Pavement Cuts for Utilities - A Guide for Their Management

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PAVEMENT CUTS FOR UTILITIES: A GUIDE FOR THEIR MANAGEMENT

J. M. Iddins and C. F. Scholer

October 1984
Publication No. H-84-6

Purdue University—School of Civil Engineering
in cooperation with
Indiana Department of Highways
Indiana Association of County Commissioners
Indiana Association of Cities and Towns
Federal Highway Administration
PAVEMENT CUTS FOR UTILITIES
A GUIDE FOR THEIR MANAGEMENT

J. M. Iddins
and
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INTRODUCTION

The conditions of our city and county streets are of increasing interest to the motoring public. The public is paying more fuel tax, but receiving less in terms of smooth-riding quality roads. In fact, the rough-riding surface causes the motoring and bicycling public to spend thousands of dollars each year for front-end alignments and other repair work on their automobiles, trucks and bikes. The public is turning to local city and county governments and for answers about the poor road conditions.

Even with increased fuel taxes, city and county officials must maintain their roads and streets with low budgets and few personnel. The reason for this is that the majority of local public agency budget increases must go to salary increases, and fixed costs such as increased insurance, fuel and equipment. Therefore, actual working funds remain at low levels. The low budgets force city and county engineers to cut back on important programs like street cut repair control. Street cuts are becoming a major problem because utility contractors are often not sufficiently controlled by utility, city and county officials. Some contractors, and local government work crews have taken advantage of the lack of control by repairing the street cuts improperly. As a result of this practice, many street cut repairs fail.

Street cuts are made by a variety of organizations. While some utilities make their own street cuts, most large utilities subcontract their repairs to local general contractors. Many cities own utilities, such as a water company. The Public Works Departments in these cities handle all street cuts for the city-owned utilities. Plumbers may be contacted by homeowners to connect their homes to city water mains. Thus, even plumbers are involved in making street cuts. No matter who owns the utilities or who does the work, the same standards should apply. In this document, contractors, plumbers and utilities making street cuts will be referred to as “utility contractors.”

This manual was written to show the methods which work well for several states, counties and cities. The purpose of this manual is not to have every city and county rewrite and reorganize their entire street cut program. The cities and counties with incomplete programs may improve or round out their programs. The contents of this manual should not be used as specifications, but as a guide to develop a set of specifications and procedures. The research for this manual was conducted through personal interviews, telephone calls and letters to state, county, city and utility engineers. States were contacted because cities and counties usually develop their material from state specifications. The State Highway Departments or Departments of Transportation of Indiana, Kentucky, Tennessee, Michigan, Illinois and Ohio were contacted. The Indiana city engineers of Indianapolis, Valparaiso, Kendallville, West Lafayette, Lafayette, Bedford, and Alexandria were contacted. Only one county engineer was contacted because most street cuts are made in cities.
SPECIFICATIONS AND PROCEDURES

Procedures for utility contractors to follow when making road cuts have been developed by most cities and counties within Indiana. These procedures vary greatly from city to city or county and county. This chapter is designed to aid in the development or improvement of specific procedures. The whole object is to provide citizens the most service for their tax dollars. These guidelines were developed by consultation with several state highway departments and county and city engineers.

The main points of detailed policies and procedures are listed below. Each is then briefly discussed.

- Performance Bond
- Permit
- Specifications
- Inspection Procedures
- Emergency Procedure
- Penalties

Performance Bonds

Surety (performance) bonds should be required for utility work and occupancy on city or county roads. The bonds are intended primarily to guarantee prompt and satisfactory replacement and repair of facilities that may be damaged or disrupted by the utility contractor’s operations. The amount of the performance bond varies among local governments. One method of determining the amount is to set a flat rate, a minimum of $2,500 (1981 figure). The other method is to have the monetary value of the bond based on the potential for road damages.

The bond should remain in force until the work complies with standards, and all permit matters are complete to the satisfaction of the engineer (inspector). The normal period to hold a performance bond is one to two years. The bond should not be released until the repair is reinspected. Examples of standard performance bonds are presented on the next page. Most cities consulted require the utilities to maintain a standing performance bond. Therefore, one is not needed for each cut. [1]
SURETY BOND  
(For Utility Permits)

KNOW ALL MEN BY THESE PRESENTS:

That we ___________, ___________, PRINCIPAL, and
___________, ___________, SURETY, are
held and firmly bound unto the DEPARTMENT OF TRANSPORTATION,
Bureau of Highways, of the State of Tennessee to perform
the work described in the Application and Utility Use and
Occupancy Agreement attached hereto and requested this the
____ day of __________, 19___, in the
manner prescribed in said Application and Agreement and to
repairs or replace any portion of pavement, shoulders, bridges
or any other part of the highway described in said Agreement
which may be damaged as a result of the work heretofore
referred to. We do hereby agree to repair or replace any
damaged portion of said highway in accordance with the
Standard Specifications for Road and Bridge Construction of
the Department of Transportation, Bureau of Highways, of the
State of Tennessee. In the event such repairs or replace-
ments are not made in a manner satisfactory to the Department
of Transportation, Bureau of Highways, of the State of
Tennessee, we hereby agree to reimburse said Department of
the cost of such repairs.

RUNNING SURETY BOND

(For Utility Permits)

WHEREAS, it will be necessary, from time to time for
such work to locate utilities on and to
perform work on State Highway rights of way within the
County (Strike one) of ___________, Tennessee,
after applying for and being granted an Application and Utility
Use and Occupancy Agreement with the Department of Trans-
portation, Bureau of Highways, of the State of Tennessee for
each such installation and,

WHEREAS, in consideration of the entering into Applica-
tion and Utility Use and Occupancy Agreements by the
Department of Transportation, Bureau of Highways, of the State
of Tennessee,

We, ___________, ___________, PRINCIPAL, and
___________, ___________, SURETY, are held and
firmly bound unto the Department of Transportation, Bureau of
Highways, of the State of Tennessee to perform any work within
County (Strike one) of ___________, Tennessee,
subject to the requirements as stated in said Application and Utility Use and Occupancy
Agreement between ___________, ___________, and the Depart-
ment of Transportation, Bureau of Highways, of the State of
Tennessee, as applied for and granted after the __ day of
________, 19___, in the manner prescribed in each
of said respective agreements and to replace or repair any
portion of pavement, shoulders, bridges or any other part of any highway described in said respective agreement which may be
damaged as a result of the work performed heretofore referred to.
We do hereby agree to repair or replace the damaged portions of
said highways in accordance with the Standard Specifications for Road and Bridge Construction of the Department of Trans-
portation, Bureau of Highways, of the State of Tennessee. In the
event such repairs or replacements are not made in a manner satisfactory to the Department of Transportation, Bureau of
Highways, of the State of Tennessee, we hereby agree to reim-
burse the Department of Transportation, Bureau of Highways for the costs of such repairs.

We do bind ourselves in the sum of $___________,
for a term beginning the __ day of __________, 19___,
until proper release is received from the Department of
Transportation, Bureau of Highways, of the State of
Tennessee.

NOW, THEREFORE, the PRINCIPAL AND SURETY assume all
obligations and liabilities as set forth above.

SIGNED, SEALED and dated this the __ day of
________, 19___.

PRINCIPAL

BY

SURETY

BY

SURETY Company No. _____________

Mailing Address of Surety Company _____________

Name and Address of Agency Writing Bond _____________

A copy of the Power of Attorney properly executed by the
company authorizing the agent signing above to bind the
company as SURETY on this bond must be attached hereto.

TRANSPORTATION, Bureau of Highways, of the State of Tennessee for each installation for which an Application and Utility Use and Occupancy Agreement was entered into between the PRINCIPAL and said Department from the date last above written until the termination of this Bond as provided
for hereinafter. It is expressly understood and agreed that the above sum represents the total aggregate liability under
this Bond on all work performed under Agreements issued as
aforesaid but not properly released by said Department.

This Bond may be terminated by the SURETY following the
issuance of written notice of intention to terminate by certified
mail to the Utilities Engineer, Department of Transportation,
Bureau of Highways, of the State of Tennessee, Nashville,
Tennessee, 37219, and said termination will become effective
thirty (30) days after receipt of said notice. Proper termina-
tion notice notwithstanding, PRINCIPAL and SURETY will remain
bound to the State of Tennessee under the terms hereof and be set
out for the performance of any projects, with SURETY (strike one) of ___________, Tennessee, for which Application
and Utility Use and Occupancy Agreements were entered into
between the date last above written and said date of termination,
until proper release is received from the Department of Trans-
portation, Bureau of Highways, of the State of Tennessee for
each of said projects.

NOW, THEREFORE, the PRINCIPAL and SURETY assume all
obligations and liabilities as set forth above.

SIGNED, SEALED and dated this __ day of
________, 19___.

SURETY Company No. _____________

Mailing Address of Surety Company _____________

Name and Address of Agency Writing Bond _____________

A copy of the Power of Attorney properly executed by the
company authorizing the agent signing above to bind the
company as SURETY on this bond must be attached hereto.

Figure 1: Examples of Standard Performance Bonds
Permits

Most highway and street departments require a permit for utility contractors allowing them to make roadway cuts. The permit procedures vary greatly with the agencies consulted.

Permit costs in the states consulted seem to range from no charge to $40. States with no charge permits usually bill the utility contractor separately for inspection services. The permit cost is usually charged per 500 feet of road. Therefore, under the flat 40 dollar system, a utility trench 1000 feet long would cost $80.00. The 40-dollar permit fee usually takes care of inspection services. A combination of both methods seems well adapted for city use. A small 5 to 10 dollar handling fee and a later bill for the amount of inspection services performed is recommended. The amount charged should be stated in with the procedures and specifications. The cost for inspection should be charged per trip and not per hour. A fair charge would be $10 to $15 per visit.

APPENDIX 2A
INDIANA STATE HIGHWAY DEPARTMENT PERMIT FORM

State of Indiana
Department of Highways

Permit:

Type of Permit:
☐ Cut Road
☐ Pave Lane
☐ Bridge Approach
☐ Miscellaneous

Driver's Name:

Sub District:

Telephone:

Project Location:

Project Description:

Project Purpose:

Bond Required: ☐ Yes
☐ No

PERMIT FEE: $-

Special Provisions:

This permit is valid for one year from the date of issue and will be canceled on receipt of the bond. Any person desiring to make any roadway cuts, including storm water inlets, shall obtain a permit from the Department of Highways, Indiana. A permit will be issued upon receipt of bond in the amount of $1000.00 and after satisfactory investigation. A permit fee of $25.00 must be paid upon application for the permit. The bond must be made payable to the State of Indiana and must be executed by duly authorized officers of a reputable surety company licensed by the State of Indiana. The bond must be secured in accordance with the provisions of Indiana Code Title 22, Chapter 5, Article 13. In the event of non-compliance with the terms of the permit or in the event of non-payment of any sum due, the surety company shall be liable to the State of Indiana for the full amount of the bond. This permit is subject to the provisions of Indiana Code Title 22, Chapter 5, Article 13.

INSP.

PERMIT APPLICANT SIGNATURE

DISTRICT PERMIT ENGINEER

DISTRICT ENGINEER

INSP.

Personally appeared before me

in applicant this day of 19

Witness my hand and the seal hereof done. My Commission expires.

INSPECTION

INSP. PRINTED

Figure 2: Indiana State Highway Department Permit Form
States require utility contractors to submit a copy of their work plans for street cuts. The states review the plans to ensure standards and specifications are being met. Cities usually do not require the submittal of plans. They only require that the pavement be replaced in "as good or better than original condition." This seems reasonable because cities do not have the work force that the states have to check all the permit plans. This is where specifications are important. They will be discussed in more detail in the next section.

Utility contractors have time schedules as well as any business. Therefore, the ability to be able to forecast a project's duration is important, including the time needed to obtain a permit. The time duration for permit approval should be well-defined for the contractors. Time durations for cities or counties will be much less than for states since plans usually do not have to be reviewed. A complete schedule by work days would be helpful for the utility contractors. Procedures for emergency cuts will be discussed later in this chapter.

---

**Figure 3: ISHD Permit Review Time Table**

<table>
<thead>
<tr>
<th>Step</th>
<th>Time (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>All applications are initially received at the District Office over the counter or by mail. The District is to verify all pertinent existing field conditions as described by the applicant. The application is reviewed for completeness and compliance with standards. It is forwarded to the Permit Department with recommendations.</td>
</tr>
<tr>
<td>2.</td>
<td>The Permit Department is to initially perform a preliminary review of the application for completeness and compliance with standards.</td>
</tr>
<tr>
<td>3.</td>
<td>The Permit Department forwards by memorandum to the Traffic Division the following information: a) Permit Form (SF 41768) b) Plans c) Traffic control plans d) Means and sequence of performing work e) Copy of memorandum from the District The Traffic Division is to review all information provided related to but not limited to: a) Traffic control at the time of work activity b) Effects on State Highway traffic and facilities c) Conflicts with future traffic construction projects d) Recommend unique special provisions The Traffic Division is to forward their recommendations either by note on the Permit Department memorandum for minor comments or by separate memorandum for more complicated responses to the Permit Department.</td>
</tr>
<tr>
<td>4.</td>
<td>The Permit Department collects and coordinates all Departments and District findings. A memorandum to the Assistant Chief, Division of Maintenance is prepared and forwarded containing the combined recommendations, the permit application form, the special provisions, the plans, and other information.</td>
</tr>
<tr>
<td>5.</td>
<td>The Assistant Chief, Division of Maintenance makes a final determination and the memorandum with instructions noted is returned to the Permit Department for final processing. If the permit is approved, the Assistant Chief signs the permit form.</td>
</tr>
<tr>
<td>6A</td>
<td>Approved permits are assigned a permit number, start date, expiration date, and special provisions are attached. The Permit Department distributes the copies of the issued permit to the District, the applicant, the Survey, and to file.</td>
</tr>
<tr>
<td>6B</td>
<td>Disapproved permits are assigned a denial number. A letter to the applicant with copies to the Survey and District is prepared for the Assistant Chief, Division of Maintenance signature. The letter states that the permit application is disapproved and the reasons(s) for the denial.</td>
</tr>
</tbody>
</table>

- Total (6B or 6A) |
- (6B for grading and drainage permit) |
- Excluding Mail Time
Specifications

The phrase "replaced in as good or better than original condition" is no substitute for an up-to-date set of specifications. Specifications are essential to quality street cut repairs. All states consulted have specifications, while very few cities and counties do. The specifications should be used by inspectors during their inspection of the repair. Specifications help to ensure that the essential features for proper street repair are upheld. The features are:

- Integrity of the pavement structure, shoulders, and embankment slope
- Restoration of the structural integrity of the entrenched roadbed
- Security of the pipe against deformation likely to cause leakage
- Assurance against the trench becoming a drainage channel
- Assurance against drainage being blocked by the backfill

These are all important points which the specifications and inspectors are there to protect.

Example of Material Specifications
(Not: All numbers refer to Indiana State Highway Standard Specifications-1978)

Hot Asphalt Emulsion (AE) Pavement
(Section 402)

The materials shall conform to the requirements set out in the following referenced subsections.

402.02 Aggregates.
402.03 Bituminous material.
402.04 Preparation of mixtures.
   Composition Limits for:
   Base No. 4, No. 5
   Binder No. 8, No. 9
   Surface No. 11-III, Type IV

The base, binder and surface mixtures specified above, shall be made using coarse aggregate in combination with fine aggregate and a percent of bitumen, as specified in the "Job-Mix Formula" of the "Indiana State Highway Standard Specifications - 1978" (Subsection 402.04-b).

Hot Asphalt Concrete Pavement
(Section 403)

The materials shall conform to the requirements of the subsections referenced below.

403.02 Aggregates.
403.03 Bituminous material.
403.04 Preparation of mixtures.
   Composition Limits for:
   Base No. 4, No. 5
   Binder No. 8, No. 9
   Surface No. 11-B

The base, binder, and surface mixtures specified before, shall be made using coarse aggregate in combination with fine aggregate and a percent of bitumen, as
specified in the “Job-Mix Formula” of the “Indiana State Highway Standard Specifications - 1978” (Subsection 403.04-b).

**Cold Mixed Bituminous Pavement**  
*(Section 406)*

Materials shall conform to the subsections listed below.

406.02 Aggregates and Bituminous material.

Coarse Aggregates:

- For Base Mixtures (open graded)  
- For Base Mixtures (dense graded)  
- For Binder Mixtures  
- For Surface Mixtures  
- Natural Sand Surface  
- Bituminous Material for Mixture.  
- For Stockpiling, Asphalt  
- Emulsion AE - 150

Prime Coat  
*(Section 408)*

Materials should conform to the requirements of the subsections listed below.

408.02 Bituminous material.

- Cut-Back Asphalt, MC - 70  
- Asphalt Emulsion, AE - P

408.03 Cover Aggregate.

- Coarse Aggregate  
- Fine Aggregate

Tack Coat  
*(Section 409)*

The type and grade of bituminous material shall be as set out and referenced below, or as specified.

409.02 Bituminous material.

- Asphalt Emulsion, AE - T  
- Cut-Back Asphalt, RC - 70

Backfill (“B” Borrow)  
*(Section 211)*

Structure backfill material shall conform to the requirements set out in Subsection 211.02 of the “Indiana State Highway Standard Specifications - 1978.”

Some utilities may prefer to use alternate specifications. It is a good policy to let the utility use its own specifications, meeting minimum standards. The specifications should be reviewed by the city or county engineer. It is important to maintain a good working relationship between the engineer and the utility.
Items which should be included in a good set of procedures are:

- Bonds
- Permits - with clause for emergency cuts
- Traffic control procedures
- Required materials
- How to make a cut
  - a. Pavement cut
  - b. Backfill and density check
  - c. Pavement restoration
- Long term responsibility for the cut
- Alternatives to street cuts
- Penalties for non-compliance

**Inspection Procedures**

The inspection phase of street cuts is important to the quality of the finished product. The street cut restoration done within any Indiana city or county will be no better than the inspection effort put forth by the Permit Office and other city agencies. In addition, the Permit Office must have enforcement mechanisms available for dealing with contractors who do not obtain permits or who perform work in violation of city codes, specifications or policies. Therefore, all street cuts should be inspected. It is recognized that most cities and counties do not have the manpower to furnish a thorough inspection program. Somewhere in the policies and procedure it should be stated:

Any inspection by the city or county shall in no way relieve the utility owner of any duty or responsibility to the general public nor shall such services and/or control by the city or county relieve the utility owner from any liability for loss, damage or injury to persons or adjacent properties. [16]

If large projects require constant surveillance, then an inspector should be assigned to the project.

The inspector should make sure all repairs are made in accordance with stated specifications and codes. Failure to install facilities in accordance with these policies should result in immediate action. The inspector should advise the utility contractor to suspend further construction activities at that site until corrective measures have been made to the satisfaction of the city or county. [16]

A good policy is to have the utility contractor call the Engineer’s office 24 hours before the cut is to be made. This gives the city or county time to schedule an inspector to the repair. Some cities and counties require a call when the firm is ready to backfill. This may impede the work, but it should greatly increase the quality of the street repairs. [4]
The immediate inspection is important, but continual surveillance for settlement or failure can also improve quality. Procedures for failure or settlement will be discussed in a later section. One idea imposed by some states on utilities is paint markings on the repaired surface. The Indiana State Highway Department uses the national color code listed below.

1) Safety Yellow  
2) Safety Orange  
3) Safety Blue  
4) Safety Red  
5) Safety Green  
6) Safety Gray  
7) Safety White  
8) Safety Pink  

<table>
<thead>
<tr>
<th>Type of Permit</th>
<th>District</th>
<th>Sub-District</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overhead</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Driveway</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cut Road</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire Line</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arterial</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Permit Inspection Report and Cost Summary**

To: Chief, Division of Maintenance and Engineer of Permit

This is to inform you the work in the referenced permit has been thoroughly inspected and found to be as checked in the box below.

Date of Inspection:

☐ COMPLIES — (The work has been completed according to all provisions outlined in the permit and final approval is granted.)

☐ DOES NOT COMPLY — (The applicant has been informed to make the following corrections to comply with the permit provisions.)

☐ CANCEL — Explain:

Notify Survey or Bond Number:

Release Survey on Bond Number:

☐ No inspection fees are to be charged.

☐ Inspection costs are shown on reverse side of this report.

The following is an itemized cost summary for services performed on the referenced permit:

<table>
<thead>
<tr>
<th>STATE EMPLOYEE</th>
<th>Date</th>
<th>Hours</th>
<th>Hourly Rate</th>
<th>Labor</th>
<th>Overhead</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>VEHICLE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sub Total:</td>
</tr>
<tr>
<td>OTHER</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sub Total:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total:</td>
</tr>
</tbody>
</table>

**Figure 4: ISHD Inspection Form**
The above colors are used to paint a 2" x 4" rectangular patch on the curb side to identify the cut (or a 3" diameter disc at the leading edge). This paint should be maintained by the utility for one year after the repair is made. This way the local agency can immediately tell which utility is responsible for the settlement or failure. Below are locations where the paint can be purchased.

Perfection Paint & Color Company, Inc.
715 East Maryland Street
Indianapolis, IN 46202
Phone: (317) 632-4311

Perfection carries all the colors in Aerosol spray cans with inverted tips. The paint is $2.95/can and must be bought by the 12 can case for $35.40.

Fox Valley Marking Systems, Inc.
172 South Northwest Highway
Dept. 968
Cary, IL 60013
Phone: 800-323-4770 (Toll Free)

Fox Valley carries all the colors except gray and pink in Aerosol spray cans with inverted tips. The paint is $2.17/can and must be bought by the 12 can case for $26.00.

Local paint dealers should also be consulted to see if they can obtain these specialty items. [4]

**Emergency Procedures**

Sometimes emergencies arise that demand repairs immediately, especially with gas and water utilities, which demand repairs immediately. Therefore, the city or county engineer should have set procedures with which utilities are familiar for handling these situations. A good policy, which seems to work well for several cities, counties and states, is a requirement that utilities notify the permit office by phone. At night, there should be a designated person to handle the call so that the utility can be issued a permit number. The permit number allows the company to begin work immediately. The utility must come into the Permit Office the next day to complete the permit application and pay the fee.
Figure 5: ISHD Preliminary Application for Emergency Cuts

Penalties for Non-Compliance

There are generally good relations between the local governments and utility companies. The most effective enforcement mechanism for a contractor caught doing work without a proper permit is the issuance of an ordinance violation ticket by an inspector or the police department. Consideration should be given to raising the minimum fines for such code and ordinance violations. Forwarding copies of letters detailing problems relating to a particular company to the Better Business Bureau has proven to be an effective mechanism for obtaining compliance with city codes, requirements, procedures, and policies. [4]

When settlement of a street cut occurs, an established policy for handling this kind of situation is important. If the area to be repaired does not endanger the public, the recommended action is to notify the proper utility to make the repairs. A specific time period should be designated, such as two weeks. If the repairs are not made within this period, city or county forces should make the repairs and bill the utility. The utility contractor should not be issued any more permits until its current bill is paid. If the utility contractor refuses, the bonding company should be notified. This policy would not work for utility companies. Limiting access to the right-of-way would only hurt the customers. Therefore, in the case of utility companies, if the initial fine is not paid in two weeks, it should be doubled, or some similar procedure should be followed. The county and city engineers should have an agreement on this policy with utility companies. It should be stressed that good relations and communication with utilities can prevent such situations as the one described above.
Along with the above methods and procedures, several other characteristics of a good street cut program are common to cities and counties. One of the most common procedures is the follow-up inspection. For all street cuts, the follow-up inspection should be done 6 to 12 months after the repair. For individual contractors an additional inspection should be done one to two years later, before the performance bond is released. Good communication between county, city and utility engineers is another common characteristic. Many cities and counties had monthly meetings with all the utilities present to discuss problems or future plans of the city, county or utilities. For example, letting the utilities know well ahead of time about any road construction is important. The utilities need to be able to get their repairs done before road crews start. The importance of good communication cannot be stressed enough.
TESTING

The only way to ensure quality street cuts is through a thorough program of inspection and testing. This section of the chapter will present the various methods practical for cities and counties to use in testing base material compaction of street cuts. Most cities and counties will not have the manpower to do their own testing. Therefore, one way to develop a program is by calling in a consultant. Several testing firms in the Indianapolis area were consulted for prices. It must be emphasized that every utility repair does not have to be tested. It is recommended that the consultant, if hired, should work four to eight hours per week. The consultants interviewed said the charge for this would be $60/4 hours or $120/8 hours (May 1983). Three tests could be made per hour. This should be plenty of tests for a county or town. The price is reasonable if it helps reduce street cut settlement. Working with local consultants gives the Engineer’s office considerable flexibility. The consultant furnishes the equipment and manpower. If funds begin to run low, the testing can be reduced or stopped. [5]

For counties and cities that wish to do their own testing, there are basically two types of tests: destructive and non-destructive. The destructive tests disturb already-compacted material. Non-destructive tests can determine density without disturbing the compacted material. The non-destructive tests are preferable, but the cost can be prohibitive. This is especially true of nuclear testing.

- Nuclear Gage Monitoring Equipment
  - $3400 + 100
  - Initial 5-7/person
  - $2.75/badge every two weeks

Although the initial cost is high, it is a valuable method because of its speed and accuracy.

Most cities and counties do not have the funds available for modern nuclear testing so several methods are presented. The inexpensive methods recommended are the Sand Cone and the Clegg Impact Tester.

Clegg Meter $1200-$1300
Lafayette Instrument Co.
P. O. Box 5729
Lafayette, IN 47904
Phone: (317) 423-1505
These two tests can be used with state standard base materials to develop standard compaction methods. The Clegg Impact tester can then be used to field check the compaction.

No matter which means is selected, the testing will enable the inspectors to see if the utility contractors are meeting compaction standards. If they are not, penalties must be established. Most utility contractors will not change their procedures until fines are issued. A testing program with penalties for non-compliance should encourage utility contractors to do a better job the first time around. [2]

All the methods presented are valuable for checking the backfill of street repairs. Since cities and counties generally have budget and manpower shortages, the Clegg Impact Tester is recommended. Because it is inexpensive and easy to use, it has an advantage over the other methods.
TRAFFIC CONTROL FOR STREET CUTS

Traffic control for street cut repairs is very important. The public is no longer tolerant of unsafe practices of county, city and utility forces. Motorists involved in accidents due to poor traffic control at a street cut repair, are likely to sue the negligent party. Counties and cities do not have the funds to handle legal fees and penalties for unsafe practices. Therefore, counties and cities must take extra precautions to be sure the roadway is safe at all times. The main reason for adequate traffic control should be safety for the workers and motorists instead of avoiding costly legal expenses.

There are basically three important components of traffic control:

- To get the work done
- To keep the traffic moving with minimum disruption
- To maintain safety

Public agencies with authority over the roadway are primarily responsible for seeing that the above criteria are met. They should establish and maintain current, up-to-date specifications. Utility Contractors must realize that any specifications used serve only as minimum standards for the most common situations. This is because it is not practical to develop detailed standards to meet all situations that may conceivably arise. Anything other than standard procedures can be confusing to the public. [11]

The public agency should have thorough inspection procedures to ensure that the utility contractors comply with established specifications. The Indiana State Highway Commission has developed an Indiana Manual on Uniform Traffic Control Devices. The 1981 manual has a complete section (Part VI) devoted to construction and maintenance which covers “Traffic Controls for Street and Highway Construction and Maintenance Operations”. Most cities and counties have developed their specifications using this as a guide and require their specifications be used in conjunction with the manual.

Once the specifications have been established, utilities doing the work or having the work done share the safety responsibility with the public agency. At the job site, once the work begins, each worker is responsible for his/her safety, other workers’ safety and safety to the motorist. The foreman takes direct responsibility for all workers’ safety and the safety of the motorist. Safety is achieved by advance warning for motorists, visibility, protection of the work area and clear directions to traffic. [15]

HERPICC is constantly updating its library of material on safety. Presently, there are three slide tape presentations on Traffic Control at the job site. They are:
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- No. 1200 Selection and Use of Traffic Control Devices
- No. 1300 Safety: The Mark of a Professional I
- No. 1400 Safety: The Mark of a Professional II

These slide tape presentations can be obtained by calling HERPICC at 800-428-7639, toll-free. The presentations can be shown to local crews during lunch or on a rainy day.

Traffic control and safety at street cut repairs are essential for protecting the workers and the motorist. This seems to be the area where most utilities or contractors hired by utilities are negligent. It is hard to say if the utility, the public agency or the workers are at fault. Therefore, it is important that the public agency take the initiative for traffic control and safety by establishing a well-defined program of specifications and inspection.
METHODS OF COMPACTION

In counties and cities street repairs are usually backfilled with the excavated material. Granular material should be used if possible, except in clay soils. If granular material was used in a clay soil, the utility trench may become a drainage channel. Therefore, granular material is not always the best backfill. Granular backfills are also more expensive than the excavated material. The excavated material can be used for backfill if the boulders (larger than three inch diameter) are removed and are compacted to its original density. Also, after excavation and during the actual repair of the utility, care should be taken to protect the fill from moisture loss. This can be accomplished by covering the material with a tarpaulin. During hot dry weather the material should be lightly sprinkled every 30-40 minutes. Counties and cities must keep close control on utility contractors if excavated material is used for backfill.

Compaction and Stabilization Methods

Once the inspector or utility contractor at the repair site determines that the excavated material is unsuitable for fill, he must make several decisions. Should the material be replaced or treated (with cement, lime or bitumen) to produce an adequate fill? A common fill used to replace poor material in Indiana is the coarse aggregate 53-B (Indiana Department of Highways' classification). Used with the right compaction methods, this material can produce an inexpensive quality fill. Compaction of coarse aggregates will be discussed later.

One alternative to replacing the fill material, previously mentioned, is using cement, lime or bitumen to improve the soil characteristics. These substances can be fairly expensive when used over large areas. The majority of street cut repairs are only about 25 square feet in area. Using these materials should produce fewer repair failures. Failures mean the utility contractor must return to the site and redo the repair or patch the road. Therefore, the use of these materials could be economical for this size of street cut repair.

For granular backfill there are several means of compaction. Fine aggregates (sand) can be compacted or stabilized by mechanical compactors, saturation and chemical means. When mechanical compaction is used, the size of cut may determine which mechanical compactor is selected. For large open cuts, some type of vibratory plate compactor should be selected. For smaller excavations, a smaller compactor like the Bomag Soil Tamper T50 (118 lbs) or the Stomper VR-15 (135 lbs) is satisfactory. Any type of compactor similar to these could be used. These are the ones used by the Indiana State Highway Department in their Pothole Repair Study. Saturation is the most common method for bringing sand to its proper relative compaction. Saturation is quick and easy, but should not be used when the repair is surrounded by a soil with a high percentage of clay. Local ready-mix suppliers can deliver a slurry sand mix. This is just a saturated sand which will flow around utilities and need no further compaction. Local suppliers consulted sell this material for $12.50/ton. Portland cement is the chemical
means of stabilizing a fine aggregate backfill. [12]

Due to the expense of portland cement, mechanical and saturation are the most common means used to reach the specified relative compaction of fine aggregates.

For coarse aggregates, the most widely used method of compaction is mechanical compaction. Some moisture is added to lubricate the particles. The size of the cut, as with the fine aggregates, determines size of compactor to be used. For large areas a vibratory plate, Bomag T70 (175 lbs) or Wacker GVR 2201 (105 lbs), would be selected. For smaller areas the Bomag T50 (118 lbs), Stomper VR-15 (135 lbs) or similar machine should be used.

As discussed earlier, when soil is used for backfill, the material should be compacted in six inch loose lifts. Sprinkling the backfill before each compaction should help to achieve a higher density than if compacted dry. The compactors mentioned earlier should also be used on soils to achieve adequate compaction. Soils can also be stabilized by the chemical means mentioned earlier.

Another method similar to the chemical stabilization methods is a controlled density fill. Controlled density fill (CDF) can be made to densities of 90 to 135 pounds per cubic foot and compressive strengths can be produced from low to 1600 psi. Local site materials are selected for use in the mix. Controlled density fills will flow around structures and no special finishing is needed. The mix needs to be protected from loads for four hours. CDF can be easily excavated without caving in or running. The controlled density mix is available through local ready mix concrete suppliers under a licensing arrangement with:

Brewer & Associates
P. O. Box 7239
Toledo, Ohio 43615

The mix is composed of cement, fly ash and other locally available materials. Controlled density fills are best used when a large quantity of backfill material is needed. It would not be practical to call a concrete mixer out for a small street cut repair. [3]

- CDF needs no tamping labor.
- CDF can be made to any consistency.
- CDF flows readily in and around pipes.
- CDF can easily be made to meet density and/or strength specifications.
- CDF can be applied without forms or support.
- CDF can be worked on within hours under normal conditions.
- CDF can be cut or trenched without caving in or running. [3]
Conclusion

The actual compaction and consolidation of the backfill and surface material is extremely important in order to produce a long lasting quality street cut. Cities and counties should consider setting up an inspection and testing program. This was discussed in the testing chapter, but is re-emphasized here.

Methods for repairing street cuts are presented in the Foreman manual. These are presented as a guide for cities and counties to up-date or develop their own specifications. It must be stressed that clear communication to the utility contractors of their obligations, when they make road cuts, is essential. No fines should be issued until the utilities are informed what is required of them. A good policy, which the Indianapolis Department of Transportation instated is: before a permit is issued, the utility or contractor, buying the permit, must purchase or show proof of ownership of a Right-of-Way Activity Manual. The Right-of-Way Activity Manual contains all the specifications and states all the liabilities of utilities or contractors working in the right-of-way. A Right-of-Way Activity Manual can be purchased by mailing $10.00 (May 1983) to:

DOT Permit Office
Room 2760 City-County Building
Indianapolis, IN 46204
ALTERNATIVES TO UTILITY CUTS

Utility pipes, beneath pavements, are subjected to various loads which cause them to crack, break and leak. Dynamic loads are constantly being applied to them through the base material by traffic. Sometimes breaks are produced by differential settlements caused by a wetting up or a drying out of the subsoil. People notice the street cuts immediately after a road is resurfaced. In some situations, this is the time when leaks begin. The old pipes are subjected to the heavy vibratory loads used to compact the bituminous surface. Most cities and counties refuse to issue street cut permits for a period of two to five years after the road is resurfaced, unless an emergency arises. There are many other reasons for requiring alternative methods to street cuts. Heavy traffic is one of these reasons.

Utility contractors have had to find other means to replace damaged pipes since street cuts were not allowed on resurfaced streets. Presently there are three methods of untouched construction used in Indiana. Old leaky pipes can be replaced by jacking, coring or boring. All three methods are being used and provide utility contractors with valuable alternatives to street cuts. Generally utilities call in specialty contractors to handle untouched construction.

![X-section of a road](image)

**Figure 6: Jacking, Coring or Boring of New Pipe**
Jacking is one of the most popular un trench ed methods in the state for pipes less than six inches in diameter. A casing or corrosion-resistant carrier must be used. Driving works most effectively in compressible soils. A steady thrust, hammering or vibrating is needed to drive the pipe with a pilot shoe. The city of Alexandria used a backhoe to provide the steady thrust. Driving should not be used for long distances. Long drives may wander far from the desired line and grade. [9,16]

Boring is another popular alternative to street cuts. Large pipes can be jacked through oversize bores, carved progressively ahead of the pipe. The auger should not exceed the outside diameter of the following pipe by more than 1 inch. The spoil is mucked back through the pipe. Line and grade are easy to control. A grout backfill shall be used for pipes more than 12 inches in diameter and for overbreaks, unused holes, or abandoned pipes. [16]

Coring is the third alternative to utility cuts. This method is used mainly when driving becomes too difficult in hard soils. Line and grade are fairly easy to control with coring. A small casing (six inches or less) without a pilot shoe is drilled into the difficult soil. The soil enters the pipe as it advances. Then the core is removed by sluicing, during or after the drilling. [9,17]

More cities and counties are turning to these methods to prevent traffic disruption and eliminate street cut settlements. City and county engineers should keep track of local contractors’ and utilities’ abilities to do un trench ed construction. As stated earlier, un trench ed construction is a specialty item that demands special skills.

Quality street cut repairs are possible. In fact, many are being made. But bad repairs are the ones people notice. City and county engineers can, without too much effort, greatly increase the quality of the street repairs in their county or city. After all, the local road user deserves the best smooth riding surface that their tax dollars can provide.
BIBLIOGRAPHY


