Technology Solutions for Temporary Traffic Control Operations

Automated Flagger Assistance Device, Portable Traffic Signal, and Residential Driveway Temporary Signal Applications

AFAD (Image: Michigan DOT)

Portable Signal (Image: Horizon Signal)

August 2025

American Traffic Safety Services Association

Author:

Tim Luttrell, P.E. under contract with ATSSA

Contributors:

Eric Perry, P.E.

Nagham El-Zine, P.E.

Members of ATSSA's Technical Committees

Contents

List of Figures

List of Tables

Introduction

Transportation agencies, contractors, traffic control services companies, and a broad range of other stakeholders desire efficiency and safety in implementing temporary traffic control (TTC) for a variety of situations. Vendors are continuously researching, prototyping, and engineering devices that can improve operations and safety. For devices to gain adequate use, they need to be simple, straightforward, easily moved to the site—or remobilized to another location—and cost effective to use.

Temporary traffic control applies to work zones, planned special events, and traffic incident management. Each situation is different and requires planning to ensure adequate levels of safety. While incident management planning focuses on proactive verification and response, work zones and planned special events both benefit from the use of devices within the traffic control plan that can improve safety.

Fatalities and serious injuries at or near temporary traffic control setups remain problematic. In 2023, 39,345 fatalities occurred on highways in the United States.[1] In the same year, 818 fatal crashes occurred in work zones, resulting in 899 work zone fatalities.[2] In addition, nearly 38% of the 156 fatalities coded as non-motorist deaths are individuals working at the project site. In 2024, eight flaggers were struck and killed by approaching vehicles.[3] Regardless of the number of advanced warning signs installed, distracted drivers often do not lower their speeds accordingly when approaching typical temporary traffic control configurations.

> In 2024, eight struck-by incidents resulted in eight flagger fatalities. All of these fatalities were the result of individuals being struck by an approaching motorist.

The American Traffic Safety Services Association (ATSSA) is committed to reducing work zone injuries and fatalities through promotion of safe work zone traffic control practices. ATSSA members research, develop, and manufacture devices and technologies that provide greater levels of efficiency and safety in and around work zones. Of particular focus is moderate- to high-speed two-lane rural work zones where traffic is controlled by stopping one lane at a time and alternating traffic through the work zone.

Depending on conditions at project sites, there are several options for managing traffic flow through work zones on two-lane highways. These techniques are outlined in the *Manual on Uniform Traffic Control Devices* (MUTCD), in existing ATSSA publications, and in transportation agency standards and specifications. Two devices with significant safety, mobility, and efficiency benefits include automated flagger assistance devices (AFAD) and portable traffic

[1] National Highway Traffic Safety Administration, "NHTSA Estimates 39,345 Traffic Fatalities in 2024," news release, April 8, 2025, NHTSA Releases 2023 Traffic Deaths, 2024 Estimates.
[2] "Work Zone Data," National Work Zone Safety Information Clearinghouse, accessed August 1, 2025, http://www.workzonesafety.org/work-zone-data/.
[3] "Fatality and Catastrophe Investigation Summaries," Occupational Safety and Health Administration, accessed August 1, 2025, https://www.osha.gov/ords/imis/accidentsearch.html.

signals (PTS). In addition, the Federal Highway Administration recently granted interim approval for the Residential Driveway Temporary Signal (RDTS) that provides guidance to motorists entering a one-lane, two-way work zone configuration from a driveway.

Practitioners have a need for information on proven, tested techniques that can improve work zone safety. This need includes examples of requirements and accepted practices for use of the AFAD, PTS, and RDTS on two-lane roadways. This case study outlines some examples of proper application of the devices, along with example agency requirements and traffic control plan standard drawings. These case study examples will benefit interested transportation agencies and private sector representatives.

Automated Flagger Assistance Devices

AFADs provide enhanced safety for flaggers by allowing them to control the flagging devices from a safe location off the shoulder of the roadway. AFADs can be mounted on a trailer, cart, or tripod and are operated by a trained flagger to control traffic in one or both directions. AFADs typically have a gate arm, which is used to control the flow of traffic into a one-lane, two-way work zone.

Portable Traffic Signals

PTS are trailer- or cart-mounted devices that may include multiple signal heads and control traffic at the approach to a one-lane, two-way taper or open lane. PTS control each traffic approach to a project site on a two-lane road without the need for flaggers. These devices can use pre-determined or customized timing plans.

Differences and Similarities in the AFAD and PTS

AFADs are controlled by one or more individuals from within the work zone and are designed for use with short- and intermediate-term operations (typically one work shift). Some agencies limit AFAD use to three days. AFADs can be equipped with a red and flashing yellow indicator or a stop/slow indicator.

Figure 1. Closed Lane AFAD Application in Michigan (Image Courtesy Michigan Department of Transportation)

The MUTCD outlines several requirements and recommendations for applying AFADs, including the following condition information:

- AFADs shall only be used in situations where there is only one lane of approaching traffic in the direction to be controlled.

- When used at night, the AFAD location shall be illuminated in accordance with Section 6D.06.
- Because AFADs are not traffic control signals, they shall not be used as a substitute for or a replacement for a continuously operating temporary traffic control signal as described in Section 6L.01.
- AFADs shall meet the crashworthy (see definition in Section 1C.02) performance criteria contained in Section 6A.04.
- If used, an AFAD shall be operated only by a flagger (see Section 6D.01) who has been trained on the operation of the AFAD. The flagger(s) operating the AFAD(s) shall not leave the AFAD(s) unattended at any time while the AFAD(s) is being used. The owner-agency may also require operators to have manufacturer training for operation.
- Traffic control using AFADs must either include an AFAD at each end of the work zone, or an AFAD at one end and a flagger at the opposite end.
- AFADs must be operated by qualified flagger(s) with unobstructed views of the AFADs and traffic approaching in both directions. Check with your state department of transportation (DOT) on the requirements for AFAD operation.
- Proper training related to the specific device in use may be required by the owner-agency and should be provided to operators prior to use.
- AFADs may include a stop/slow indication or a red/yellow signal lens, along with an actuated gate arm.

Some AFAD systems link portable camera technology to portable electronic devices in the field for closer monitoring of the approaches by appropriate personnel. Additional personnel may monitor the operation using a connected device while the flagger controls the AFAD from a nearby location. This application has also been used with multiple flaggers and with pilot car operations, where the pilot vehicle leads traffic through more complicated routes. In this example, the operation used two flaggers near the AFAD to control each device along with one pilot car operator. In addition, AFADs support traffic rerouting through third-party app connectivity.

The following map indicates the states that permit the use of AFADs and PTS.[4]

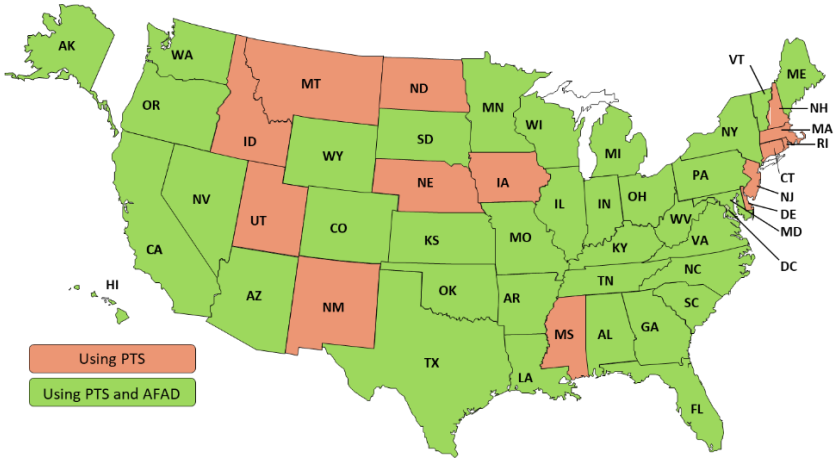

Figure 2. AFAD/PTS Use by State (As of December 2022)

Figure 3. Pedestal-mounted PTS (Image Courtesy Branz Technologies)

PTS allow more efficient traffic flow compared with traditional flagging operations because they use detection system components that allow signal timing to be adjusted in real-time based on traffic conditions. PTS have a variety of applications depending on the duration of the project and can also be used on two-lane roadways and bridges where traffic must alternate in the long-term. One agency uses PTS for daytime work on high-volume, two-lane roadways and for all nighttime work on two-lane roadways. PTS can be mounted on a trailer or smaller pedestal for ease of maneuvering. Trailer-mounted PTS can be used to control both vehicular and pedestrian traffic.

Part 4 of the MUTCD outlines requirements for using temporary traffic signals as noted in the following list.

- Advance signing shall be used when employing a temporary traffic control signal.
- A temporary traffic control signal shall:
    A. Meet the physical display and operational requirements of a conventional traffic control signal;
    B. Be removed when no longer needed; and
    C. Except as provided in Paragraph 5 of this Section, be placed in the flashing mode during periods when it is not desirable to operate the signal in the steady mode, or

[4] Usage statistics determined based on the presence of a standard drawing, specification, verbal or written agency confirmation, or the device is included on the agency's approved products list. In some cases, information may not have been readily available.

the signal heads shall be covered, turned, or taken down to indicate that the signal is not in operation.

Residential Driveway Temporary Signal

In addition to managing two-lane traffic approaching the work area, another challenge in effectively managing traffic in and around work zones is traffic entering from driveways and side streets. For a long section of one-way flow on a two-lane road with one lane closed, driveway entry into the traffic space can be confusing for motorists unless they are able to follow a mainline vehicle or platoon of vehicles. To alleviate this issue, FHWA released an interim approval to allow the RDTS.

RDTS—formerly referred to as Driveway Assistance Devices—are trailer-mounted traffic control units engineered to manage driveway ingress and egress within extended one-lane, two-way operations on two-lane roadways. These systems interface with Portable Traffic Signals (PTS) located at each terminus of the work zone to coordinate traffic flow.

RDTS utilize flashing yellow arrow indicators to inform driveway users of the current direction of travel on the mainline, thereby reducing the risk of wrong-way entries. By providing clear, real-time directional guidance, RDTS enhance safety and operational efficiency within the TTC zone, particularly in areas with frequent driveway access points. Recent evaluations have shown positive benefits from the application, including one statistic citing a safe side-street traffic-movement rate of 93 percent.[5]

FHWA issued Interim Approval for the use of RDTS, authorizing specific signal indications to support safe driveway and side street operations within one-lane, two-way TTC zones. Approved signal indications include flashing and solid yellow arrows, as well as a circular red lens to denote a stop condition. These visual cues are critical for guiding vehicles entering the mainline from driveways or side streets.

[5] Iowa State University Institute for Transportation, "Research studies driveway assistance devices (DADs) as potential work zone option," news release, May 16, 2022, https://intrans.iastate.edu/news/research-studies-driveway-assistance-devices-dads-as-potential-work-zone-option/.

To reinforce proper turning behavior, RDTS installations must include regulatory signage such as:

NO TURN ON RED

TURN ONLY IN DIRECTION OF ARROW

These signs work in conjunction with the signal indications to prevent wrong-way entries and improve compliance with temporary traffic patterns.

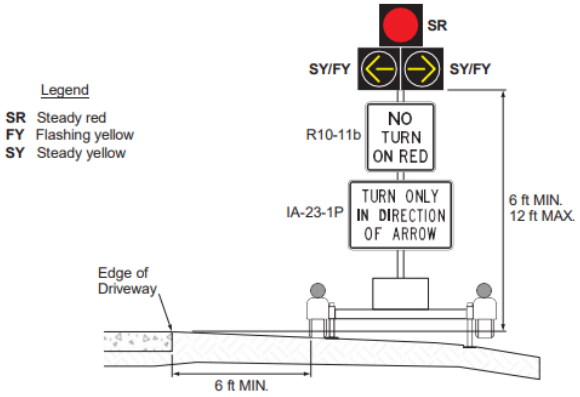

Figure 4. RDTS Device configuration (Image: FHWA)

RDTS units are trailer-mounted and feature a 360-degree rotating mast, allowing flexible orientation during deployment to accommodate varying site conditions. The system is designed for interconnectivity, enabling multiple RDTS units to operate in coordination with Portable Traffic Signals (PTS) located at each end of the work zone. This networked configuration ensures synchronized traffic control across the entire TTC zone.

Each RDTS is powered by an onboard battery system, supplemented by solar panels to extend operational duration and reduce maintenance needs. The device actively manages traffic from side streets and driveways by displaying either a STOP indication or a directional arrow, depending on the current flow of mainline traffic.

Per FHWA guidance, jurisdictions seeking to deploy RDTS must submit a written request to the Office of Transportation Operations. Additionally, a State Department of Transportation may request blanket Interim Approval on behalf of all jurisdictions within the state, streamlining the adoption process and promoting uniformity in work zone safety practices.

Strengths, Benefits, and Challenges to Using AFAD and PTS Technologies

In addition to several other strategies that can be used, both AFAD and PTS devices are components of a practitioner's work zone safety and mobility toolbox. Each strategy must be used appropriately and in appropriate situations for maximum effectiveness.

Table 1 outlines some common types of TTC operations and their associated benefits.

Table 1. Types of Flagging Operations: Differences, Benefits, and Requirements

Example Strategy	Benefits, Uses, Challenges, and Requirements
Two flagger operation	• Allows monitoring of traffic delays and queues • Requires two individuals with potential exposure to traffic
Single flagger operation	• Flagger is positioned to be visible to road users approaching from both directions • Appropriate in low-volume, low-speed situations with adequate sight distance
Pilot car operation	• A pilot car leads traffic through a more complex work zone • Flaggers control both approaches to the work zone
Automated Flagger Assistance Device (AFAD)	• Designed for short- and intermediate-term activities • Allows the flagger(s) to stand in a safer position off the shoulder (requires trained flaggers) • May include red/yellow indicator lights or stop/slow indicator • Typically trailer-mounted devices or portable units with gate arms and manual control • Must be controlled remotely by an appropriately trained individual with unobstructed views of the AFAD and approaching traffic (in both directions for a single operator) • May include one or two flaggers – AFAD shall not be left unattended • Requires signing similar to traditional flagging operations and may be supplemented with additional traffic control devices
Portable Traffic Signal (PTS)	• Designed for short- to long-term work zones with one-lane, two-way tapers that remain in place while no workers are present • No need to position a flagger on the shoulder near the path of oncoming traffic • Requires signing similar to traditional flagging operations, although flaggers should not be used to control these devices. PTS use should be based on state/local municipality requirements for traffic signals, and authorization may be required in the jurisdiction.
Residential Driveway Temporary Signal (RDTS)	• Controls driveway traffic entering a one-lane, two-way TTC zone • Provides an indication of the direction of turn by communicating with PTS at each end of the work zone • Received FHWA Interim Approval in January 2025

Summary and Conclusions

The benefits of using AFAD and PTS devices are readily apparent. Table 2 summarizes these benefits based on the type of device used and typical situations.

Table 2. Summary AFAD and PTS Benefits and Applications

Type of Device	Typical Situations and Benefits
AFAD	Allows the flagger to stand in a safer position off the shoulder; applicable to short-term work zones where one or more flaggers are present
Pedestal-Mounted PTS	Smaller footprint where widths may be limited; removes the need for the flagger(s); allows flexibility in positioning devices in work zones on bridges or narrow shoulders where a flagger would not have a safe position on the bridge or an adequate escape route; common applications include maintenance and utility work, parking garages, and side roads
Trailer-Mounted PTS	Applicable to long-term work zones with one-lane, two-way tapers that remain in place while no workers are present; removes the need for the flagger(s); broad application including temporarily signalizing a two-or four-way stop-controlled intersection, use with bridge repair, emergency knockdowns, and haul roads
RDTS	Programmed to work in conjunction with the PTS at each end of the work zone; provides guidance to driveway traffic entering a one-lane, two-way constriction on which direction the vehicle platoon is traveling

Temporary traffic control for work zones and planned special events requires careful planning and consideration of innovative approaches to minimize impacts. The temporary traffic control approaches highlighted in this document provide work zone safety and mobility benefits when implemented by agencies, contractors, and private sector representatives. The American Traffic Safety Services Association is committed to improving work zone safety and reducing injuries and fatalities through outreach on innovative practices.

Resources for Practitioners

Caltrans Flagging Instruction Handbook, 2020. https://dot.ca.gov/-/media/dot-media/programs/construction/documents/construction-safety-and-insurance/safety-traffic/flagging-instruction-handbook.pdf

Flagger Force brochure, 2019. https://www.flaggerforce.com/newsletters/OnTheMove-newsletter_Feb-2019/inc/html/11.html?page=10

National Highway Traffic Safety Administration Press Release, 2020. https://www.nhtsa.gov/press-releases/2020-traffic-crash-data-fatalities

Tennessee Department of Transportation Work Zone Field Manual, 2019. https://www.tn.gov/content/dam/tn/tdot/traffic-engineering/Work%20Zone%20Field%20Manual%20-%20Final%204-29-2019.pdf

Virginia Department of Transportation Work Area Protection Manual Revision 2.1. http://www.vdot.virginia.gov/business/resources/traffic_engineering/workzone/wapm/2011_WAPM_REV_2_1.pdf

Wisconsin Department of Transportation Work Zone Field Manual, 2021. https://wisconsindot.gov/dtsdManuals/traffic-ops/manuals-and-standards/wzfm/wzfm.pdf

Work Zone Safety Information Clearinghouse. http://www.workzonesafety.org/work-zone-data/ https://workzonesafety.org/work-zone-devices/