AGC/MoDOT Annual COOP Meeting

Safety/Traffic Division &
Specialty Contractors/Suppliers
Breakout Session

December 5, 2018

District Work Zone Review

- St. Louis – June 11-14, 2018
- Central – July 16-18, 2018
- Northeast – August 27-29, 2018

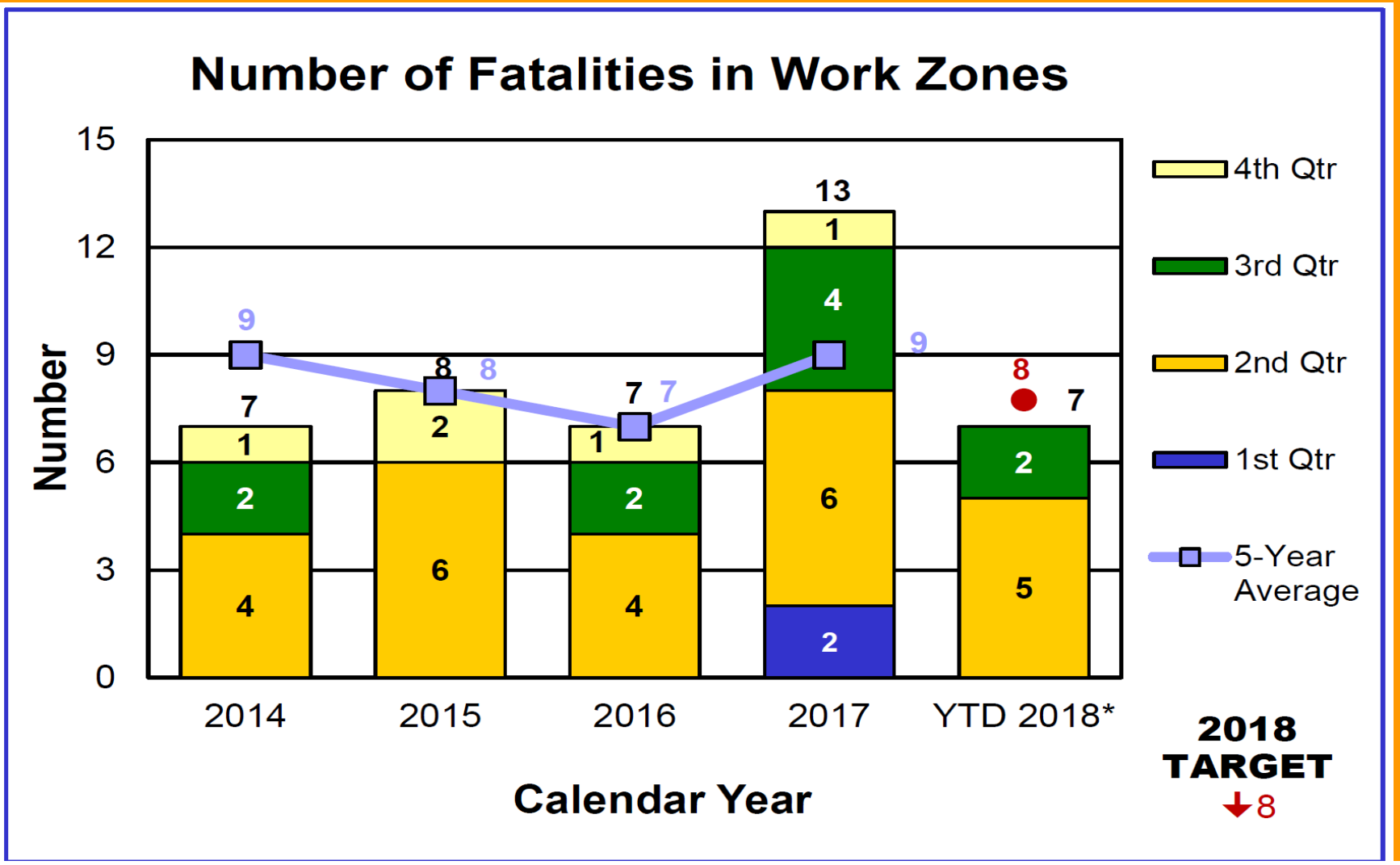
History

- 1996 – Work Zone Reviews
- Focus on Safety and Mobility
- 2003 – WZ Safety and Mobility Policy
- 2004 – 30 Fatalities
- MoDOT Recognized Practice

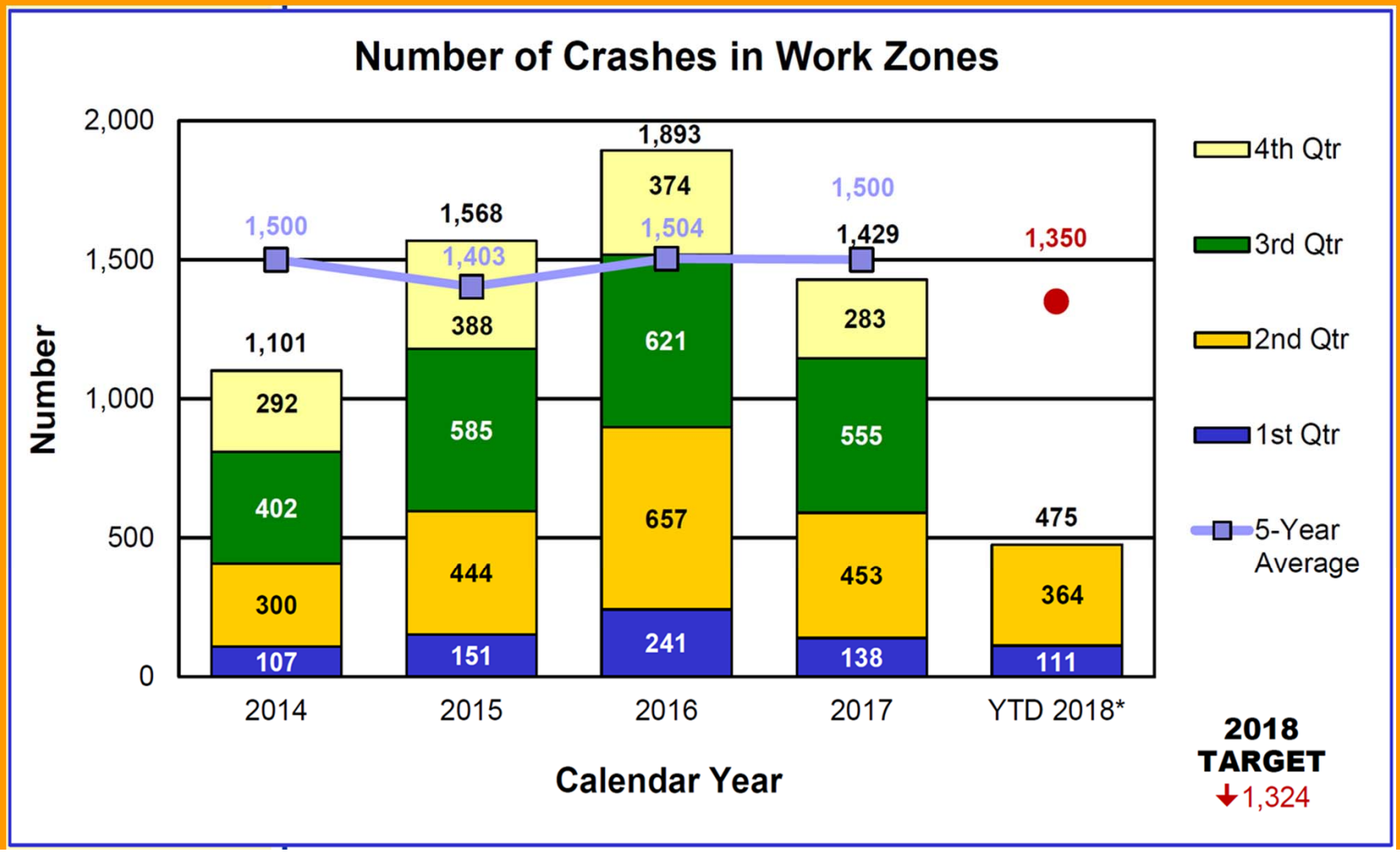
Fatal and Serious Injury Crashes

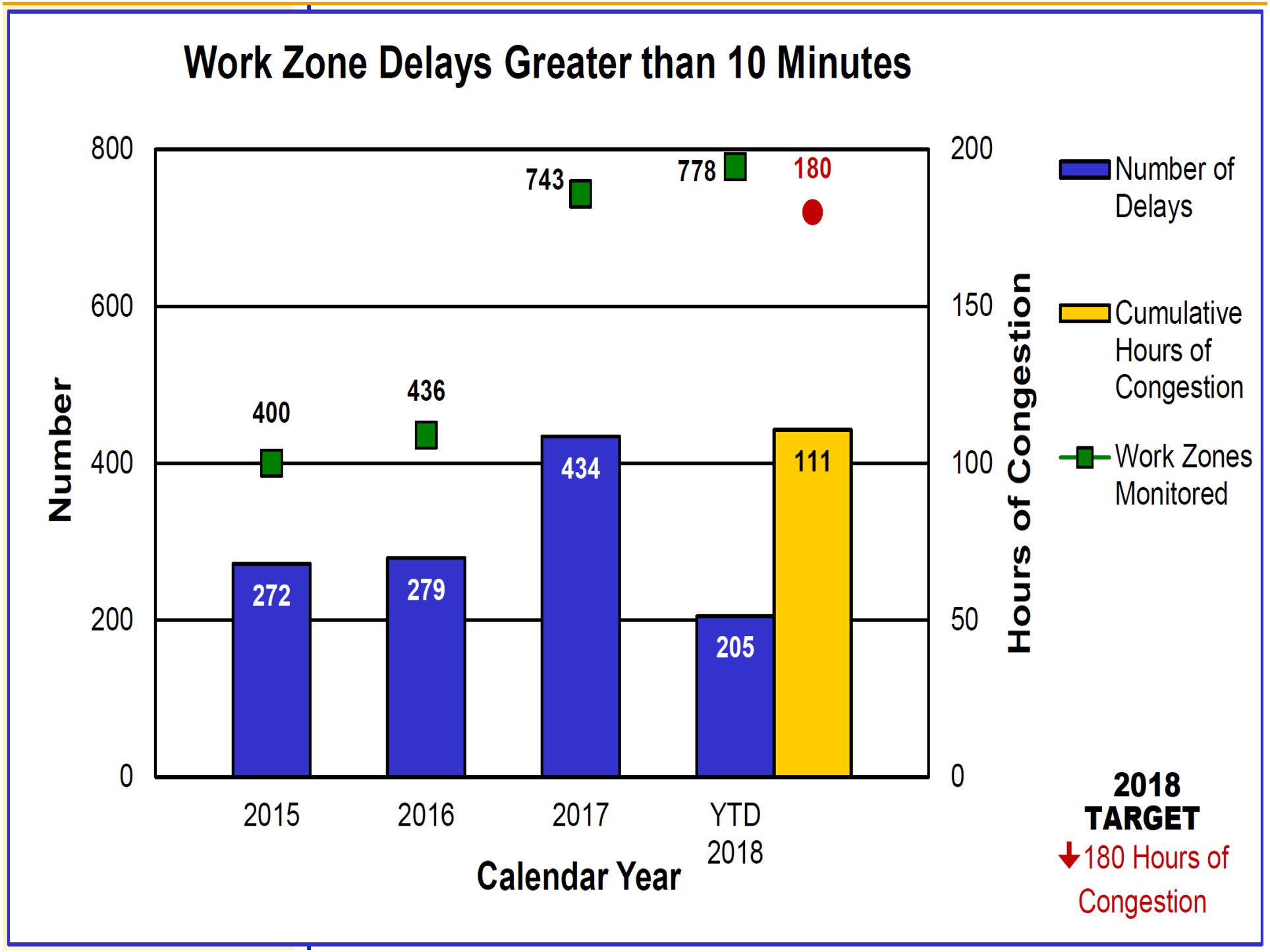
- 56% due to aggressive and distracted driving
- Rear-end crashes most predominant of two or more vehicles
- 62% occurred in urban areas
- 66% occurred in divided roadways
- **56% occurred on ideal geometry (level with no curves)**

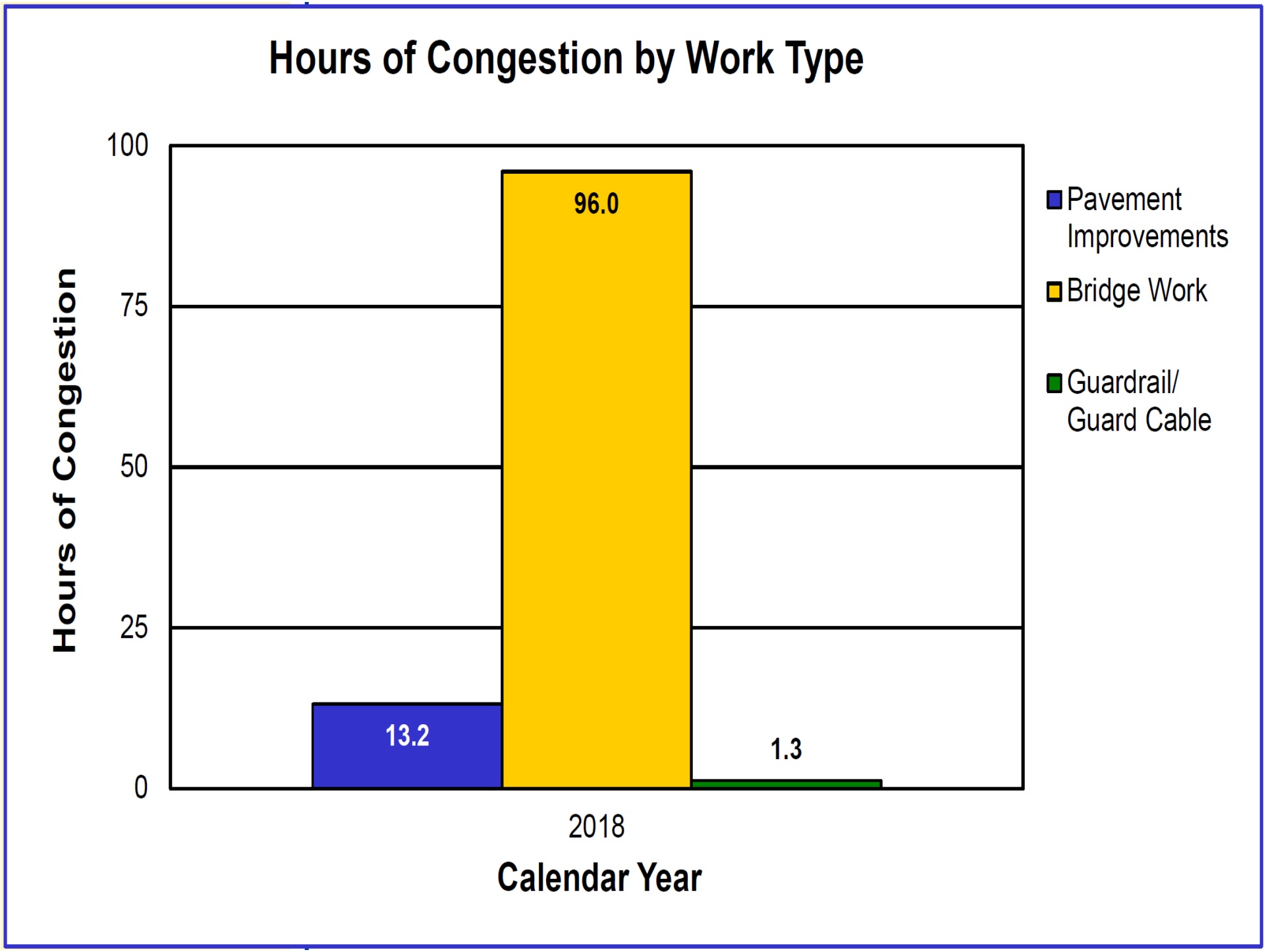
11 Fatalities on State System
1 Fatality on Non-State System
(2018)



1,446 Crashes on State System
747 Crashes on Non-State System
(2017)

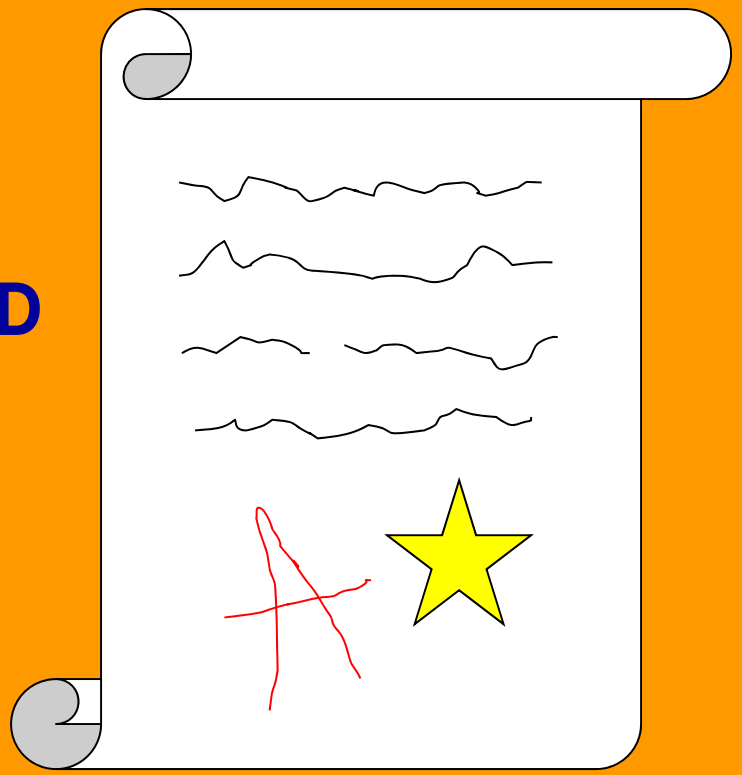



Work Zone Delays Greater than 10 Minutes
800
600
400
200
0
Number
200
150
100
50
0
Hours of Congestion
400
436
743
778
180
272
279
434
205
111
2015
2016
2017
YTD 2018
Calendar Year
Number of Delays
Cumulative Hours of Congestion
Work Zones Monitored
2018 TARGET
180 Hours of Congestion


Hours of Congestion by Work Type
Hours of Congestion
100
75
50
25
0
96.0
13.2
1.3
2018
Calendar Year
Pavement Improvements
Bridge Work
Guardrail/ Guard Cable

The Grading Scale

- A = Excellent;
- B = Good to Very Good;
- C = Acceptable;
- D = Below Average;
- F = Unacceptable;
  - With +/- for grades B,C & D

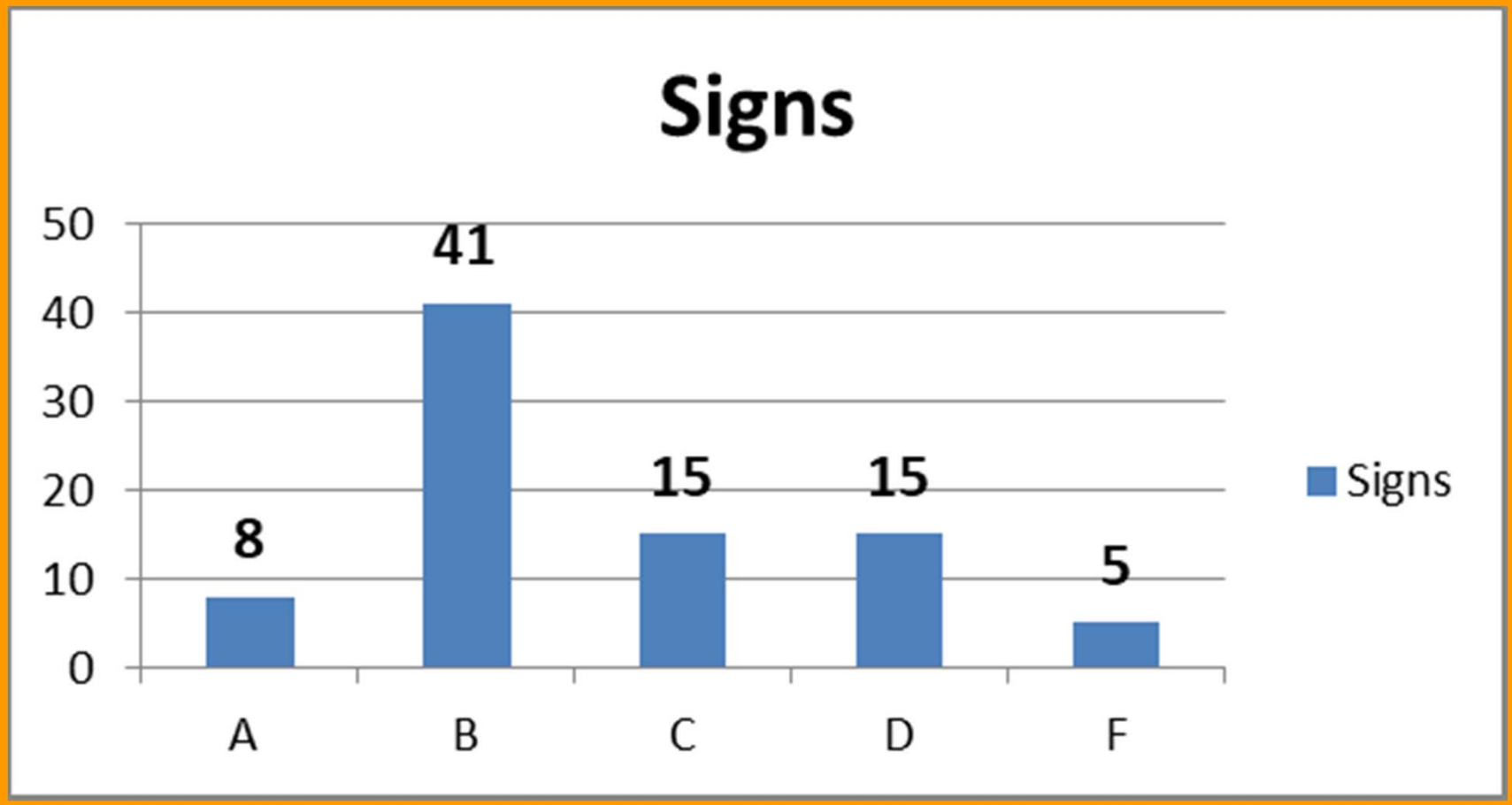


Areas Inspected

- Signing
- Channelizers
- Barricades
- Traffic Barriers
- Crash Cushions
- CMS/Arrow Panels
- Flaggers
- Workers & Work Site
- Roadway Conditions
- Entrance/Exit Ramps
- Tapers
- Lighting
- Pavement Marking
- Truck/Equipment Crossings
- Traffic Management

Facts

- Reviewed 84 work zones
- Types of work zones reviewed included:
  - Construction;
  - Maintenance;
  - Maintenance On-call; and
  - Permit
  - LPA

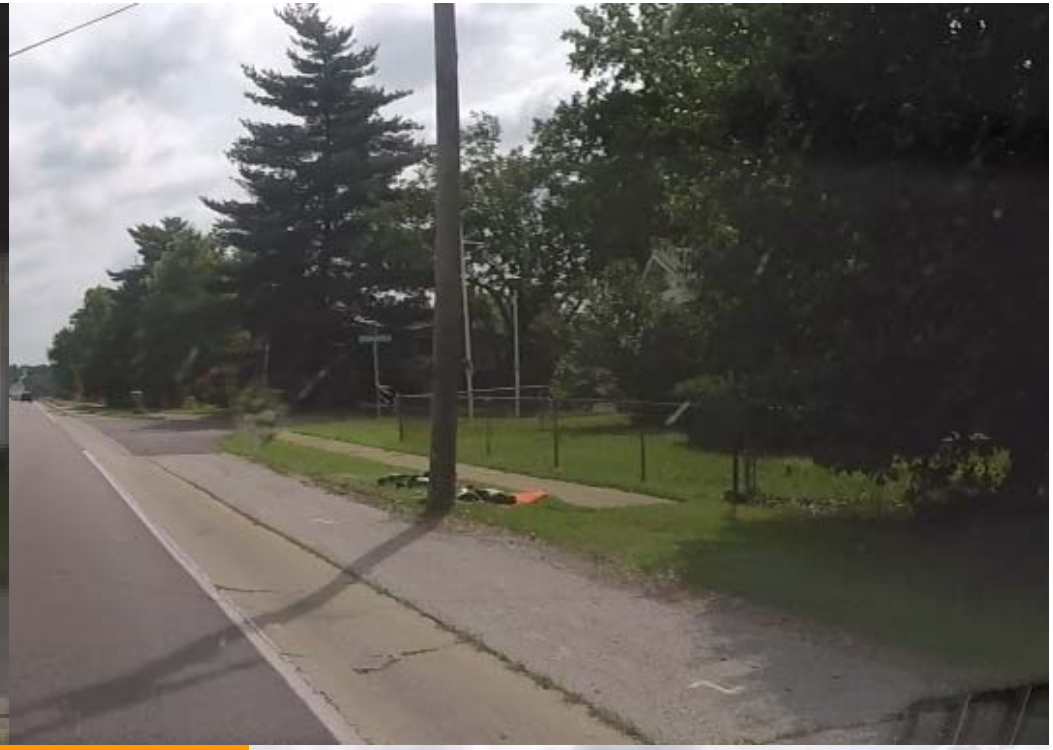

Signs
50
40
30
20
10
0
41
8
15
15
5
A
B
C
D
F
Signs

Signs may be seen in early spring but by summer it could be obscured by vegetation.

Left lane sign blocking EXIT sign.

Sign legs are up in air and concern if hit by a vehicle because not crash tested.

Utility sign is blocking sidewalk.

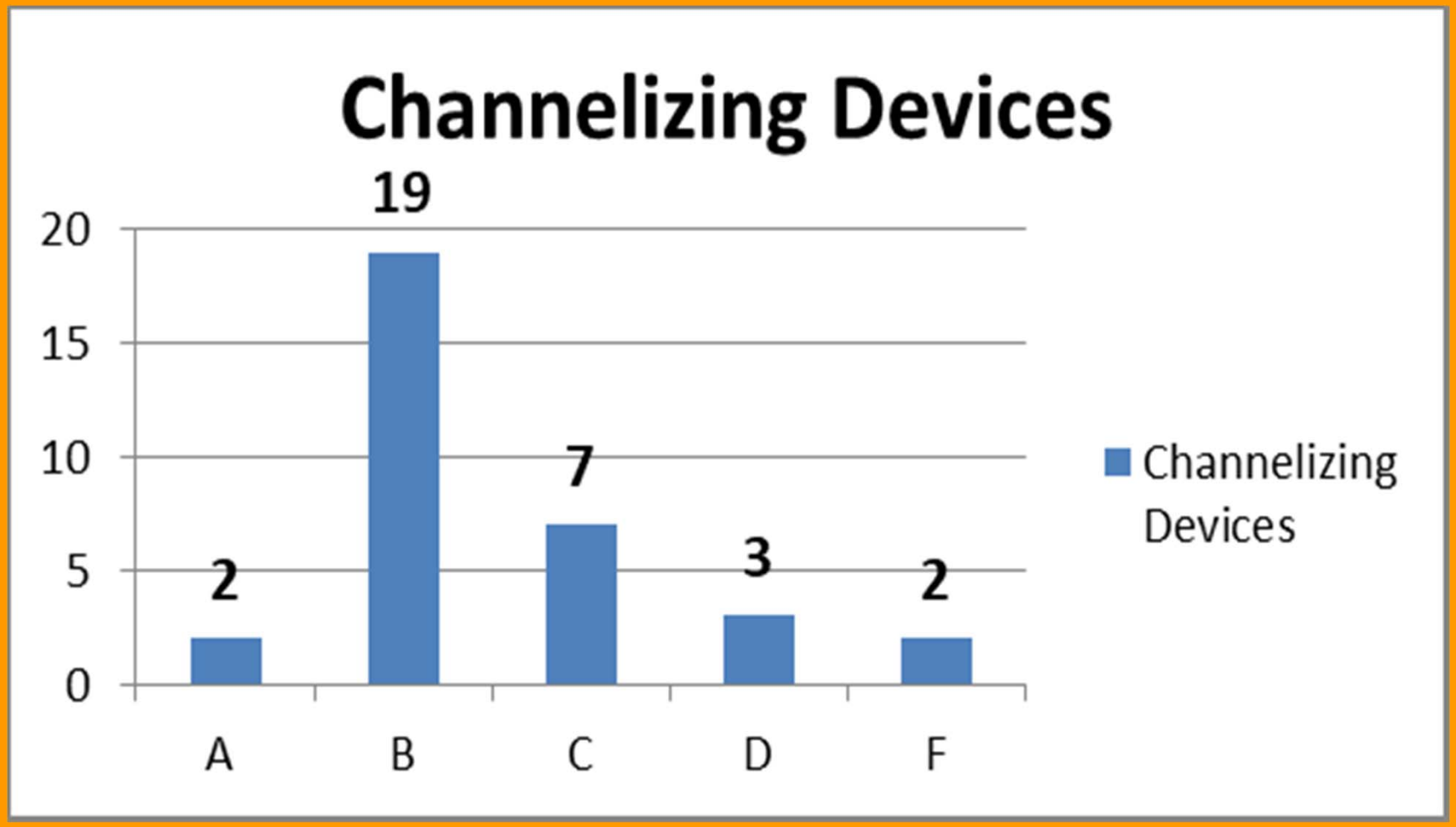


Is the area used by pedestrian a shoulder or sidewalk, but it is used by pedestrians. Further down an actual shoulder is available.

Both “shoulder” and sidewalk were closed how will the pedestrians be able to get down the sidewalk/road?

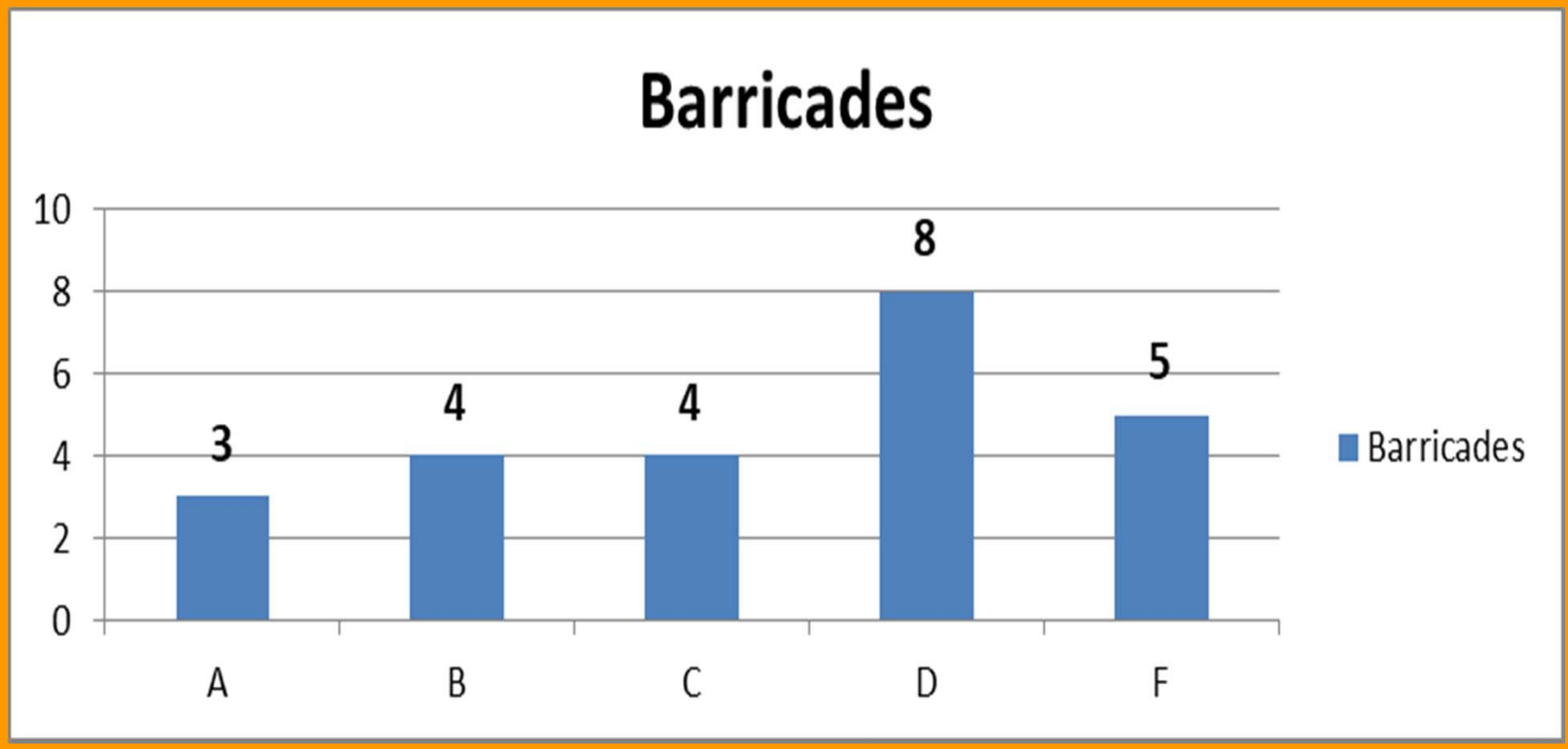
Ballasting

For skid mounted signs, ballasting should be limited to one *sand bag height* on the sign legs. The crossbar should be no higher than 12-inches (one sandbag over the crossbar is acceptable).


Channelizing Devices
19
20
15
10
5
0
7
3
2
2
A
B
C
D
F
Channelizing Devices

Channelizers (DIBs) are in good condition and taper is set-up properly.

Channelizers were poor quality. Edge drop did not have a slope and needed channelizers in placed.

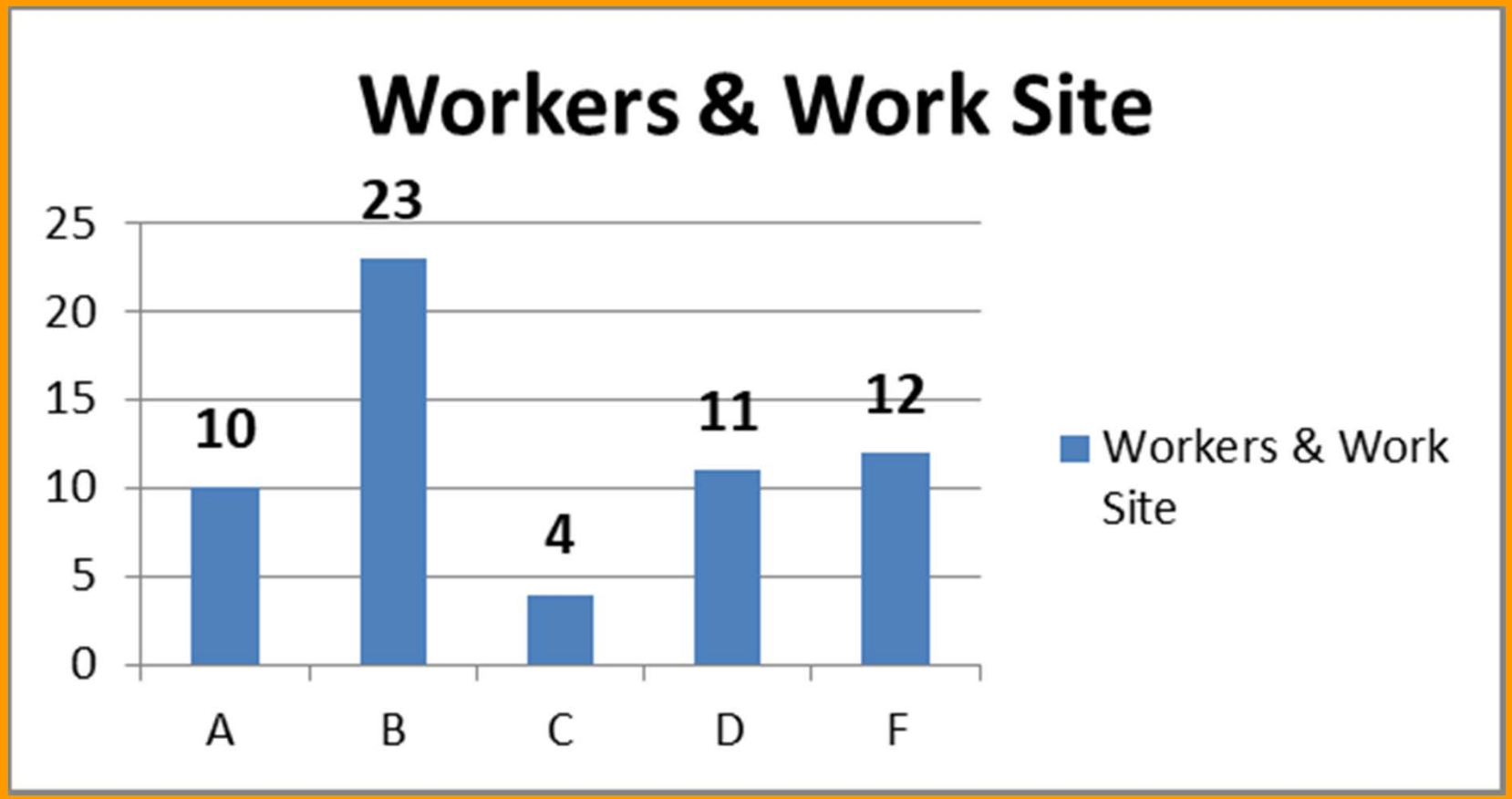

Barricades
10
8
6
4
2
0
3
4
4
8
5
A
B
C
D
F
Barricades

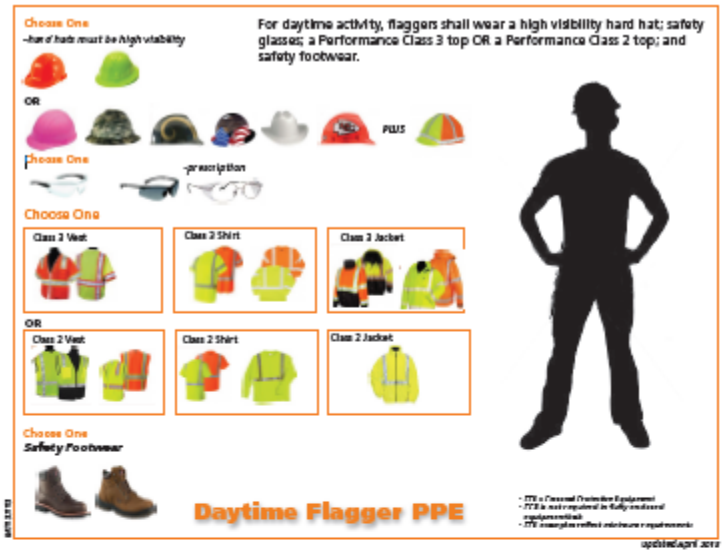
Need another type 3 barricade.

Project is left wide open, which traveling public could enter a possible dangerous situation.

Vehicles parked in front of the closed barricades.

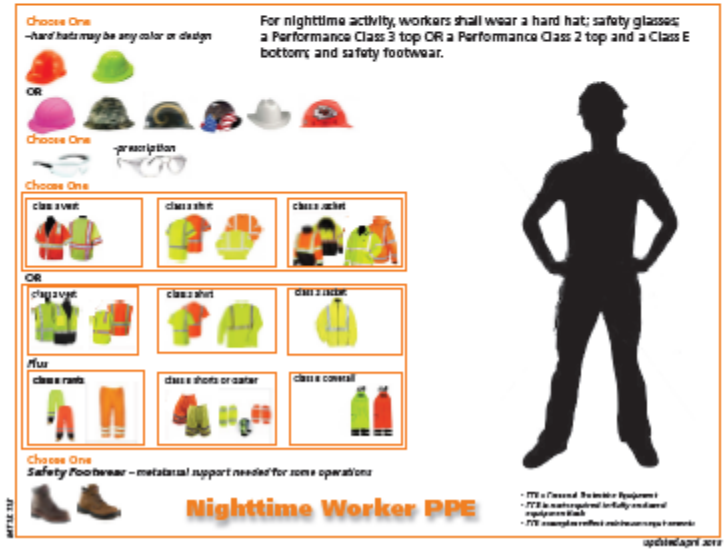
Top picture is a proper closed road. Below picture is a soft closure to allow deliveries that were coming at an interval of 10 min. Then after deliveries were complete the closure was fully closed.


Workers & Work Site
25
20
15
10
5
0
10
23
4
11
12
A
B
C
D
F
Workers & Work Site


Choose One
–hard hats must be high visibility
OR
PLUS
Choose One
-prescription
Choose One
Class 2 Vest
Class 2 Shirt
Class 2 Jacket
OR
Class 2 Vest
Class 2 Shirt
Class 2 Jacket
Choose One
Safety Footwear
For daytime activity, flaggers shall wear a high visibility hard hat; safety glasses; a Performance Class 3 top OR a Performance Class 2 top; and safety footwear.
Daytime Flagger PPE
updated April 2012


Choose One
–hard hats may be any color or design
OR
Choose One
-prescription
Choose One
Class 2 Vest
Class 2 Shirt
Class 2 Jacket
OR
Class 2 Vest
Class 2 Shirt
Class 2 Jacket
Choose One
Safety Footwear – metatarsal support needed for some operations
For daytime activity, workers shall wear a hard hat; safety glasses; a Performance Class 3 top OR a Performance Class 2 top; and safety footwear.
Daytime Worker PPE
updated April 2012

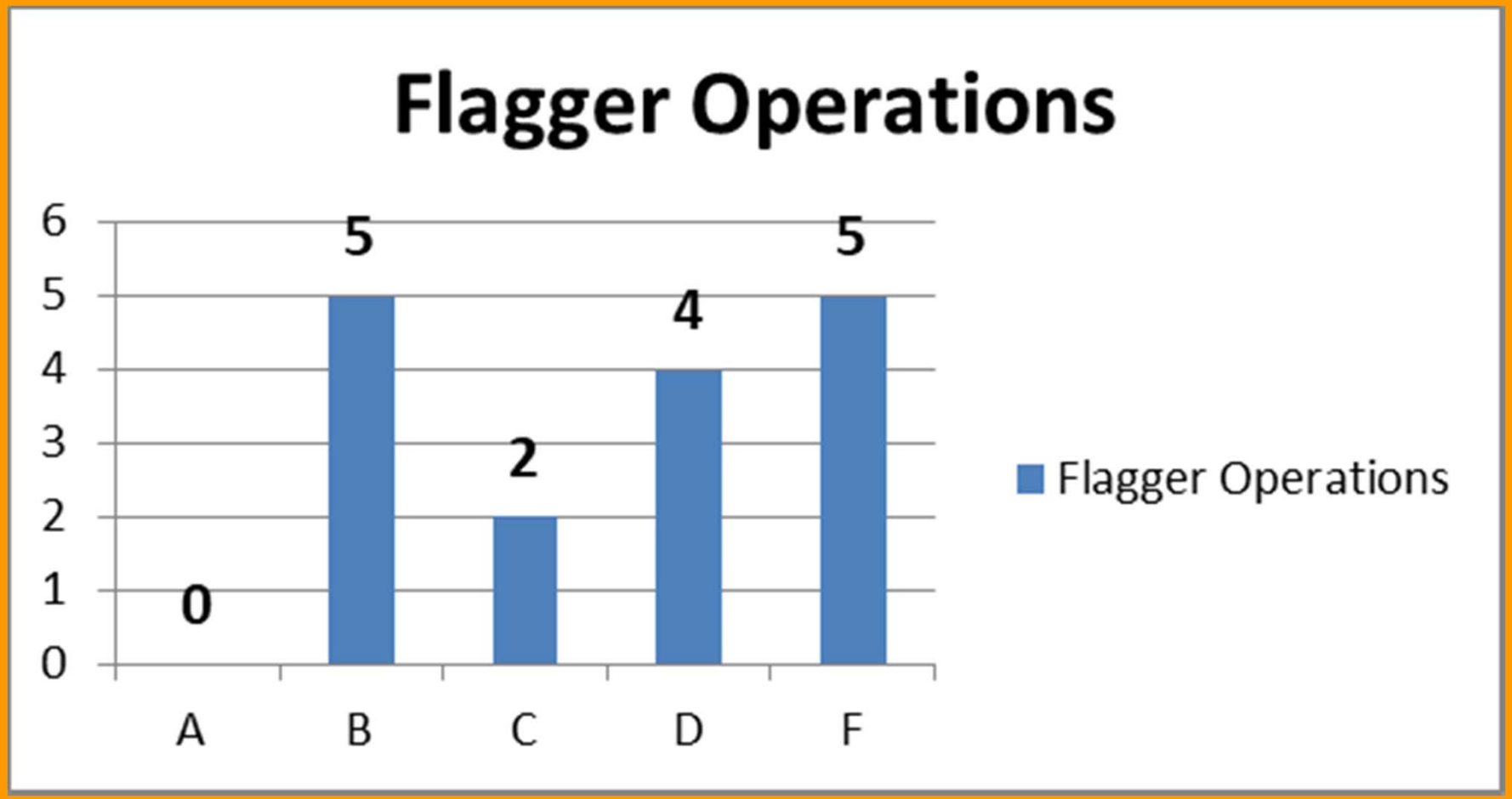

Choose One
– hard hats must be high visibility and reflective
OR
PLUS
OR
Choose One
-prescription
Choose One
class 2 vest
class 2 shirt
class 2 jacket
OR
class 2 vest
class 2 shirt
class 2 jacket
Choose One
class 2 pants
class 2 shorts or skorter
class 2 coverall
Choose One
Safety Footwear
For nighttime activity, flaggers shall wear a high visibility/reflective hard hat; safety glasses; a Performance Class 3 top and a Class E bottom OR a Performance Class 2 top and a Class E bottom; and safety footwear.
Nighttime Flagger PPE
updated April 2012


Choose One
–hard hats may be any color or design
OR
Choose One
-prescription
Choose One
class 2 vest
class 2 shirt
class 2 jacket
OR
class 2 vest
class 2 shirt
class 2 jacket
Plus
class 2 pants
class 2 shorts or skorter
class 2 coverall
Choose One
Safety Footwear – metatarsal support needed for some operations
For nighttime activity, workers shall wear a hard hat; safety glasses; a Performance Class 3 top OR a Performance Class 2 top and a Class E bottom; and safety footwear.
Nighttime Worker PPE
updated April 2012

Workers varied not having proper class of apparel vest/shirt, hard hat, protective eye ware, and proper footwear.

Should not ride behind a pull paver from site to site, just when laying material.

Parking a non-crash worthy vehicle in front of a crash worthy sand barrel array.


Flagger Operations
6
5
4
3
2
1
0
0
5
2
4
5
A
B
C
D
F
Flagger Operations

Stationary & Mobile Flagging Operations
3, 2 or 1 Cone Procedures

SAFETY BEGINS WITH ME

MDOT

Flagger Station Location

- Setup in order to be visible to oncoming traffic (500' Day & 1000' Night)
- Setup a min 500' from Flagger symbol sign & no further than 1 mile
- Setup at least 100' from the traffic control devices that delineate the work space and/or work vehicles
- Flagger stations should be located such that an errant vehicle has additional space to stop without entering the work space, the flagger must identify an escape route

Mobile & Short Duration Operations

- ***When lane width is less than 12 foot, 2 cones is recommended during Short Duration and 1 cone must be used during Mobile Operations***

Long, Intermediate and Short Term Stationary Operations

- ***When lane width is 12 foot, use of 3 cones is recommended***
- ***When lane width is less than 12 foot, 2 or 1 cone(s) may be used***

Step 1: Stopping Traffic

- Setup cone(s) as shown and return to shoulder
- Remain facing traffic, with STOP visible
- Keep visual contact with drivers of stopping vehicles
- Keep left hand raised with palm facing driver, signaling to stop

Reference 616.5.8 EPG

Step 2: Traffic has Stopped

- Once traffic has stopped, move out towards the center of the lane
- Keep the Stop/Slow Paddle in your right hand and position it out towards the center line, be sure not to cross the line with the Stop/Slow Paddle
- Keep visual contact with drivers of stopped vehicles
- Keep left hand raised with palm facing driver, signaling to stop, until traffic has stopped

Step 3: Preparing to Release Traffic

- Once you have confirmed opposing traffic is clear, make your way back to the shoulder taking the cone (as shown) with you
- Be sure to keep STOP visible to the stopped traffic
- *Based on the type of operation, lane width and number of cones used, you may need to move multiple cones*

Step 4: Releasing Traffic

- Once on the shoulder, rotate the Stop/Slow Paddle to SLOW and release traffic
- Direct traffic by signaling with your arm and waving vehicles through

These photos represent the open lane of the work zone. The flagger at the opposite end controlling traffic of the closed lane (the lane work is actually taking place in) would not move the cone(s). Instead, you would motion traffic to drive around the cone(s). There may be instances when you have to move the cone to allow traffic to pass, such as when traffic has stopped too close to the cone or to accommodate a OWOD load. A minimum of 1 cone or trim-line channelizer must be used. Additional channelizers may be used at the discretion of the District Maintenance Engineer, Safety & Health Manager, Superintendent and/or Supervisor.

Contact your Safety & Health Manager and/or Work Zone Coordinator with any questions.

Flagging Reminders

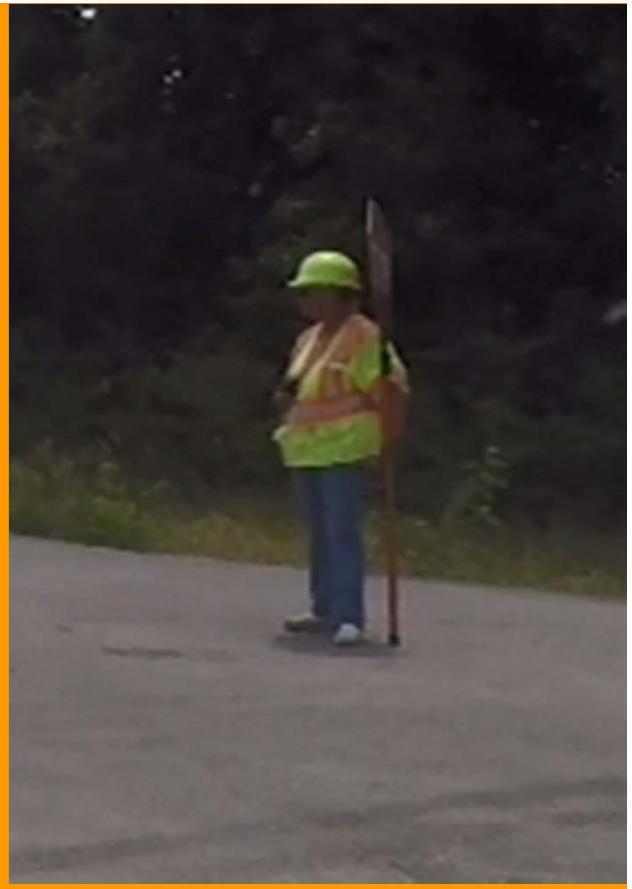
100 feet from work vehicles

Escape Route

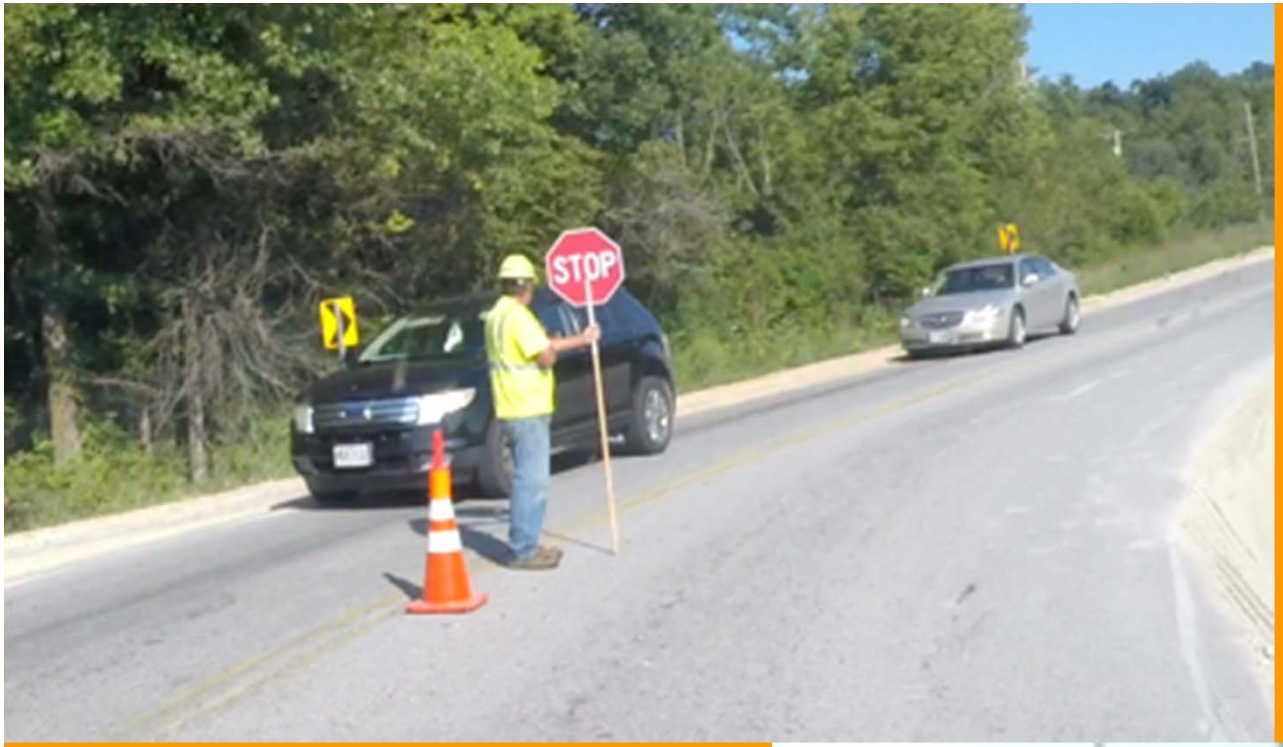
Maintain Eye Contact

Proper Procedures & Safety Apparel

10 feet behind the cone

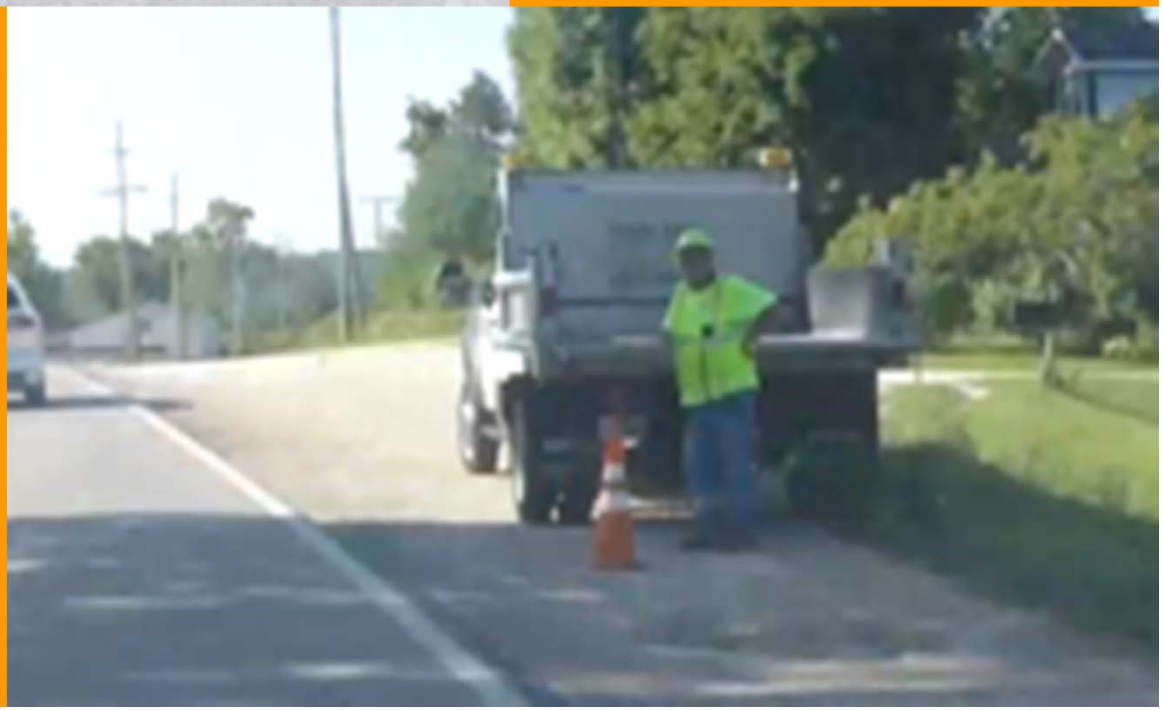


Do the flaggers appear in charged and safely position?



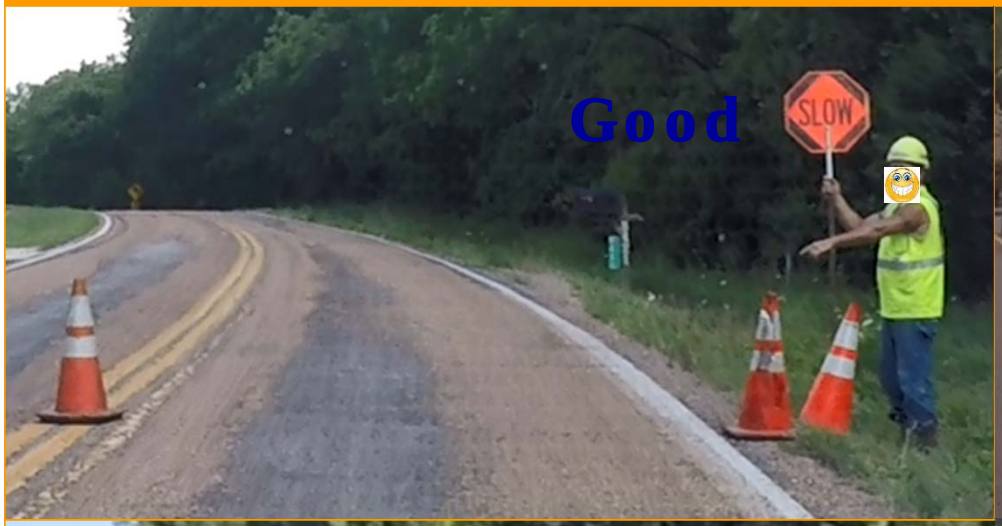
Is this flagger in proper position?

Is this flagger in charge and in a location with a safe escapable path?



Where is this flaggers escape route? Open lane of traffic or hit the soft rocks after diving over the guardrail.

3-2-1 Cone and PPE Field Procedures



New Ideas for Alerting Traveling Public of Flaggers and Workers

Rumble Strips

www.invarion.com

Figure: 616.6.87.2 Rumble Strip Placement on a Divided Highway

SPEED	SIGN SPACING (ft.)		TAPER LENGTH (ft.)		OPTIONAL	CHANNELIZER SPACING (ft.)	
Permanent Posted (mph)	Undivided (S)	Divided (S)	Shoulder (1) (T1)	Lane (2) (T2)	BUFFER LENGTH (ft.) (B)	Tapers	Buffer/ Work Areas
0-35	-	200	70	245	280	35	40
40-45	-	500	150	540	400	40	80
50-55	-	1000	185	660	560	50	80
60-70	-	SA - 1000 SB - 1500 SC - 2640	235	840	840	60	120

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

Notes:

See EPG 616.6.87 Temporary Rumble Strips for rumble strip guidance and locations.

Review appropriate typical applications for signs, sign spacing, taper length, buffer length, channelizer spacing, TMAs, AWRS, flags, etc.

Temporary rumble strips shall be orange, in color.

Long-term rumble strips shall consist of 5 strips separated at 2-4 ft. centers or manufacturer's recommendation.

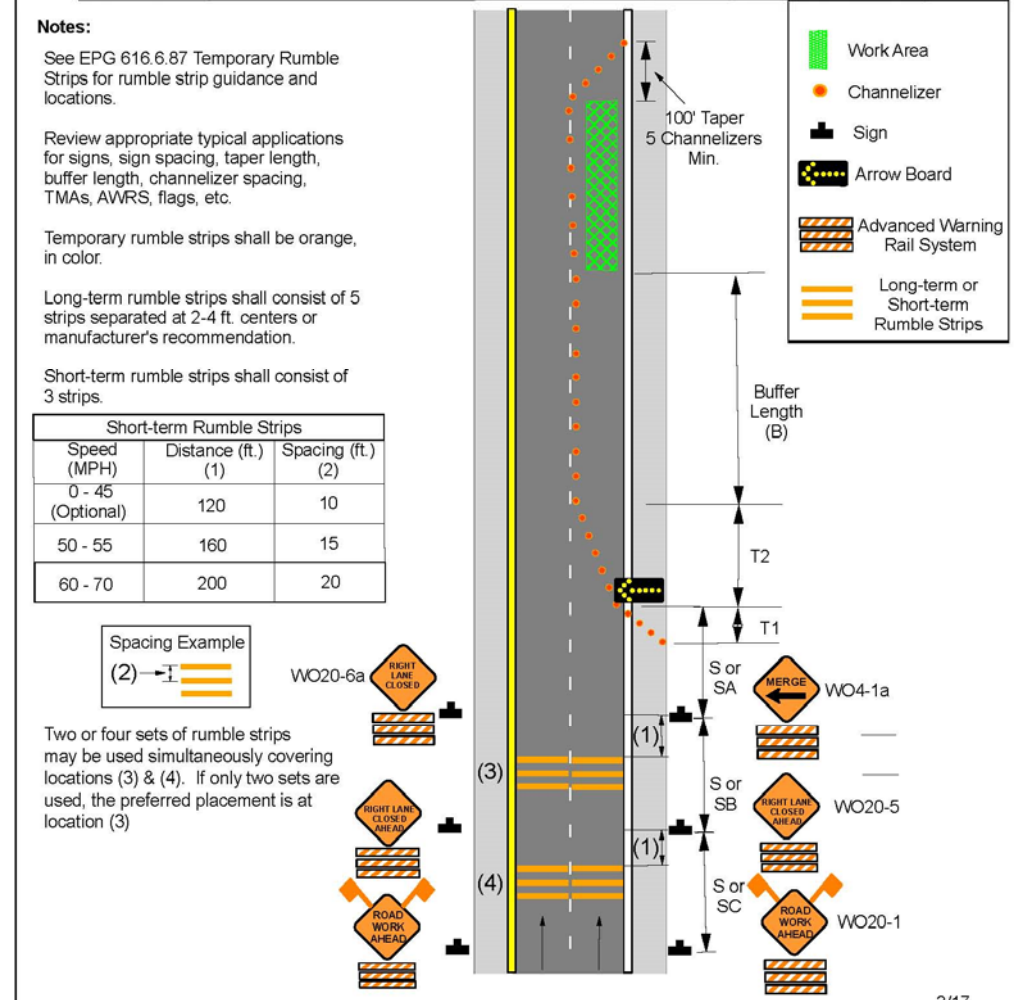
Short-term rumble strips shall consist of 3 strips.

Short-term Rumble Strips		
Speed (MPH)	Distance (ft.) (1)	Spacing (ft.) (2)
0 - 45 (Optional)	120	10
50 - 55	160	15
60 - 70	200	20

Spacing Example

(2)

Two or four sets of rumble strips may be used simultaneously covering locations (3) & (4). If only two sets are used, the preferred placement is at location (3)



3/17

Work Zone Intrusion Alert Systems

Traffic Guard Worker Alert System

Traffic Guard Portable Speed Bump

TMA Flagger

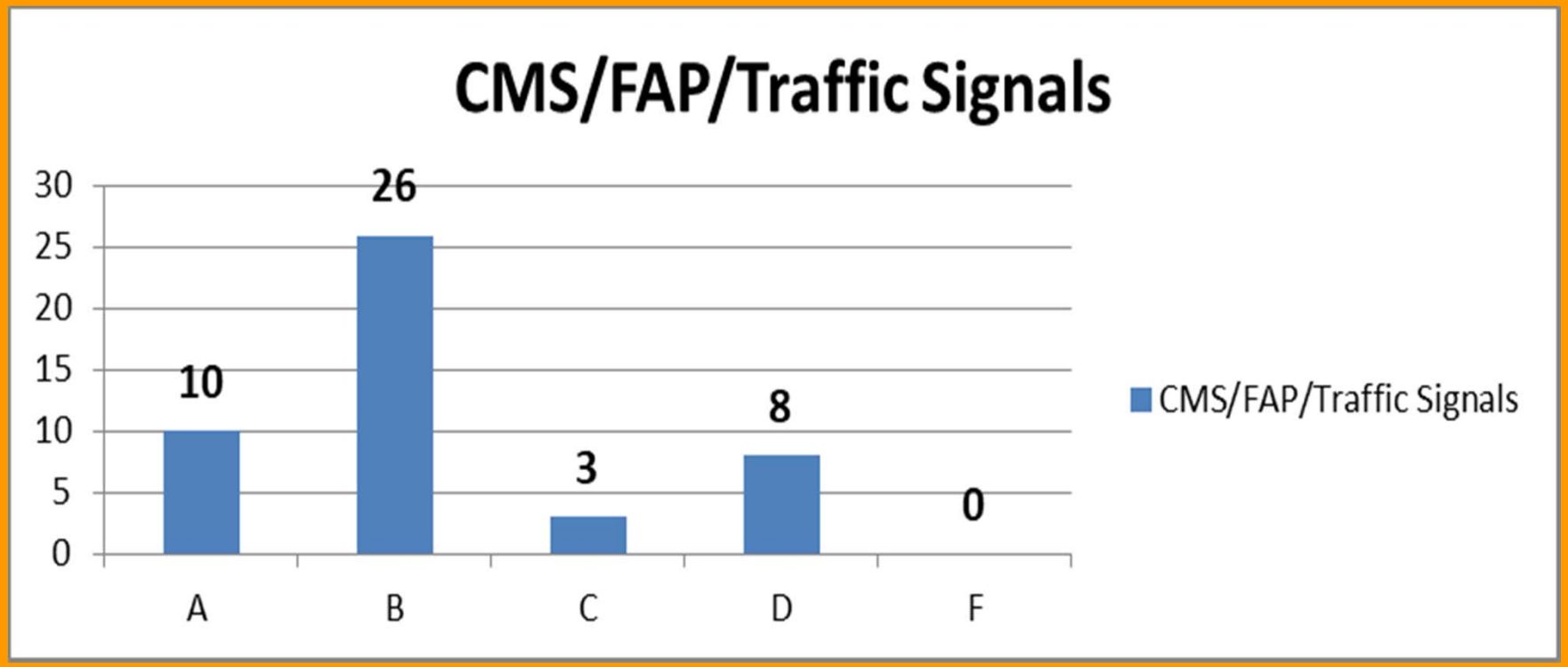
Autonomous TMA

1) RFP has been accepted.

2) MoDOT's two protective vehicle/TMA's are being updated with the technology in Florida.

3) Study will proceed next year.

Audible Alert


CMS/FAP/Traffic Signals
30
25
20
15
10
5
0
26
10
8
3
0
A
B
C
D
F
CMS/FAP/Traffic Signals

CMS sign can be used to advertise upcoming projects. An innovation challenge showing what a fine may be if caught speeding.

Make sure your message is exactly what you want to tell the public.

How to let traveling public of up coming slow/stop traffic?

www.invarion.com

Dynamic Late Merge System
(Zipper Merge)

SPEED	SIGN SPACING (ft.)	
Normal Posted (mph)	Undivided (S)	Divided (S)
0-35	200	200
40-45	350	500
50-55	500	1000
60-70	1000	SA - 1000 SB - 1500 SC - 2640

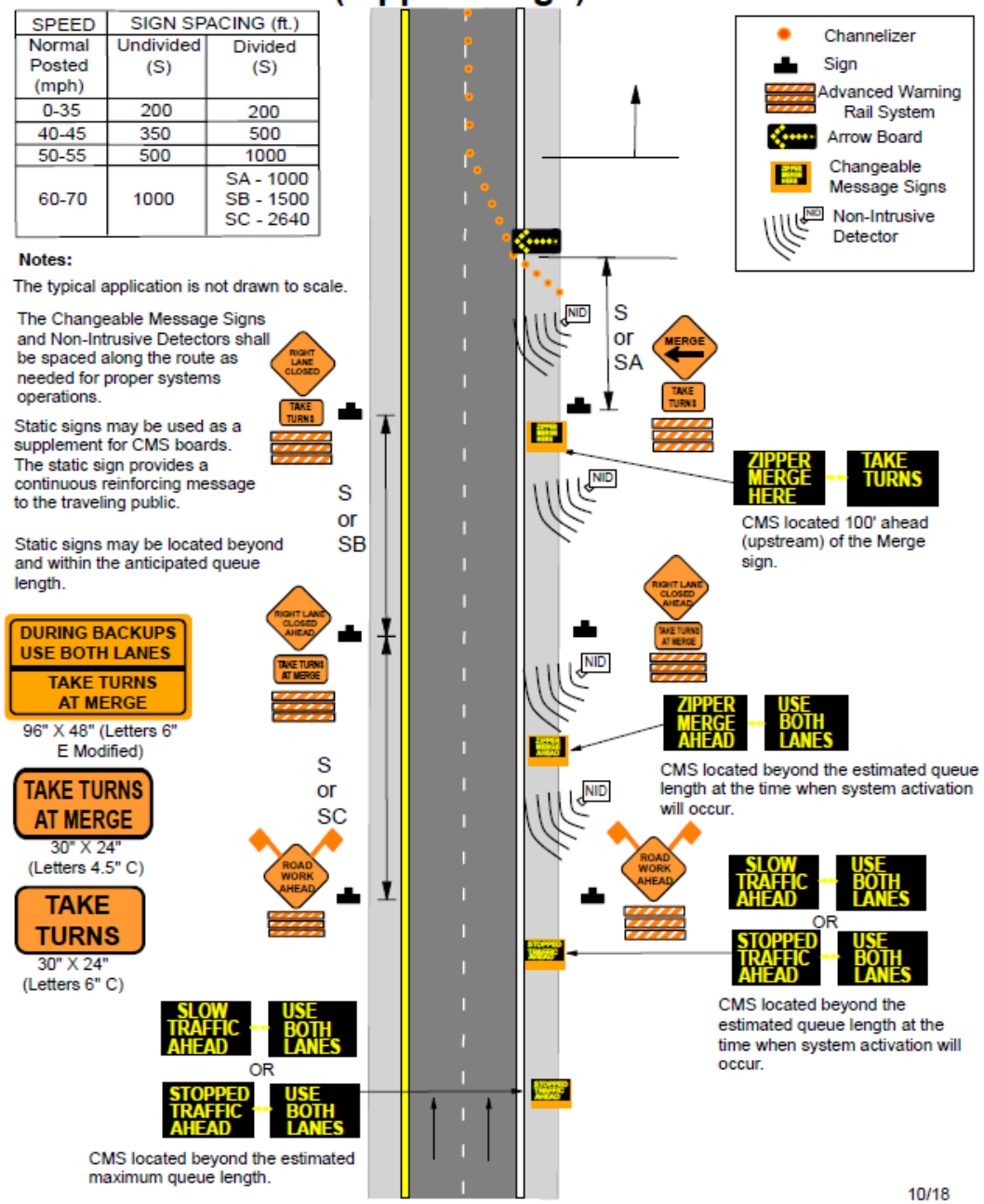
Notes:

The typical application is not drawn to scale.

The Changeable Message Signs and Non-Intrusive Detectors shall be spaced along the route as needed for proper systems operations.

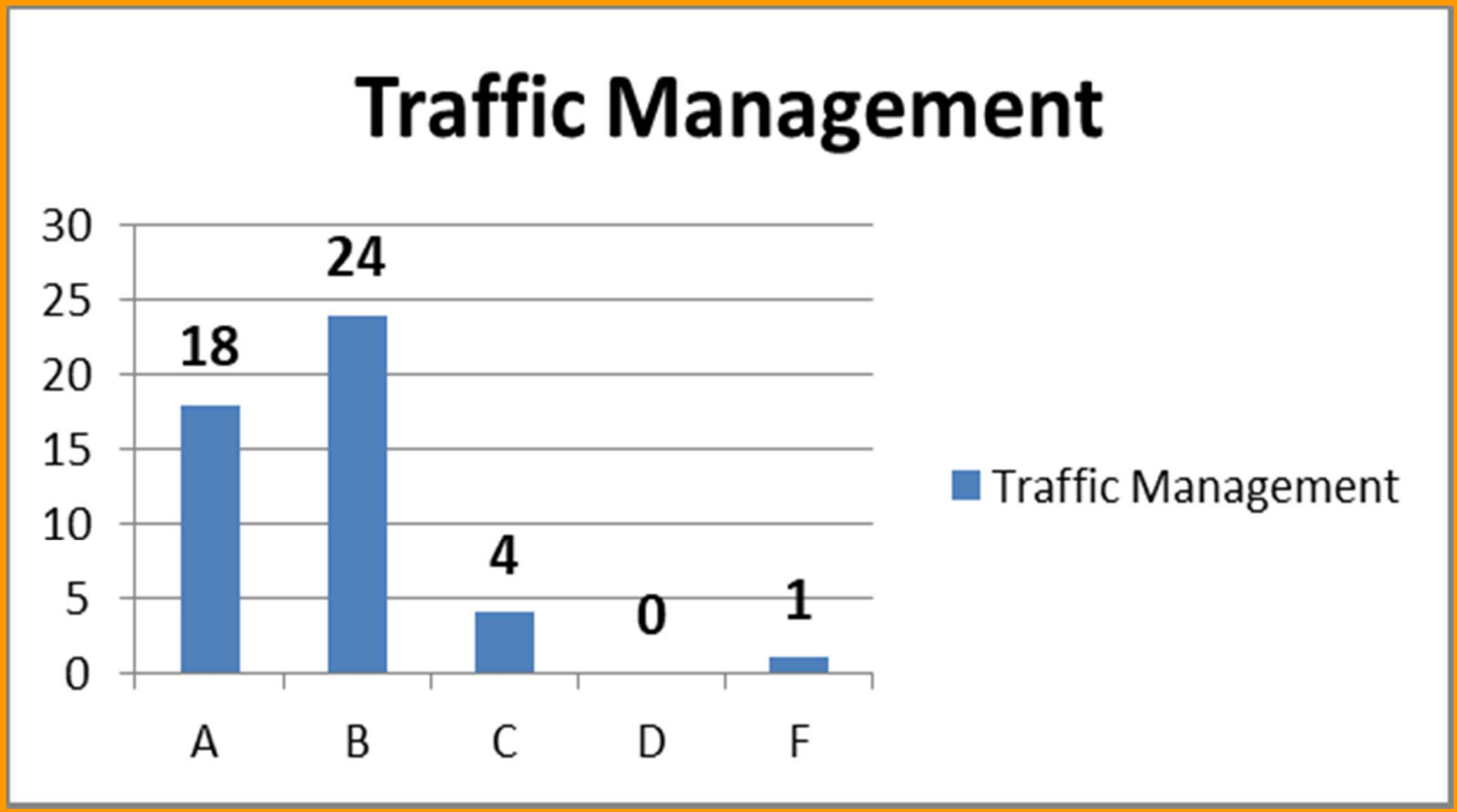
Static signs may be used as a supplement for CMS boards. The static sign provides a continuous reinforcing message to the traveling public.

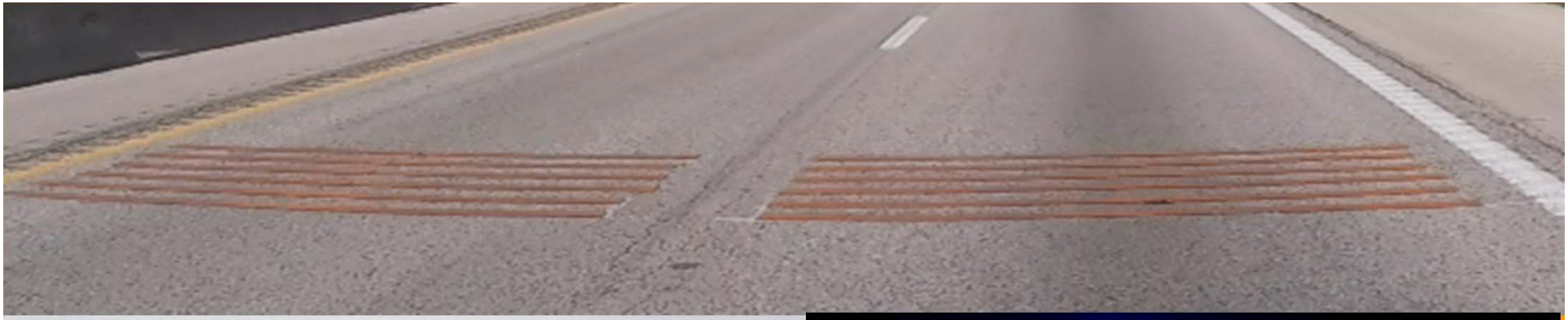
Static signs may be located beyond and within the anticipated queue length.

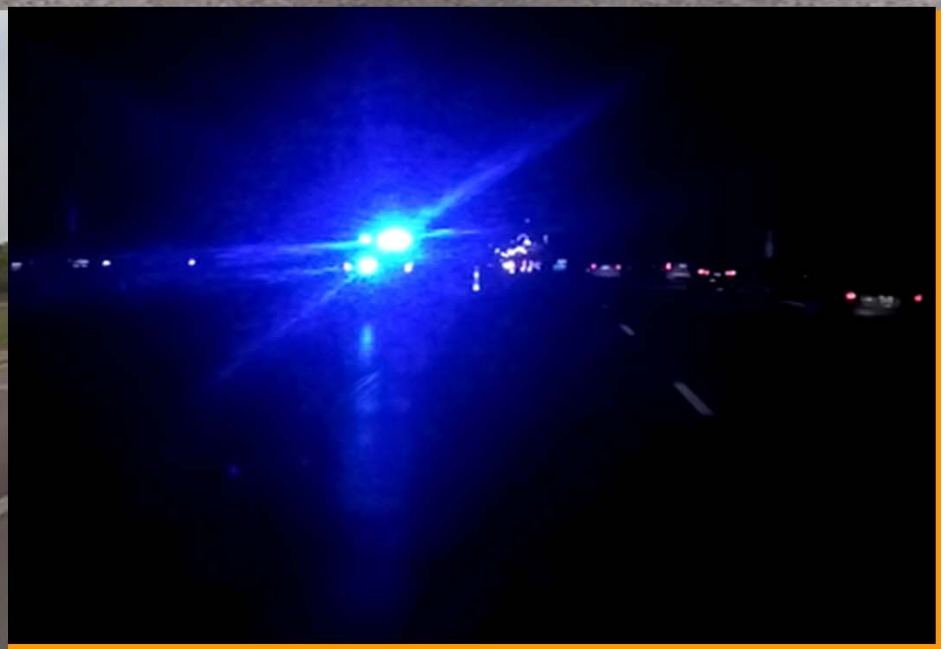


10/18

The use of Law Enforcement


Traffic Management
30
25
20
15
10
5
0
18
24
4
0
1
A
B
C
D
F
Traffic Management





Rumble strips to get attention.

Law Enforcement to get attention.

Red/Blue light to get attention at night, be careful of brightness.

Innovation Winner

JAWS Debris Remover

Person can remove debris while protected inside a vehicle.

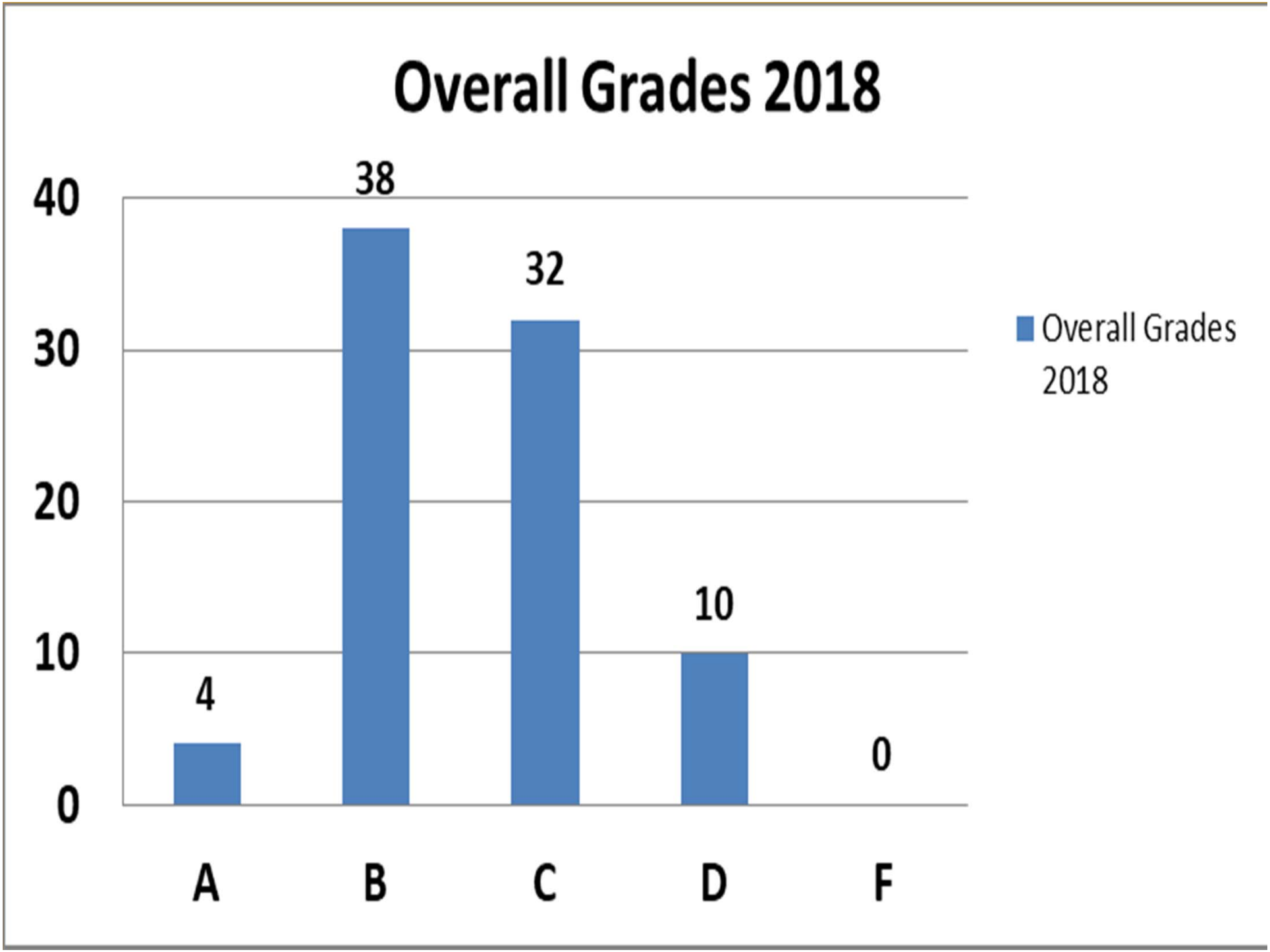
Work Zone Simulation Training

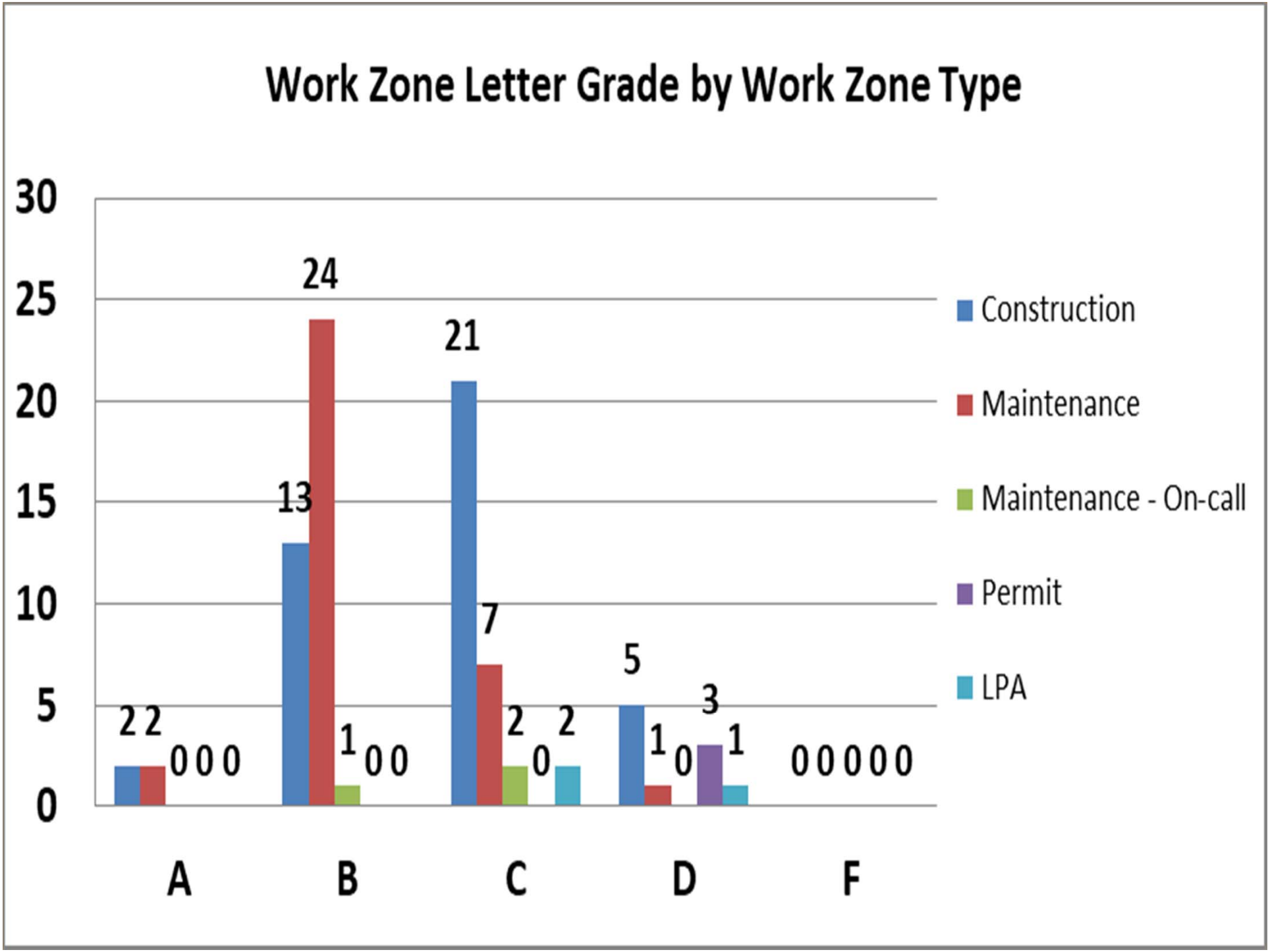
Figure 1. (a) Virtual Reality Headset and Immersion in a work zone scenario, (b) Example of poor signage in the work zone scenario


ROAD
WORK
AHEAD
ROAD
WORK
AHEAD
ROAD
WORK
AHEAD

Daytime scenario

Nighttime scenario with eye tracker

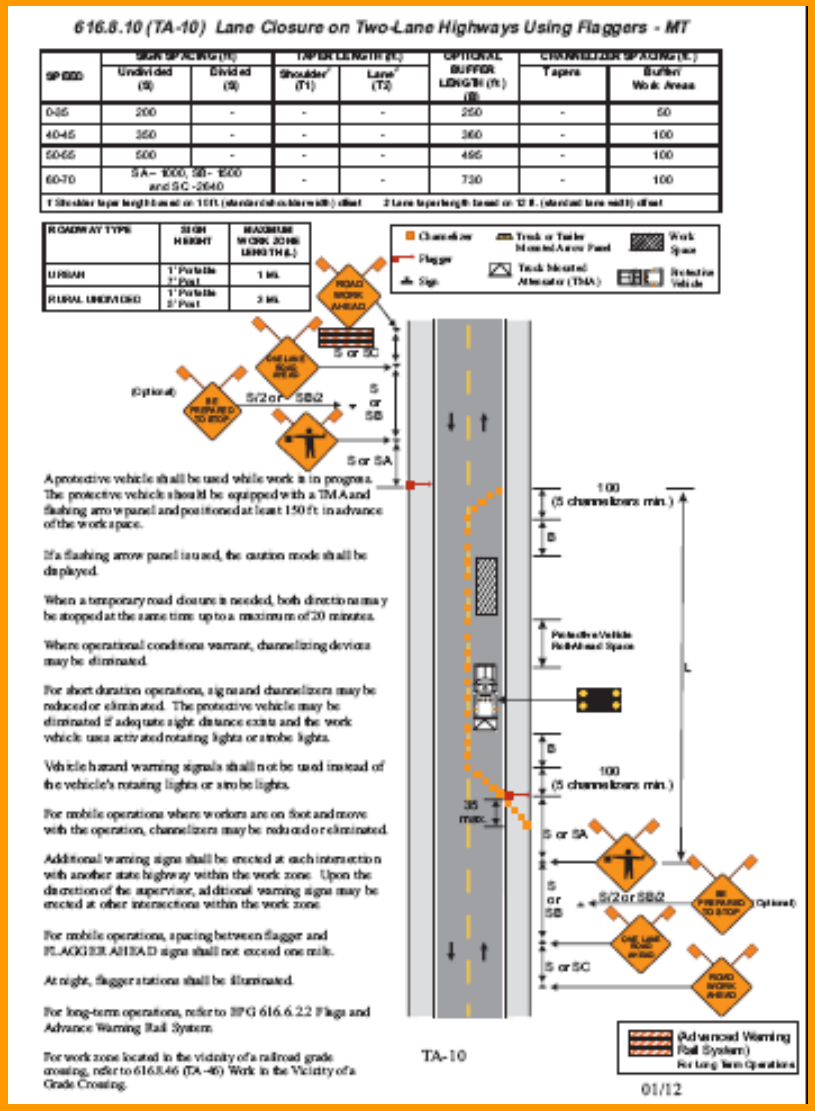

Overall Grades 2018
40
30
20
10
0
38
32
10
4
0
A
B
C
D
F
Overall Grades 2018


Work Zone Letter Grade by Work Zone Type
30
25
20
15
10
5
0
A
B
C
D
F
2 2 0 0 0
13 24 1 0 0
21 7 2 0 2
5 1 0 3 1
0 0 0 0 0
Construction
Maintenance
Maintenance - On-call
Permit
LPA

Resources

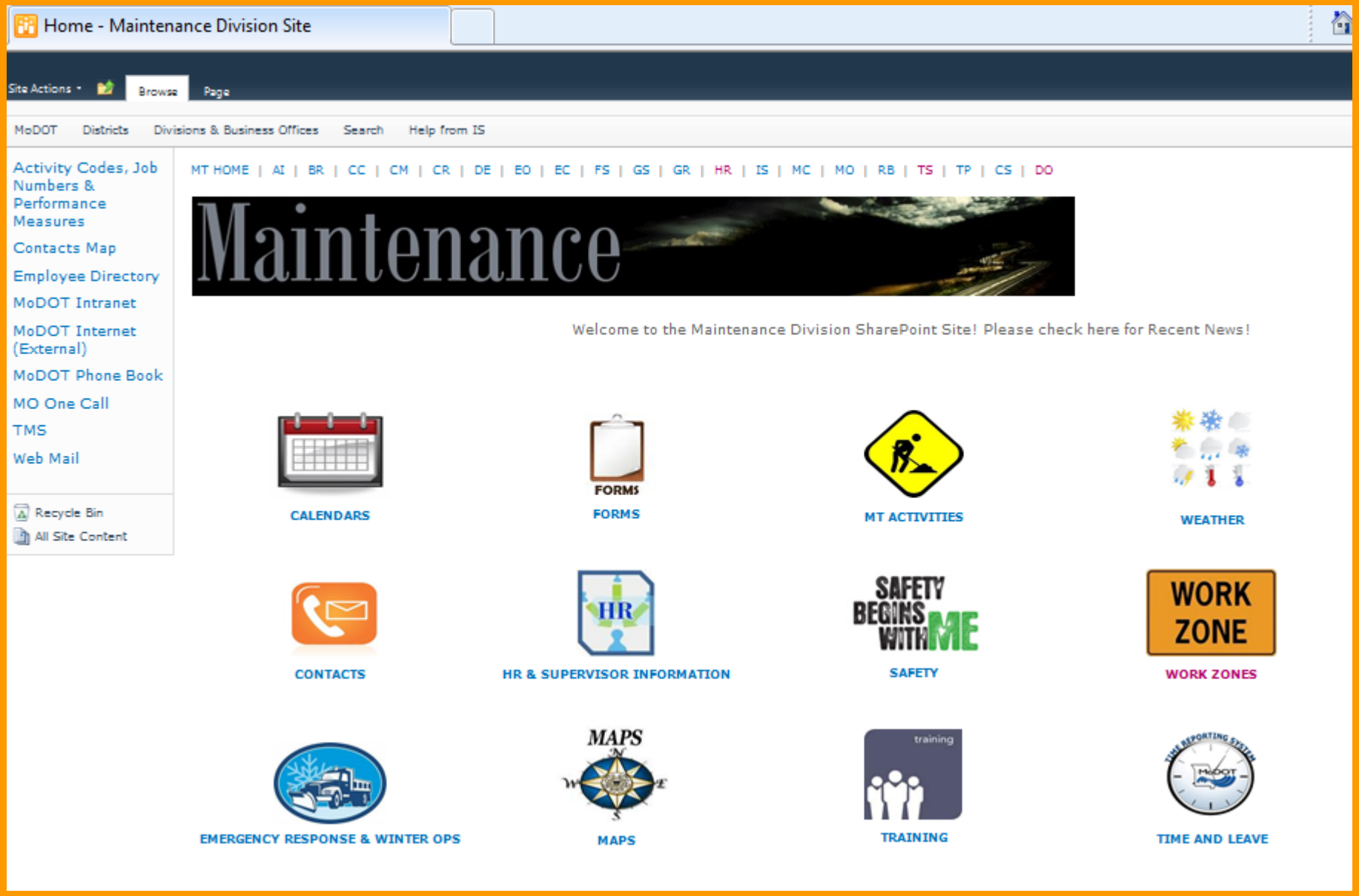
Quality Standards for Temporary Traffic Control Devices

July 2013



Work Zone Coordinator

Resources


Home - Maintenance Division Site
Site Actions
Browse
Page
MoDOT
Districts
Divisions & Business Offices
Search
Help from IS
Activity Codes, Job Numbers & Performance Measures
Contacts Map
Employee Directory
MoDOT Intranet
MoDOT Internet (External)
MoDOT Phone Book
MO One Call
TMS
Web Mail
Recycle Bin
All Site Content
MT HOME | AI | BR | CC | CM | CR | DE | EO | EC | FS | GS | GR | HR | IS | MC | MO | RB | TS | TP | CS | DO
Maintenance
Welcome to the Maintenance Division SharePoint Site! Please check here for Recent News!
CALENDARS
FORMS
FORMS
MT ACTIVITIES
WEATHER
CONTACTS
HR
HR & SUPERVISOR INFORMATION
SAFETY BEGINS WITH ME
SAFETY
WORK ZONE
WORK ZONES
EMERGENCY RESPONSE & WINTER OPS
MAPS
MAPS
training
TRAINING
TIME AND LEAVE

Construction and Materials Division

1617 Missouri Blvd Jefferson City MO 65109 | (573) 751-3689 | David Ahlvers PE, Construction and Materials En

D-Tracker

Teams, Meetings, and Industry Associations

New Products

eProjects

Chemical Lab

Physical Lab

Geotechnical

Division Administration

Highway Safety/Traffic Contacts

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Nick Voltenbureg
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Nickolas.Voltenburg@modot.mo.gov

Questions?

Work Zone Intrusion Alert System Pilot Project

- As part of MoDOT's continuing effort to improve the safety of their workforce and motorists, MoDOT has developed a pilot to study the effectiveness of work zone intrusion alert systems.
- These systems are designed to alert workers of unauthorized entry of vehicles entering into the work zone.
- These systems will also alert workers of internal conflicts that may happen within the work area when equipment encroaches too closely to workers.