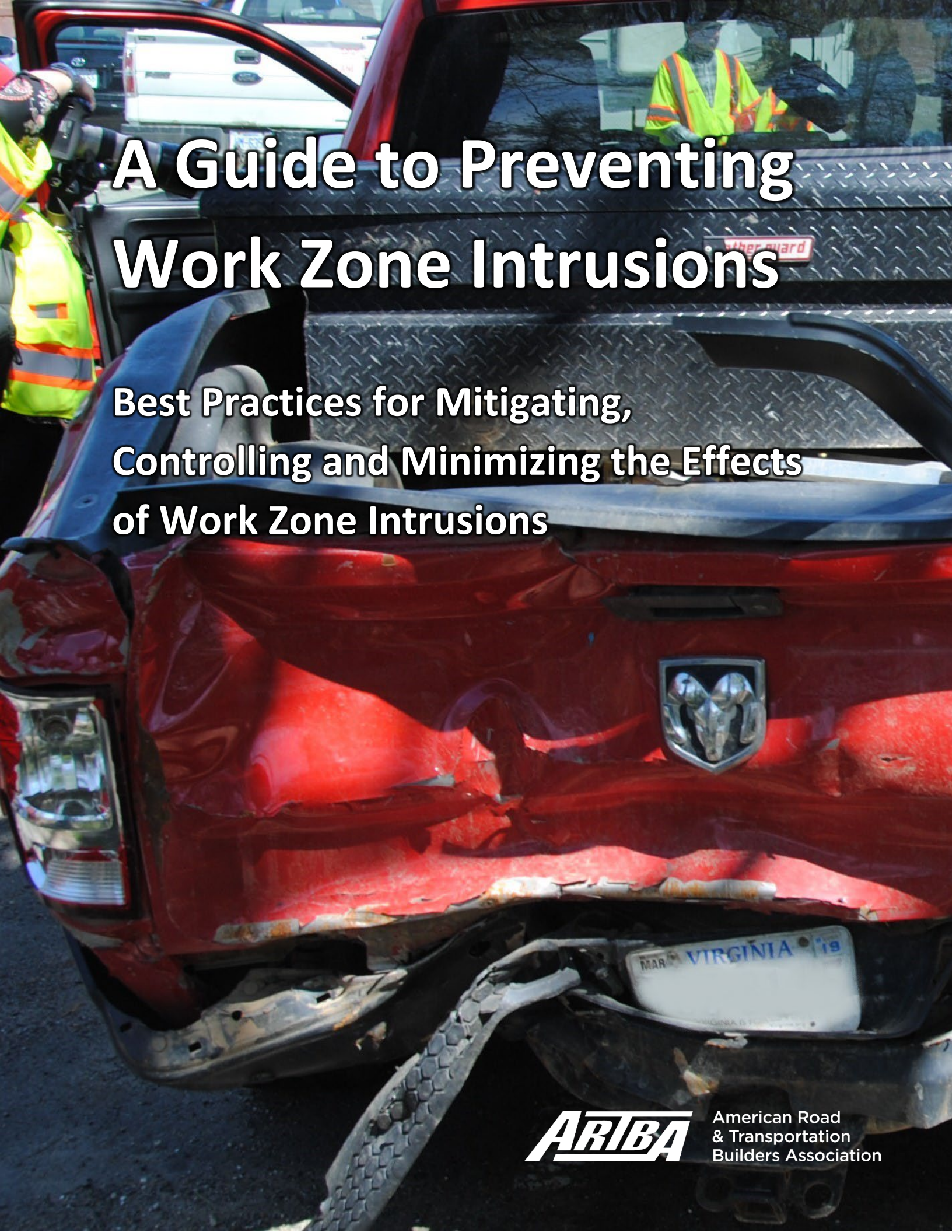

A Guide to Preventing Work Zone Intrusions

Best Practices for Mitigating, Controlling and Minimizing the Effects of Work Zone Intrusions

ARTBA
American Road & Transportation Builders Association

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Overview

This work zone intrusion prevention guide was prepared by members of the American Road & Transportation Builders Association's (ARTBA) Safety Forum. It is intended to be used by ARTBA's members as a template to build their own document with company- or organization-specific information and images. Organizations should consider state and local agency policies to ensure their version aligns with these recommendations.

While ARTBA believes the information to be correct and accurate, it is the employer's responsibility to comply with regulations set forth in federal, state, and local workplace safety standards, including the Occupational Safety and Health Act. In providing this advisory document, ARTBA and its staff and officers do not assume the employer's duty to provide its workers with a safe and healthful workplace and are not responsible for the actions or employer-related compliance with this or any other standard. The document is intended for general informational purposes only, and not as a substitute for advice from a qualified professional. No warranty is made regarding the document

Introduction

Vehicle intrusion incidents occur when a vehicle enters the work area. Work zone intrusions are a significant cause of worker deaths and injuries in the roadway and transportation construction industry. On average, 60 industry workers are killed annually from being struck by vehicles and equipment in roadway construction zones. While such intrusions may be due to driver recklessness, inattention, distraction, or impairment, they may also take place due to improper temporary traffic control. This means controls may be necessary that do not rely on the motorists' assessment of a situation and go beyond the plans and specifications outlined in the Manual on Uniform Traffic Control Devices (MUTCD). This guidance document provides a set of coordinated transportation management strategies and describes how they might be used to manage the work zone impacts of a roadway construction project. Transportation management strategies for a work zone include temporary traffic control measures and devices, safe work practices, training, planning and coordination, and worker protection.

Part 1: Model Practices

Leadership and Management

Effective leadership is required to ensure employees have the training and resources available to mitigate anticipated safety challenges on the job site. Management obligations include clear, demonstrated commitment regarding the allocation of resources for the implementation of best practices, accountability, training, and personal protective equipment. Specifically:

- Traffic Control Supervisors should have completed approved training and have obtained certifications regarding the control of traffic as required by the jurisdiction where they are working. It is advisable for project managers and engineers to have completed training in work zone traffic control design.
- All management, supervisors and traffic control personnel associated with construction operations where workers are exposed to traffic should have obtained approved training and/or third-party certification associated in one or more of the following areas: traffic management and design, temporary traffic control set up and removal, and/or project management safety.
- Company leaders should engage with their subcontractors and other contractors on the site report to coordinate safety practices, including temporary traffic control and adequate worker training.
- Local company management should meet with their respective law enforcement agencies to request additional visibility and enforcement presence. Representatives from these agencies should be invited to project safety meetings.
- Additionally, local company management should meet with state associations and local departments of transportation (DOTs) regarding additional safety strategies for improving work zone safety such as temporary concrete barriers or mobile barriers, utilizing rumble strips, deploying law enforcement officers, or setting-up detour routes or road closures.
- At the start-up of a new project, consider sharing information with major trucking companies and state trucking associations requesting them to communicate with truck drivers regarding the hazards of the work zone and to seek alternate routes if available. In some situations, large commercial carriers may need to be re-routed and agencies that issue oversize permits must be notified.

Risk Assessment (Job Hazard Analysis - JHA) / Reduction of Risk

Job Hazard Analysis (JHA)

JHA is the process of identifying the required steps in a particular job or task, identifying the known and anticipated hazards associated with those steps, and identifying the controls that will be used to eliminate or mitigate those hazards. The JHA is included in the work plan.

Work Plan

Work Plans for each operation must be established to proactively identify potential occupational safety or health hazards exposure, assess and prioritize the risks associated with those hazards, and identify the controls necessary to eliminate or mitigate those hazards. Each shift should begin with a safety meeting to identify and control potential hazards and risks, allowing specific and evolving concerns to be addressed frequently. Workers should be trained to recognize potential hazards and have the authority to report and initiate control methods.

Work Zone Risk Assessment

The ongoing risk assessment of the work site should include the hazards and changing conditions in the work zone. It is important for everyone on the site to understand the location within the project work zone where intrusions may occur. The assessment should include:

- Safety processes to be used on-site.
- Specific work zone training for site workers.
- Hazards and risks relevant to the work area and the applicable risk reduction methods.
- Past/potential incidents, injuries and near misses.
- Safety equipment.
- Proper personal protective equipment (PPE) including high visibility clothing.
- A daily meeting between the project supervisor and the project team traffic control supervisor to discuss special concerns, ramp closures, and set up and break down times for the next shift's closure.
- Truck ingress and egress.
- Dedicated spotters who are trained to watch for possible intrusions and report unsafe conditions.

Huddles for Safety, Quality, Production, Environmental and Code of Conduct

A daily (or more frequent) gathering should take place where a foreman or crew lead person identifies the hazards and challenges associated with planned tasks. The discussion should focus on the precautions that will be taken to avoid potential hazards and challenges using the project work plan and associated JHAs.

Other Risk Reduction Methods

At the beginning of each shift, and as conditions change, a brief safety gathering of the onsite crew should be held to discuss the work plan, safety controls, daily goals, and work strategies. These meetings may include briefings on the following site conditions:

- Adjustments to engineering controls such as temporary concrete barriers or mobile barrier devices.
- Variable speed options (where available and appropriate) to temporarily lower the speed of the traveling public.
- Portable rumble strips to alert the traveling public
- Detours to reroute traffic.
- Law Enforcement.
- Durable copies of traffic control plans (external and internal) should be given to field staff to ensure the traffic control installation is compliant with the contract documents, addresses the identified risks, and recognize additional means, methods or processes that may provide intrusion protection.
- Before start-up or during maintenance work, check that all equipment in the work zone is parked at an angle to direct traffic away from workers.

When necessary, plans should be updated to reflect information learned from these meetings.

Specialized Worker Training

- Train workers to mount and dismount vehicles and equipment on the side away from traffic.
- Provide flaggers, equipment operators, and other crew members with aerosol-type warning horns and/or high-decibel whistles to warn crew members of immediate hazards.
- Train quality assurance (QA) and quality control (QC) personnel as flaggers so they can flag for each other while performing short-term work adjacent to traffic.
- Train all company drivers and hired haulers to stop and sound their truck's air horn when they hear the warning horn.
- Create a process for workers to identify near-misses, correct observed deficiencies, and comply with the safety plan and procedures.

Safe Work Best Practices

- As much as possible, minimize time spent working directly adjacent to traffic.
- Exit equipment on the side away from traffic.
- When traveling on foot in the work zone, deliberately maximize your distance from traffic.
- Never walk down the middle of the lane or within the width of the lane if other options are available.
- Walk on a nearby sidewalk if possible.
- If traffic is on both sides of the closure, walk closest to the side facing oncoming traffic in your direction of travel.
- If someone needs to work directly adjacent to traffic, utilize a spotter to watch oncoming traffic. Consider taking an additional lane as a buffer.
- All breaks, meetings, or idle time should be spent in a safe area away from traffic.

- When maintenance needs to be performed on equipment, it should be moved off the roadway and away from traffic or behind protective devices, (i.e., barrier wall).
- In an emergency, if vehicles or equipment cannot be moved off the roadway, position another vehicle with an attenuator directly behind it or close the lane. Contact emergency responders for assistance.
- Use additional channelizing devices whenever possible to tightly close the radius at crossovers, side streets, and driveway entrances.
- Ensure that flaggers position themselves properly on the shoulder or in the safest possible location that is visible to the motoring public for at least 500 ft. (distances may vary depending on speed and other state and local standards).
- Set-up/Take-down Temporary Traffic Control (ATSSA?)(Different road types, highway, urban, suburban)

Technology

There is an expanding array of technological advances for use in the construction MOT environment. This guide references some of these devices to provide guidance and raise awareness of technology solutions. Research is recommended to ensure implementation of the newest proven methods for protecting employees working next to traffic. Technology should be evaluated on case-by-case basis.

(See Appendix B for a list of products for consideration.)

One Lane-Two Way Traffic Control

Automated Flagger Assistance Device (AFAD)

AFAD's are remote-operated traffic control devices enabling flaggers to be positioned out of the traffic lane(s) and are used to control traffic in advance or within a work zone. These devices are designed to be remotely operated and reduce the number of flaggers required for a project.

When implemented, AFAD operators are only required to be flagger certified according to the MUTCD. An AFAD shall be remotely operated by an operator who has been trained and understands the operating procedures of the AFAD in use. When the AFAD is in operation, the operator shall not leave the AFAD unattended for any reason.

AFADs should be prioritized and utilized in accordance with the policies of the local road authority having jurisdiction over the project. AFADs can be less risky to employees because they reduce their direct exposure to traffic, thereby creating less risk exposure for the company for incidents.

Portable Traffic Signals

Portable Traffic Signals are independently powered, portable traffic signaling equipment that can be remotely controlled to manage traffic as a means of temporary traffic control in a roadway work zone.

Personal Protective Equipment (PPE)

There are many choices to consider when selecting PPE for specific tasks. Below are the items that have been determined to be effective when working next to live traffic. Employer and employees should ensure the PPE meets local agency requirements.

Head Protection

When setting or picking up closures, employees are subject to excess wind from being on moving vehicles and being passed by high-speed traffic. Safety helmets are a best practice that provides head protection and are not as easily dislodged.

High Visibility Clothing

Workers are required to wear high-visibility clothing that meets requirements determined by the U.S. Federal Highway Administration (FHWA) and the U.S. Occupational Safety and Health Administration (OSHA). Both agencies look to the ANSI/ISEA 107 standard as the basis of their requirements. For roadway construction, the 107 standard requires "Type R" apparel for roadway construction, Class 2. For improved nighttime visibility, Class 3 clothing is needed.

Personal Lighting

Part of the process of keeping employees safe at night is making sure they are visible. This is not only done through high visibility on vests, pants, or gaiters but by projecting light as well. Head-mounted lights and headlamps can be used for personal lighting. Care must be taken to ensure any lighting does not distract drivers.

Halo Light

Halo lights are best used in low-light situations and for people who are walking around inside a soft closure. This adds some additional lighting for completing tasks but is mainly for illuminating the body and making personnel more visible.

Personal Headlamps

Personal headlamps are best used for those working in specific areas or dedicated work that requires spotlighting. These aid in providing lighting while completing a specific task, but also can help make the employee more visible to others.

Vehicle Recommendations

Camera Installation in Work Vehicles
It's best to have multiple cameras/angles installed and well-maintained on the vehicles when completing MOT work.

- **Rear-Facing**: Captures any incidents from the rear. It also captures the actions of the employees on the cone setting operation. This comes in handy for incident investigations, verifying injury claims that were not witnessed, and performance training and review.
- **Forward-Facing**: Captures the driver's actions and any incidents/issues in front of the vehicle. This can be used for incident investigations and to verify any complaint that may be made regarding our driver's actions.
- **Cab-Facing:** This will also capture the driver's action when behind the wheel. This will help reduce the use of handheld devices while driving. It can be used in incident investigations to verify the driver was performing their job function appropriately.

Note: The use of red and blue lights on temporary traffic control devices and equipment may not be approved or legal in some jurisdictions.

Work Vehicles
It is recommended that all work vehicles entering and exiting traffic be outfitted with revolving or flashing lights/beacons to improve the communication between construction vehicles and the public. Vehicles should also be equipped with retroreflective tape/sheeting to make them more visible to traffic and alert motorist to their presence. Organizations should be aware of local standards and regulations to ensure lighting is compliant.

Equipment Considerations to Prevent Work Zone Intrusions

- Crash attenuators
- Proper lighting for nighttime operations
- Retroreflective tape and sheeting on tools, vehicles, and other equipment
- Temporary rumble strips
- Speed feedback signage
- Portable, changeable message signs
- Well-maintained and properly deployed channelizing devices.
- Positive Protective Barriers
    - Mobile Barriers
    - Movable Barriers
    - Concrete, plastic, and steel barriers

Pre-Construction Public Communications

Campaigns can be an effective means to alert the public about construction in an area, encouraging motorists and other roadway users to use alternative routes, plan for delays, and pay attention to the additional hazards associated with roadway construction zones. Public communications may include:

- Billboards
- Radio and TV advertising
- State and local 511 or other public information systems
- Signs promoting worker presence, increased penalties for speeding in work zones, and other warnings.
- Use of Law Enforcement/off-duty police presence.

Part 2: Model State DOT Practices

[Insert State Best Practices Matrix]

Part 3: State Agency Payment for Temporary Traffic Control

There are specific tools and funding mechanisms state agencies can use to ensure adequate temporary traffic control devices are used to protect workers. These include:

Eligibility of Construction and Highway Safety Equipment Acquisition Costs as a Direct Charge

In a memorandum dated September 8, 2017, FHWA affirmed that if a division administrator determines that the cost of equipment is reasonable and necessary for a Federal-aid project(s) and the State provides adequate assurances of a federal highway or transportation interest, the cost of equipment acquisition may be approved as a direct charge. Such allowance is helpful for equipment such as mobile and movable barrier that can be used for many years, beyond the duration of any single project. (See Appendix A.)

Safety Contingencies

The infrastructure Investment and Jobs Act (IIJA) also known as the Bipartisan Infrastructure Law (BIL) created an opportunity for state transportation agencies to create work zone safety contingency funds to pay for additional safety needs on a project that were not anticipated when the project began. Contingency funds are not intended for contract extras or quantity overruns. Change orders are typically used as a mechanism to address unforeseen conditions that arise during construction. Unfortunately, when unexpected traffic safety concerns are identified during the project, the time required for processing and approving a change order may impede efforts to address the safety problems quickly and efficiently. Safety contingency funds can be used to address those needs in a more expedited manner. (See ARTBA/NAPA Work Zone Safety Contingency Fund Q&A)
(List states who have these programs in place?)

FHWA Subparts J & K

23 CFR 630.1012 (FHWA's Subpart J) explains payment procedures for transportation management plans as they apply to payment for work zone temporary traffic control items:

§ 630.1012 Project-level procedures.
(c) The Plans, Specifications, and Estimates (PS&Es) shall include either a TMP or provisions for contractors to develop a TMP at the most appropriate project phase as applicable to the State's chosen contracting methodology for the project. A contractor developed TMP shall be subject to the approval of the State, and shall not be implemented before it is approved by the State.

(d) The PS&Es shall include appropriate pay item provisions for implementing the TMP, either through method or performance based specifications.

(1) For method-based specifications individual pay items, lump sum payment, or a combination thereof may be used.

(2) For performance based specifications, applicable performance criteria and standards may be used (e.g., safety performance criteria such as number of crashes within the work zone; mobility performance criteria such as travel time through the work zone, delay, queue length, traffic volume; incident response and clearance criteria; work duration criteria).

23 CFR 630.1102 (Subpart K) further defines the role of the DOT with an overview of the regulation requirements. It explains a primary purpose behind the regulation of temporary traffic control treatments includes "*contract pay items to ensure the availability of funds for these provisions*."

Section 630.1108(f) provides a detailed explanation of how payments should be made for various forms of temporary traffic control:

(f) Payment for Traffic Control. Consistent with the requirements of 23 CFR 630.1012, Project-level Procedures, project plans, specifications, and estimates (PS&Es) shall include appropriate pay item provisions for implementing the project Transportation Management Plan (TMP), which includes a Temporary Traffic Control (TTC) plan, either through method or performance-based specifications. Pay item provisions include, but are not limited to, the following:

(1) Payment for work zone traffic control features and operations ***shall not be incidental to the contract*** or included in the payment for other items of work not related to traffic control and safety; *(emphasis added).*

(2) As a minimum, separate pay items shall be provided for major categories of traffic control devices, safety features, and work zone safety activities, including but not limited to positive protection devices, and uniformed law enforcement activities when funded through the project;

(3) For method-based specifications, the specifications and other PS&E documents should provide sufficient details such that the quantity and types of devices and the overall effort required to implement and maintain the TMP can be determined;

(4) For method-based specifications, unit price pay items, lump sum pay items, or a combination thereof may be used;

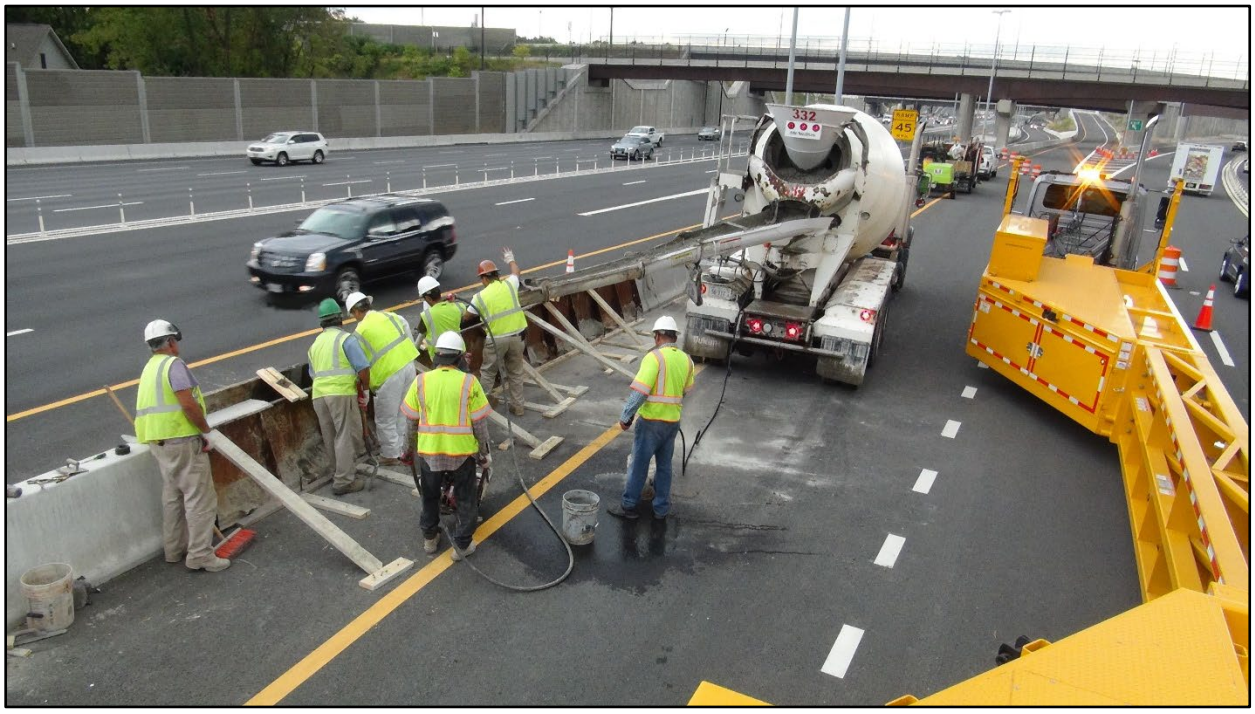
(5) Lump sum payment should be limited to items for which an estimate of the actual quantity required is provided in the PS&E or for items where the actual quantity required is dependent upon the contractor's choice of work scheduling and methodology;

(6) For Lump Sum items, a contingency provision should be included such that additional payment is provided if the quantity or nature of the required work changes, either an increase or decrease, due to circumstances beyond the control of the contractor;

(7) Unit price payment should be provided for those items over which the contractor has little or no control over the quantity, and no firm estimate of quantities is provided in the PS&Es, but over which the highway agency has control of the actual quantity to be required during the project;

(8) Specifications should clearly indicate how placement, movement/ relocation, and maintenance of traffic control devices and safety features will be compensated; and

(9) The specifications should include provisions to require and enforce contractor compliance with the contract provisions relative to implementation and maintenance of the project TMP and related traffic control items. Enforcement provisions may include remedies such as liquidated damages, work suspensions, or withholding payment for noncompliance.



Appendix A

U.S. Department of Transportation
Federal Highway Administration

Memorandum

Subject: **INFORMATION**: Eligibility of Construction and Highway Safety Equipment Acquisition Costs as a Direct Charge

Date: September 8, 2017

In Reply Refer To:
HIF-1/HSA-1

From: Thomas D. Everett
Associate Administrator for Infrastructure

Elizabeth Alicandri
Associate Administrator for Safety

To: Directors of Field Services
Division Administrators

Purpose

The purpose of this memorandum is to provide guidance to the Federal-aid division offices concerning the eligibility of construction and highway safety equipment acquisition costs as a participating direct charge to a single Federal-aid project when certain conditions are met.

Background

The FHWA's policy for participation in costs associated with equipment acquisition is based on the Uniform Administrative Requirements, Cost Principles and Audit Requirement for Federal Awards in 2 CFR Part 200. States may request participation in such costs through: a) an approved indirect cost rate plan or b) on a project basis through an approved depreciation rate (amortized cost) analysis based on costs that are necessary, reasonable, and allocable to a specific Federal-aid project. Federal-aid funds will participate only in the portion of the amortized cost directly attributable to the time the equipment is used on a specific Federal-aid project.

The FHWA expects that States will continue to follow this general policy. However, the Division Administrator may approve the direct charge to an eligible Federal-aid program funding source for the up-front acquisition cost of equipment if a State's request for prior written consent [2 CFR 200.439(b)(1)] provides sufficient documentation supporting a Federal highway or transportation interest. This direct cost option provides additional flexibility to the States for costs that benefit the Federal-aid highway program.

Guidance

As defined in 2 CFR 200.33, equipment means the tangible personal property (including information technology systems) having a useful life of more than 1 year and a per-unit acquisition cost that equals or exceeds the lesser of the capitalization level established by the non-Federal entity for financial statement purposes, or $5,000. Under these regulations, capital expenditures for equipment used in a Federal grant are generally unallowable as a direct charge to the Federal grant program except with the prior written approval of the Federal awarding agency.

If a State requests to charge the full cost of equipment acquisitions as a direct charge to a single project rather than allocating the amortized acquisition costs over the useful life of the equipment, it must provide FHWA with adequate assurances that there is a Federal highway or transportation interest in doing so. These assurances include:

- A certification that the equipment will be used on an authorized Federal-aid project within 3 months.
- A certification that the equipment will be used for its intended purpose over the useful life of the equipment. The certification must include a discussion on the expected useful life of the equipment and the annual number and types of projects that would benefit from the use of this equipment.
- A certification that the contracting agency has in place sound internal controls for documenting and monitoring its efficient use on eligible activities. The Division Administrator may require a report from the State documenting the use of the equipment as part of its monitoring program.
- A certification that the equipment will be maintained and not lie idle for extended periods of time making it inefficient as a direct cost activity.
- Evidence that adequate internal controls are in place and reasonable assurances that Federal-aid funds are not participating in unallowable costs.

The State must also provide documentation concerning compliance with FHWA's construction contracting requirements related to equipment, including but not limited to:

- Use of publicly owned equipment (23 CFR 635.106),
- Material or product selection requirements (23 CFR 635.411), and
- Buy America requirements[1] (23 U.S.C. 313 and 23 CFR 635.410).

If the Division Administrator determines that the State's request is eligible and approves the request, the approval must be provided by the Division Administrator in writing and may not be delegated. If direct cost participation is not supported, States may continue to perform an amortization of purchase costs as is normally done for equipment and assign the allocable costs to the projects, utilizing an approved equipment usage rate.

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[1] The Buy America provisions of 23 U.S.C. 313 apply to any obligation of funds under Title 23, and therefore FHWA's Buy America requirements apply to all Federal-aid projects, not just highway construction projects.

If direct cost participation is approved, a separate Federal-aid project must be established for the sole purpose of acquiring equipment. The contracting agency must certify that the equipment will be used in accordance with the eligibility criteria for the applicable Federal-aid funding.

National Highway Performance Program and Surface Transportation Block Grant Program Projects

The FHWA participates in the costs of construction as defined in 23 U.S.C. 101. This includes all costs incidental to the construction or reconstruction of a highway on Federal-aid projects. The costs of equipment used in highway construction, or equipment used by the State to administer the Federal-aid project, are eligible project costs. However, the equipment must be necessary for the implementation of a Federal-aid project. Examples of equipment that may meet eligibility criteria as a direct charge under certain conditions include the acquisition of equipment used to construct the project or equipment used by the contracting agency to administer the project. National Highway Performance Program and Surface Transportation Block Grant Program funds cannot participate in unallowable costs, such as routine maintenance or law enforcement that is typically performed with State funds (or projects where there is no Federal highway or transportation interest).

Highway Safety Improvement Program (HSIP) Projects

In certain circumstances, the FHWA Division Administrator may approve HSIP funding for the direct charge of equipment as a highway safety improvement project, provided the activity is consistent with the State strategic highway safety plan (SHSP), and: (i) corrects or improves a hazardous road location or feature; or (ii) addresses a highway safety problem [23 U.S.C. 148(a)(4)].

The specific HSIP eligibility criteria are clarified in the HSIP Eligibility Guidance, dated February 26, 2016. One of the basic foundations of the HSIP is the direct linkage between the data-driven priorities established in the SHSP and the identification, development, and implementation of HSIP projects, specifically listed in 23 U.S.C. 148(a)(4)(B). The purpose of the linkage is to ensure that the limited HSIP funds are used effectively to achieve a significant reduction in traffic fatalities and serious injuries on all public roads.

After the initial purchase of the equipment using HSIP funds, the State may use the equipment for its intended safety purpose on any public road (including local roads) for any project (e.g. Federal-aid or non-Federal-aid, capital improvement or maintenance, etc.).

Summary

In summary, if the Division Administrator determines that the cost of equipment is reasonable and necessary for a Federal-aid project(s) and the State provides adequate

assurances of a Federal highway or transportation interest as described above, the cost of equipment acquisition may be approved as a direct charge. Otherwise, States may continue to perform an amortization of purchase costs as is normally done for construction equipment.

If you have any questions about this policy, please contact Gerald Yakowenko, Team Leader, Office of Program Administration (202-366-1562) or Karen Scurry, Office of Safety (609-637-4207).

Appendix B – Intrusion Prevention Devices

Pi-Lit: (pi-lit.com)
Pi-Lit offers several products that help make road work more visible. Sequential lighting solutions (smart lights), cloud-based products and traditional lighting solutions.

SAWS: (sawsinc.net)
SAWS is an early warning system designed to help minimize incidents in construction zones by using traffic radar sensors. This system helps alert drivers in the construction zones to stop, yield or be aware of approaching dangers.

iCone: (iconeproducts.com)
iCone products can provide real-time information on traffic patterns, strike alerts on attenuators or other devices and serves as a warning device to travelers who use online navigation systems.

Ver-Mac Video System: (ver-mac.com)
- High-definition camera with integrated Wi-Fi and GPS
- Mounts to the windshield
- Powered from the vehicle battery with an auxiliary and a plug-in adapter
- Automatically downloads videos when the camera is in Wi-Fi range of the base station
- Multiple cameras on one server