

DPW – Infrastructure Services Division
Pavement Restoration Specification for Utility Cuts and Trenches
Common Resolution 090139 – Public Works Committee
June 3, 2009

The following is a summary of information regarding the review and update of this pavement restoration specification.

BACKGROUND

The current specifications were developed in 2002 and fully implemented in 2003/04 after a review and analysis of current practices and procedures with the goal of preserving useful pavement life, reducing maintenance costs, improved utility coordination, standardizing of methods and increased revenue. The changes were based on consideration of age and type of pavement, type and size of excavation and new construction methods.

Many of the current excavations causing failures are pre-existing locations which were completed prior to 2003 when the current revised specifications were introduced. Over the ensuing five years current practices have improved.

Currently the City issues ~8,000 excavation permits per year to private utilities, plumbers, City sewer and water maintenance work. The City establishes both administrative permits fees and related inspections fees for these excavations. Both fees are reviewed every year and revised accordingly under separate actions to ensure they remain consistent with related impacts and costs.

In 2008, an audit of the City's Paving Program identified through observation that utility cut patches were not compatible with the surrounding pavement and causing distress. Common Council Resolution Number 081339 directed DPW to revise and update the restoration policy for utility cuts and trenches in the public way.

REVISED STANDARDS

The existing specifications and standards were review based on experience, current techniques and practices, other communities and related research and have been revised. The specifications are still based on pavement age and type and some new elements including:

1. Established requirements for keyhole (coring) excavations resulting in less disruption and reduced restoration areas. The City piloted a program with We Energies over the past year in this technique with satisfactory results.
2. Eliminate used of trench flooding settlement techniques.
3. Revised standards to require use of flowable fill (slurry) backfill materials to ensure adequate and consistent excavation backfill to form a firm foundation for the pavement surfaces.
4. Revised standards to require crack/joint sealing of all trench edges for excavations longer than 200 feet.

IMPLEMENTATION

Effective date of July 1, 2009 will be established and revised specifications will be distributed by the Commissioner of Public Works to all utilities, plumbers, underground contractors and related City departments.

CITY OF MILWAUKEE

**DEPARTMENT OF PUBLIC WORKS
INFRASTRUCTURE SERVICES DIVISION**

**Pavement Restoration Specifications
For
Utility Cuts and Trenches**

**September 2002
Revised May 2009**

Asphalt & Concrete Streets (Keyhole Excavation)

Pavement Age - < 4 years

- No Keyhole excavations permitted.

Pavement Age - 4 years to 6 Year Paving Program

- Common keyhole methods involve creating a pavement opening only 12 to 18 inches in diameter, usually made with circular-drill core-hole cutter, allowing for remote access to the facilities.
- No Keyhole excavation may be done over a joint in the pavement.
- No restoration without inspectors' approval.
- **Coring:**
- Coring is the term used to describe the method of cutting pavement through the use of a circular hole saw that is commonly on a truck or trailer. This circular saw with a diamond encrusted bit executes an 18-inch diameter (or smaller) cut in the pavement. The cut plug, nicknamed a "core", is removed from the roadway and set aside to be replaced later with the use of a quick-setting grout. The core may be cut with or without the use of a pilot hole. The pilot hole is 1 to 2 inches in diameter, and is used to aid in the removing and replacing of the core. An expansion plug tool may be inserted into the pilot hole after drilling has been completed. The tool is then used to lift the core out of the roadway.
- **Vacuum Excavation:**
- Once the core has been cut and removed, vacuum excavation is required to excavate down to the pipe.
- **Backfilling and Restoration:**
- The keyhole is then backfilled with a slurry fill. Then epoxy grout is mixed and poured into the keyhole. Restoration is accomplished by replacing the cut-pavement core into the roadway, oriented in its original position. The epoxy grout will ooze up the sides of the keyhole and the excess can be wiped away. The epoxy grout will set in 30 minutes and then the road can be opened to traffic again.

Asphalt Streets
(Longitudinal Trench)

Pavement Age - < 11 years

- Divide lane: Crushed stone base, trench width plus 4 ft. Binder on top, full lane overlay.
- Single wide roadway: Crushed stone base, trench width plus 4 ft. Binder and top, full lane overlay.
- Residential: Crushed stone base, trench width plus 4 ft. Binder and top, one half of roadway overlay.
- If trench is on centerline in #2 or #3 width is one half of roadway centered on trench.
- All trenches require slurry backfill. Slurry shall be 3" slump, number 1 and 2 concrete aggregates without cement.
- Where sawing is required, it shall be full depth.
- Asphalt shall be placed in accordance with Part 6 of the current City of Milwaukee Street Construction Specifications.
- No restoration without inspectors' approval.

Pavement Age - 11 years to 6 Year Paving Program

- Divided lane: CS Base, trench width plus 4 ft. Binder and top, minimum 8 ft. overlay.
- Single wide roadway: CS Base, trench width plus 4 ft. Binder and top, minimum 8 ft. overlay.
- Residential: CS Base, trench width plus 4 ft. Binder and top, minimum 8 ft. overlay.
- If trench is on centerline in #2 or #3 width is one lane or one quarter of roadway respectively.
- All trenches require slurry backfill. Slurry shall be 3" slump, number 1 and 2 concrete aggregates without cement.
- Where sawing is required it shall be full depth.
- Asphalt shall be placed in accordance with Part 6 of the current City of Milwaukee Street Construction Specifications.

- No restoration without inspectors' approval.

Improvement Status – on 6 Year Paving Program

- Existing concrete base – replace concrete base.
- 4" asphalt surface 2 feet wider than trench, 6" Cr. St. base.
- All trenches require slurry backfill. Slurry shall be 3" slump, number 1 and 2 concrete aggregates without cement.
- Where sawing is required it shall be full depth.
- Asphalt shall be placed in accordance with Part 6 of the current City of Milwaukee Street Construction Specifications.
- No restoration without inspectors' approval.

Asphalt Streets

(Roadway Cut within One and Two Traffic Lanes)

Pavement Age - < 11 years

- Divided lane: Replace the base of the roadway cut in kind; replace the asphalt binder and top full lane width.
- Single wide roadway: Replace the base of the roadway cut in kind; replace the asphalt binder and top full lane width.
- Residential: Replace the base of the roadway cut in kind; replace the asphalt binder and top one half of roadway width.
- Minimal longitudinal length – 4 feet.
- If roadway has concrete base place 1" long tie rods (#6) @ 2' centers – all sides of cut.
- All cuts require slurry backfill. Slurry shall be min. 3" slump, number 1 and 2 concrete aggregates without cement.
- Roadway cuts – all saw cuts must be full depth. Asphalt replacement – all saw cuts must be depth of asphalt.
- Any trench 200 feet or longer: Crackfilling all sides of the cut is required.
- Restore permanent pavement markings (if necessary).
- No restoration without inspectors' approval.

Pavement Age - 11 years to 6 Year Paving Program

- Divided lane: - Replace the base of the roadway cut in kind; replace the asphalt binder & top one half of lane width if cut is in one half or the other.
- Replace the base of the roadway cut in kind; replace the asphalt binder & complete lane width if less than 50% of the original lane width remains on either side of the cut.
- Single wide roadway: - Replace the base of the roadway cut in kind; replace the Asphalt binder and top one half of lane width.
- Replace the base of the roadway cut in kind; replace the asphalt binder and top complete lane width if less than 50% of the original lane width remains.

- Residential: - Replace the base of the roadway cut in kind; replace the asphalt binder & top one quarter of roadway width.
 - Replace the base of the roadway cut in kind; replace the asphalt binder and top half of roadway width if less than 50% of the original lane width remains.
- Minimal transverse width and longitudinal length of 4 feet.
- If roadway has concrete base place 1' long tie rods (36) @ 2' centers – all sides of cut.
- All cuts require slurry backfill. Slurry shall be min. 3" slump, number 1 and 2 concrete aggregates without cement.
- Roadway cuts – all saw cuts must be full depth. Asphalt replacement – all saw cuts must be depth of asphalt.
- Any trench 200 feet or longer: Crackfilling all sides of the cut is required.
- Restore Pavement markings (if necessary).
- No restoration without inspectors' approval.

Improvement Status – on 6 Year Paving Program

- Replace the base in the cut – then asphalt surface.
- Minimal transverse width and longitudinal length of 4 feet.
- If roadway has concrete base place 1' long tie rods (#6) @ 2' centers – all sides of cut.
- All cuts require slurry backfill. Slurry shall be min. 3" slump, number 1 and 2 concrete aggregates without cement.
- Any trench 200 feet or longer: Crackfilling all sides of the cut is required.
- No restoration without inspectors' approval.

Concrete Streets (Longitudinal Trench)

Pavement Age - < 16 years

- Full panel replacement if trench is fully within panel.
- Full panel replacement plus if trench is on joint line. Use paint to redefine lane if necessary.
- Residential: Replace one half of street.
- One foot long #6 tie rods on two foot centers both sides of trench, mortared or epoxy in place.
- All trenches require slurry backfill. Slurry shall be 3" slump, number 1 and 2 concrete aggregates without cement.
- Where sawing is required, it shall be full depth.
- All joints, bonded, sawed, or hand formed shall be sealed.
- No restoration without inspectors' approval.

Pavement Age - 16 years to 6 Year Paving Program

- Replace one half of lane if trench is in one half or the other.
- Full panel replacement if trench is in center of lane.
- Residential:
 - Centerline to quarter point.
 - Flange line to quarter point.
 - One quarter of roadway if trench is at quarter point.
- One foot long #6 tie rods on two foot centers both sides of trench, mortared or epoxy in place.
- All trenches require slurry backfill. Slurry shall be 3' slump, number 1 and 2 concrete aggregates without cement.
- Where sawing is required it shall be full depth.
- All joints, bonded, sawed, or hand formed shall be sealed.

- No restoration without inspectors' approval.

Improvement Status – on 6 Year Paving Program

- Replace trench width
- One foot long #6 tie rods on two foot centers both sides of trench, mortared or epoxy in place.
- All trenches require slurry backfill. Slurry shall be 3" slump, number 1 and 2 concrete aggregates without cement.
- Where sawing is required it shall be full depth.
- All joints, bonded, sawed, or hand formed shall be sealed.
- No restoration without inspectors' approval.

General Note: Lane markings shall be restored in-kind.

Concrete Streets

Roadway Cut completely within one panel)

Pavement Age - < 4 years

- Full panel replacement (paint lines if necessary).
- Residential: Replace one half of street width (flange line to centerline). Replace entire panel length (transverse joint to transverse joint) (paint lines if necessary).
- 1' long tie rods (#6) @ 2' centers – all sides of cut.
- All cuts require slurry backfill. Slurry shall be min. 3" slump, number 1 and 2 concrete aggregates without cement.
- All saw cuts must be full depth.
- No restoration without inspectors' approval.

Pavement Age - 4 to 15 years

- Replace full lane width. Replace to transverse joint if less than 50% of the original panel length remains (paint lines if necessary).
- Residential: Replace one half of street width (flange line to centerline). Replace to transverse joint if less than 50% of the original panel length remains (paint lines if necessary).
- Roadway cuts shall not be less than 4 feet in length or width.
- 1' long tie rods (#6) @ 2' centers – all sides of cut.
- All cuts require slurry backfill. Slurry shall be min. 3" slump, number 1 and 2 concrete aggregates without cement.
- All saw cuts must be full depth.
- No restoration without inspectors' approval.

Pavement Age - 16 years to 6 Year Paving Program

- Replace one half of lane if roadway cut is in one half or the other. Replace to transverse joint if less than 50% of the original panel length remains.

- Full lane replacement if the roadway cut is in center of lane. Replace to transverse joint if less than 50% of the original panel length remains (paint lines if necessary).
- Residential:
 - Replace centerline to quarter point. Replace to transverse joint if less than 50% of the original panel length remains.
 - Replace flange line to quarter point. Replace to transverse joint if less than 50% of the original panel length remains.
 - Replace half of roadway if cut is at the quarter point. Replace to transverse joint if less than 50% of the original panel length remains.
- Roadway cuts shall not be less than 4 feet in length or width.
- 1" long tie rods (#6) @ 2' centers – all sides of cut.
- All cuts require slurry backfill. Slurry shall be min. 3" slump, number 1 and 2 concrete aggregates without cement.
- All saw cuts must be full depth.
- No restoration without inspectors' approval.

Improvement Status – on 6 Year Paving Program

- Replace roadway cut length & width. Replace to joint if less than 2 feet of panel length remains.
- Roadway cuts shall not be less than 4 feet in length or width.
- 1" long tie rods (#6) @ 2" centers – all sides of cut.
- All cuts require slurry backfill. Slurry shall be min. 3" slump, number 1 and 2 concrete aggregates without cement.
- No restoration without inspectors' approval.

Concrete Streets
(Roadway Cut within two traffic lanes)

Pavement Age - < 4 years

- Replace two full panels (paint lines if necessary).
- Residential: Replace full width of street (flange line to flange line). Replace entire panel length (transverse joint to transverse joint) (paint lines if necessary).
- 1" long tie rods (#6) @ 2" centers – all sides of cut.
- All cuts require slurry backfill. Slurry shall be min. 3" slump, number 1 and 2 concrete aggregates without cement.
- No restoration without inspectors' approval.

Pavement Age - 4 to 15 years

- Replace two lane widths (longitudinal joint to longitudinal joint). Replace to transverse joint if less than 50% of the original panel length remains (paint lines if necessary).
- Residential: Replace full width of street. Replace to transverse joint if less than 50% of the original panel length remains (paint lines if necessary).
- Roadway cuts shall not be less than 4 feet in length or width.
- 1' long tie rods (#6) @ 2' centers – all sides of cut.
- All cuts require slurry backfill. Slurry shall be min. 3" slump, number 1 and 2 concrete aggregates without cement.
- All saw cuts must be full depth.
- No restoration without inspectors' approval.

Pavement Age - 16 years to 6 Year Paving Program

- Replace one half of each lane damaged by roadway cut. Replace complete lane width (longitudinal joint to longitudinal joint) if less than 50% of the original lane width remains. Replace to transverse joint if less than 50% of the original panel length remains (paint lines if necessary).

- Residential: - Replace centerline to quarter point of each lane. Replace to longitudinal joint if less than 50% of the original lane width remains. Replace to transverse joint if less than 50% of the original panel length remains.
- Roadway cuts shall not be less than 4 feet in length or width.
- 1' long tie rods (#6) @ 2' centers – all sides of cut.
- All cuts require slurry backfill. Slurry shall be min. 3" slump, number 1 and 2 concrete aggregates without cement.
- All saw cuts must be full depth.
- No restoration without inspectors' approval.

Improvement Status – on 6 Year Paving Program

- Replace roadway cut length & width. Replace to joint if less than 2 feet of panel remains.
- Roadway cuts shall not be less than 4 feet in length or width.
- 1' long tie rods (#6) @ 2' centers – all sides of cut.
- All cuts require slurry backfill. Slurry shall be min. 3" slump; number 1 and 2 concrete aggregates without cement.
- No restoration without inspectors' approval.

Concrete Streets
(Roadway Cut within two adjacent panels)

Pavement Age - < 4 years

- Replace two full panels (paint lines if necessary).
- Residential: Replace two panels within one half of the street width (paint lines if necessary).
- 1' long tie rods (#6) @ 2' centers – all sides of cut.
- All cuts require slurry backfill. Slurry shall be min. 3" slump, number 1 and 2 concrete aggregates without cement.
- All saw cuts must be full depth.
- Any trench 200 feet or longer: Crackfilling all sides of the cut is required.
- No restoration without inspectors' approval.

Pavement Age - 4 to 15 years

- Replace two lane widths (longitudinal joint to longitudinal joint). Replace to transverse joint if less than 50% of the original panel length remains (paint lines if necessary).
- Residential: Replace one half of the street (flange line to centerline). Replace to transverse joint if less than 50% of the original panel length remains (paint lines if necessary).
- Roadway cuts shall not be less than 4 feet in length or width.
- 1' long tie rods (#6) @ 2' centers – all sides of cut.
- All cuts require slurry backfill. Slurry shall be min. 3" slump, number 1 and 2 concrete aggregates without cement.
- All saw cuts must be full depth.
- Any trench 200 feet or longer: Crackfilling all sides of the cut is required.
- No restoration without inspectors' approval.

Pavement Age - 16 years to 6 Year Paving Program

- Replace one half of lane if roadway cut is in one half or the other. Replace to transverse joint if less than 50% of the original panel length remains.
- Full lane replacement if cut is in center of lane. Replace to transverse joint if less than 50% of the original panel length remains (paint lines if necessary).
- Residential:
 - Replace centerline to quarter point. Replace to transverse joint if less than 50% of the original panel length remains.
 - Replace flange line to quarter point. Replace to transverse joint if less than 50% of the original panel length remains.
 - Replace half of roadway if cut is at the quarter point. Replace to transverse joint if less than 50% of the original panel length remains.
- Roadway cuts shall not be less than 4 feet in length or width.
- 1' long tie rods (#6) @ 2' centers – all sides of cut.
- All cuts require slurry backfill. Slurry shall be min. 3" slump, number 1 and 2 concrete aggregates without cement.
- All saw cuts must be full depth.
- Any trench 200 feet or longer: Crackfilling all sides of the cut is required.
- No restoration without inspectors' approval.

Improvement Status – on 6 Year Paving Program

- Replace roadway cut length & width. Replace to joint if less than 2 feet of panel remains.
- Roadway cuts shall not be less than 4 feet in length or width.
- 1' long tie rods (#6) @ 2' centers – all sides of cut.
- All cuts require slurry backfill. Slurry shall be min. 3" slump, number 1 and 2 concrete aggregates without cement.
- Any trench 200 feet or longer: Crackfilling all sides of the cut is required.
- No restoration without inspectors' approval.

Concrete Streets

(Roadway Cut within two or more lanes and two or more adjacent panels)

Pavement Age - < 4 years

- Full panel replacement of any panels damaged (paint lines if necessary).
- Residential: Replace full roadway width (flange line to flange line). Replace damaged panels from transverse joint to transverse joint (paint lines if necessary).
- 1' long tie rods (#6) @ 2' centers – all sides of cut.
- All cuts require slurry backfill. Slurry shall be min. 3" slump, number 1 and 2 concrete aggregates without cement.
- All saw cuts must be full depth.
- Any trench 200 feet or longer: Crackfilling all sides of the cut is required.
- No restoration without inspectors' approval.

Pavement Age - 4 to 15 years

- Replace complete lane widths (longitudinal joint to longitudinal joint). Replace to transverse joint if less than 50% of the original panel length remains (paint lines if necessary).
- Residential: Replace full width of street (flange line to flange line). Replace to transverse joint if less than 50% of the original panel length remains (paint lines if necessary).
- Roadway cuts shall not be less than 4 feet in length or width.
- 1' long tie rods (#6) @ 2' centers – all sides of cut.
- All cuts require slurry backfill. Slurry shall be min. 3" slump, number 1 and 2 concrete aggregates without cement.
- All saw cuts must be full depth.
- Any trench 200 feet or longer: Crackfilling all sides of the cut is required.
- No restoration without inspectors' approval.

Pavement Age - 16 years to 6 Year Paving Program

- Replace one half of each lane damaged by roadway cut. Replace complete lane width (longitudinal joint to longitudinal joint) if less than 50% of the original lane width remains. Replace to transverse joint if less than 50% of the original panel length remains (paint lines if necessary).
- Residential: - Replace centerline to quarter point of each lane. Replace to longitudinal joint if less than 50% of the original lane width remains. Replace to transverse joint if less than 50% of the original panel length remains (paint lines if necessary).
- Roadway cuts shall not be less than 4 feet in length or width.
- 1' long tie rods (#6) @ 2' centers – all sides of cut.
- All cuts require slurry backfill. Slurry shall be min. 3" slump, number 1 and 2 concrete aggregates without cement.
- All saw cuts must be full depth.
- Any trench 200 feet or longer: Crackfilling all sides of the cut is required.
- No restoration without inspectors' approval.

Improvement Status – on 6 Year Paving Program

- Replace roadway cut length & width. Replace to joint if less than 2 feet of panel remains.
- Roadway cuts shall not be less than 4 feet in length or width.
- 1' long tie rods (#6) @ 2' centers – all sides of cut.
- All cuts require slurry backfill. Slurry shall be min. 3" slump, number 1 and 2 concrete aggregates without cement.
- Any trench 200 feet or longer: Crackfilling all sides of the cut is required.
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