CONSTRUCTION SPECIFICATION FOR KEYHOLE EXCAVATION AND PERMANENT REINSTATEMENT OF KEYHOLE CORES

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TS 4.70.01 SCOPE

This specification covers the requirements for keyhole coring, vacuum excavation, backfilling, and reinstatement of the keyhole core in pavements, sidewalks and other improved surfaces as a permanent repair within the City of Toronto road allowance.

TS 4.70.02 REFERENCES

This specification refers to the following standards, specifications or publications:

City of Toronto

TS 1.00	Construction Specification for Maintenance of Traffic
TS 3.45	Construction Specification for Concrete Pavement and Base Repair
TS 5.00	Construction Specification for Sodding
TS 5.10	Construction Specification for Topsoil
TS 310	Construction Specification for Hot Mixed, Hot Laid Asphaltic Concrete Paving
TS 501	Amendments to OPSS 501 (Feb 96) – Construction Specification for Compacting
TS 1010	Amendments to OPSS 1010 (Apr 04) – Material Specification for Aggregates – Base, Subbase, Select Subgrade, and Backfill Material
TS 13.10	Specification for Unshrinkable Fill
MCR	Municipal Consent Requirements

Ontario Provincial Standard Specifications, General

OPSS 180	Management and Disposal of Excess Material

Ontario Traffic Manual

Book 6 – Warning Signs

Book 7 – Temporary Conditions

TS 4.70.03 DEFINITIONS

For the purpose of this specification, the following definitions apply:

Applicant: means a person applying for consent to make an installation within the City of Toronto's streets.

Boulevard: means that part of a public street that is not used, or intended to be used, for vehicle travel by the general public, and that is situated between the travelled portion of the road and the adjoining property line.

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.

Composite Pavement: means a rigid pavement having an asphalt concrete surfacing over Portland cement concrete base (with or without granular base/subbase). See Rigid Pavement also.

Flexible Pavement: means a roadway pavement consisting of a layer(s) of asphalt concrete placed over granular base and granular subbase.

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

OPSS: means Ontario Provincial Standard Specification

OTM: means Ontario Traffic Manual, published by MTO

Permanent Repair: means the process whereby a temporary repair completed for keyhole cutting is replaced to reinstate the pavement to a condition acceptable to the City of Toronto.

Rigid Pavement: means a pavement having a Portland cement concrete surface or composite structure (asphalt over concrete base) over granular base and/or granular subbase.

Road: means the portion of the street designed, improved and ordinarily used by vehicle traffic.

Sidewalk: means that part of a public street located within the boulevard that is improved for the exclusive use of pedestrians.

Street: means a highway as defined in subsection 1(1) of the Municipal Act, 2001.

Temporary Patch: means the asphalt concrete patch installed by the Applicant or its designated contractor.

TS: means Toronto Specification

Unshrinkable Fill: means a mixture of aggregates, cementing material and water, with or without chemical admixtures, that hardens into a material with higher strength than soil but less than 0.4 MPa compressive strength at 28 days that can be removed with hand tools.

TS 4.70.04 SUBMISSION AND DESIGN REQUIREMENTS

Refer to the Municipal Consent Requirements

TS 4.70.05 MATERIALS

TS 4.70.05.01 Supply of Materials

Unless otherwise specified, the Contractor shall supply all materials necessary for the execution and completion of the work.

TS 4.70.05.02 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 or sidewalk 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 testing in accordance with TS 4.70.05.02.01 and TS 4.70.05.02.02.

TS 4.70.05.02.01 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

TS 4.70.05.02.02 Field Testing of Bonding Material

In testing, the bonding material shall, within 30 minutes at 21ºC, reach an equivalent traffic loadable condition that is at a minimum two (2) 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 35 MPa using 19 mm minus aggregates.

TS 4.70.05.03 Unshrinkable Fill as Backfill Material

The materials for and the production of Unshrinkable Fill shall meet the requirements of TS 13.10 - Specification for Unshrinkable Fill, and shall be produced and supplied by a qualified supplier listed on the City of Toronto's List of Qualified Suppliers (latest edition) where available. Prior to the use of Unshrinkable Fill, the Contractor shall provide documentation of compliance with the above requirements.

The supplied Unshrinkable Fill will be tested and material that does not meet TS 13.10 requirements will be removed and replaced at the Applicant or its contractor's expense. All costs associated with the removal and replacement of deficient Unshrinkable Fill shall be borne by the Applicant or its contractor, including the cost of administration and retesting.

TS 4.70.05.04 Imported Granular as Backfill Material

Granular material shall not be used for keyhole backfill; however, granular "A" as per TS 1010 may be used in lieu of Unshrinkable Fill in boulevards only where an exemption on the use of Unshrinkable Fill has been granted by the General Manager of Transportation or his representatives.

Where an exemption has been granted, a qualified independent materials engineering and testing firm shall provide Geotechnical Certificates within 7 days of completion of work to confirm that the approved backfill materials meet specified compaction requirements.

The Granular A shall be managed to prevent contamination, and to preserve or maintain its moisture condition to within ± 2 percent of its Optimum Moisture Content as determined by a Standard Proctor Maximum Dry Density Test.

TS 4.70.06 EQUIPMENT

TS 4.70.06.01 Supply of Equipment

Unless otherwise specified, the Applicant or its contractor shall supply all equipment necessary for the execution and completion of the work.

TS 4.70.07 CONSTRUCTION

TS 4.70.07.01 General

Keyhole excavation will not be permitted within a five year period following the completion of roadway reconstruction, and within a three year period following roadway resurfacing. Exemptions will be granted for emergencies only where the work must be completed immediately because of health and safety reasons, or the provision of essential service is endangered. All other exemption requests must be made in writing to the General Manager of Transportation.

All construction and maintenance work performed by the Applicant or its contractor using keyhole excavation method shall be carried out in such a manner that the pavement or sidewalk surfaces worked upon are restored and colour matched as close as possible to, if not better than, the original condition of the surface. Excess bonding material shall be removed from the restored surface. A "patched" appearance is visually unacceptable to the abutting properties, and efforts should be made to avoid this in surface restoration wherever possible.

The performance measures of the finished surface shall meet TS 4.70.08.

TS 4.70.07.02 Keyhole Coring

Pavement and sidewalk cuts for vacuum excavation in keyhole coring shall not be greater than 460 mm 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.

Larger cores, up to 610 mm in diameter, or overlapping cores, or cores closer than 1 metre from each other, a joint or any longitudinal or transverse crack greater than 3 mm width may be allowed only with the prior approval of the City. The finished surface shall meet the requirements and performance measures of TS 4.70.08.

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.

Flexible Pavements:

Keyhole cores will not be permitted in flexible pavements where the asphaltic concrete is less than 100 mm thick. The Applicant or its contractor must demonstrate to the satisfaction of the City staff through a program of coring of the existing pavement that the pavement has a minimum of 100 mm thickness of

asphaltic concrete. In addition, Keyhole cores should not be closer than 1 meter from each other, a joint or any longitudinal or transverse crack greater than 3 mm width.

Composite Pavements:

Keyhole cores should not be closer than 1 meter from each other, a joint or any longitudinal or transverse crack greater than 3 mm width.

Sidewalks and Other Hard Surfaces on Boulevard:

Keyholes should not be closer than 100 mm from a crack greater than 3 mm width, an expansion joint or the edge of sidewalk

TS 4.70.07.03 Backfilling

Materials used in backfilling keyhole excavation shall meet TS 4.70.05.03 and TS 4.70.05.04.

The City of Toronto'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 Expressways, Major Arterial Roads, Minor Arterial Roads, Collector Roads and Local Roads. With the written permission of the General Manager of Transportation Services or his designate, Granular "A" as per TS 4.70.05.04 may be used in lieu of Unshrinkable Fill in boulevards.

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. The Applicant or its contractor shall bring the Unshrinkable Fill or other backfill, approved by the City, to a level 50 mm below the base of the pavement structure or to the base of the sidewalk using a vibrator as necessary. A 50 mm thick leveling course of pea gravel (1/2 inch) shall be placed on the Unshrinkable Fill when the Unshrinkable Fill has set. The pea gravel leveling course can be tamped by hand.

Unshrinkable Fill shall be used in all cuts made on streets scheduled for reconstruction or resurfacing within the current construction season and when keyhole cores are defective or unusable.

TS 4.70.07.04 Permanent 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 ensure that the keyhole core is placed in the same orientation as originally constructed, the Contractor shall place a temporary mark (paint or chalk) to help align the keyhole core.

TS 4.70.07.05 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 another equivalent core of sound condition and matching existing pavement of the same diameter, depth and composition as the defective core is available, it may be reinstated in substitution of the defective core.

If the keyhole core is limited to the horizontal delamination of two or more successive layers of asphalt concrete, that core may not be considered to be defective if the layers are capable of being rebonded to each other with the bonding compound during reinstatement.

Temporary Reinstatement

If the core is found to be defective, the pavement shall be temporary reinstated with HL-1. Surface course should be placed and mechanically compacted in uniform lifts not exceeding 50 mm 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. The total thickness of the hot-mix asphalt and HL-1 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.

TS 4.70.07.06 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 300 mm 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. An asphalt mix shall be used to jam the plate into the pavement along all edges.

Permission must be sought 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 its contractor. The cores shall be made readily available for restoring the keyhole.

TS 4.70.07.07 Traffic Control

The Applicant and/or its contractor shall comply with all City traffic control standards, including the requirements as stipulated in TS 1.00 as well as the latest editions of the Ontario Traffic Manual (OTM) Book 7 Temporary Conditions and Municipal Consent Requirements, Appendix “G”. 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 as per Ontario Traffic Manual (OTM) Book 6.

It shall be the duty of the contractor or any person working, cutting, or conducting excavation in or upon any public place to establish and maintain barriers and warning devices necessary for the safety of the workers and the general public. City inspector may review the contractor's placement of these barriers and warning devices. When, in the judgment of the Inspector, additional barricades or warning devices are necessary, he/she shall so inform the contractor and the contractor shall take prompt action to comply.

TS 4.70.07.08 Management and Disposal of Excess Material

Management and disposal of excess material shall be according to OPSS 180.

The Applicant or its contractor is required to remove all materials excavated by keyhole excavation off site at their expense.

TS 4.70.07.09 Records

The contractor shall maintain records containing the location and details of all keyhole core repairs. The records shall be made available to the City on request within 7 days.

The records shall be kept for submission to the City of Toronto upon completion in a format that will allow the City to upload this information into a data base for future reference.

A location sketch of the keyhole core is required to illustrate the centre of the keyhole core referenced to two or more physical objects. The location sketch shall include ties of a horizontal distance taken from the curb line at right angles to the keyhole core, a horizontal distance measured from the centre of an identified manhole to the keyhole core, and/or a distance measured from the top of a hydrant (if in close proximity) to the keyhole core.

TS 4.70.08 QUALITY ASSURANCE

TS 4.70.08.01 Surface Tolerance

Pavements:

The reinstated core shall be flush and level with the adjacent pavement. No gap, attributable to the positioning of the core, should be found between the bottom of the straightedge and the surface of the pavement when a 1.0 m long straightedge is placed in any direction on the surface of the keyhole cores, except across the crown or drainage gutters.

Sidewalks:

The reinstated core shall be flush and level with the adjacent pavement. No gap, attributable to the positioning of the core, shall be found between the bottom of the straightedge and the surface of the sidewalk when a 1.0 m long straightedge is placed in any direction on the surface of the keyhole cores of the sidewalk.

TS 4.70.08.02 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 mm extending full depth or partial depth through the core; or

b) Any deteriorated piece of the keyhole core is larger than 10 percent of the overall area of the keyhole core

All unacceptable keyhole cores shall be removed, disposed of offsite, and a matching replacement core shall be installed or a temporary asphalt patch of HL-1 shall be constructed at the keyhole core location. In the case if a defective keyhole cores, this location shall be restored according to TS 4.70.07.05. The keyhole core repair work shall all be completed at the Applicant or its contractor's expense.

TS 4.70.08.03 Warranty

The Applicant will warrant the keyhole for 3 years and shall maintain a rigorous quality control and assurance programs such that each keyhole will be inspected and reported once every 12 months under contract warranty period.

TS 4.70.09 MEASUREMENT FOR PAYMENT

Measurement will be made for each reinstated keyhole core as specified.

TS 4.70.10 BASIS OF PAYMENT

Payment at the contract price for the above item shall be full compensation for all labour, equipment and material required to do the work including traffic control, coring, vacuum excavation, backfill material, and bonding material.

Model Municipal Regulatory Language for Coring and Reinstatement

City of Toronto TS 4.70 Construction Specification for Keyhole Excavation and Permanent Reinstatement of Keyhole Cores (November2007)	**Maricopa Association of Governments Uniform Standard Specifications for Public Works Construction, § 355: Utility Potholes-Keyhole Method** (August 2010)
Excavation Method	**Excavation**
.03: Keyhole Excavation: means the operation of coring a circular hole through the roadway pavement or sidewalk using diamond drilling/coring equipment to remove the asphaltic concrete or concrete courses of flexible pavement, rigid pavement, composite pavement and sidewalk and the removal of materials from the ground by water or air vacuum excavation method, and its disposal. 07.02: 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.	355.1: This specification covers the requirements for coring, vacuum excavation, backfilling, and reinstatement of the asphalt core into asphalt pavement. 355.2: Excavation requires coring a circular hole through asphalt pavement using drilling/coring equipment and removal of the intact asphalt pavement core. The vertical alignment of the coring operation shall be perpendicular to the horizon and cutting shall be extended the full depth of the existing pavement section.
Core Size	**Excavation (Core Size)**
07.02: Keyhole Coring: Pavement and sidewalk cuts for vacuum excavation in keyhole coring shall not be greater than 460 mm (18 in) in diameter. Larger cores, up to 610 mm (24 in) in diameter, or overlapping cores, or cores closer than 1 metre (3.3 ft) from each other, a joint or any longitudinal or transverse crack greater than 3 mm (1/8 in) width may be allowed only with the prior approval of the City. Keyhole cores will not be permitted in flexible pavements where the asphaltic concrete is less than 100 mm (4 in) thick.	355,2: Pavement cores shall not be greater than 24 inches in diameter, shall not be spaced closer than 3 feet between cores (edge to edge), shall not contain a joint or any pavement cracks greater than 1/8-inch wide, and shall only be obtained from pavements where the asphalt concrete section is at least 4 inches thick.
Keyhole Coring (Surface Restoration)	**Pavement Restoration**
07.02: 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. Excess bonding material shall be removed from the restored surface. A "patched" appearance is visually unacceptable to the abutting properties, and efforts should be made to avoid this in surface restoration wherever possible. 07.02: All construction and maintenance work performed by the Applicant or its contractor using keyhole excavation method shall be carried out in such a manner that the pavement or sidewalk surfaces worked upon are restored and colour matched as close as possible to, if not better than, the original condition of the surface.	355.4: The pavement surface shall be restored to its original condition by setting the reinstated pavement core flush with and in its original orientation. 355.4: Excess bonding material shall be removed from the restored pavement surface. A "patched" appearance shall be avoided in surface restoration wherever possible.

Model Municipal Regulatory Language for Coring and Reinstatement

Bonding Material for Keyhole Cores	Asphalt Pavement Core Bonding Materials § 708
	355.4: Bonding agent meeting the requirements of Section 708 shall be used for pavement core reinstatement.
03: 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.	708.2: Bonding material shall be a single component cementitious, rapid hardening, high strength, waterproof bonding agent conforming to the physical properties shown in Table 708-1.
05.02: Bonding material shall be impervious to water penetration at the joint after application.	708.2: Bonding material shall be impervious to water penetration at the joint after curing.
The bonding material is required to securely bond the undamaged keyhole core to the pavement or sidewalk and to fill the annular space at the joint.	708.2: The bonding material is required to securely bond the asphalt concrete core to asphalt concrete pavement and to fill all voids between the core and pavement and within the core.
05.02: 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 testing in accordance with TS 4.70.05.02.01 and TS 4.70.05.02.02.	708.3:Specifications and test results for the bonding material shall be submitted to the Agency for review and approval before use.
05.02: In testing, the bonding material shall, within 30 minutes at 21ºC, reach an equivalent traffic loadable condition that is at a minimum two (2) 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 35 MPa using 19 mm minus aggregates	708.2: Bonding material shall, within 30 minutes at minimum ambient temperature of 70 degrees F., allow an 18" diameter core to support a traffic load equivalent to at least three (3) times the AASHTO H-25 standard wheel load.
Defective Keyhole Cores	**Deficiencies (Defective Cores)**
07.05: 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 another equivalent core of sound condition and matching existing pavement of the same diameter, depth and composition as the defective core is available, it may be reinstated in substitution of the defective core.	355.6: Where the pavement core is found to be fractured or defective upon removal, or becomes damaged after removal and prior to reinstating, the defective or damaged core shall not be used to reinstate the pavement. Pavement repair shall be performed in accordance with Detail 212, Type A Pavement Repair. **NOTE: No core substitution allowed at present**.

Model Municipal Regulatory Language for Coring and Reinstatement

Unacceptable Cores	**Unacceptable Cores**
08.02: A keyhole core is considered unacceptable when one of the following conditions exist: a) The keyhole core contains any vertical cracks wider than 3 mm (1/8 in)extending full depth or partial depth through the core; or b) Any deteriorated piece of the keyhole core is larger than 10 percent of the overall area of the keyhole core 07.05: If the keyhole core is limited to the horizontal delamination of two or more successive layers of asphalt concrete, that core may not be considered to be defective if the layers are capable of being rebonded to each other with the bonding compound during reinstatement.	355.6:A pavement core is considered unacceptable when one of the following conditions exist: a) The core contains any vertical cracks wider than 1/8-inch extending full depth or partial depth through the core; or b) Any deteriorated piece of the core is larger than 10 percent of the overall area of the core. c) Two or more successive layers of asphalt concrete in the core become horizontally delaminated and cannot be rebounded to each other with the bonding compound.
Removal & Replacement of Unacceptable Cores	**Removal & Replacement of Unacceptable Cores**
08.02: All unacceptable keyhole cores shall be removed, disposed of offsite, and a matching replacement core shall be installed or a temporary asphalt patch of HL-1 shall be constructed at the keyhole core location. In the case if a defective keyhole cores, this location shall be restored according to TS 4.70.07.05. The keyhole core repair work shall all be completed at the Applicant or its contractor's expense.	356.6 All unacceptable pavement cores shall be removed from the job site. 355.6: Pavement repair shall be performed in accordance with Detail 212, Type A Pavement Repair.
Surface Tolerance	**Surface Tolerances**
08.01: The reinstated core shall be flush and level with the adjacent pavement. No gap, attributable to the positioning of the core, should be found between the bottom of the straightedge and the surface of the pavement when a 1.0 m (3.3 ft) long straightedge is placed in any direction on the surface of the keyhole cores of sidewalks or pavements, except across the crown or drainage gutters.	355.5: 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, except across the pavement crown or drainage gutters.
Keyhole Orientation	**Keyhole Orientation**
07.04: To ensure that the keyhole core is placed in the same orientation as originally constructed, the Contractor shall place a temporary mark (paint or chalk) to help align the keyhole core.	355.2: Contractor shall place a temporary mark (paint or chalk) on the pavement core and adjacent pavement prior to cutting to insure that the pavement core when replaced will have the same orientation as found in the original pavement.

Model Municipal Regulatory Language for Coring and Reinstatement

Restoration Timing &Temporary Road Plates	Restoration Timing &Temporary Road Plates
07.04: Permanent 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.	355.4: The contractor shall reinstate the pavement core within 24 hours of cutting the pavement.
07.06: 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 300 mm 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. An asphalt mix shall be used to jam the plate into the pavement along all edges.	355.4: Holes left open longer than 24 hours after cutting shall be covered with an approved steel road plate capable of supporting traffic loads. The steel plate must be rounded with a fitted collar that, when inserted into the hole, will prevent the steel plate from tipping, tilting, bouncing or spinning out of the hole under traffic conditions. An asphalt mix shall be used to ramp pavement up to the steel plate along all edges.

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