



# *Guidance*

## *Temporary Traffic Control For Work Zones on Unpaved Roads*



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**Work Zone Safety  
Consortium**

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# Preface

According to the U.S. Department of Transportation, Federal Highway Administration (FHWA), there were 1.4 million miles of unpaved roads in the United States in 2012. Unpaved roads account for about 35% of the more than 4 million miles of roads that make up our nation's transportation systems.<sup>1</sup> About 1.3 million miles of these unpaved roads are in rural areas where local jurisdictions have ownership of about 1.2 million miles.

Temporary traffic control (TTC) is required any time work is performed within the right-of-way of an unpaved road, just as for paved roads. As on paved roads, TTC plans for unpaved roads should be developed by a trained individual. All TTC plans must comply with local regulations and ordinances and should take into account recommended practices from the national *Manual on Uniform Traffic Control Devices* (MUTCD).<sup>2</sup> A TTC plan should be developed for all work operations conducted on all roadways open to public travel.

## Objectives

The purpose of this guidance document is to assist agencies responsible for maintenance and construction on unpaved roadways in identifying appropriate TTC for these activities. Typical maintenance activities include grading and pulling debris from ditches, while typical construction activities include resurfacing and reconstruction.

Users of this document will:

- gain an understanding of the ACTIVITY AREA of a TTC zone on an unpaved road,
- review the need to warn the traveling population of work zone operations on an unpaved road, and
- review safety devices used on equipment when working on an unpaved road.

This document is organized into the following sections:

- Temporary Traffic Control (TTC) Concepts for Unpaved Roads
- Types of Work Zone Activities on Unpaved Roads
- TTC Plans

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# Temporary Traffic Control for Work Zones on Unpaved Roads

## Introduction

Unpaved roads typically serve fewer than 3,000 vehicles per day and are used by a wide range of vehicles (automobiles, farm equipment, large trucks, etc.) at high speeds (55 mph or more) depending on the location and characteristics of the roadway.<sup>1</sup> Below are descriptions of some features.

- Unpaved roads can be relatively narrow, some less than 12 feet in total width. Examples of such roads include those owned by the U.S. Forest Service (FS), the U.S. Bureau of Land Management (BLM), and the U.S. Bureau of Indian Affairs (BIA).
- Traveling over unpaved surfaces (such as gravel or natural surfaces) can generate dust, resulting in reduced visibility and other temporary work hazards.
- Washboards, potholes, loose material, and inconsistent grades on unpaved road surfaces may affect drivability and vehicle control.
- Maintenance occurs fairly frequently on unpaved roads, at least twice a year and as often as once a day on more heavily traveled unpaved roadways.
- Stopping distances are much longer on gravel and natural surfaces than on paved surfaces.
- Most unpaved roads follow the natural grade of the terrain. This may include a number of horizontal and vertical curves that limit the sight distance of approaching motorists.
- Due to the nature of the low-volume unpaved road, the traveling public does not expect to encounter other vehicles.

Maintenance personnel, utility workers, and other staff working in the right-of-way must consider all these characteristics when designing and deploying temporary traffic control (TTC) on unpaved roads.



**TTC on unpaved road** (Source: Jo Michele Sheridan).

Responsibility for the design, placement, operation, and uniformity of traffic control devices (TCDs) on unpaved roadways rests with the public agency or official having jurisdiction, or, in the case of private roads open to the public, with the private owner or private official having jurisdiction. Unpaved road owners are primarily local agencies, as well as the Forest Service, the Bureau of Land Management, and the Bureau of Indian Affairs. Other agencies such as state DOTs and private organizations own a much smaller portion of the 1.4 million miles of unpaved roads in the U.S.



**Example unpaved road owned by the U.S. Forest Service** (Source: *UnPaved Roads Less Traveled* Blog).

## Temporary Traffic Control (TTC) Concepts for Unpaved Roads

TTC is required any time work is performed within the right-of-way of an unpaved road, just as for paved roads. The national *Manual on Uniform Traffic Control Devices* (MUTCD)<sup>2</sup> defines the primary function of TTC as “to provide for a reasonably safe and effective movement of road users through or around TTC zones while reasonably protecting road users, workers, responders to traffic incidents and equipment.” The MUTCD includes national TTC requirements for work zone operations on unpaved roads. Signs, channelizing devices, and work vehicle lights can all be used to provide TTC on these roadways. The choice, number, and location of these devices vary by the type of work performed, its duration, and the location of the work within the roadway right-of-way.



In general terms, work zone TTC serves the following three purposes:

- to warn about changes in the roadway surface, equipment, or personnel in or around the roadway or about unexpected conditions ahead so that the motorist will exercise caution;
- to provide clear and positive guidance to all road users (motorists, bicyclists, and pedestrians) approaching and passing through the TTC zone; and
- to reflect the current condition of the roadway.

## Temporary Traffic Control (TTC) Requirements

The national MUTCD<sup>2</sup> defines these four key areas of a work zone, each with distinctive TTC requirements:

- advance warning area,
- transition area,
- activity area, and
- termination area.

**Advance Warning Area** The ADVANCE WARNING area tells road users what to expect. Depending on the work performed and work zone site characteristics, TTC in the ADVANCE WARNING area may be a single sign, a series of signs, or high-intensity rotating, flashing, oscillating, or strobe lights on a work vehicle.

As an example, consider a short-duration operation on a low-volume, unpaved road with adequate sight distance in both directions, in which neither the work nor the traveling public creates dust clouds obscuring the work area. In this operation, sufficient advance warning may be achieved with the high-intensity lights on a work vehicle. Conversely, a work operation that is not clearly visible to the traveling public and requires motorists to modify their path may require the full series of advance warning signs. Selection of the appropriate advance warning devices should be accomplished by an individual who is well trained in TTC concepts and procedures.

**Transition Area** The TRANSITION AREA redirects road users out of the normal path. TTC requirements in the TRANSITION AREA also depend on the work operation and site characteristics. Light grading operations with sufficient sight distances in both directions, in which neither the work nor the traveling public creates dust clouds, may rely on high-intensity flashing lights to indicate a need for approaching motorists to leave the normal travel path. By contrast, in operations where sight distances are limited and where motorists must

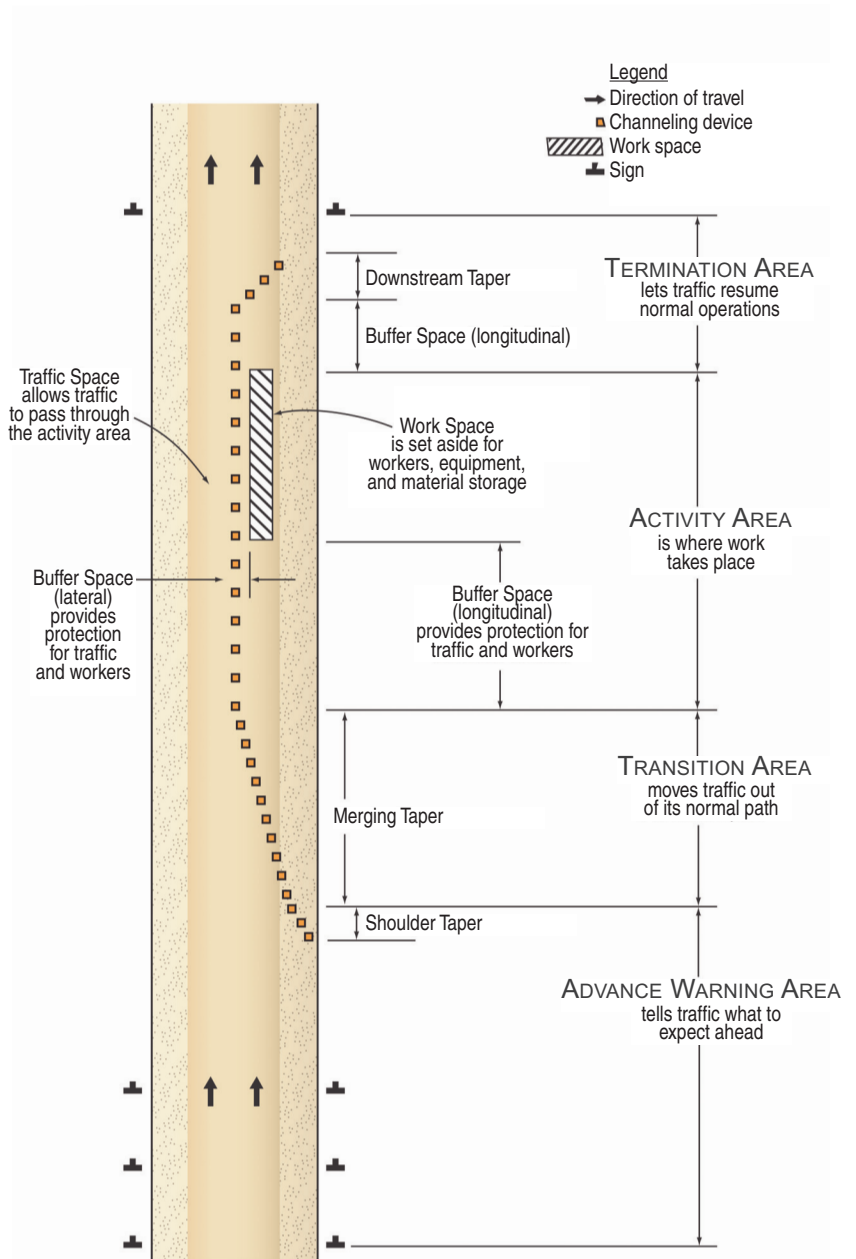


Figure 1. Component Parts of a TTC Zone.

leave the normal travel path for significant distances, a full series of channelizing devices may be needed to delineate where motorists must leave the lane. Typically, these types of operations will also require flaggers or other means of alternating one-way lanes around the work area. This TTC may need to be installed a significant distance from the workers and equipment. Further, when flaggers are used, they should be properly trained and equipped with a stop-slow paddle.<sup>3</sup>

**Activity Area** The ACTIVITY AREA is where the work activity takes place. As with paved roadways, unpaved roadways may require a number of spot maintenance activities including drainage repair and replacement, approach grading, and sign repair and replacement. For these activities, the TTC and the Traffic Control Plan (TCP) on paved and unpaved roads are interchangeable .

An activity unique to unpaved roads is the process of reshaping the road surface. This is accomplished using a motor grader/maintainer to cut the gravel surface and remove material from the surface, place the material into a berm or windrow, and then spread the material across the full width of the unpaved road. This process is described in the *Gravel Roads Construction and Maintenance Guide*.<sup>4</sup> Most agencies will rework sections of roadway one to two miles long, leaving the berm/windrow of gravel to be picked up with each pass of the grader. In the *Temporary Traffic Control Zone Layout* manual of the Minnesota DOT,<sup>5</sup> *Miscellaneous Layout 6K-72* provides a discussion of the safety equipment needed for the motor graders but does not describe how the berms or windrows can cause a hazard to the motoring public. This hazard potential is discussed on page 6 of this document.

**Termination Area** The TERMINATION AREA informs the traveling public of the end of the work zone, where motorists return to the normal driving path. As most unpaved roads are two-lane, two-way, and low-volume, the TERMINATION AREA is set up only occasionally as needed for local conditions.

In summary, TTC is required any time work is performed within the right-of-way of an unpaved road, just as for paved roads. Such work includes typical road maintenance activities, but also extends to utility work and driveway and drainage work. The national MUTCD provides examples of TTC typical applications for various types of work situations, such as:

- work beyond the edge of the shoulder,
- work on the shoulder or edge of the road, and
- work in the travel lanes.

On low-volume unpaved roads, high-intensity flashing lights on work equipment and vehicles may be sufficient when working beyond or on the edge or shoulder of the road.

As on paved roads, TTC plans for unpaved roads should be developed by a trained individual. All TTC plans must comply with local regulations and ordinances and should take into account recommended practices from the national MUTCD.

## Types of Work Zone Activities on Unpaved Roads

The following work zone activities are commonly performed on unpaved roads:

**Grading** Grading involves the reshaping of the traveling surface through removal of all potholes and/or washboards and the re-establishment of the crown of the unpaved road. Grading is performed by a motor grader that cuts the surface of the unpaved road to the bottom of the potholes and/or washboards and then spreads the material across the surface of the roadway.

**Pulling Ditches or Shoulders** Due to the nature of an unpaved road, the surface material will migrate off of the road surface



**Typical washboard damage on an unpaved road**  
(Source: Jo Michele Sheridan).

and collect in roadside ditches or on the shoulders. To assist with drainage and to recover the lost material, ditches or shoulders are *pulled*, which means that road surface material is removed and deposited back onto the roadway.

**Resurfacing** As vehicles travel the unpaved road, the surface material loses the binder holding it together, requiring replacement of the material. Surface material is hauled onto the roadway, and the roadway is then graded.

**Reconstruction** An agency may need to increase the amount of ballast under the unpaved roadway to improve load carrying ability, drainage, or snow removal. This is accomplished by hauling ballast material onto the surface of the roadway, grading the material, and then placing new surface material on top of the ballast.

With each of these work zone activities, temporary traffic control should be planned with consideration of the traveling public and how these activities will impact the safety of both the public and the employees. The following components should be considered.

## Components of Unpaved Roadway Work Zone Operations

When developing a temporary traffic control plan, the organization should consider the design speed, the traffic volume, the roadway geometrics, and the type of work. With unpaved roads, two additional concerns should be considered.

**Location of Berm or Windrow** For maintenance and construction activities such as reshaping the road surface, as described on page 6, it is important to recognize that the berm can create a challenge for the road user. Even a small traversable berm (less than 6 inches across) can affect the traveling public. As the berm size increases, the effect of the berm increases. Therefore, the **ACTIVITY AREA** for this type of work is located between the beginning and the end of the berm, which may be one to two miles long. The entire berm must be considered a part of the **ACTIVITY AREA** even if the equipment and crew are located some distance upstream or downstream from the berm.



**The entire berm must be considered in developing and deploying TTC.** (Source: EquipmentWorld).

**Flow of Traffic** The primary equipment used on an unpaved road is the motor grader or maintainer. This type of large equipment requires a skilled operator and may need to work against the flow of traffic to prevent *stretching* the material. (Stretching reduces the depth of the material on the roadway and shortens its service life.) Motorists do not expect equipment to be traveling toward them on their side of the roadway. This operation can trap the motorist between the shoulder of the road and the material berm. In the case of a small berm, the motorist can safely cross it. In cases where the berm is larger, the ability of a motorist to cross the berm will be problematic. In areas with adequate sight distance where the motorist can see



**Dust poses a hazard for workers and motorists.** (Source: Soil Stabilization of Oklahoma).

the motor grader working the unpaved road, a motorist will usually yield the right away to the equipment working in the travel lane. Some states statutes specifically allow the operation of equipment against the flow of traffic when performing road maintenance operations. However, these statutes do not negate the need to warn the traveling public.

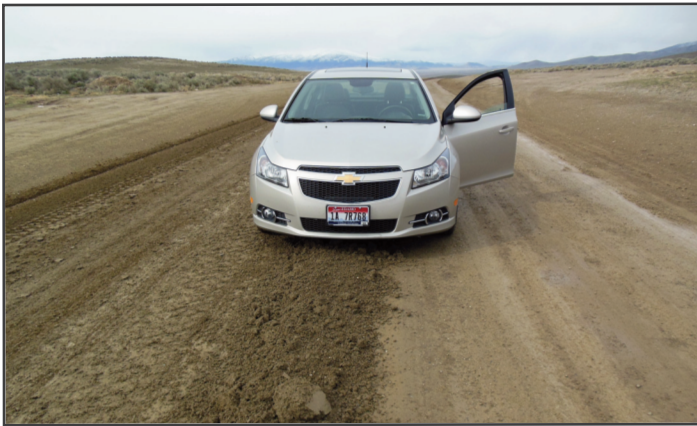
An additional concern expressed by equipment operators is dust generated by the grading operation. When the motor grader cuts the surface of the roadway, it exposes the binder in the material to wind or tire action, which makes the roadway very dusty. Such dusty conditions can increase the hazard, not only for the traveling public but also for the operator. In dusty conditions, advance warning is even more crucial. If dust cannot be controlled with moisture, suspend operations.



# Temporary Traffic Control (TTC) Applications on Unpaved Roads

Following are three example set ups that demonstrate how MUTCD<sup>2</sup> TTC applications can be tailored to meet the specific needs of unpaved roadways. The examples are light grading, surface reshaping, and reconstruction using a detour. The examples all involve sufficient sight distances. On roads with horizontal and/or vertical curves or other sight distance challenges, additional advance warning will likely be required.

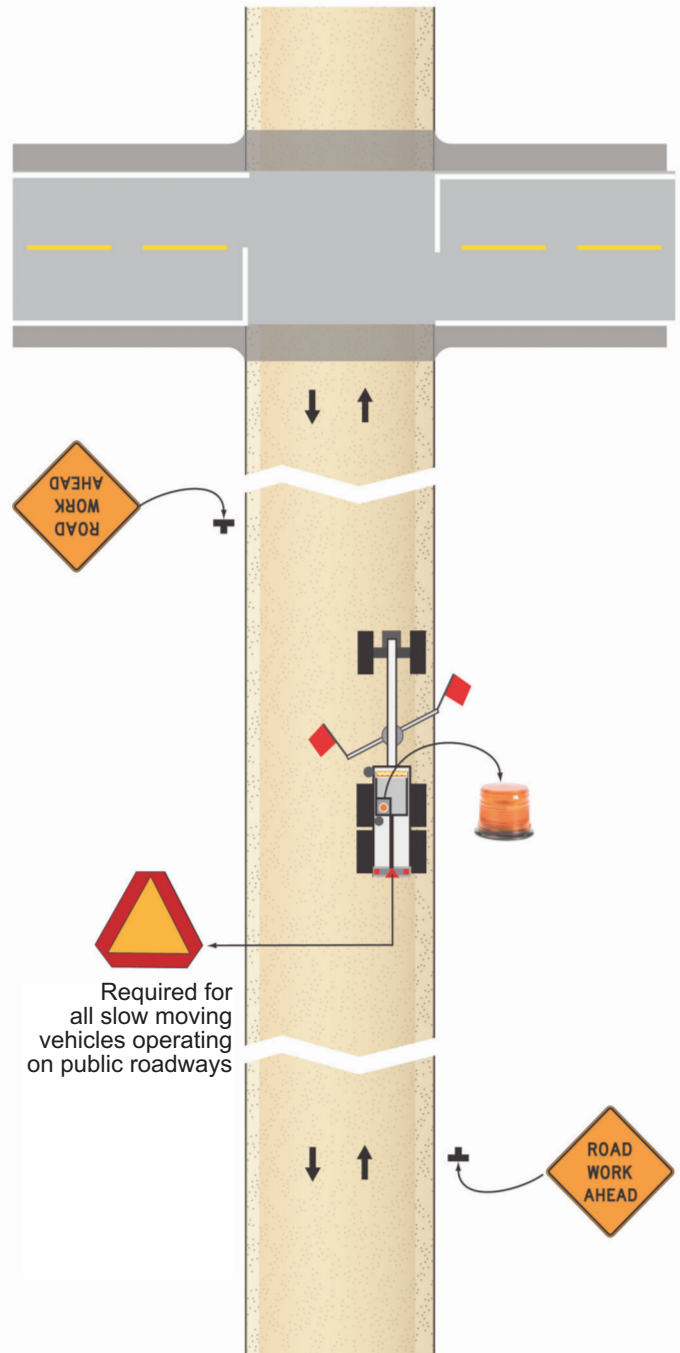
**Light Grading** Light grading generates a berm that is small enough to be traversable and motorists can see sufficiently ahead to pass safely by the **ACTIVITY AREA**. Minor grading operations typically involve a single motor grader working with traffic to correct minor issues within the roadway where the berm is approximately 6 inches or less in height. The small berm presents a lower risk of causing the motorist to lose control.



**A small berm presents lower risk to the motorist.** (Source: Bruce Drewes, 3T Group LLC).

### Notes:

1. Grading operations should be scheduled and completed during daylight hours and suspended during poor weather or visibility conditions.
2. When grading, using moisture will prevent segregating the material and creating additional dust that reduces the visibility of the operation.
3. The **ROAD WORK AHEAD** signs should be installed at the approach of each crossroad or street but no more than 3 miles from the maintenance operation.
4. When performing light grading (with a berm less than 6 inches) the **ROAD WORK AHEAD** sign may be omitted if there is adequate decision sight distance so that the equipment can be seen by the motorist approaching the equipment from either direction. All warning and rotating lights should be operating.
5. Motor grader should be equipped with flashing or rotating light in addition to the vehicle's hazard lights. Flashing or rotating lights should be visible 360 degrees around the motor grader when viewed from a distance of 600 feet. Motor grader should be equipped with a **SLOW MOVING VEHICLE** sign. The motor grader blade ends may be equipped with orange flags to provide additional warning and visibility to passing vehicles.



**Figure 2. TTC application for light grading.**





**Reconstruction Using a Detour** When the reconstruction and resulting berm are significant, the work space takes all or most of the road surface, leaving no room for traffic to negotiate past the work activities.

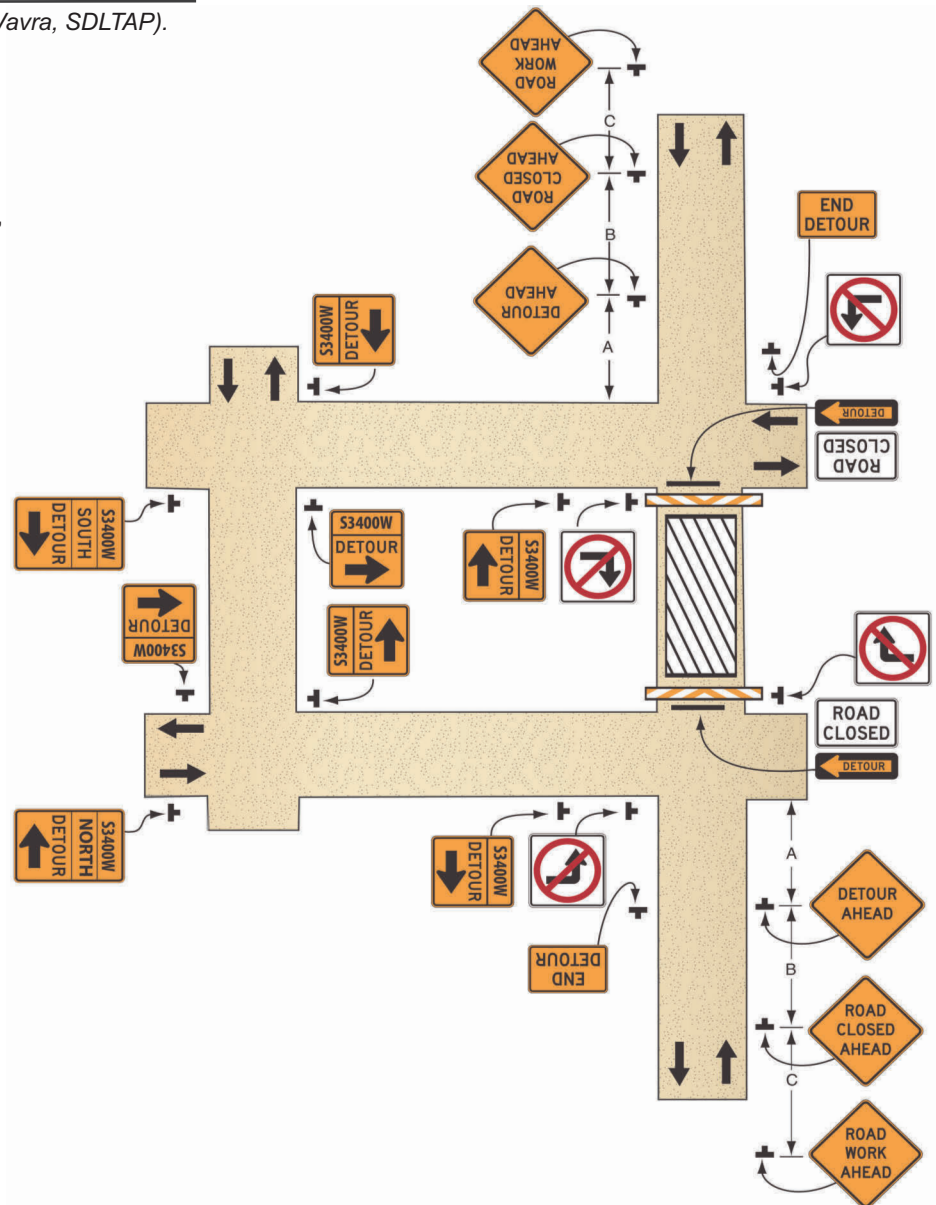


**Reconstruction work space.** (Source: Greg Vavra, SDLTAP).

An agency may need to reconstruct the unpaved roadway by correcting the drainage and/or adding surface materials. With this type of work, additional equipment may be used and a large amount of material may create a large berm (12 inches or more across). This will present significant hazards for the traveling public. To improve safety for motorists and workers, a detour may be the best TTC. Not all road users will be familiar with the local road system and some may be confused by the road closure, so signing should be used to assist users negotiating the detour.

**Notes:**

1. Not all local agencies use route makers for their system. MUTCD Section 6F.59 states "A Street Name sign should be placed above, or the street name should be incorporated into, a **DETOUR** (M4-9) sign to indicate the name of the street being detoured."
2. With an increase in traffic at the intersections where the detour begins and ends, a review of the usage of the **STOP** and **YIELD** signs should be completed.
3. Flashing warning lights and/or flags may be used to call attention to advance warning signs.
4. Flashing warning lights may be used on the Type 3 Barricades, which should be installed at the point where the road is closed.
5. For more complex TTC signing situations, technical assistance can be obtained from the local LTAP/TTAP or State DOT.



**Figure 4. TTC application for reconstruction using a detour.**

# Temporary Traffic Control Plans

To assist and protect the transportation agencies/organizations, as well as the traveling public, Section 6C.01 of the national MUTCD<sup>2</sup> provides guidance on the development of Temporary Traffic Control Plans.

Key elements:

- A traffic control plan should be developed for all operations conducted on all roadways open to public travel. A plan may be a simple drawing of a typical traffic control plan that addresses the safety of all parties traveling in, around, or through the work area.
- Persons purchasing, designing, setting up, and maintaining traffic control elements should be trained for the job decisions they will make.
- The public's primary concern is to travel from point A to point B. Motorists do not expect delays due to construction or maintenance activities. Advance warning is a primary tool to warn the public of these activities. Without advance warning, the motorist may be surprised or confused by the construction or maintenance work.

Unpaved roads are usually low-volume roads, which may lead to motorists traveling at higher speeds. The setup of the signs in the ADVANCE WARNING area is the primary – and sometimes only – warning before the motorist enters the work space. The ADVANCE WARNING area should inform motorists of the hazards they will encounter.

## Conclusion

This guidance document is intended to assist agencies and organizations that own or work on our nation's unpaved road system. The document has provided information of the following key points:

- The primary maintenance performed on unpaved roads is grading the surface to improve ride-ability and drainage and to remove defects. Other maintenance includes pulling shoulders/ditches, resurfacing/regraveling, and stabilization of the surface.
- This document encourages agencies that maintain unpaved roads to review policies, standards, and traffic control plans to ensure these meet the needs of the organization and ensure the safety of the driving public.
- A motor grader performing a light grading operation is usually a mobile operation that moves continuously and may also meet the definition of a short-term work operation provided in the national MUTCD; i.e., more than one hour and less than one daylight period.
- This document presents three temporary traffic control plans identifying temporary traffic control devices that may be needed to provide positive guidance to the traveling public.
- The personnel developing temporary traffic control should be trained for the job decisions they will make.
- All agencies and organizations should have specific temporary traffic control plans before working on or in roadways. The TTC plan should consider the safety of all road users and work zone employees.



**Grading is the primary maintenance performed on unpaved roads** (Source: Envirotac).

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