Ohio's Research Initiative for Locals (ORIL) Project Fact Sheet

Best Practices for Pavement Restoration of Open Utility Cut Installations/Repairs on Local Roadways in Ohio

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Background

There are an estimated 3.6 million road opening permits issued nationwide each year (Jarnecke and Pollock, 2017). While advanced planning and coordination with other planned roadway work can reduce impacts, open utility cuts are often unavoidable. As a result, local public agencies face the challenge of ensuring pavements are repaired properly after the installation or repair of subsurface utilities creates open cuts in the roadway. Repairs can result in weakening of the pavement foundation, decreasing the expected service life and leading to deterioration of the repaired area before the surrounding undisturbed pavement. Performance of repaired areas are influenced by several factors such as backfill materials, compaction of the backfill, season in which it was completed, and compaction of the asphalt surface. There is a need to develop a best practices matrix which can be used to improve the long-term performance of pavement repairs of open utility cuts, specifically in Northern Ohio.

Research Approach

A survey of local agencies in Ohio identified current practices. This information was augmented with phone interviews of local agency personnel. Three agencies (Cities of Cleveland, Columbus, and Dayton) were selected for in-person interviews, site visits and in-depth testing. When feasible, repairs were observed during construction. Field evaluations were made at sites that had performed well and others that performed poorly; specimens were collected for laboratory analysis. Field evaluations included measurement of dimensions of repair, transverse and longitudinal surface profiles through the center of the lane using a FACE Dipstick® profiler, measurement of deflections with a falling weight deflectometer, and collection of pavement specimens. Laboratory tests included measurement of pavement layer thicknesses and moisture content. For asphalt pavements, in-place density was determined within the repair, and where concrete was used in the repair compressive strength was measured.

Findings and Conclusions

Based on the work completed in this study, the following conclusions can be made:

- Repairs were selected from a list of those provided by each agency. Based on results from this limited study, FWD deflections indicated the stiffness in the repair was typically as stiff or greater than the stiffness found in the existing pavement. Therefore, it can be expected that for the repairs evaluated, they will have a service life equal to the existing pavement.
- Although the use of T-repair was identified as a current practice in some literature, other literature supports the idea that T-repair requires additional sawcutting and material, but does not provide the perceived benefits of structural support or prevention of water infiltration.
    - Field evaluation results indicated no significant difference between measured stiffness on sites where T-repair was used and sites where vertical cut was used.
    - Base moisture content was found to be higher in field evaluations conducted where a vertical repair is required compared to other sites where T-repair is required. It could not be determined if this was due to the repair method alone.
- For repairs with heat weld included in the field evaluation, joints in the repairs had reflected through the heat weld. Therefore, it may not be effective in reducing water infiltration.
- Many agencies required sealing the joints of asphalt surface repairs. This helps prevent water infiltration and reduces raveling, as does crack sealing. However, water infiltration will only be prevented for as long as the crack seal is maintained.

Best Practices Matrix

Item	Source	Best Practice
Backfill material	Literature Search	• For uniform stiff support of the pavement restoration it is recommended low-strength mortar (LSM) should be used.
	Survey/Interviews/ Site Visits	• Survey showed about equal number of agencies allow LSM that allow granular material. • Site visits showed lack of quality control and quality assurance on LSM. It is recommended samples of LSM be collected at time of placement to ensure proper curing. It is recommended material tickets also be collected at time of placement to ensure material meets specifications. • Where granular material is used, agency specifications should be followed to ensure material is not saturated and is compacted properly.
	Field Evaluations	• Based on field evaluations no significant difference was found between granular material and LSM relative to stiffness.
Pavement material: Concrete	Literature Search	• It is recommended the concrete patch be dowelled to the existing pavement where concrete pavement thickness is greater than or equal to 7 in. (175 mm), otherwise dowels are not recommended.

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Item	Source	Best Practice
	Survey/Interviews/ Site Visits	• When plain concrete is exposed, replace entire slab. • Match existing concrete pavement thickness.
Pavement material: Brick	Survey/Interviews/ Site Visits	• Replacing brick with brick pavers maintain the historical aesthetics of the neighborhood, although it is costly and time consuming. Using dyed and stamped concrete may be used as an alternative.
Pavement material: Asphalt	Field Evaluations	• Based on examination of extracted asphalt cores, in many repairs it appeared asphalt was placed in one lift in the repair and had relatively high air voids in the repair. Therefore, it is recommended placement and compaction of asphalt is inspected to ensure adherence to standard and adequate compaction of the material.
Pavement material: Concrete composite/ rigid brick composite	Survey/Interviews/ Site Visits	• Utilize a concrete base in the repair, placed at least to height of existing concrete to prevent heaving of repair.
Pavement material: Brick composite	Survey/Interviews/ Site Visits	• Agencies interviewed repaired brick composite with either a concrete or asphalt base. Insufficient projects were available to verify performance.
Repair method	Survey/Interviews/ Site Visits	• The repair area was minimized with keyhole repairs. Consideration needs to be given to the condition of the existing pavement as well as the backfill material used.
	Field Evaluations	• No significant differences were found between stiffness in those repairs made with a vertical and those with a T-repair. Therefore, either repair method should provide sufficient structural performance. • It was found vertical repairs with granular backfill had the greatest average total deviation and average maximum dip among all combinations of repair type and backfill material evaluated. While this trend was observed, there were not enough repairs in each category to draw statistically significant conclusions as to which combination has the greatest tendency towards settlement.
Construction	Literature Search/ Survey/Interviews/ Site Visits	• Where asphalt is used in the surface of the repair, it is recommended that crack sealing be applied by the overband method to the joint to prevent water infiltration and reduce raveling. • Saw cut pavement to provide clean square joints for the permanent pavement restoration of the repair.
Extent of repair	Survey/Interviews/ Site Visits	• Removal of any saturated unbound material is necessary. Limits of the excavation may have to be expanded to ensure saturated material is completely removed and adequate compaction can be achieved. • Several agencies required the use of pavers to pave asphalt full lane width for large or long repairs. Definition of large varied from city to city, with the smallest being 100 square feet. • If the repair is within three feet of the curb or lane line, the repair should be extended to the curb, or the entire slab should be replaced.
Temporary/emergency repairs	Survey/Interviews/ Site Visits	• Use concrete, cold mix, or asphalt for temporary repairs. If weather does not permit the use of asphalt use either concrete or cold mix for temporary repair. If cold mix is used, replace cold mix with asphalt as soon as hot mix asphalt is available. If asphalt is preferred as the permanent surface, utilize a bond breaker (plastic, etc.) between the permanent concrete base and temporary concrete surface. Replace concrete with asphalt when it is suitable to do so.
Quality Assurance	Survey/Interviews/ Site Visits	• Sufficient staff is needed to provide inspection on a significant portion of open utility cut repairs. • Repairs of publicly owned utilities should be subjected to the same specifications as privately owned utilities; therefore, repairs completed by agency forces should also be inspected. • It is recommended the contractor be required to contact the agency prior to critical points in the repair including placement of backfill and asphalt in order for the inspector to be present. For enforcement, it is recommended a non-compliance clause be included in the permit such that if the contractor is non-complaint a warranty is placed on the repair. • Utilize RFID tags in temporary repairs where asphalt or cold patch has been placed, to ensure the permanent repairs have been performed and to identify responsibility parties in the event of failure. • Utilize RFID tags in permanent repairs where asphalt is placed, to identify responsibility parties in the event of failure and for enforcement of warranties, if applied.
Administration/Policy	Literature Search	• Establish a contractor pre-qualification process. Only issue permits to prequalified contractors.
	Survey/Interviews/ Site Visits	• Require permits to perform open utility cut work in the right-of-way. • Sufficient staff is needed to oversee permitting process and to track permits. • The agency and utility companies should share capital improvement program plans with one another to coordinate planned work to minimize need to perform open utility cuts on new pavement. • The agency should establish a moratorium policy to minimize open utility cut work on new pavement and to ensure expected service life of existing pavement. • Fees should be set to recover the costs associated with permitting and inspection.
New and emerging technology	Survey/Interviews/ Site Visits	• Trenchless technology minimizes the area of the repair. Consideration should be given to local ordinances and density of utilities in the area.

REFERENCES

Jarnecke, D. and M. Pollock. Best Practices for Utility Cut Pavement Repair. Paper No. 17-01617, Presented at the *96th Annual Meeting of the Transportation Research Board*, Washington, DC. January 8-12, 2017

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