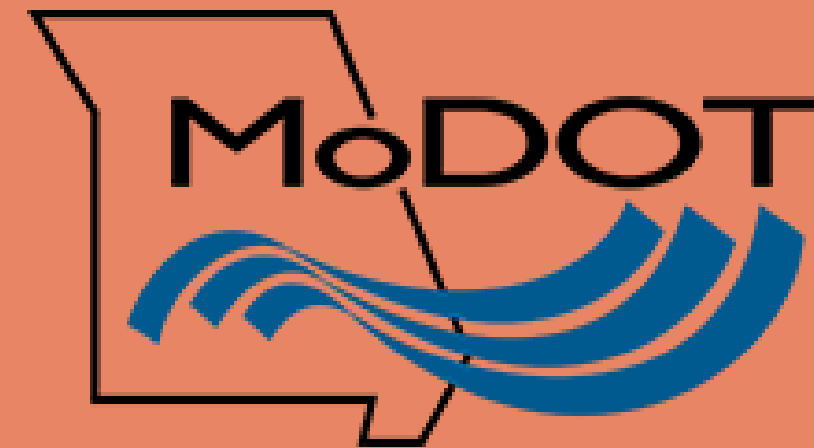


Smarter Work Zones, Safer Work Zones

Chris Engelbrecht

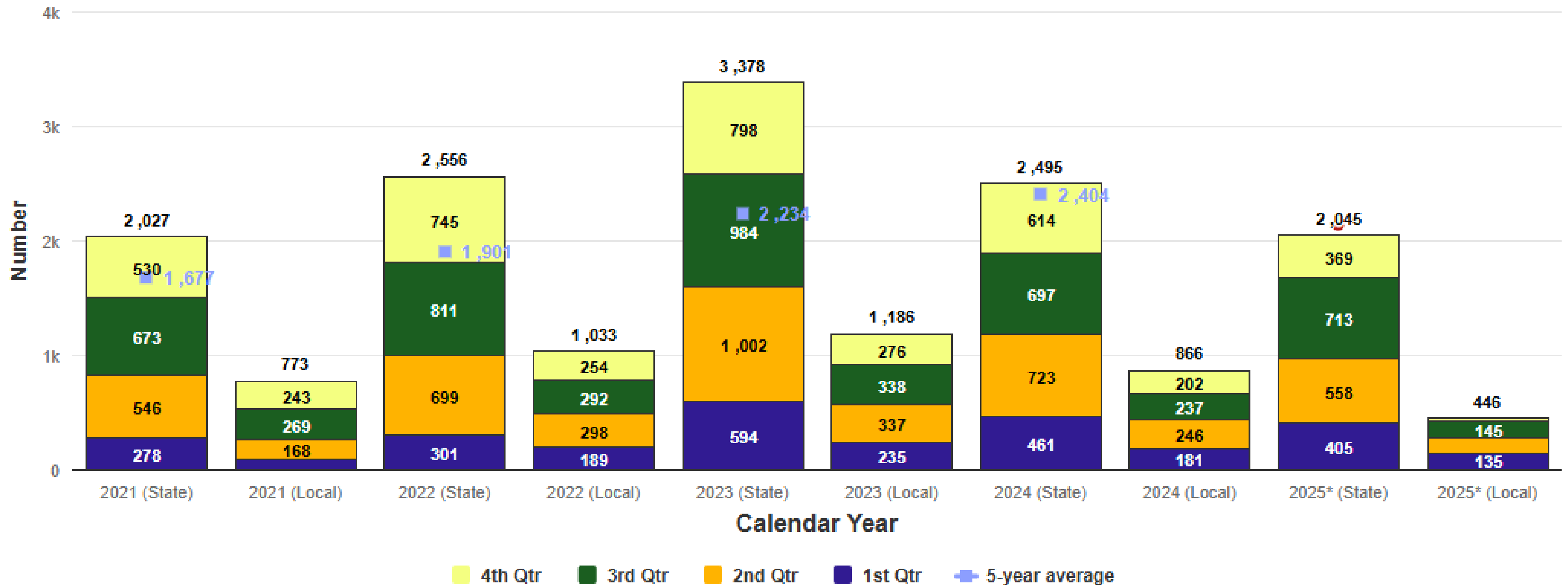
Safety and Emergency Management Director

Missouri Department of Transportation



Missouri Work Zone Crashes

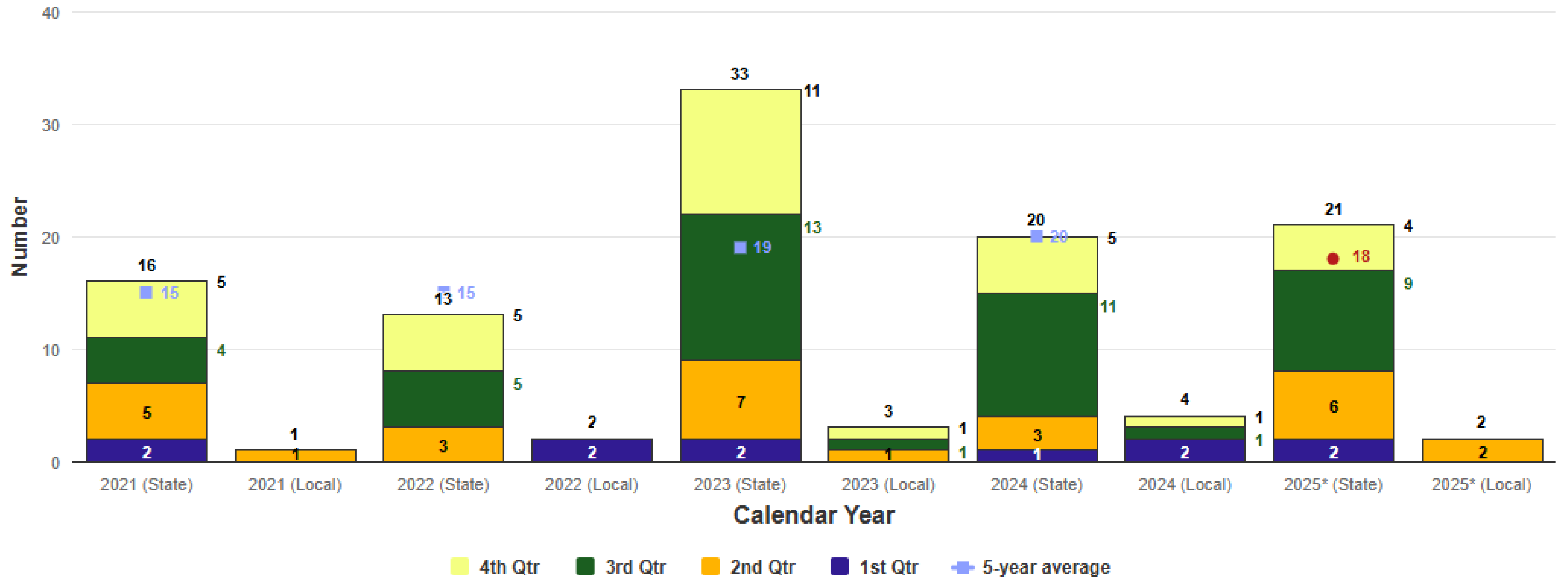
Number of Crashes in Work Zones



Target: Below 2,138

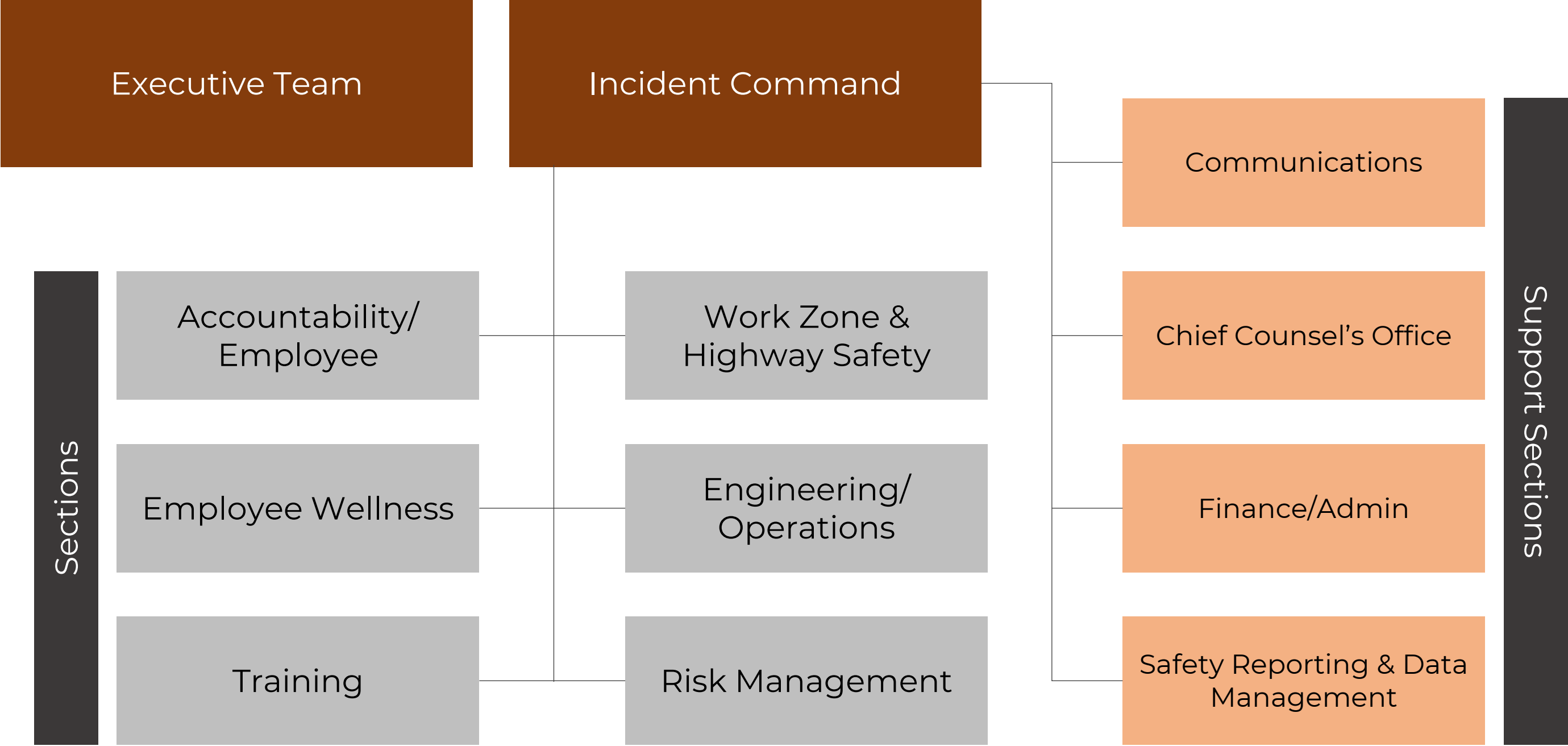
Missouri Work Zone Fatalities

Number of Fatalities in Work Zones



Target: Below 18

SAFETY RESPONSE TEAM



SAFETY EXPECTATIONS FOR FIELD PROFESSIONALS

DAILY SAFETY BRIEFING

Safety is one of MoDOT's core values and it is everyone's responsibility to keep themselves, their co-workers, and the public safe. Starting each shift with the following safety routine will ensure that every step has been taken to eliminate as many risks as possible.

As a minimum, the following items will be part of each daily pre-shift briefing with crews:

**Risk Based Assessment (RBA)
review and discussion**

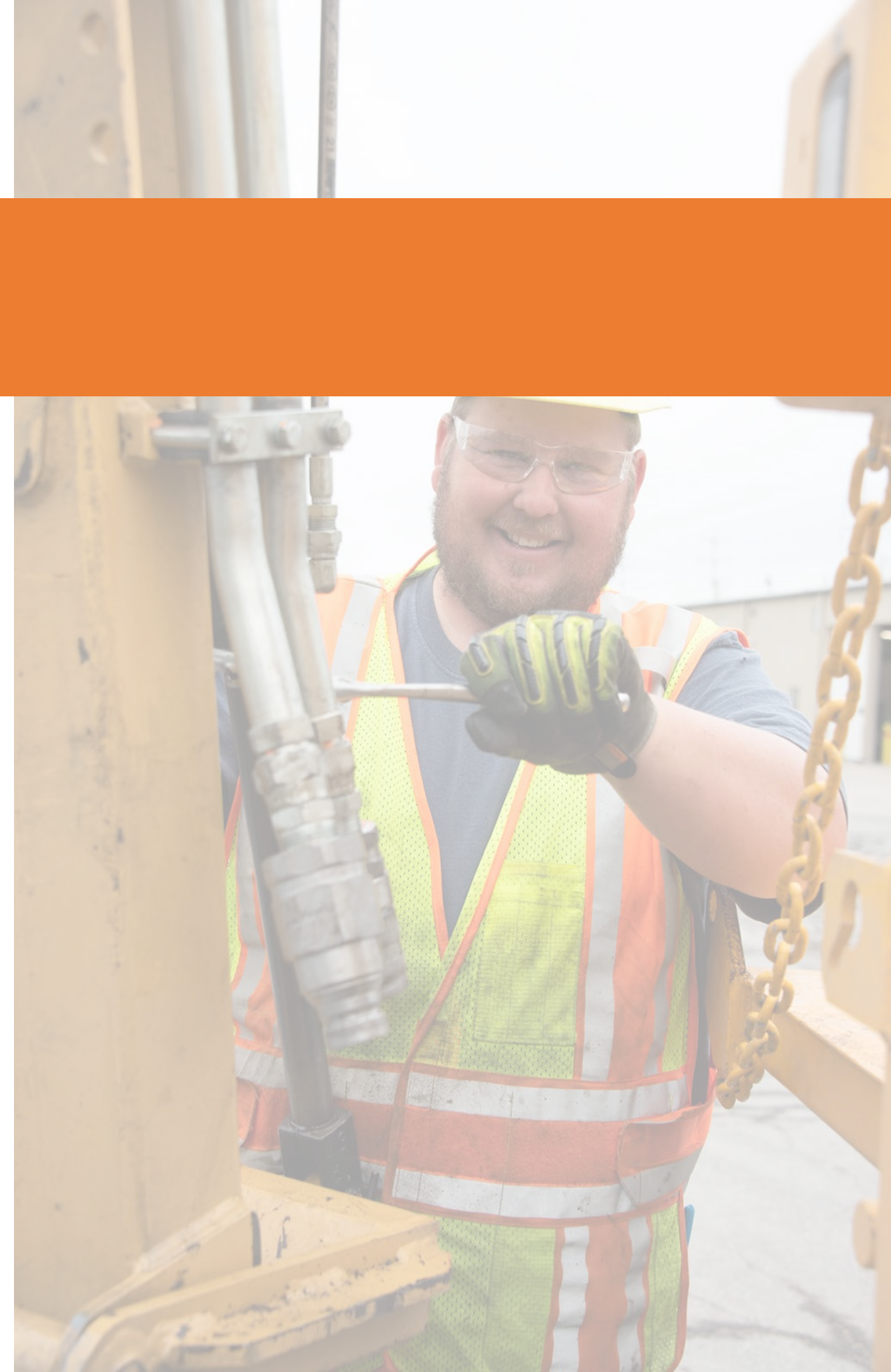
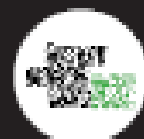
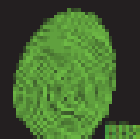
**Work Zone Typical Application (TA)
review and discussion**

**Assignment of roles
(flagger, laborer, operator)**

Assignment of equipment

Stretch and flex

Review any issued safety alerts



616.8.10SDTMA (TA-10SDTMA) Short Duration Lane Closure on a Two-Lane Highway using TMA Flaggers

- **Short Duration:** Defined as workers on foot for 60 minutes or less in one location.
- **Location:** A location is defined as the maximum length of work zone (L) for the road you are working on.
- **Position TMA Flagger #1 in the closed lane of traffic:**
 1. Position TMA Flagger #1 a minimum of 150 feet in advance of the work space, if possible. Spacing may vary due to hills, curves, and intersections.
 2. If the distance between the TMA Flagger and the work vehicle exceeds 500 feet, add an additional protective vehicle.
- **Position TMA Flagger #2 in the open lane of traffic.**
- **Single TMA Flagger:**
 1. Do not release traffic into the opposing lane of traffic.
 2. The traffic may be released when all work vehicles are out of the travel lane.
- **If a TMA Flagger becomes inoperable, refer to:**
 1. EPG 616.10SD (TA-10SD) Short Duration Lane Closure on a Two-Lane Highway using Flaggers.
 2. EPG 616.8.10S (TA-10S) Stationary Lane Closure on a Two-Lane Highway using Flaggers.
- **Notes:**
 1. Flaggers are required to have current flagger certification training.
 - a. External flagger training will meet standard specifications located in section 616.4.3.
 - b. Internal flaggers will be trained in accordance with EPG 616.5.1.
 2. One or both lanes of traffic may be stopped at the same time for up to a maximum of 15 minutes.

For other operations, refer to:

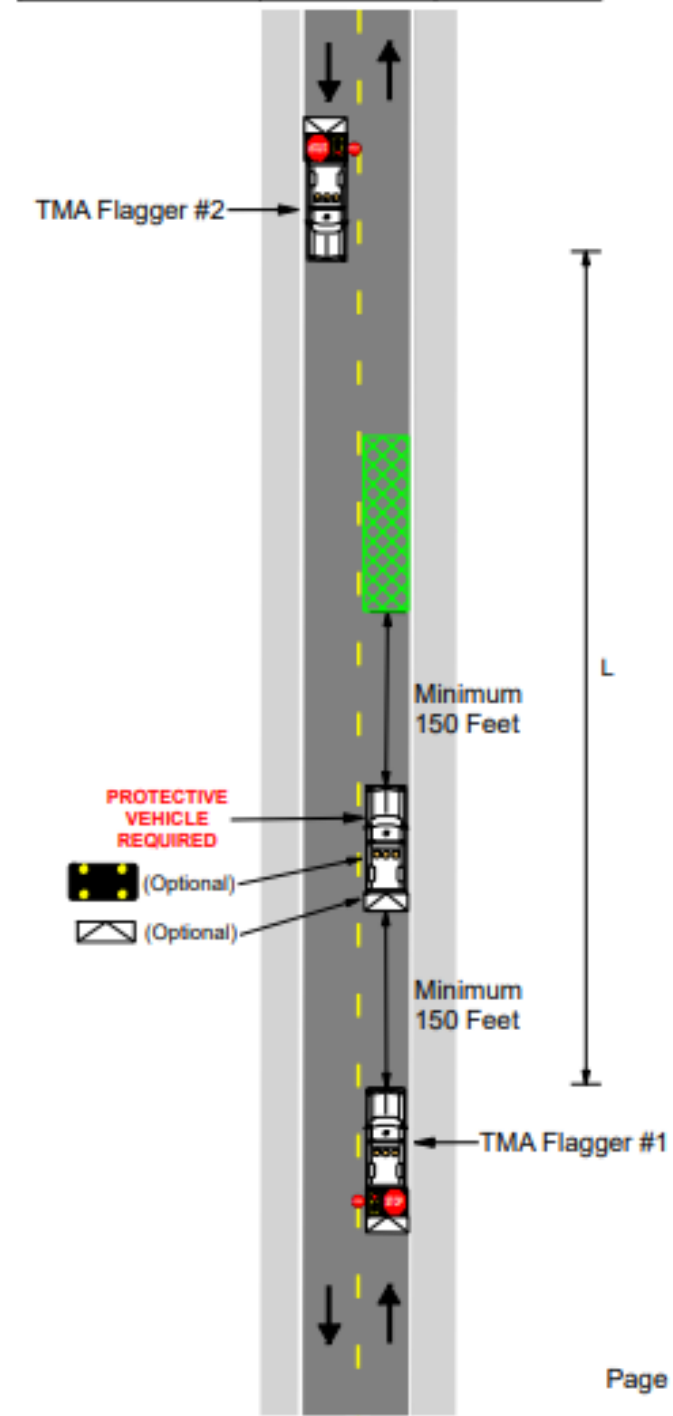
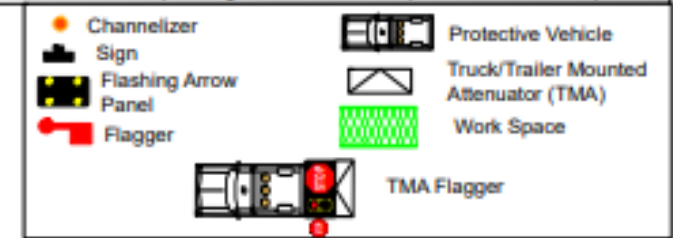
- **Mobile:**
 1. EPG 616.17M (TA-17M) Mobile Operation on a Two-Lane Highway.
- **Stationary:**
 1. EPG 616.8.10S (TA-10S) Stationary Lane Closure on a Two-Lane Highway using Flaggers.
 2. EPG 616.8.10STMA1 (TA-10STMA1) Stationary Lane Closure on a Two-Lane Highway using a TMA Flagger.
 3. EPG 616.8.10SMA2 (TA-10SMA2) Stationary Lane Closure on a Two-Lane Highway using Multiple TMA Flaggers.

616.8.10SDTMA (TA-10SDTMA) Short Duration Lane Closure on Two-Lane Highways Using TMA Flaggers

SPEED	SIGN SPACING (ft.)	TAPER LENGTH (ft.)		RECOMMENDED CHANNELIZER SPACING (ft.)		
		Shoulder (1) (T1)	Lane (2) (T2)	Buffer Length (ft.) (B)	Tapers	Buffer/Work Areas
0-35	200	-	-	250	-	-
40-45	350	-	-	360	-	-
50-55	500	-	-	495	-	-
60-70	1000	-	-	730	-	-

1. Shoulder taper length based on 10 ft. (standard shoulder width) offset. 2. Lane taper length based on 12 ft. (standard lane width) offset.

TYPE OF ROADWAY	SIGN HEIGHT (MINIMUM)	MAXIMUM WORK ZONE LENGTH (L)
URBAN	1" Portable 7' Post	1 MI.
RURAL UNDIVIDED	1" Portable 5' Post	3 MI.
VEHICLE	48 Inches Recommended	-



Date:

Type of Work:

Location:

Work Zone Specialist:

Field Notes:

TYPICAL APPLICATIONS



SAFETY SCORECARD

Safety Dashboard

[Safety Score Calculation](#)

[Change Area](#)

[Data Sheet](#)

[Training Data](#)

[Quarterly Report](#)

[Export to PDF](#)

[Safety Mgt](#)

[Home](#)

ADMINISTRATION - ERP (6M70) ER, ADMINISTRATION - RE (6M40) CR, ADMINISTRATION-AI (6M10) AI, ADMINISTRATION-CC (6M2...



CD SPEC CREW BRIDGE SOUTH (7DB2)

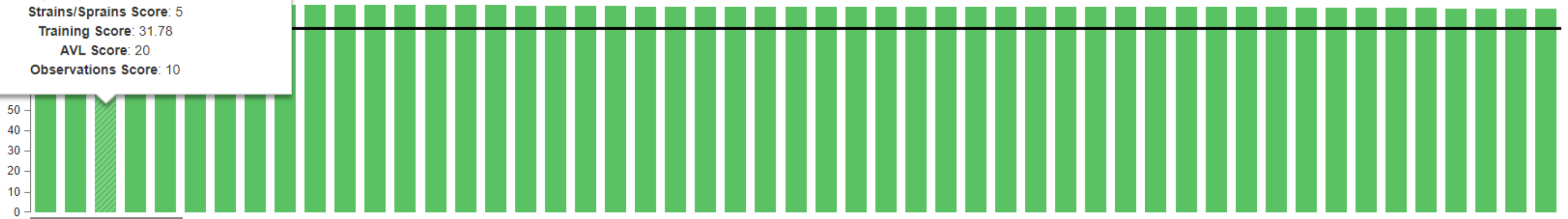
Overall Score: 106.78
 Recordable Score: 5
 Vehicle Score: 5
 Accountability Score: 20
 Backing Score: 5
 Slips/Trips/Falls Score: 5
 Strains/Sprains Score: 5
 Training Score: 31.78
 AVL Score: 20
 Observations Score: 10

SAFETY SCORE

5% Vehicle Incidents Rate, 5% Vehicle Incidents Rate, 20% Accountability, 5% Backing, 5% Slips/Trips/Falls, 5% Strains/Sprains, 35% Required Training Completed, 20% AVL Driving Behaviors + 10 Bonus Points for Observations

Recordables and Vehicle Incidents = Past 36 Months, Percent Trained = Real Time, All Other Components = Past 12 Months

— Safety Score Goal
 > 90% Expected



SAFETY INVESTMENTS

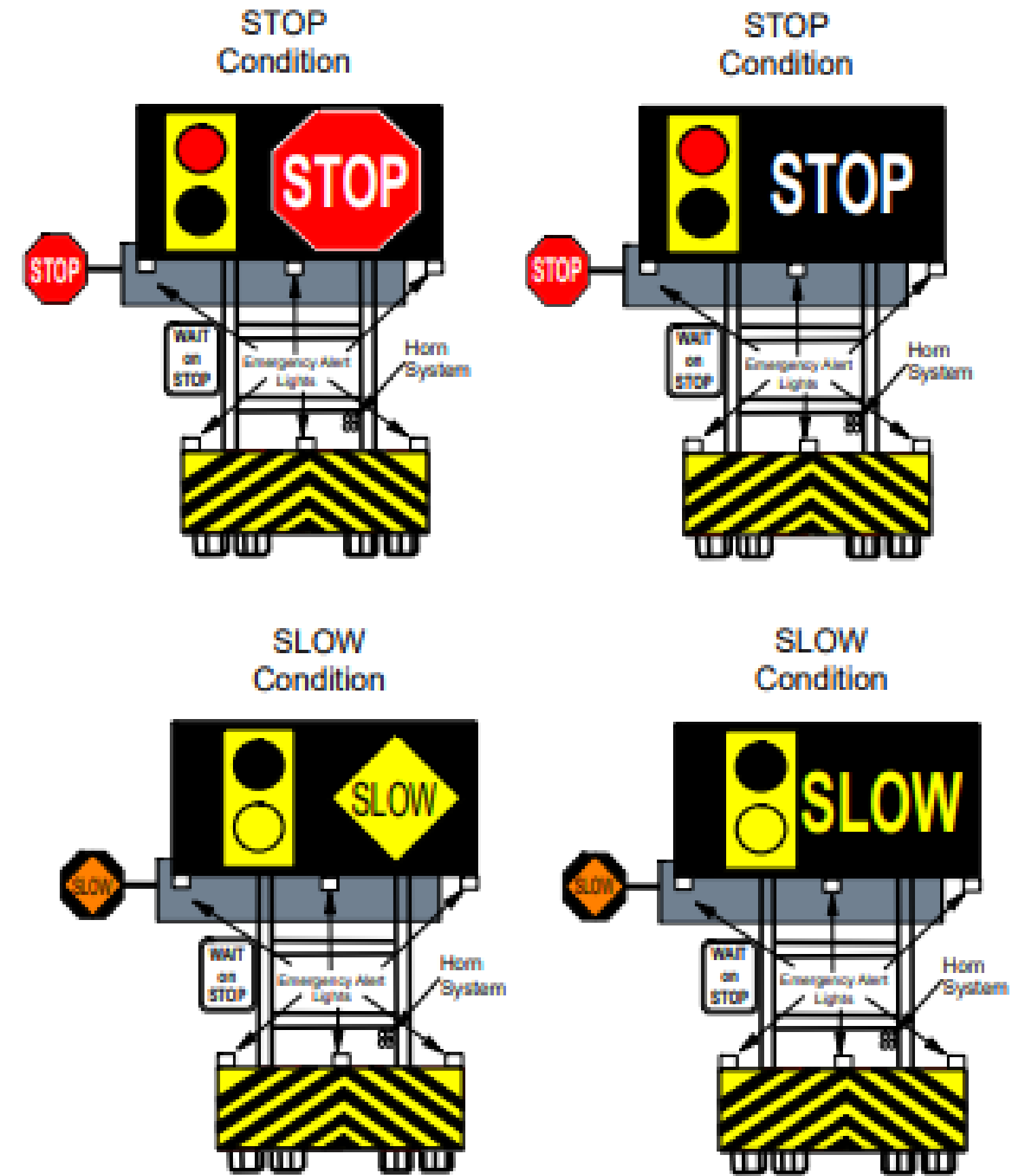
- Protective Equipment
- Technology
- Innovation
- Safety & Technical Training



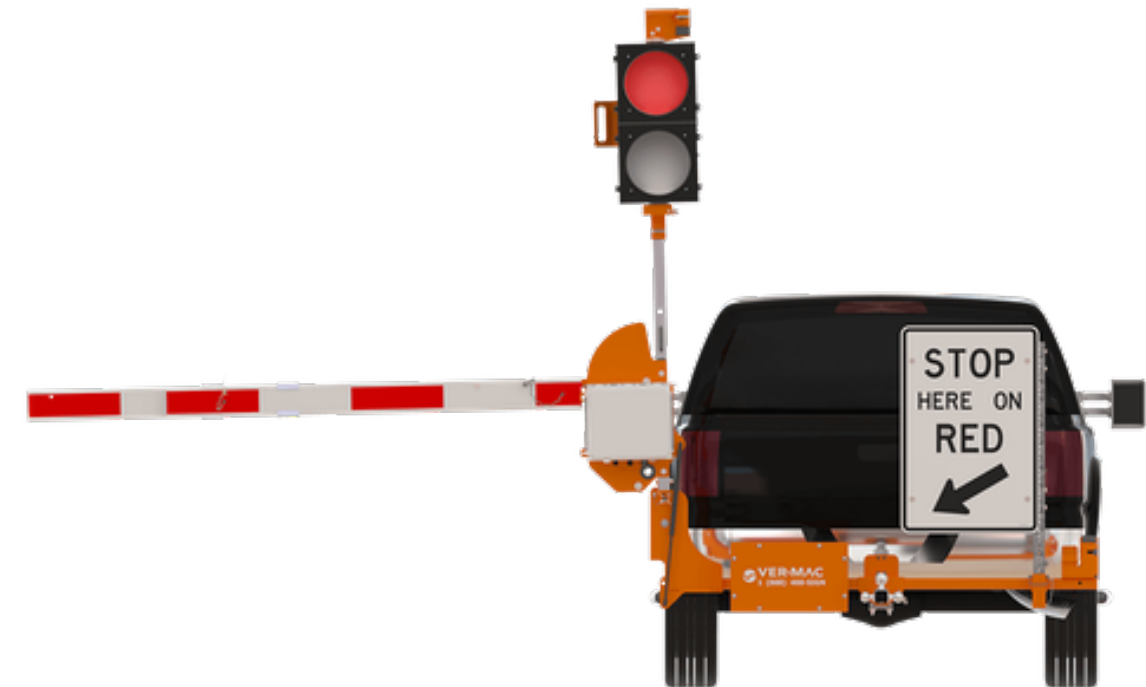
TRUCK MOUNTED ATTENUATORS (TMAS)



TMA FLAGGER UNITS



TRUCK AFAD UNITS



VEHICLE MOUNTED FULL MATRIX BOARDS

LED Arrow Board



Full Matrix Message Board



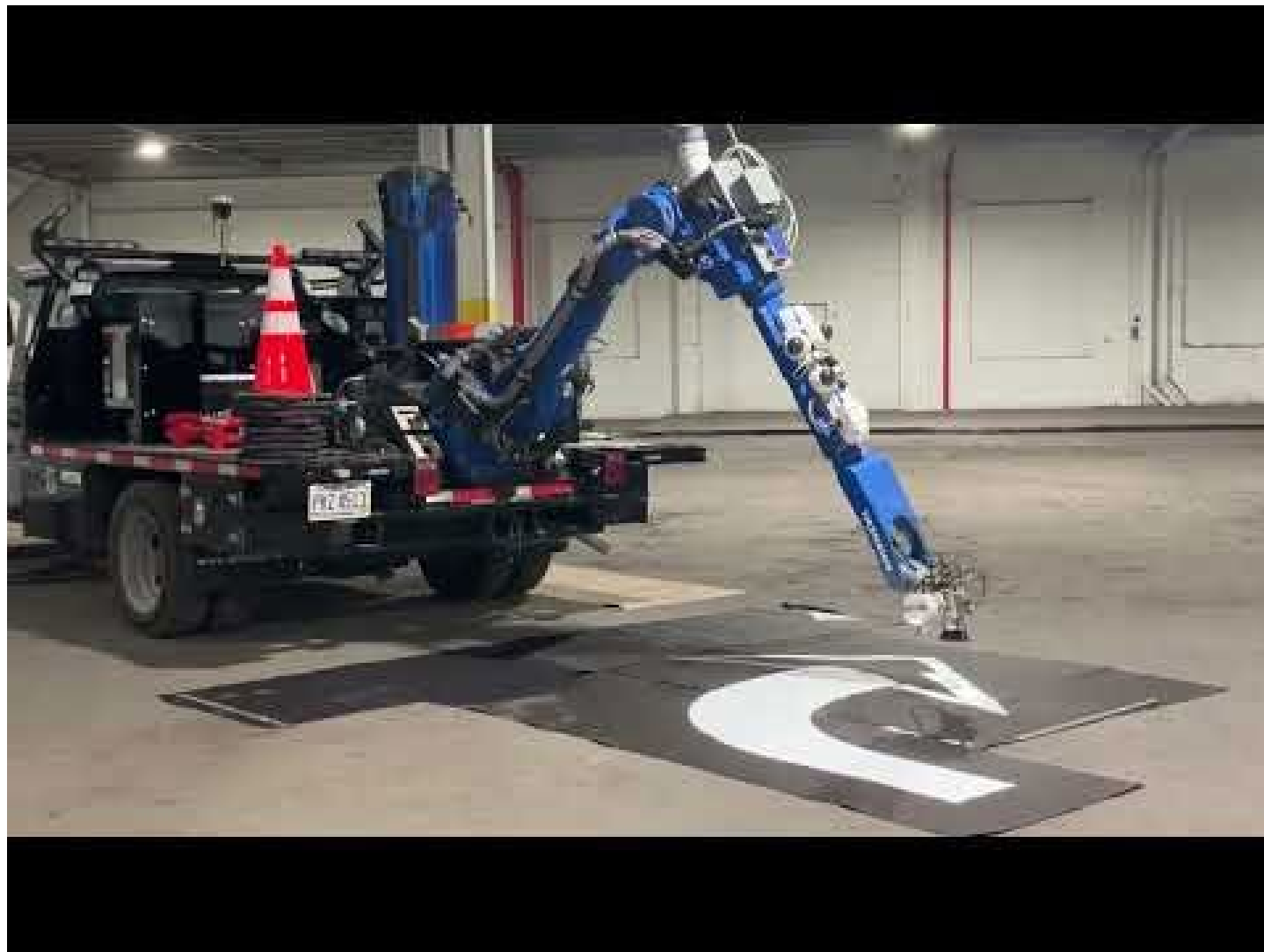
AUTOMATED POTTHOLE PATCHERS



STRIPER RECORDING/LAYOUT AUTOMATION



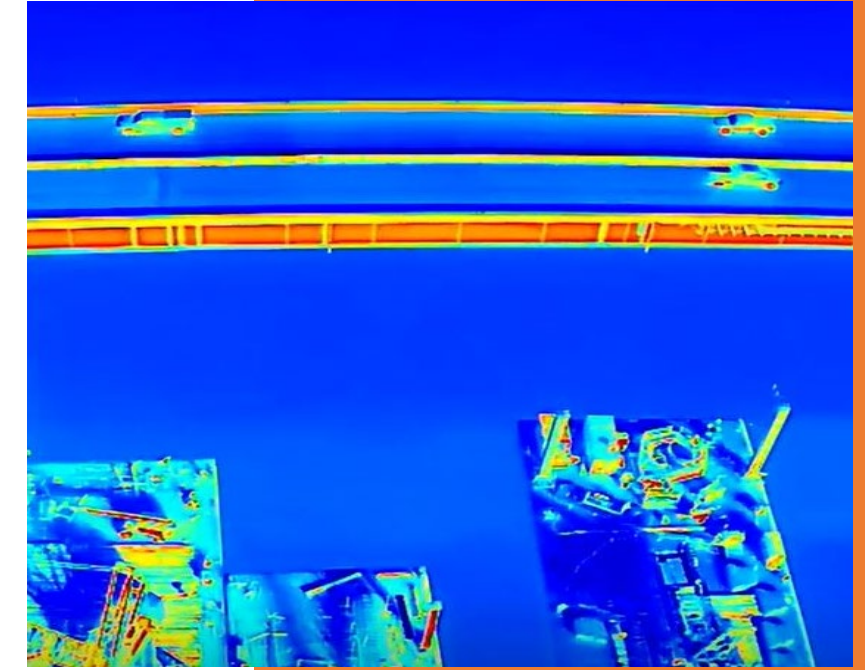
ROBOTIC PAVEMENT MARKING



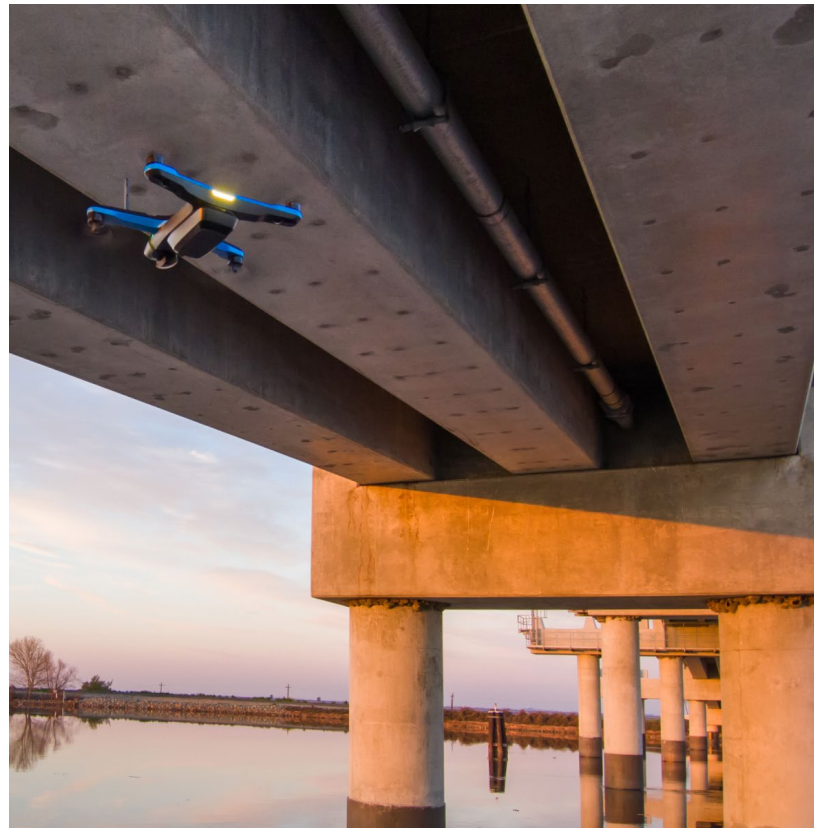


UNMANNED AERIAL VEHICLES

- UAV w/ **Camera**
 - Bridge Inspection
 - Communications
 - Damage Assessment
 - Incident Management



- UAV w/ **LiDAR**
 - Surveys
 - Asset Characterization

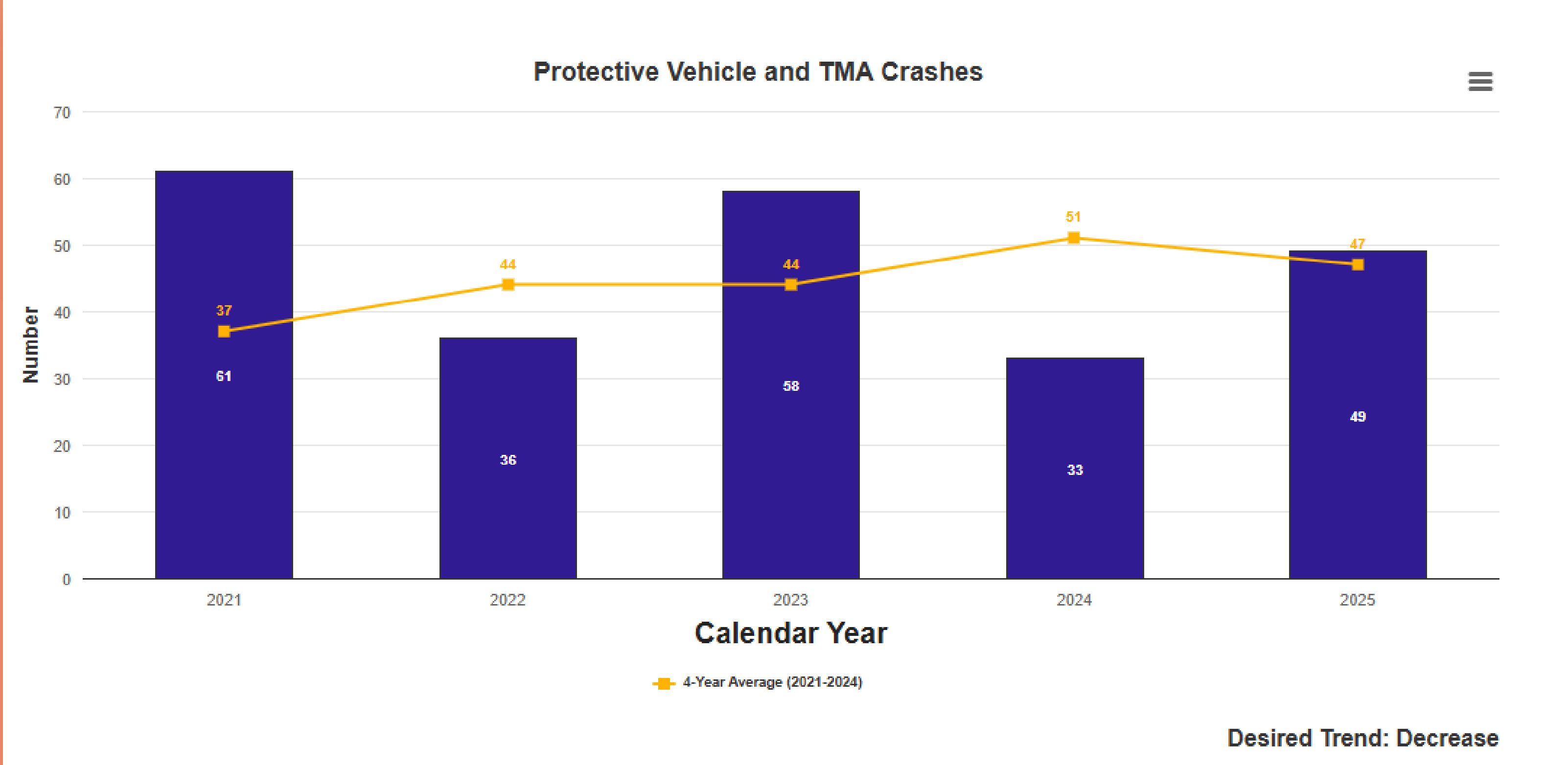


- UAV w/ **Thermal**
 - Bridge Inspection

TMA VIDEO RECORDING SYSTEMS



MoDOT PV/TMA Crashes



Missouri TMA Crash Stats

2023 - 2025

MMS Safety Management: TMA/PV

*Only contains incidents with status of Level 2 Reviewer through Completed Status

Date

1/1/2023 1/14/2026

Count of Incidents with TMA

136

Count of Incidents with Protective Vehicle

13

Count of Incidents with Trailer Mounted TMA

101

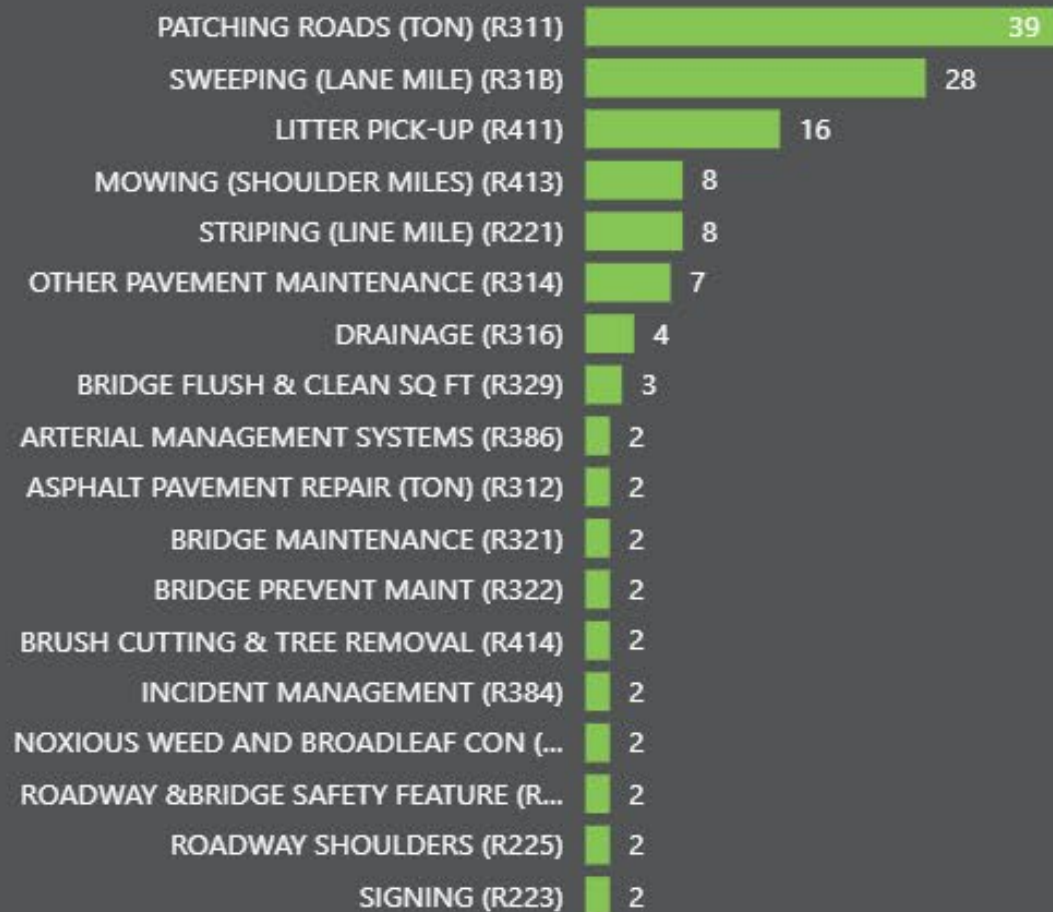
Count of Incidents with Truck Mounted TMA

30

Count of Incidents with Flagger TMA

5

TMA/PV Hit by Activity



of Units with Emergency Lights Installed

131

% of Emergency Lights Activated

84%

of Units with Emergency Audible Installed

87

% of Audible Alerts Activated

64%

LANE_NUMBER_HI

Right Shoulder

5

4

3

2

Count of TMA Incidents with HAAS Installed

29

Human and Financial Cost of TMA Impacts



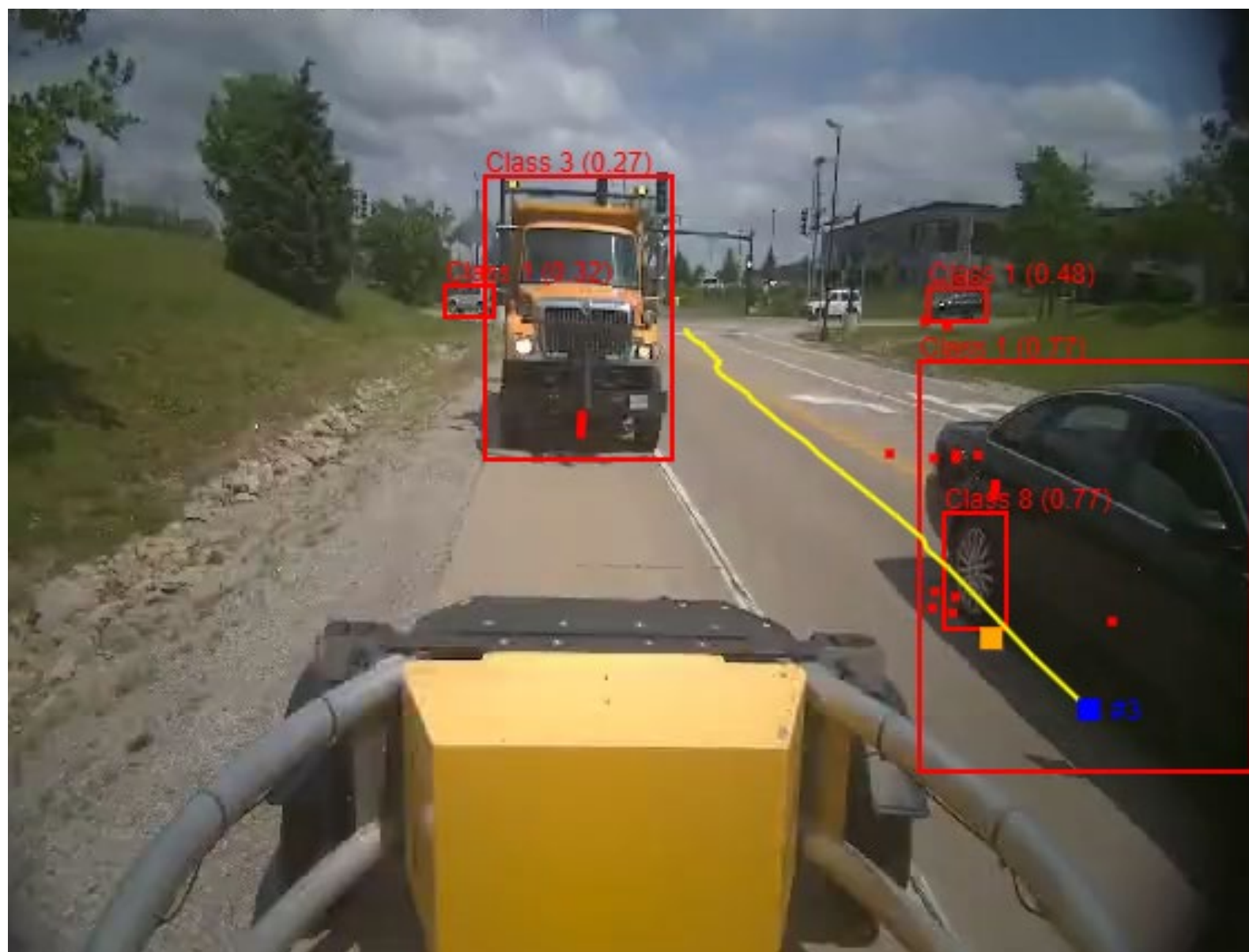
Past Mitigation Strategies



Omnisight Fusion Sensor



- Compact device with solid aluminum enclosure
- Sealed and pressure tested
- Local-EDGE processing allows for real-time decisions
- Cellular equipped for remote updates
- Comprehensive dashboard with health metrics, reports, event history, updates



FLAGGING







BARRICADES



ROAD
CLOSED





ROAD CLOSED
4 MILES AHEAD
LOCAL TRAFFIC ONLY

SIGNING





SAFETY PLANS & PERSONAL PROTECTIVE EQUIPMENT











FHWA Subpart K

Positive Protection Devices:

- Mandatory in high - speed zones or where workers have no escape.
- Consider for long - duration, high - risk projects.

Exposure Control Measures:

- Full/partial road closures, detours, night work, accelerated construction.

Other Traffic Control Measures:

- Signs, rumble strips, ITS, speed management, intrusion alarms, flaggers.
- Law Enforcement: Needed for high - risk conditions; costs eligible for Federal - aid.

Work Vehicles:

- Safe entry/exit procedures required.

Compliance:

- Update policy by Dec 31, 2025
- Implement by Dec 31, 2026

Questions ?

Thank you!

Chris Engelbrecht
Safety & Emergency Management Director
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Christopher.Engelbrecht@modot.mo.gov