Reducing or Eliminating Flagger Exposure to Traffic and Struck-By Incidents

Moving Flaggers Out of the Line of Fire

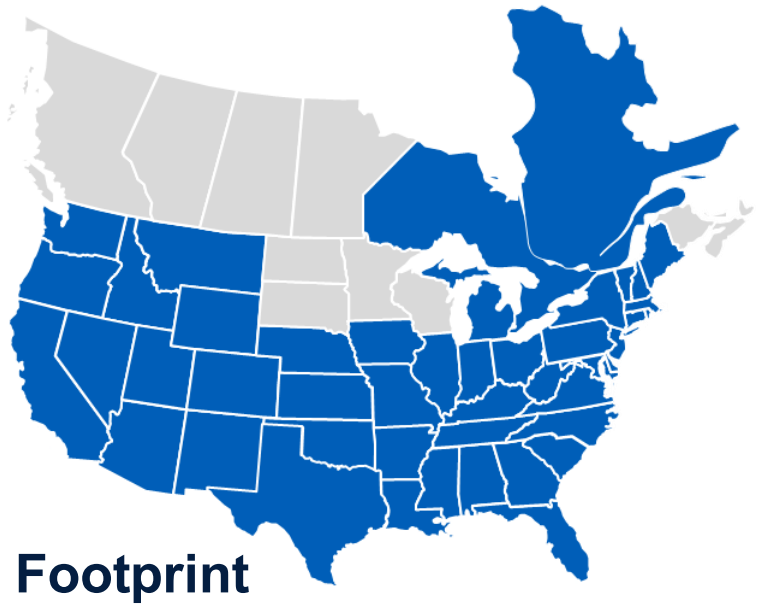
Practical controls, technology pilots, and lessons learned from AMAT

Todd Pfeiffer, CSP, CPEA
Vice President, Safety & Health, East Operations
CRH Americas Materials



CRH Americas Materials

STATION 1



Footprint

~1,700
Operating Locations

~29.9K
People

9 Divisions

Local Brands (Selection)

Product Portfolio

- Aggregates – 230M tons
- Asphalt – 53M tons
- Ready Mix – 17M tons
- Paving
- Marine Operations
- Rail Ops
- Trucking

CRH is the leading provider of building materials. AMAT is our largest segment

CRH is a member of the S&P 500

Why this matters

A serious event changed the questions we asked.



A flagger was working near a milling operation. A contracted haul truck was backing toward the milling machine. The flagger was struck and killed during that movement.

The useful question is not only what the driver or flagger should have seen. It is:

What planning or design decisions could have kept this person out of that location?

Change the first question

Before we rely on personal protection, can we eliminate or reduce the exposure?

1	**Eliminate**	Closure, detour, redesign
2	**Reduce**	Fewer people, less time exposed
3	**Relocate**	Safer location, better sight distance
4	**Separate**	Physical or operational controls
5	**Protect and verify**	Station, training, field checks

Do not make a person the primary defense against a moving vehicle.

Flagger safety must be designed into the project

Exposure reduction requires shared planning and authority.

1. **Project owners and DOTs**
2. **Designers and traffic engineers**
3. **Contractors and project teams**
4. **Traffic-control and safety professionals**
5. **Law-enforcement partners**

Many flagger exposures are created or prevented by decisions made before the project reaches the field.

Where DOT and project-owner support matters

Consider these questions early, while alternatives are still available.

DOT and project-owner support can help teams evaluate and approve:

- Closures, detours, and alternate routing
- Work sequencing that reduces positions or exposure time
- Safe flagger stations and escape routes
- Separation from haul, backing, access, and egress routes
- AFADs, portable signals, positive protection, and other approved controls
- Timely field changes when conditions differ from the plan



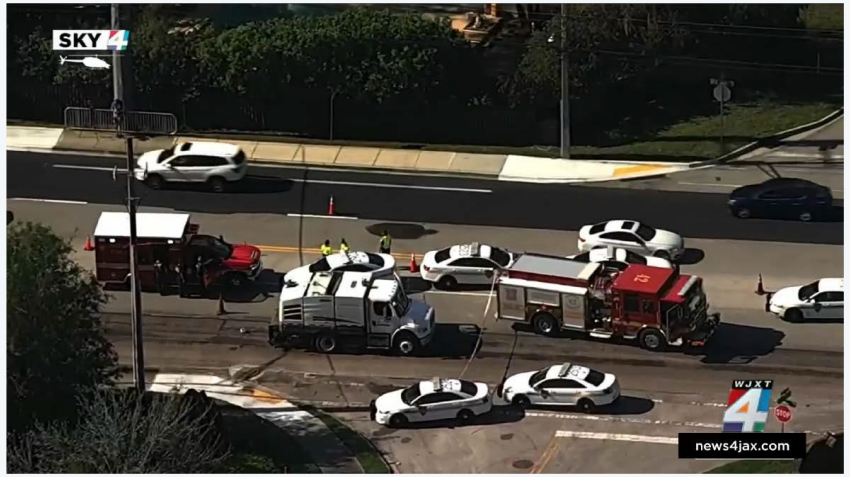
Contractors cannot eliminate exposure alone. The most effective options require early owner, designer, and contractor coordination.

Public traffic is only part of the exposure

Flaggers Operate Where Public and Internal Traffic Control Meet

EXTERNAL TRAFFIC

- High Volume
- Distracted or impaired drivers
- Excessive speed
- Insufficient stopping distance
- Aggressive or confused motorists





INTERNAL TRAFFIC

- Backing haul trucks
- Distributor trucks
- Sweepers and sign trucks
- Equipment repositioning
- Changing access and egress paths

The flagger often stands where these two systems meet.

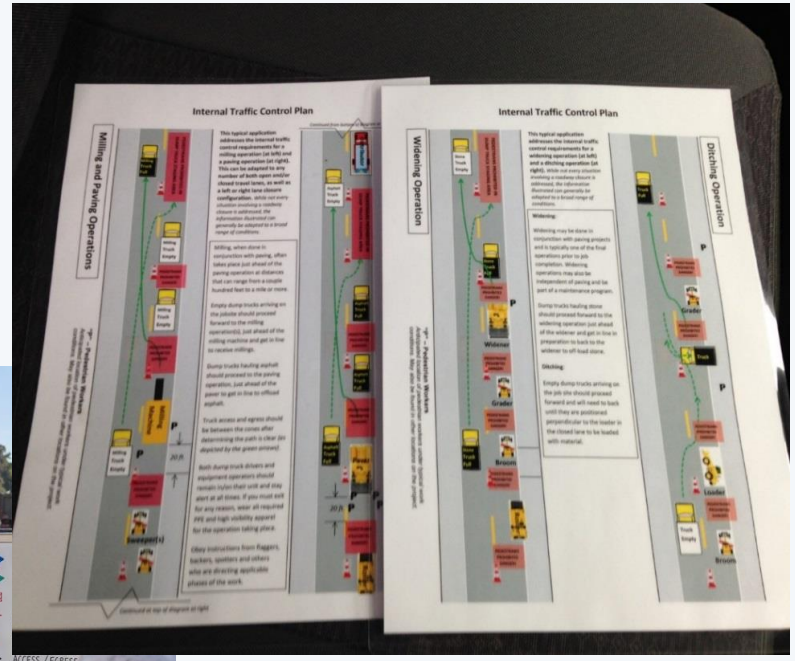
Control what happens behind the cones

The plan must be understandable, current, and communicated.

ITCP

ANSI Standard A10.47 2021

Std covering - WZ Safety for Roadway Construction

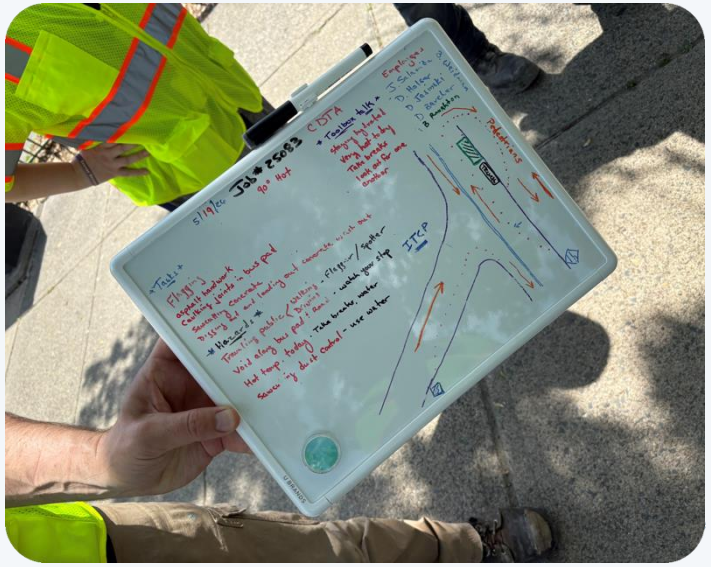




Internal Traffic Control Plan

ITCP Should Include

- Flagger stations
- Truck access and egress
- Equipment travel paths
- Backing areas
- Worker-free zones
- Staging and delivery locations
- Changes as the work moves



Utilizing a whiteboard at the job site

Training Is Necessary. It Cannot Remove Vehicle Exposure.

Training can

Prepare the flagger to do the job right.

Training cannot

Decide where the flagger stands, or stop the vehicle.

Verify Flagger Qualifications Before Assignment

- Meet applicable state or local requirements
- Verify credentials for all flaggers – employees, temporary and third-party flaggers
- Confirm qualifications are current before the shift





Site-Specific Flagger Orientation

Flagger qualification does not automatically prepare someone for the hazards and traffic movements of a specific project.

Certification establishes general knowledge. Orientation prepares the flagger for this project.

Contracted Flagger/MOT Orientation - Site Specific

Flagger/Employee Name (Print) _____

Introduction at the Job
- ⬭ Confirm **Flagger Training** and/or card
- ⬭ Overview scope of work & contact info
- ⬭ Parking of vehicles at jobsite
- ⬭ First aid kit location & trained personnel

General Information
- ⬭ Always assess risks before doing the task
- ⬭ Expectation - **"If I SEE something, I will STOP and DO something.**
- ⬭ Participation req'd in safety meetings / T-5s
- ⬭ Your active involvement in safety is expected
- ⬭ No cell phones during safety sensitive work
- ⬭ No listening to music with/without ear buds

Incident Reporting
- ⬭ Reporting protocol for accidents & incidents
- ⬭ Report all injuries to supervisor immediately
- ⬭ For serious injuries, call 911
- ⬭ Location and use of phones/radios on site

Required Personal Protective Equip (PPE)
- ⬭ Safety vests / arm & leg reflective gear
- ⬭ Hard hats & hard toe footwear required
- ⬭ Nightime flagging PPE, as applicable
- ⬭ Safety glasses, as needed - flying obj/particles
- ⬭ Dust masks for voluntary use/respiratory prot.

Safety - Members of the Public
- ⬭ Stand up fallen cones, signs & barricades
- ⬭ Assist drivers and pedestrians through the workzone as necessary

Safety - Awareness in the workzone
- ⬭ Be aware of potential workzone intrusions
- ⬭ Minimize time spent adjacent to traffic
- ⬭ Do not walk down the middle of closed lane
- ⬭ Use a spotter if your back is turned to traffic
- ⬭ WZ speed limit of equip near pedestrians is 5 mph - use extreme caution
- ⬭ Veh/equip can back at anytime - **Be Aware!**

Hazardous Materials & Environmental
- ⬭ Safety Data Sheet (SDS) location / GHS System
- ⬭ Key chemicals used on the job - asphalt, cleaners, fuels, asphalt release agents, oils, etc.
- ⬭ Reporting and containing any chemical spills
- ⬭ Potential for Silica dust exposures in road construction

Maint of Traffic (MOT) Trucks & Seat Belts
- ⬭ Working in the rear of MOT truck to place/remove cones is an approved stand-up operation when safely done
- ⬭ *Transporting workers in back of MOT truck is* ***Prohibited***
- ⬭ All transportation of workers must be done with workers seated and with seat belts worn.
- ⬭ No jumping from elevated areas, STEP SAFELY DOWN
- ⬭ Look for objects on ground before exiting
- ⬭ Respect handrails / no climbing on objects or rails

Struck By Equipment Hazards
- ⬭ Watch for mobile equip - eye contact / communicate! Don't approach unless eye contact & wait for the wave
- ⬭ Back up alarms required - listen for them. Veh/equip without b/u alarms must be removed from the jobsite
- ⬭ Dump Trucks and Sweepers present a very high risk of struck by incidents, remain highly alert to their location

Key Flagger Expectations
- ⬭ Stay at the assigned flagger station, use proper signals
- ⬭ Do not wander / Do not cross open or closed lanes unless absolutely required - Then with utmost caution
- ⬭ If you don't need to be near the roadway - Get Back!
- ⬭ Construction vehicles and equipment can move at anytime. Do not stand behind or beside equip/trucks
- ⬭ Ensure you are in a safe place with an exit route
- ⬭ Never stand in the travel lane to stop traffic, position yourself on the shoulder on the roadway or closed lane

Backer Spotter
- ⬭ Only trained workers should act as a spotter for trucks
- ⬭ Do not cross behind backing veh/equip or any unit with a driver in the cab - It could move at anytime
- ⬭ No personnel are allowed in the travelway of moving equip or vehicles. If you see someone, **STOP the operation**
- ⬭ If spotting, do not walk backwards or get behind the veh., position yourself slightly off to the side,fully visible to driver

_____
Supervisor Signature

_____
Date of Site Specific Orientation

_____
Proj Mgr. / Supt. / Ops Mgr. Signature
Optional

I understand the above new hire orientation, and have had my questions answered on the above subjects.

Flagger / Worker Signature

Flagger Task Training

When flaggers are assigned to other duties beyond flagging, they must have appropriate task training for that activity as well.



Backer spotter
Moving traffic control devices
Labor
Managing driver issues
Handling aggressive drivers

task training *is required if assigned to perform that task.*



Flaggers and Backer Spotters are NOT the same. Task Training is Required

Aggressive Driver Strategies

De-escalation is useful, but distance and escape come first

Never Confront an Aggressive Driver

- Never stand or step into the vehicle's path
- Maintain distance and preserve an escape route
- Use calm, clear, limited communication
- Warn the crew if a vehicle enters the work space
- Contact law enforcement when violence or an immediate threat is present
- Stop and reassess if driver behavior makes the setup unsafe

Move out of the path. Warn the crew. Do not attempt to stop the vehicle with your body.



Flagger Best Practices



Safety Leadership in Road Construction

Work Zone Safety is one of our CRH Life Saving Rules.

The **CRH Life Saving Rules** are based on lessons learned from past incidents and focus on the highest-risk activities in construction, materials, and roadwork.



LSR Safety Solutions

AMAT Work Zone Safety Task Force

Turning field experience into practical, repeatable controls

- Reviews serious events, recurring hazards, and field concerns
- Brings together operations, traffic-control, and safety professionals
- Shares operating practices and technology-pilot lessons
- Develops guidance, training, and field-ready topics
- Uses field feedback to refine recommendations

The goal is to influence how work is planned and performed.

Layered Strategies

SEPARATE + PROTECT

While technology has a place, it is important to think of the total picture and use layered strategies

1

Reach drivers early

Navigation app alerts

Message and speed feedback signs

Enforcement

2

Physically discourage / restrict unintended entry

Mid-lane devices

Temporary rumble strips

Positive protection

Close device spacing

3

Warn the crew

Air horns / whistles

Radio warnings

Cone or drum alarms

Radar or camera-based intrusion alerts

Worker worn vibrating alerts

Simplify the Traffic Pattern Before Adding Flaggers

Closer spacing or continuous channelization can reduce apparent openings and discourage unintended entry

- Closing approaches
- Tightening device spacing
- Using positive protection (Barrier)
- Restrict or relocate the driveway movement





These strategies may also remove the associated flagger

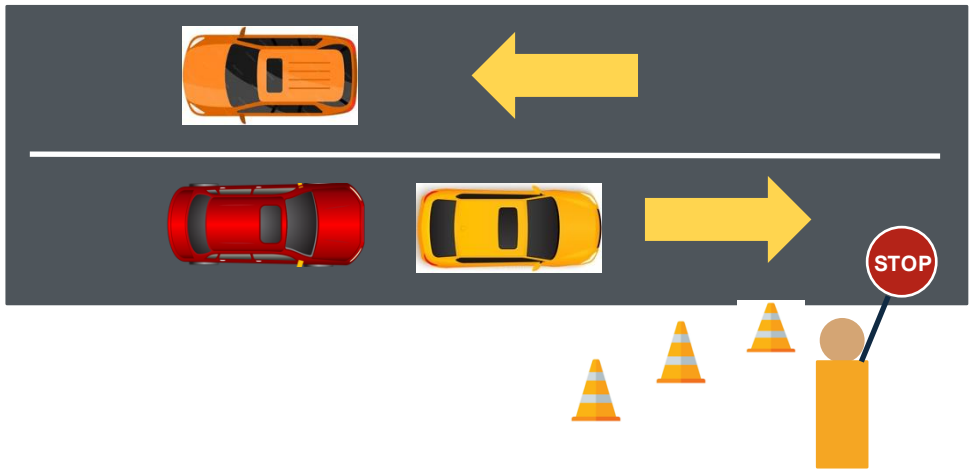


ONE FLAGGER. ONE LANE. ONE DIRECTION.

Keep each assignment clear, visible, and limited to one traffic movement.

CORRECT

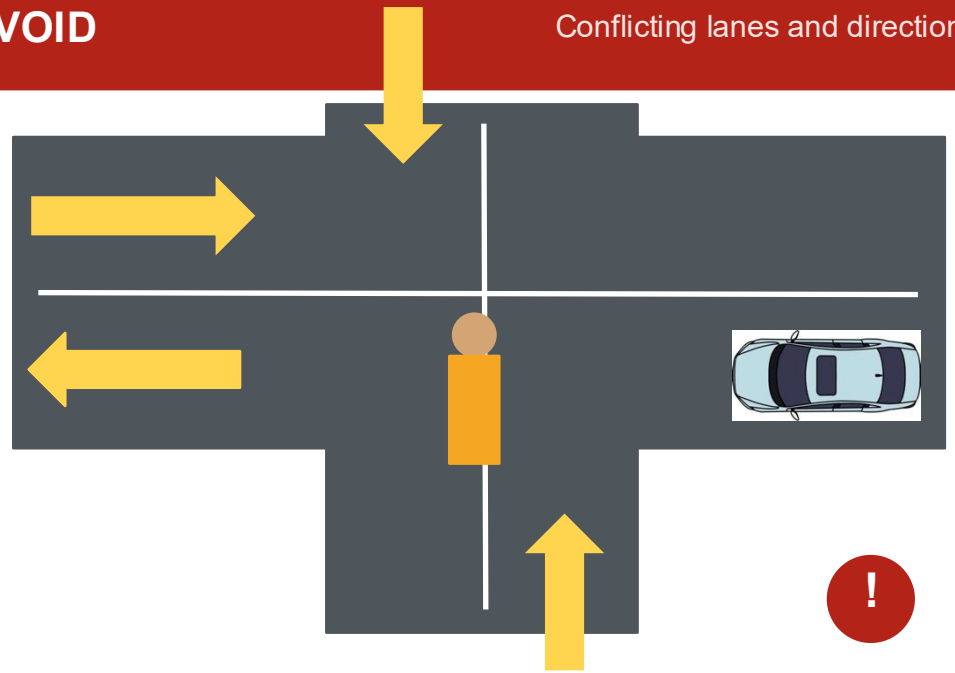
One defined movement



The flagger remains at a designated station and controls only the assigned lane approaching from one direction.

AVOID

Conflicting lanes and directions



Do not assign one flagger to manage multiple lanes, intersecting approaches, or vehicles arriving from several directions.

If the traffic pattern is too complex for one clear assignment, simplify the setup or add qualified flaggers.

Proper Positioning of Flaggers

Every Flagger Position Must Be Designed, Deliberate, and Necessary



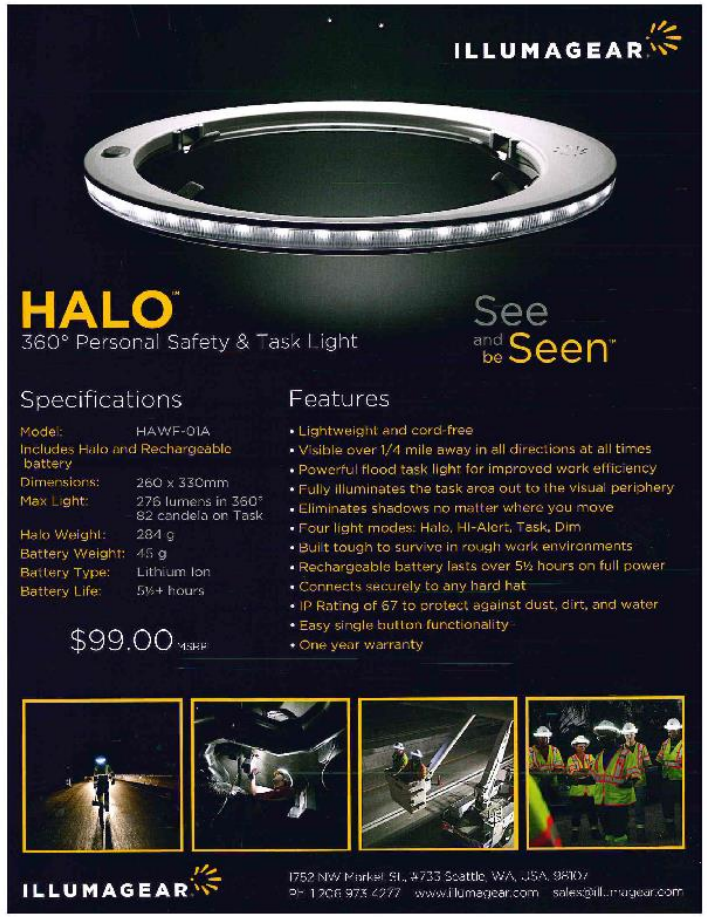
Designated flagger station

- Devices provide extra visibility to motorists
- Encourage the flagger to stay at the station and not wander

Safe Practices – Night Work

The Halo light is another personal lighting option to enhance user's vision and their visibility to third party motorists and construction operators.





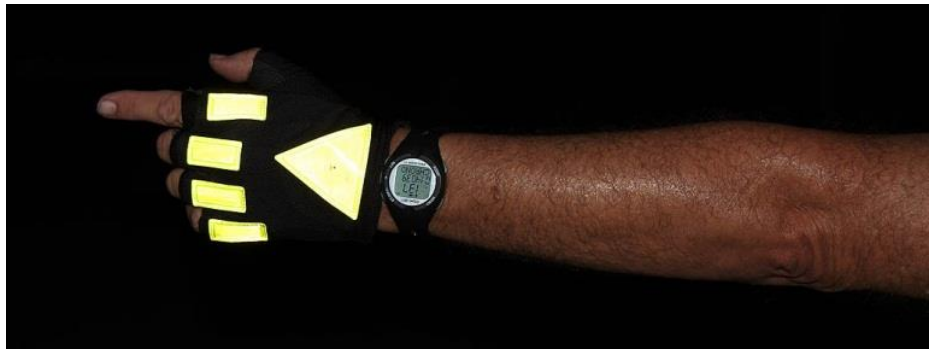
Safe Practices – Night Work - *Flaggers*

- Establish a nighttime flagger kit:
  - Flashlight with cone
    Extra Batteries
    Flashlight belt holder/pouch
  - Traffic Control Flag
  - Air Horn
  - Hi Visibility Gloves
  - Appropriate PPE











Technology Can Remove or Reduce Exposure

RELOCATE



In the field now

AFADs and portable signals

Remote operation

Speed and intrusion-warning devices

Enhanced lighting

Driver-information systems

Under development or evaluation

Robotic flagger (proof of concept)

Automated braking

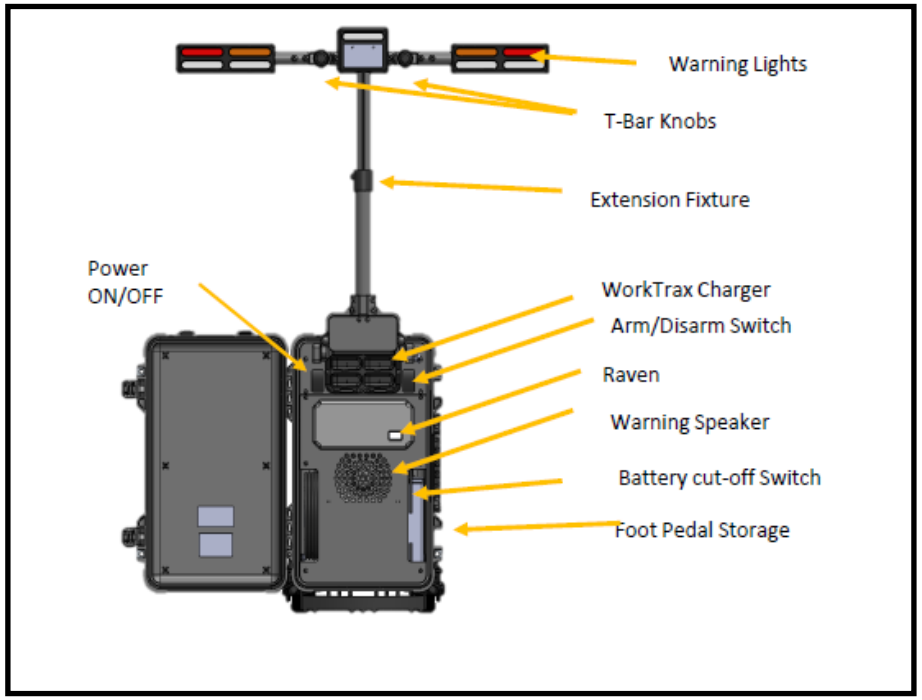
Intrusion warning devices

AI intrusion monitoring

Technology earns its place when it moves the person away from traffic, improves warning, or creates meaningful separation.

Flagger Assist - Sentry

The device automatically detects each vehicle as it approaches the work zone and will automatically alert the motorist if they're approaching too fast by flashing white & amber lights or also with a siren.

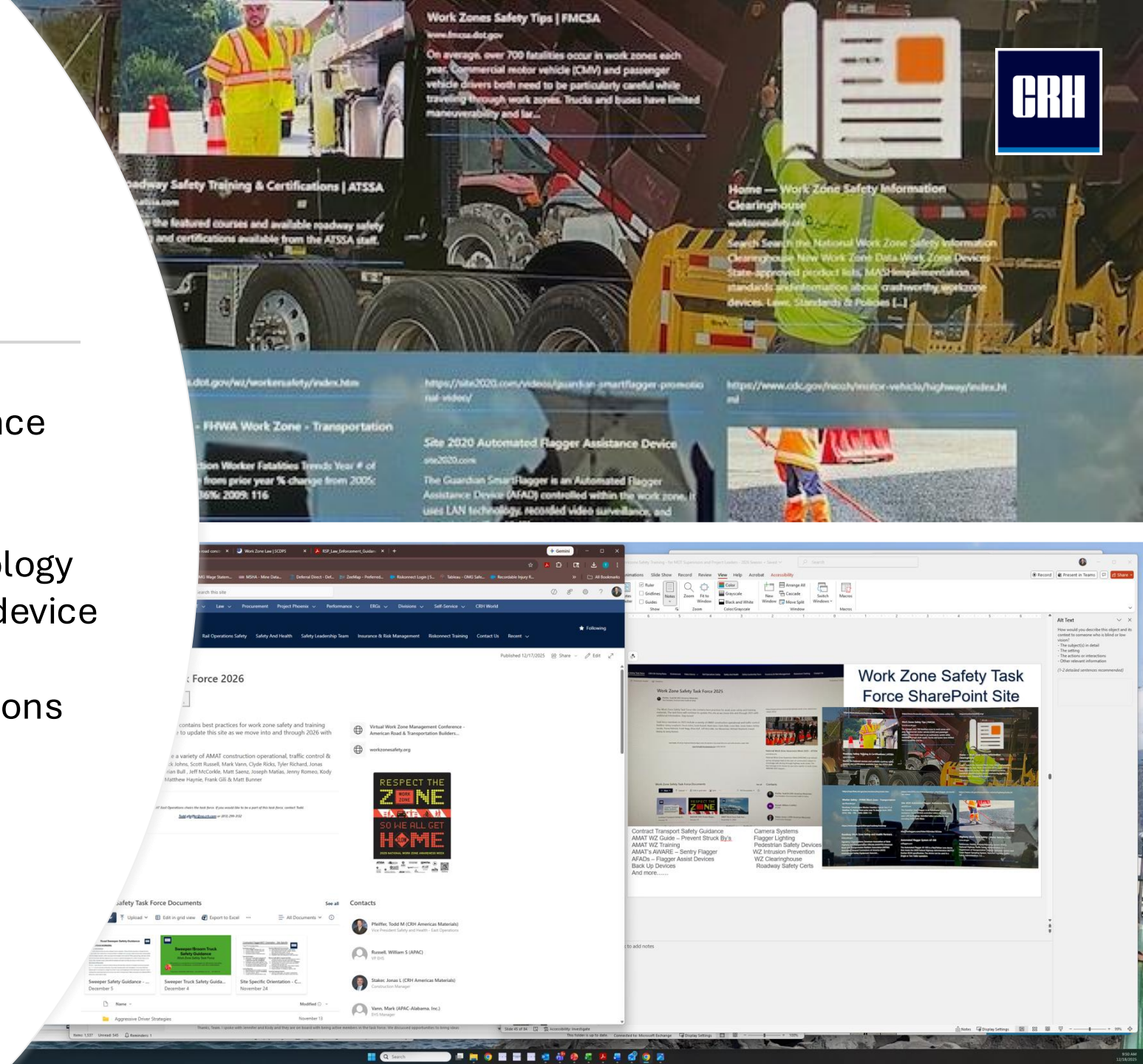


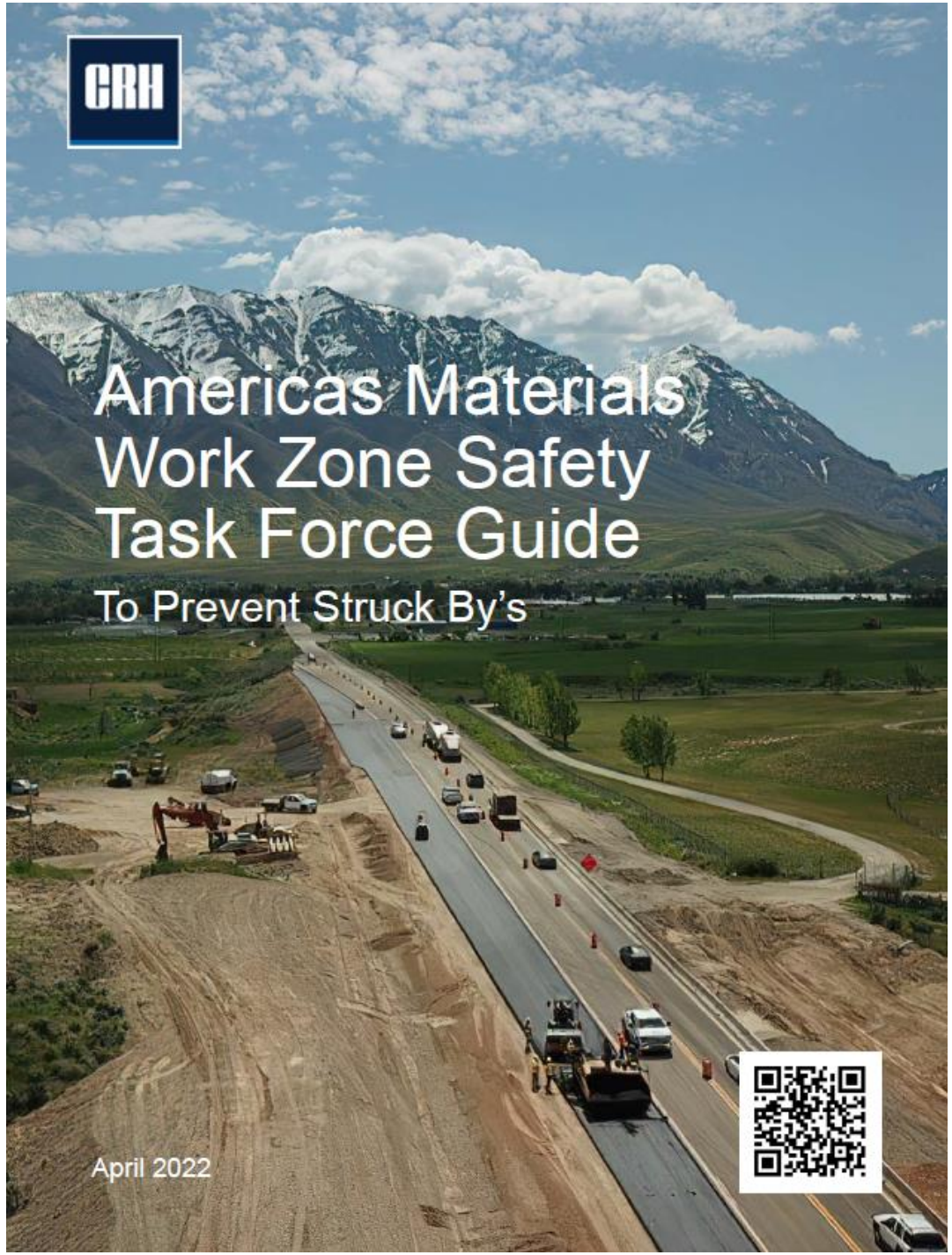


From Field Learning to Shared Resources

- Flagger and pedestrian-worker guidance
- ITCP and struck-by prevention
- Training and short field topics
- Intrusion-prevention tools and technology
- AFAD, lighting, camera, and warning-device information
- Practices shared across AMAT operations

And more……





Work Zone Safety Strategies

CRH/AMAT has developed a Work Zone Safety Task Force Guide

- ITCPs
- Vehicle-pedestrian separation
- Backing controls
- Intrusion prevention
- Flagger safety
- Visibility and communication



Work Zone Safety Initiative

Work Zone Safety Initiative

BUILDING SAFER WORK ZONES
Ready Mix Concrete Deliveries

Ready Mix Concrete deliveries often take place in or near active roadway work zones. Always prioritize your safety and the safety of the traveling public during these operations.



WORK ZONE FACTS
- In 2023, there were 101,000 estimated total work zone crashes with 39,000 estimated work zone injuries
- 899 estimated total WZ fatalities
- 307 estimated commercial truck involved crash fatalities
- 176 estimated pedestrian fatalities

WORK ZONE DELIVERY SAFETY
The following items must be considered by sales / management / dispatch BEFORE delivery:
- If delivery will be affecting roadway traffic, ensure the contractor/customer has provided a safe traffic control set up at the delivery site to include **warning signs** and **traffic control devices** like cones and barrels *(See above photo)*.
- Flaggers may be needed to safely stop traffic at the site so trucks can get in or out of the work zone. Please ensure that our contractor or customer has provided trained roadway flaggers to control traffic.
  DRIVERS: If traffic will be affected and the customer has not provided safe access or control, STOP in a safe place and call dispatch.

CHALLENGES IN WZ ACCESS & EGRESS
Ways to minimize risks specifically in roadway work zones:
- Be especially careful at work zone entrances
- Use only designated vehicle access points
- Evaluate surrounding traffic – *Look & check mirrors.*
- Ensure lights are activated – *strobe, turn signal, etc.*
- Be aware of your potential to accelerate / decelerate in relation to traffic flow
- If objects will be blocking your vision, find another entry / exit point or seek assistance



If you need help getting into a jobsite, **STOP** in a safe place and ask for a spotter or call dispatch.





Work Zone Safety Initiative

BUILDING SAFER WORK ZONES
Aggressive Driver Strategies

Recent incidents involving aggressive drivers resulted in AMAT reviewing this risk and issuing the following recommendations.

Common Aggressive Behaviors in Work Zones
- Speeding through work zones
- Tailgating equipment or vehicles; erratic maneuvers
- Ignoring site signage and flaggers
- Confronting flaggers and other site workers



Aggressive Driver Training / Strategies
- Flaggers and all pedestrian workers must be explicitly trained to **never stand in the path of moving traffic or confront aggressive drivers**. While this may seem like common sense, some flaggers or other workers instinctively step into a vehicle's path to protect others. *This is a dangerous action that will not stop a determined motorist and must be avoided*
- Equip flaggers and other key workers with air horns or whistles to provide warning
- **Consider using enhanced maintenance of traffic (MOT)** to control certain situations. Use additional cones/barrels or more substantial traffic control devices to provide a visible deterrent/block to motorists
- Use additional law enforcement officers near flagger stations or at the point of ongoing work to help reduce aggression
- Eliminate or reduce flaggers whenever possible. Also, request from the owner or agency to close the roadway or portions of the road or work from traffic
- Consider additional signage, alternate route information and focus on minimizing traffic queue time among other enhancements

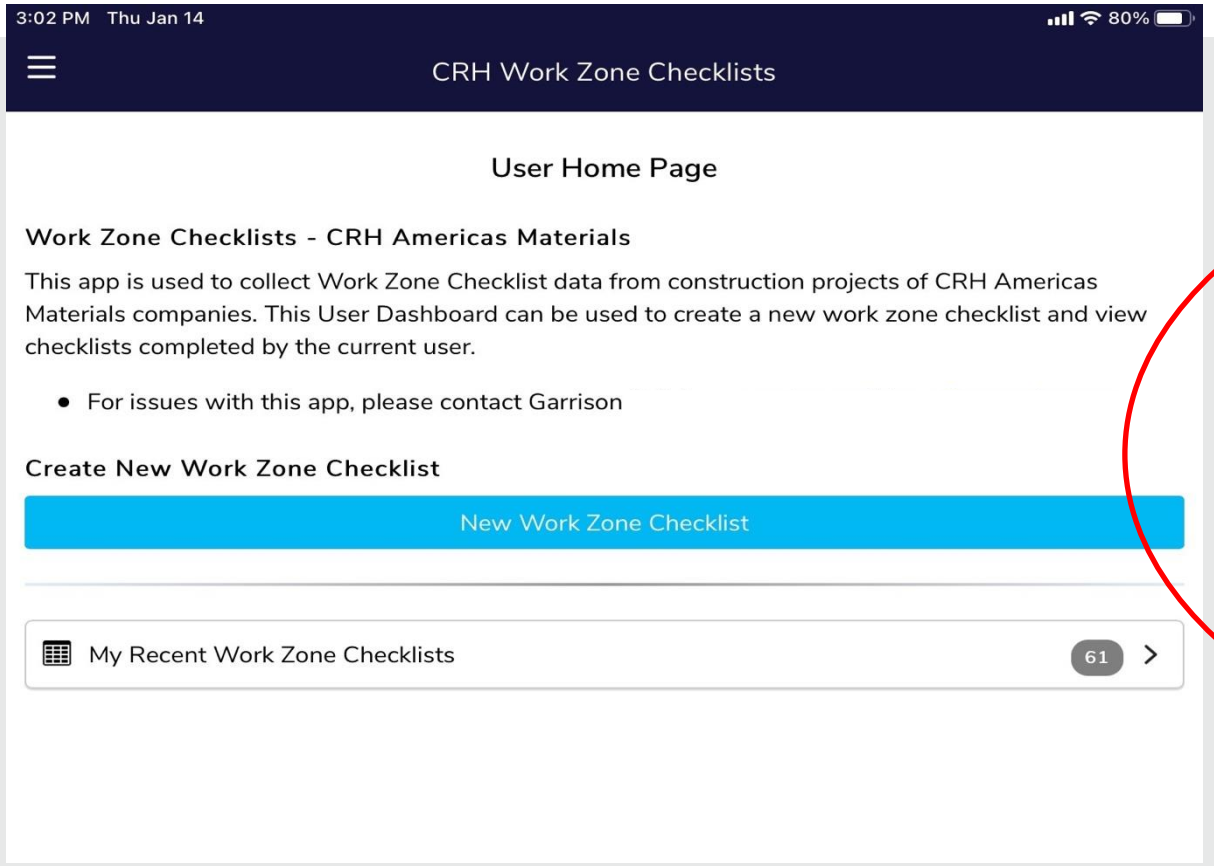


Deescalation Techniques
Flaggers and all pedestrian workers should be instructed in de-escalation techniques. For example:
i) Maintain a calm and neutral demeanor, avoiding sudden movements and threatening body language. Also, never use the paddle or flag to hit or strike a vehicle
ii) Avoid engaging with an angry motorist; however, if engaged, show concern and a willingness to understand the other person's situation.
iii) Use clear and concise language: Sir/Ma'am please stay in your vehicle. Traffic will be moving in another moment.

If there is a risk of imminent violence, call police immediately and remove yourself from the situation to seek safety



Work Zone Daily Checklists - CRH App



Traffic Control Checklist

1. **Pavement Drop-Offs & Low Shoulders**
   - All pavement drop-offs (e.g., shoulder drop-offs, uneven lanes) and low shoulders are properly secured in accordance with all applicable Owner specifications or as otherwise directed by the engineer.
   - No pavement drop-offs exceed the limits set forth in any applicable Owner specifications.
   - The Owner has been notified of all excessive pavement drop-offs that will not, as a part of the project work, be (a) promptly eliminated by shoulder edge treatment or paving operations or (b) protected by concrete barrier walls.
   - The CRH Law Group can provide a Conditions Letter to address an unprotected drop-off.

6. **Flaggers**
   - All flaggers are trained and certified.
   - All flaggers are using proper signaling procedures. See MUTCD and all applicable Owner specifications.
   - All flaggers are wearing personal protective equipment (flaggers are wearing sufficient retroreflective material to be identifiable as a person if working during early morning, late evening, or night). See MUTCD and all applicable Owner specifications.
   - All flaggers are using appropriate equipment (e.g., retroreflective paddles for early morning, late evening, or night work). See MUTCD and all applicable Owner specifications.
   - All flaggers are positioned correctly. For example:
   - All flagger stations are preceded by advance warning signs.
   - All flaggers are clearly visible to approaching traffic.
   - Approaching traffic has sufficient distance to stop.
   - All flagger stations are properly located. See MUTCD and all applicable Owner specifications.

We have an App for that!

It includes flagger review

What this changes

Before the next flagger is assigned

- **Can we eliminate it?**
- **Can we reduce it?**
- **Can we relocate it?**
- **Can we separate it?**
- **Have we verified remaining controls?**

What changed at AMAT

Flagger exposure reviewed before work starts – can it be eliminated?

Flagger assignment deliberate

Designated stations, marked and lit

Recurring field guidance from the task force

A robotic flagger concept designed for field evaluation

Don't make a person the primary defense against a moving vehicle.



NATIONAL WORKZONE SAFETY INFORMATION CLEARINGHOUSE

Flagging Operations In Virginia



NATIONAL WORKZONE SAFETY INFORMATION CLEARINGHOUSE

Flagger Related Crashes 2024 - 2025

- **2024** ~ 66 Crashes
- **2025** ~ 54 Crashes

FR-300 Crash Report (DMV)

- No Field For Flaggers
- Used AI To Mine The Description Field For “Flagger”



NATIONAL WORKZONE SAFETY INFORMATION CLEARINGHOUSE

History of Flagger Certification

- In The Past VDOT Would Allow Another Certified Flagger To Train Someone Else With A 30-minute Video And A Short Test.
- VDOT Did Not Keep Records Of Who Was Trained.
- Flagger Cards Where Being Given Out Without Any Instruction
- We Found Fake ATSSA Flagger Cards.



NATIONAL WORKZONE SAFETY INFORMATION CLEARINGHOUSE

Revised Flagger Certification Program

- VDOT Basic And Intermediate Work Zone Training
  - 8 Or 16 Hours Of Training Which Includes Flagging Training.
  - VDOT Keeps Records Of These Classes And Can Verify Who Has Been Certified.
- ATSSA Flagger Certification
  - 4 Hour Class (In Person Or Virtual)
  - ATSSA Has A Portal To Check If Someone Has An ATSSAS Flagger Certification.



NATIONAL WORKZONE SAFETY INFORMATION CLEARINGHOUSE

Safety Benefits

- More Standardized Training
- Better Vetting Of Instructors *(Just Because You Can Flag, Doesn't Mean You Can Instruct)*
- ATSSA Has A Well-established Flagger Certification Program Used By Other States.

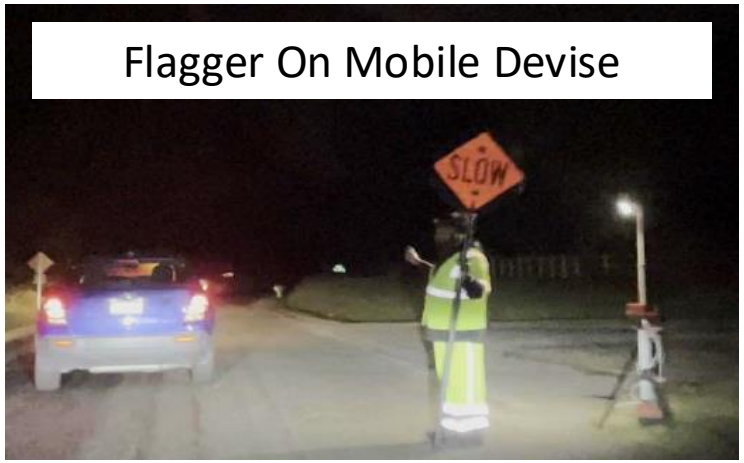
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Safety Reminders

- Ensure Proper Flagger Training
- Ensure Flaggers Are Getting Breaks

Flagger On Mobile Devise





Flagger Standing With Back To Traffic



Flagger Standing With Back To Traffic And Unzipped Vest



NATIONAL WORKZONE SAFETY INFORMATION CLEARINGHOUSE

Recommended Solutions

- VDOT Is Recommending The Following When It Comes To Two-way One-lane Traffic Control:
  - Automated Flagger Assistance Device (AFAD)
  - Temporary Traffic Signals (Cart Signals)



NATIONAL WORKZONE SAFETY INFORMATION CLEARINGHOUSE

Automated Flagger Assistance Device (AFAD)

- **Worker Safety:** Removes Human Flaggers From Direct Contact With Live Traffic And Distracted Drivers.

- **Labor Efficiency:** Allows A Single Worker To Operate Two Units Instead Of Deploying Multiple Manual Flaggers.



NATIONAL WORKZONE SAFETY INFORMATION CLEARINGHOUSE

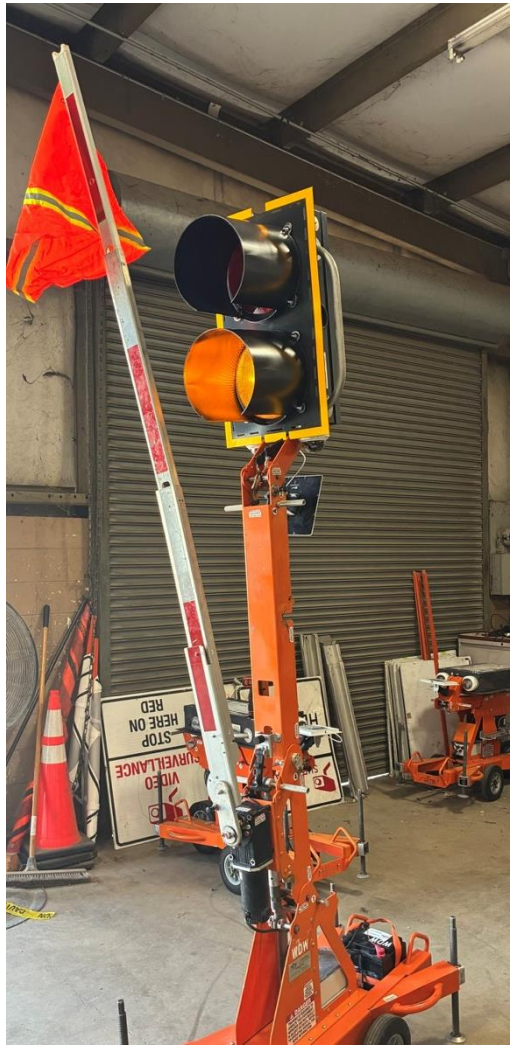
Automated Flagger Assistance Device (AFAD)

- **Driver Compliance:** High-visibility Led Lights, Reflective Gate Arms, And Standardized Signals Reduce Driver Confusion.

- **Portability:** Battery-Powered And Solar-Charged Trailers Can Be Towed And Deployed By One Person In Minutes

VDOT AFAD Requirements

- 12” Signal Heads
- Tunnel Visors
- Reflective Backplates
- Gate Height Between 3.5 And 4.5 Feet



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Temporary Traffic Signals (Cart Signals)

- Keeps Workers Out Of Live Traffic By Reducing The Need For Manual Traffic Control.
- Predictable Signalized Control Of Traffic
- Used Only During Active Work Zones



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NATIONAL WORKZONE SAFETY INFORMATION CLEARINGHOUSE

Cart Signals

- Compact In Size And Can Be Moved Easily

Folded Up For Transport Mode



Extended For Use



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NATIONAL WORKZONE SAFETY INFORMATION CLEARINGHOUSE

Cart Signals

- Place One Device On Each Side Of The Road To Meet MUTCD Requirements







NATIONAL WORKZONE SAFETY INFORMATION CLEARINGHOUSE

Thank You

Any Questions?