# Joint Transportation Research Program


**Principal Investigator:** Dulcy M. Abraham, Purdue University, dulcy@purdue.edu, 765.494.2239

**Program Office:** jtrp@purdue.edu, 765.494.6508, www.purdue.edu/jtrp

**Sponsor:** Indiana Department of Transportation, 765.463.1521


SPR-4005 2018


# Warranty Utility Cut Repairs (QC/QA of Utility Cut Repairs)

## Introduction

Utility cuts are made to either install, maintain, repair, or replace utilities buried under the roadway. Upon completion of the work, the cuts are backfilled, compacted, and resurfaced, leaving behind a pavement patch. These utility cut repairs are expected to restore pavements to their original condition. However, poor construction techniques often lead to settlement of the patches, thus increasing the roughness of the pavement and decreasing the rideability of the repaired pavement. Identifying the company responsible for faulty pavement repairs requires a considerable amount of time and effort, with inspectors having to search for permit information in a database that has records of permits dating back to the 1990s. Information from the Indiana Department of Transportation's (INDOT's) electronic permitting system (EPS) indicates that in the 2012–2016 time frame, INDOT received 12,593 cut-road permit applications. Such a large number of cut-road permit applications is motivation to investigate strategies to reduce or prevent the resulting damage from utility cuts and to develop methods for automated monitoring of utility cut repairs.

In this study, five key tasks were undertaken to develop a set of recommendations and guidelines to assist INDOT in addressing their challenges with utility cut repairs. These tasks included (1) a synthesis of utility cut repair guidelines and practice among State Transportation Agencies (STAs) or Department of Transportations (DOTs), (2) interviews with INDOT engineers and utility contractors to identify the challenges faced in effectively restoring utility cuts, (3) an evaluation of INDOT's EPS in the context of managing utility cut permit information, and (4) an investigation of automated methods to track/manage utility cut repairs.

## Findings

INDOT specifications require utility cuts to be repaired using the T-section utility patch, backfilled either with soil compacted to 95% Standard Proctor density or with flowable fill. In addition, the edges of the patch are to be treated with a tack coat for flexible pavements and dowel bars/tie bars for rigid pavements. These specifications were found to be in alignment with a majority of the specifications used by STAs who participated in this study, or whose documents were reviewed as part of the study. Interviews with INDOT personnel revealed that contractors do not always comply with INDOT specifications, and hence, repair jobs often result in improperly restored patches. They conjectured that the non-compliance is partly due to the contractor's lack of familiarity with INDOT specifications or due to difficulties in soil compaction arising out of the size constraints of typical utility cuts. INDOT personnel recommended that flowable fill be made mandatory (instead of soil backfill) to circumvent the need for compaction. They also suggested incorporating prequalification requirements for contractors who perform utility cut repairs. A common observation shared by the INDOT personnel was that utility cuts repaired with temporary patching materials in winter are often not permanently restored during the warmer months. However, determining which company is responsible for an improperly restored utility cut is challenging, given the large number of utility cuts and limited number of inspectors.

INDOT uses the EPS to assist permit managers and inspectors in reviewing, managing, and tracking permits. However, in the context of managing utility cut permits, the following five limitations were identified:

- A lack of distinction between utility cut permits and other "Cut-Road" permits, making the process of searching for utility cut permits overly tedious.
- The requirement for permittees to specify the location of a utility cut operation by means of a mouse click on a map. This method of data entry results in inaccurate locations being recorded in the EPS.
- An absence of data fields for permittees to provide information about the contractors hired to perform the work.
- A lack of data fields to record technical details of the work, such as dimensions of the cut, backfill materials, construction methods, and so forth.
- A lack of data fields to record information from periodic inspections by INDOT inspectors.

To address these limitations, the research team recommends the following modifications to the EPS:

- Addition of data fields to record the permit sub-type (i.e., utility cut), name and details of the contractor, and to store information from periodic inspections.
- Addition of data fields to record technical specifications of the work, such as length and width of the cut, depth of the excavation (if relevant), backfill material used, length of additional cutback to create the T-section, type of edge treatment, and type of surfacing material used (i.e., permanent or temporary patching materials). These additional fields could be incorporated into the EPS using a graphical user interface (GUI) (see Chapter 5).
- Discontinuing the current method of specifying permit

locations using a mouse click on a map. Instead, the permittee should be required to measure the location of the repair with a global positioning system (GPS) device, equivalent triangulation method, or physically measure the distance from a known and noted physical location, and report the latitude and longitude of the location.

Two methods for automated condition monitoring of utility cut repairs were investigated during the course of this study. The first method involved the installation of radio frequency identification (RFID) tags in the repaired pavement and the use of RFID readers on pavement monitoring vehicles. The tags which were expected to be automatically identified by the readers would provide the location of the repair, as well as information about the company responsible for the repair. By correlating the location of the repaired patch with the roadway condition at or surrounding the patch, INDOT would be able to periodically monitor repairs for settlement, and also identify the utilities and contractors responsible for the pavement cut repairs. However, based on test results conducted by the RFID vendor on a pilot INDOT project, these tags could not be reliably detected by RFID readers mounted on the vans used by the Pathway roadway condition assessment system. Since further development and testing is being considered by the RFID vendor, the research team and the Study Advisory Committee of this study decided to evaluate a second method for automated monitoring.

The second method for automated condition monitoring involves correlating a pavement monitoring vehicle's global positioning system (GPS) location with the location information of utility cut repairs from the EPS, for automated identification of the repaired patches. After a patch is identified, the roadway condition at or surrounding the patch could be used as an indicator of the condition of the repair. To implement this method, accurate location information about each utility cut repair must be available in the EPS. The current EPS does not distinguish between utility cuts and "Cut-Road" permits. The second barrier to implementation is that INDOT's data collection vehicles currently report pavement condition at intervals of approximately 0.1 miles. Since an interval of 0.1 miles could contain several utility cuts, the research team recommends that the reporting interval be reduced to 0.01 miles for this method to work effectively.

## Further Investigation

### Degradation Fee/Billings for Defective Work

Utility cuts are known to reduce the service life of roadways. Thus, it is recommended that STAs impose a fee in addition to the permit fee to recover the cost associated with subsequent reduction in pavement service life due to utility cuts. The degradation fee also serves as an incentive to the utilities to coordinate their work with STAs' road construction projects, thereby minimizing the impact to roadways. The degradation fee charged must be fair to the utility contractors and should be technically justifiable. The fee should be reflective of the loss of serviceability of the pavement and could be determined based on the age and service life of the pavement, size of the cut, and so forth.

To alleviate issues related to poor utility cut repairs, STAs may choose to pursue the rework themselves, and later bill the cost of rework to the utility contractors. The outstanding balance for the cost of rework could be considered by STAs in the approval of future permits by a utility contractor. A topic for further investigation could be the implementation of degradation fees and billings for utility cut repairs.

### Warranties

This study also recommends the implementation of warranties on utility cuts that failed to achieve the desired smoothness as required by INDOT. These warranties would ensure that adequate measures are taken to preserve the quality of the pavement. Moreover, the utility contractors would be liable for any rework that may be required to achieve the specified level of smoothness. In addition, the warranties would also serve as a motivation for the contractors to perform high-quality work, in order to avoid rework.

### Prequalification

Utility contractors' failure to comply with INDOT specifications was one of the concerns that surfaced during the interviews with INDOT engineers. This failure to comply was attributed to the lack of familiarity of utility contractors with INDOT specifications. A common recommendation to address this concern is the implementation of prequalification for contractors performing utility cut repairs. By only permitting prequalified contractors, INDOT would be assured that its standards will be met. Effectively communicating the expectations by means of INDOT-led orientations and training programs could improve contractors' understanding of INDOT requirements.

## Recommended Citation for Report

Kumar, S. S., Abraham, D. M., Zamenian, H., Ranka, B., & Lobo, P. (2018). *Warranty utility cut repairs (QC/QA of utility cut repairs)* (Joint Transportation Research Program Publication No. FHWA/IN/JTRP-2018/13). West Lafayette, IN: Purdue University. https://doi.org/10.5703/1288284316780

View the full text of this technical report here: https://doi.org/10.5703/1288284316780

Published reports of the Joint Transportation Research Program are available at http://docs.lib.purdue.edu/jtrp/.