptable when one of the following conditions exist: a) The keyhole core contains any vertical cracks wider than 3/32 of an inch extending full depth or partial depth through the core; or b) Any deteriorated piece of the keyhole core is larger than 10 per cent of the overall area of the keyhole core All unacceptable keyhole cores shall be removed, disposed of offsite, and remaining keyholes shall be filled with equivalent material that matches existing condition. Defective keyhole core repair work shall all be completed at the Applicant or its contractor's expense. An additional fee permit may apply regarding unacceptable keyhole cores if additional inspections are required.

BASIS OF PAYMENT (If Applicable)

Keyhole Core – Item Payment at the Contract Price shall be full compensation for all labor, Equipment and Material required to do the work. Payment shall include traffic control, coring, vacuum excavation, backfill material, and bonding material.

Warranty

The Applicant will warrant the keyhole for 1 year from the time of installation and shall maintain a rigorous quality control and assurance program such that each keyhole will be inspected and approved by the City.

Warranty Period for Utility Companies

Applicant or its contractor shall warrant the keyhole core repair for 12 months and shall maintain a rigorous quality control and assurance program such that each keyhole core repair will be re-inspected within the 12-month period.

Note: This City specification and standard detail for Keyhole Coring Repair utilized for locating utilities will be effective as of January 1, 2019.