

Innovative Intelligent Warning Systems (IWS)

ITS GA 2021

Our Agenda

- 1 BlinkerChevron™ Dynamic Curve Warning Systems
- 2 Overheight Warning Solutions
- 3 Wrong-Way Solutions
- 4 LegendViz™
- 5 Questions

The TAPCO Difference

Our Mission



The TAPCO family is driven to save lives by going the extra mile to enhance transportation and personal safety in our communities through innovative solutions and quality products.

Your Presenters



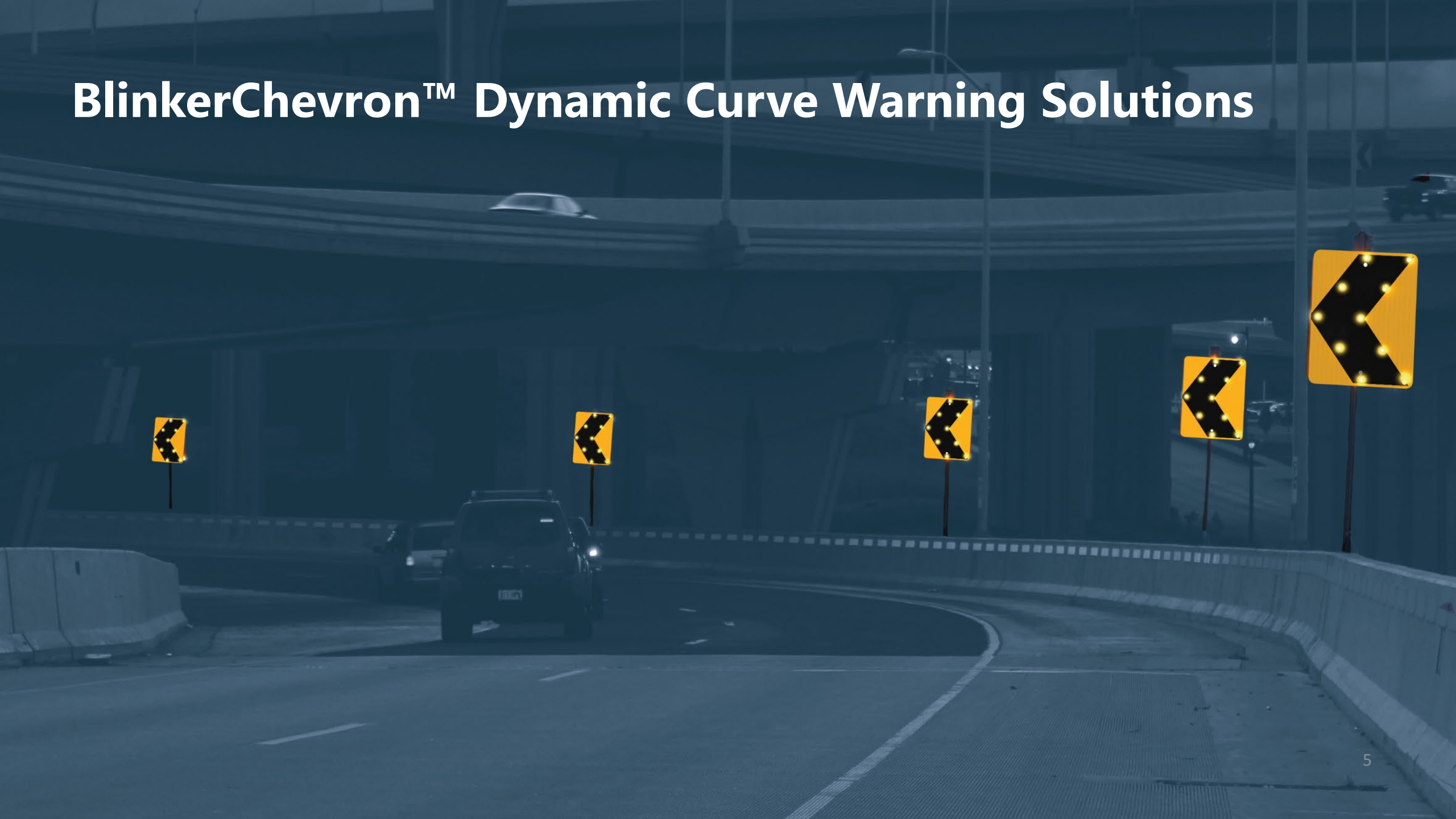
Kyle Stewart

Account Executive

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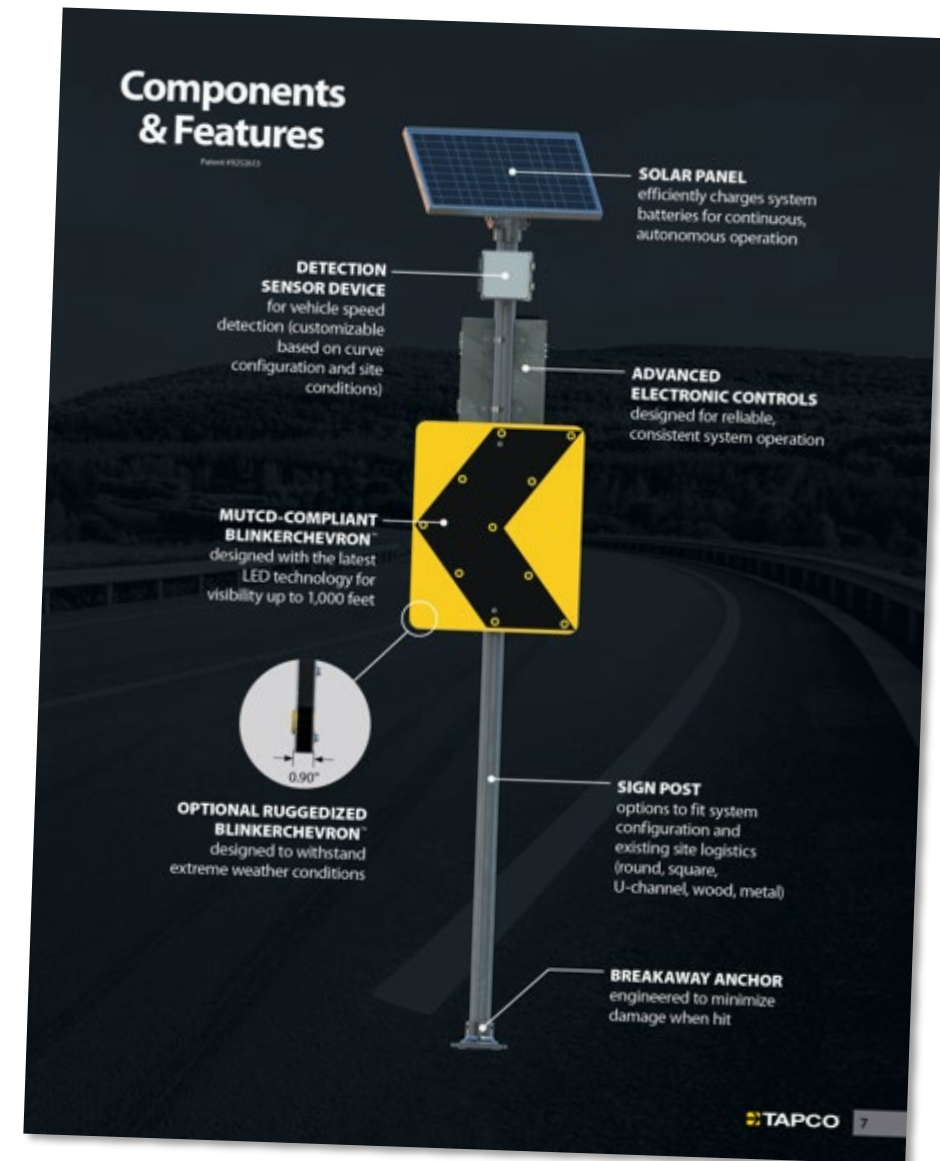
kyle.stewart@tapconet.com

BlinkerChevron™ Dynamic Curve Warning Solutions



System Components

- Top-of-pole self-contained and side-of-pole options
- Detection Sensor Device: multiple options based on curve design, number of lanes and site geometries
- MUTCD-compliant BlinkerChevron™
 - Optional ruggedized versions available
 - High power and efficient 100,000 hour LEDs
- Control cabinet, sign post and breakaway anchor



BlinkerChevron™ Dynamic Curve Warning System

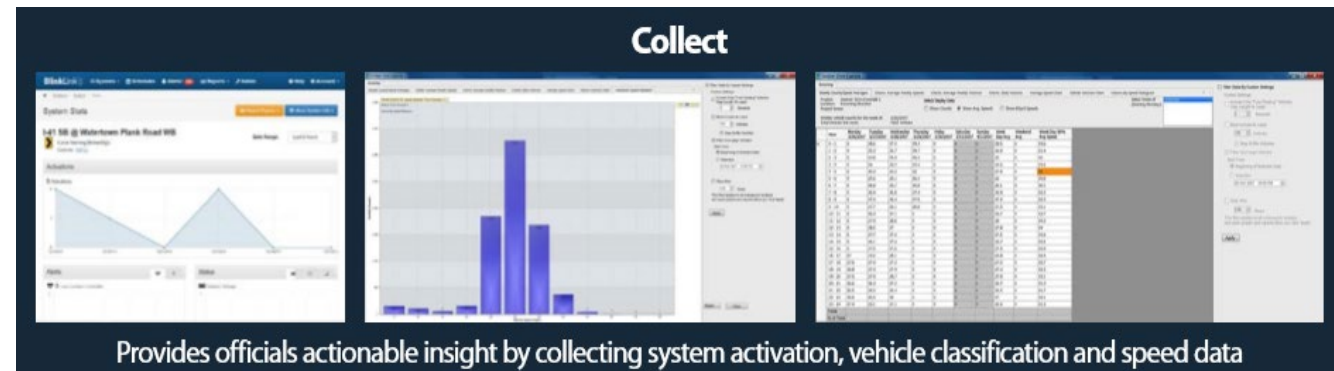
- More than 200 installations nationwide
- System features:
 - Detect offenders
 - Warn embarking motorists
 - Guide through duration of curve
 - Collect tangible and actionable data



BlinkerChevron™ Dynamic Curve Warning System

System Enhancements

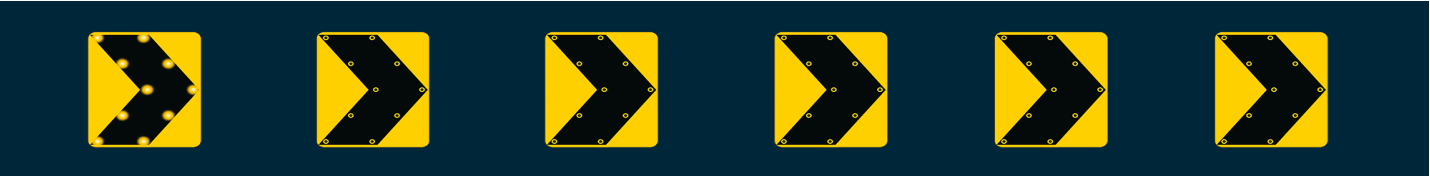
- Detect
 - Houston radar – side fire
 - Vehicle presence
 - Vehicle speed
 - ADEC sensor – overhead
 - Vehicle speed and classification
- Warn
- Guide
- Collect
 - BlinkLink®
 - Sensor software



Standard Flash Patterns

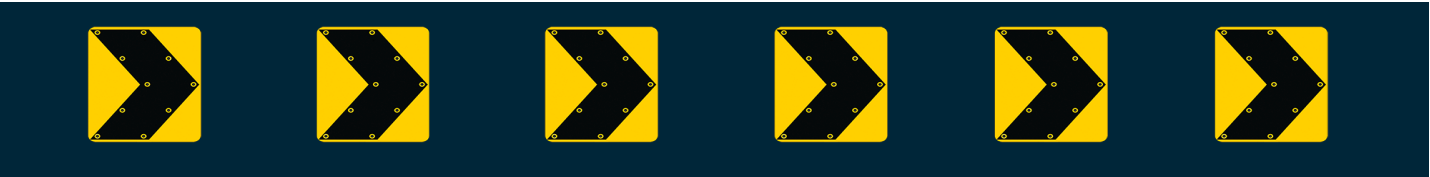


The BlinkerChevron™ sequential flash pattern delivers a pull-through effect, guiding drivers through the length of the curve



True Sequential Flash Pattern

For sequential curves with less than 5 signs



Simultaneous Flash Pattern

For all applications – 16 signs maximum

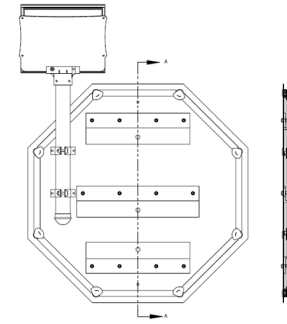


Segmented Sequential Flash Pattern

For sequential curves with 6 to 16 signs

TAPCO BlinkerSign® Solutions

Standard Sign Sheeting
.080" *.100" and .125"
available



GOOD

LED Enhanced Regulatory or Warning Signs

Standard .080" grade aluminum w/ Premium 3M DG3 reflective sheeting & anti-graffiti overlay film

Enclosed aluminum channels protect wiring against inclement weather & vandalism



BETTER Z-Bar

Improved LED BlinkerSign Wind Performance

Z-Bar bracketry increases surface area engagement for added bracing

Optional .125" aluminum substrate also available



BEST Ruggedized with Z-Bar

Premium LED BlinkerSign Wind, Snow & Impact Performance

Ruggedized multi-layer design

Extra thick .750" HDPE core routed for improved weight ergonomics & LED wiring protection

Anti-Vandal fasteners

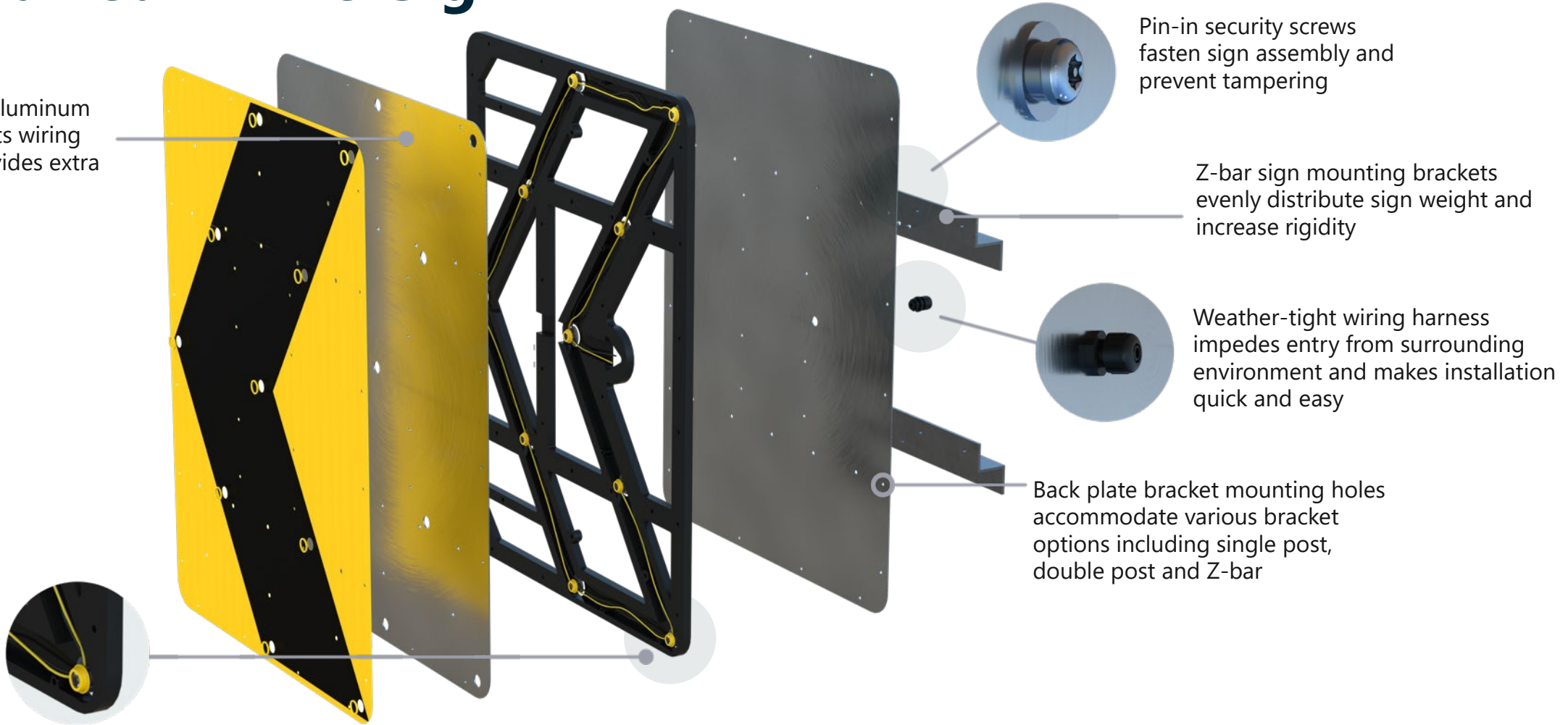
Quick install weather-tight wiring harness



Ruggedized BlinkerSign®

Extra thick 0.10" aluminum front plate prevents wiring exposure and provides extra durability

Extra thick 0.750" High Density Polyethylene (HDPE) substrate increases stiffness and is routed with enclosed channels to protect LEDs and wiring



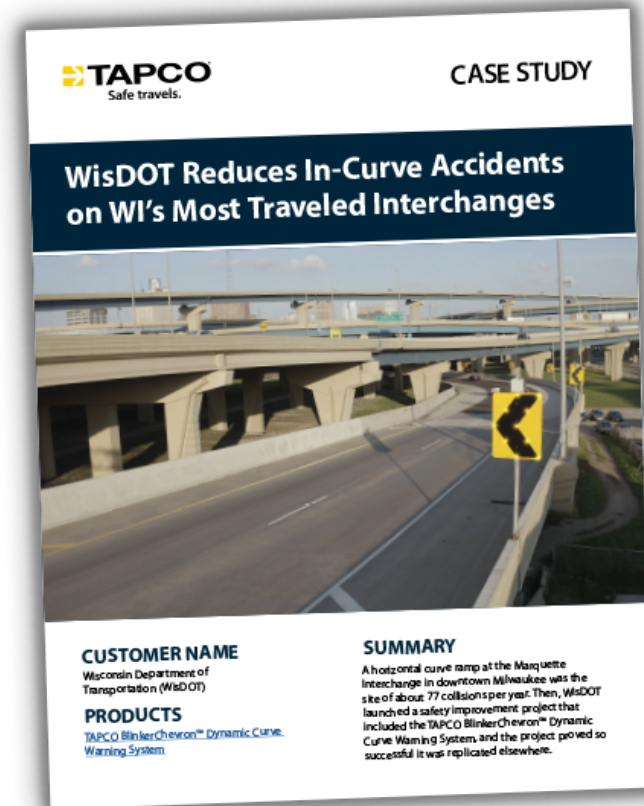
System Enhancements

- Curve ahead Blinkersign® /BlinkerBeacon™
 - Advanced detection and driver notification
- Variable Message Board or Blank-Out signs
 - Lane specific communication
- Smart Weather Pavement Moisture RWIS
 - Precipitation presence and curve activation
- In-Road Warning Lights (IRWL)
 - Outline and emphasize curved route of travel
- Connected Vehicle Interface (CVI)
 - In-vehicle alerting



Case Studies

- WisDOT – Marquette Interchange
 - About 77 collisions per year before the installation of Dynamic Curve Warning System
 - 97% decrease in accidents since the system was installed
 - This system is now installed in several other locations in the Milwaukee area and around Wisconsin as well



Overheight Warning Solutions

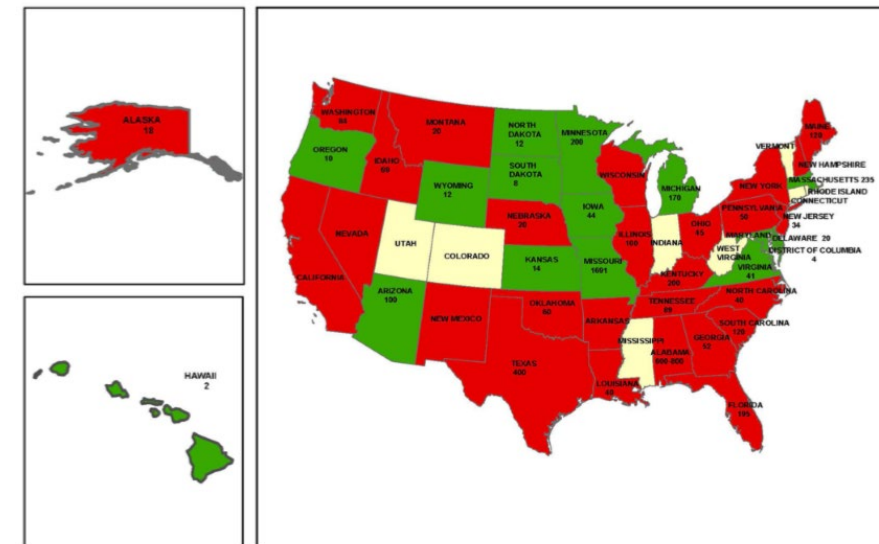


What's The Problem?



- 10,000+ annual bridge impacts nationally
- Over 600,000 bridges currently registered in the U.S.
 - 10% are structurally deficient
- 30 states have recognized bridge impacts as a problem
- Overheight impacts are a global issue
- An average repair costs \$300,000 - \$500,000

Bridge Vehicle Impact Assessment



Red = Major problem. Green = Minor problem. Yellow = No response.

What's The Reason?

- Roughly 40% of truck drivers have admitted to not knowing the specific height of their load
- Truckers using passenger based off-the-shelf navigation systems
- Lack of route planning
- Oversized loads and equipment that weren't properly secured and shifted during travel
- Distracted drivers who aren't paying attention to height limit warning signs and devices
- Unfamiliar with route geography and structures

Global GPS Selection Guide For CMVs

Did You Know...
Not all global positioning systems (GPS) are created equal. Some navigation systems are designed specifically for commercial truck and bus drivers.

Why does it matter which navigation system you use?
If you use a navigation system that does not provide you with important route restrictions, such as low bridge overpasses, the shortcut you thought would save you time and fuel, may, in fact, end up costing you a lot more money than you bargained for!

That's why it is critical that you use the right GPS navigation system when you operate your commercial truck or bus on our Nation's roadways.

Thanks for putting safety first! [Learn more tips](#)

Global Positioning Systems

Tips for safe use of GPS navigation systems

- 1. Select a GPS navigation system intended for use by professional truck and bus drivers.
- 2. Before you begin your trip, type in all relevant information about your vehicle so the system can provide you with the appropriate route, including:
 - ↳ Your vehicle's length, width and height
 - ↳ Your axle weights
 - ↳ Hazardous materials you are transporting
- 3. Follow the route recommended by the navigation system.
- 4. Always obey traffic signs and advisories (such as low bridge overpasses, axle weight limits, etc.) — especially if they provide restrictions the navigation system did not warn you about.
- 5. Do not engage in distracted driving! Avoid typing or entering addresses or information into the GPS while driving.
- 6. Not all GPS systems automatically update maps — be sure to update your maps often so that you are following the most current route planning information.

U.S. Department of Transportation
Federal Motor Carrier Safety Administration

www.fmcsa.dot.gov
FMCSA-ADO-13-007



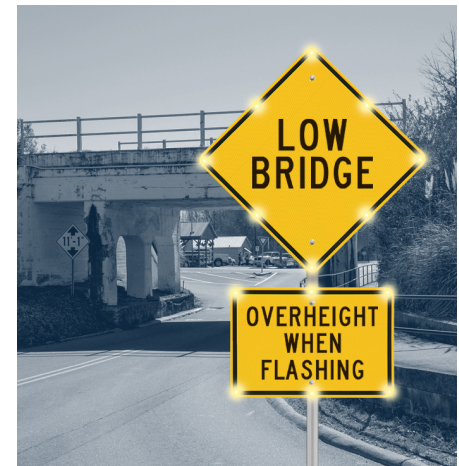
Preventative Measure:

Flashing BlinkerSigns or BlinkerBeacons

- 73% of states that have installed an overheight detection system have seen a reduction in the frequency of infrastructure strikes
 - Replaces existing static signage
 - Enhances conspicuity
 - Directs and delivers an alternative route of safe travel

“From a safety and effectiveness point of view, the laser or infrared system seems most effective, especially when combined with an active sign and warning system.”

Alaska Department of Transportation: Evaluation of Overheight Vehicle Warning Devices



Overheight Warning Solutions Portfolio

Good

24/7 or Dusk 'til Dawn

- LED enhanced treatment
- Limited deterrent capabilities
- No offender interaction
- Not BlinkLink® connected



Better

Activated Alert System

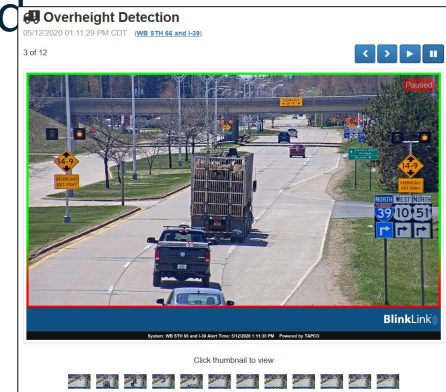
- Entry level overheight detection solution
- Dual beam infrared sensor technology
- Activated warning elements
- Not BlinkLink® connected



Best

BlinkLink® Connected System

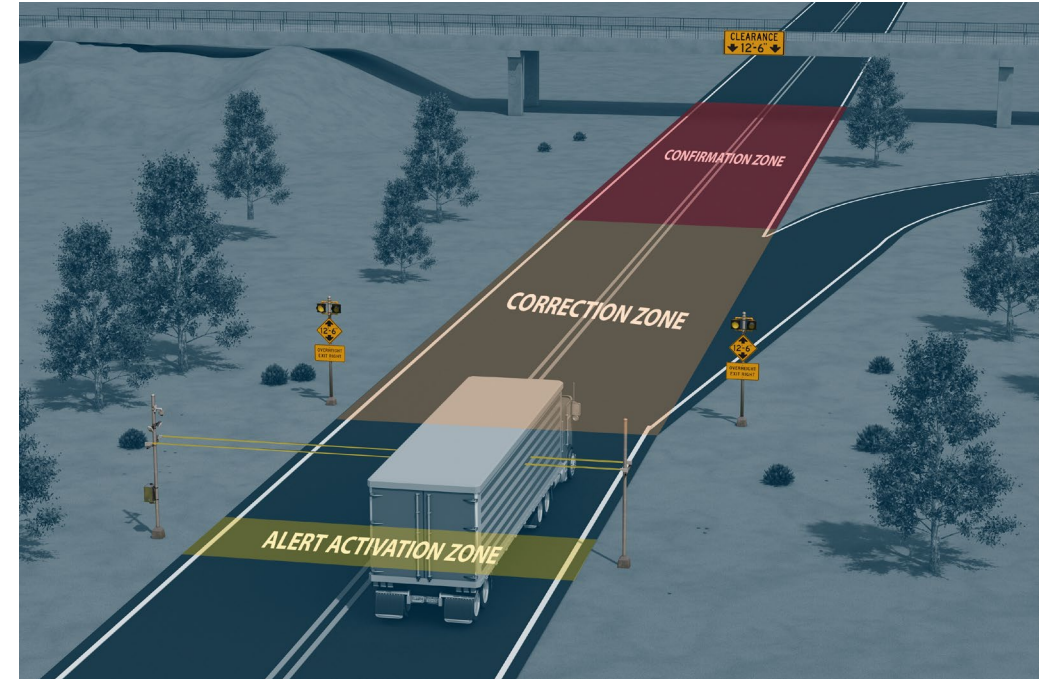
- Premium overheight vehicle detection solution
- Visual event alerting
- BlinkLink® connected
 - Vehicle details
 - Route correction confirmation
 - Time and location of event
 - System health and diagnostics



TAPCO Overheight Warning Solutions

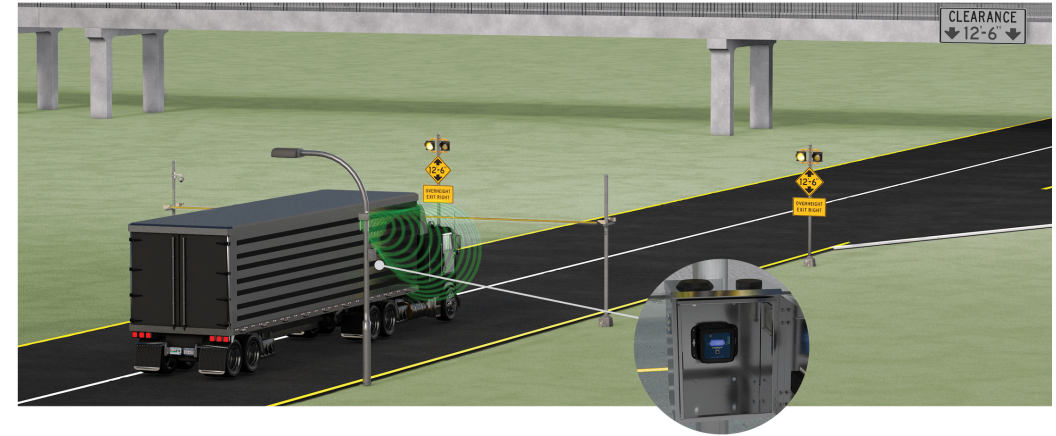
Typical 3 Zone Configuration

- Alert Activation Zone:
 - Overheight detection triggers alerts to flash
- Correction Zone:
 - Opportunity for driver to deviate route of travel avoiding collision
- Confirmation Zone Notification:
 - BlinkLink® delivers event photos of course correction or structural impact



System Enhancements

- Connected Vehicle Interface (CVI)
 - In-vehicle alerts to inform of low clearance ahead
- Overview camera(s)
 - Monitor path corrections or continued travel/impacts
- License Plate Recognition (LPR)
 - Registered vehicle owner details
- Dynamic message boards/blank out signs
 - Targeted communication to identified “offender”
- Audible sirens
 - Additional warning and awareness



Case Studies

- Athens-Clarke County, GA
 - A railroad trestle bridge on a two-lane road was the site of many major overheight collisions, one even causing a railroad derailment
 - Since installing the overheight system there has not been one collision

TAPCO
Safe travels.

CASE STUDY

Georgia County Significantly Reduces Overheight Trestle Bridge Collisions

CUSTOMER NAME
Athens-Clarke County, GA

PRODUCTS
Overheight Warning System

SUMMARY
The City of Athens-Clarke County knew it needed an overheight safety solution due to an increasing number of major strikes occurring at a low-clearance railroad trestle bridge, with one especially harmful collision causing a railroad derailment.

Wrong-Way Solutions

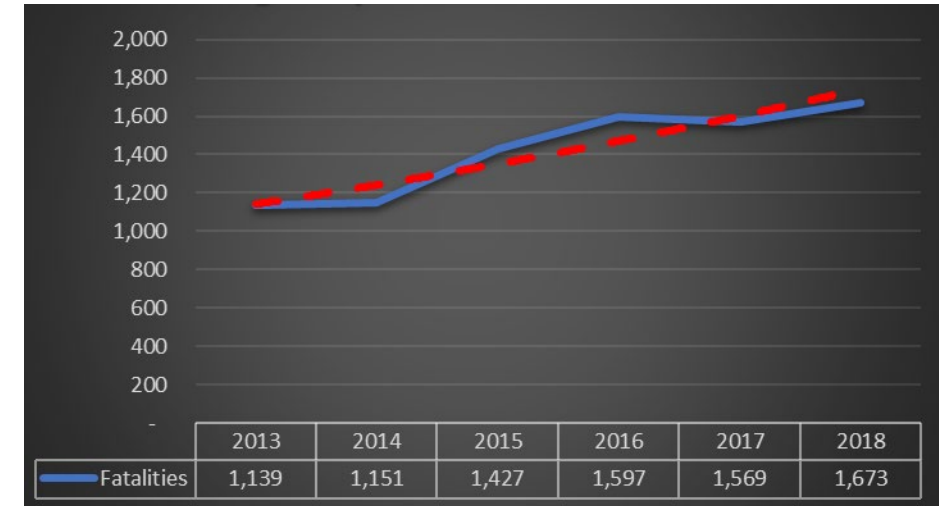


What's The Problem?

Wrong-Way Fatalities 2013-2018

- 1,673 fatalities in 2018
- Largest number since 2010
- Upward trend of wrong-way driver fatalities
- 46% increase over the last 6 years

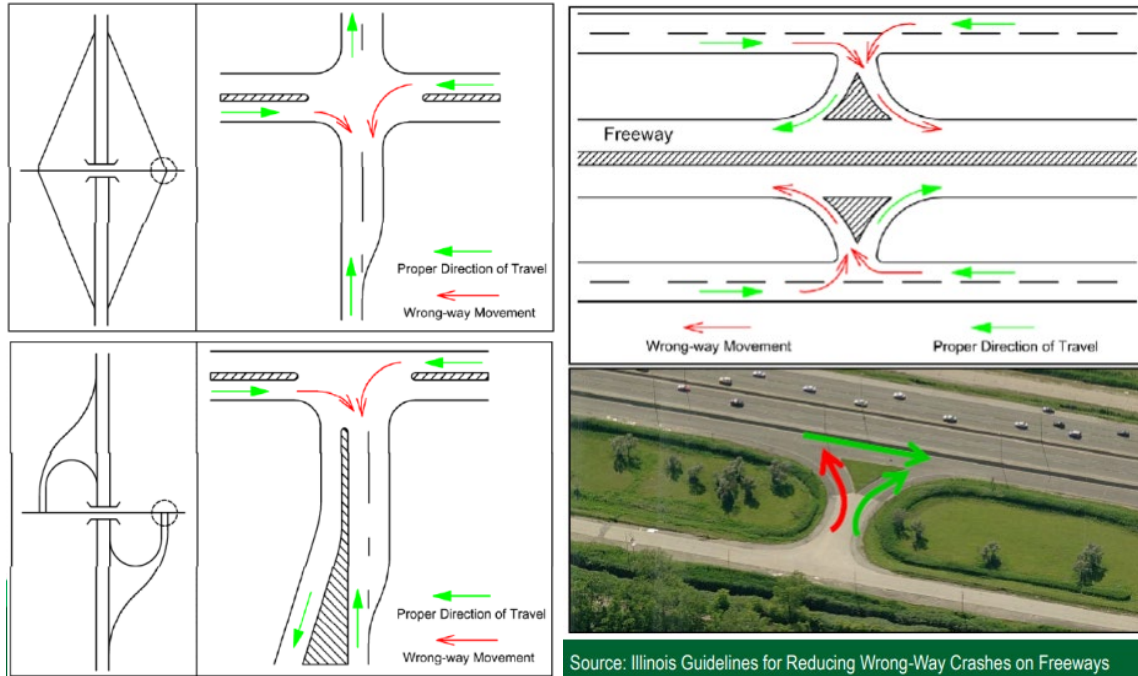
Nationally



(Source) NHTSA Fatality Analysis Reporting System

Where Do Wrong-Way Events Start?

At an Exit Ramp



Drafting, Designing, and Deploying WWD Initiative in Florida
(Source) Raj Ponnaluri, et al, 2019

Corrective/Responsive Measure:

TAPCO Wrong-Way Alert System

■ System Components

1. Thermal or radar sensor
2. Supporting white LED illuminator
3. High-speed high-definition camera
4. LED enhanced warning device
5. Cellular modem or fiber connection



Wrong-Way System Detection Portfolio



Good

24/7 or Dusk 'til Dawn

- LED enhanced treatment
- Minimal deterrent
- No offender interaction
- Susceptible to "white noise" phenomena
- Not BlinkLink® connected



Better

Radar Detection

- Entry level vehicle activated solution
- Complex ramps/install locations and severe weather may cause false detections
- BlinkLink® connected
 - Event and vehicle details
 - Directional overlay
 - Online and operating validation
 - Data capture

Wrong-Way System Detection Portfolio

Best

Thermal Detection

- Premium vehicle activated solution
- **~90% reduction in false detections**
- Ideal for interconnected ITS systems
- Required for CVI systems
- BlinkLink® connected
 - Event and vehicle details
 - Directional overlay
 - Online and operating validation

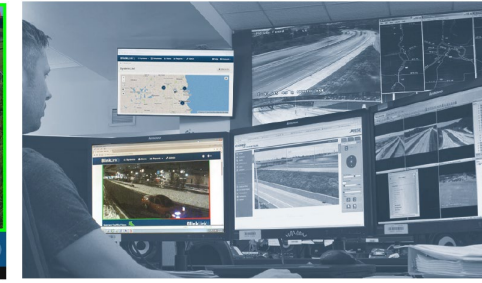
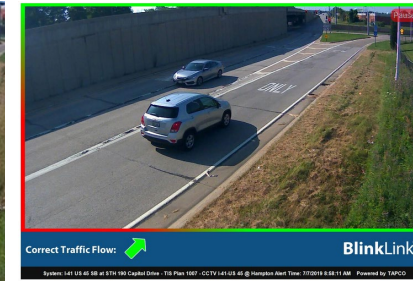
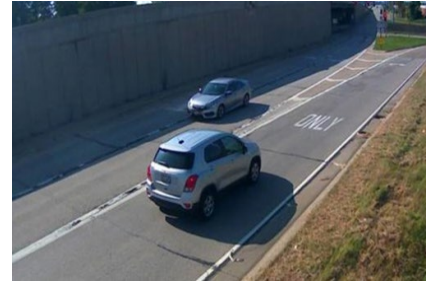


Wrong Way Vehicle Thermal Sensor



BlinkLink® Software

User-friendly, cloud based software



- Collects real-time data and relays event details
- Notifies designated parties with actionable event based information
 - Transmits images in 5 seconds or less!
- Ability to integrate with local TMS's ATMs software
- Secure API integration available for ITS device interconnectivity (DMS, PTZ cameras, etc.)
- Hi-res 1080P color images include directional overlay for situational clarity
 - Now offering 2 minute event video!
- System health and diagnostics for optimal and reliable operation



System Camera Status

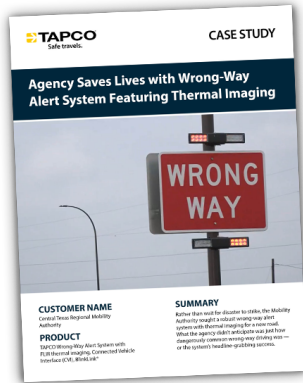
Controller	-15min	-30min	-45min	-60min	-75min	-90min
Incoming Camera	OK	OK	OK	OK	OK	OK
Outgoing Camera	OK	OK	OK	OK	OK	OK
Overview Camera	OK	OK	OK	OK	OK	OK
Sign Activation Thermal Sensor	OK	OK	OK	OK	OK	OK
Wrong Way Confirmation Thermal Sensor	OK	OK	OK	OK	OK	OK

TAPCO Wrong-Way Solutions

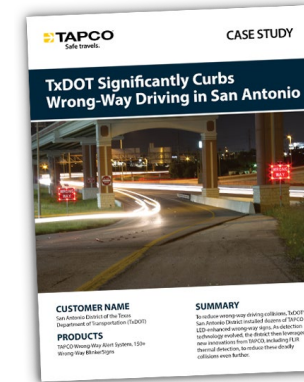
Wrong-Way Driver (WWD) Leaders since 2011 with 1,000+ installations in the U.S. and Canada

- Exclusive detection sensor offering
- Superior accuracy and precision
- Reduction in false calls and maintenance, improving system reliability
- Secure, user-friendly BlinkLink® system management software
- Ability to integrate with various communication network architectures
- Connected vehicle capability
- **387 wrong-way detections in 2019 – improved public safety!**

Case Studies



- Central Texas Regional Mobility Authority
 - Rather than wait for disaster to strike on a new three-mile stretch of toll road, the Mobility Authority installed wrong-way RRFBs along with FLIR and CVI
 - 9 months after installation there has only been 14 wrong-way drivers with a 100% correction rate



- TxDOT
 - When an on-duty officer was struck and killed by a wrong-way driver, TxDOT installed wrong-way BlinkerSigns
 - Since installing the Wrong-Way System, TxDOT had seen about a 30% reduction in reports of wrong-way calls plus an annual savings in \$1.1M

LegendViz™ Traffic Signs and BlinkerSigns



LegendViz™ BlinkerSign® Project Overview

- Strategic legend-only illumination to maximize legend to background contrast
- Standard 0.80 highway grade aluminum
- 3M DG3 translucent reflective sheeting
- Nighttime only legend illumination
- Legend steady-illumination (no flashing)



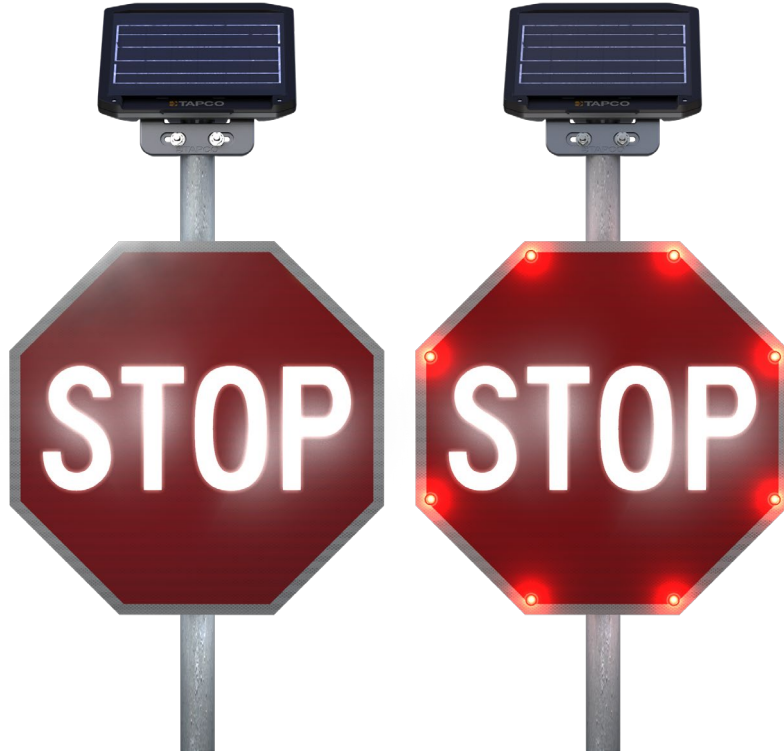
LegendViz™ BlinkerSign® Project Overview

- Legend and/or perimeter activation options
- Solar and AC power options available
 - 7+ days (13W TOP) minimum autonomy
- Made in the USA
- MUTCD compliant design



Preliminary LegendViz® Portfolio

30" (Solar and AC Options Available)



LegendViz™ Traffic Sign

LegendViz™ BlinkerSign®

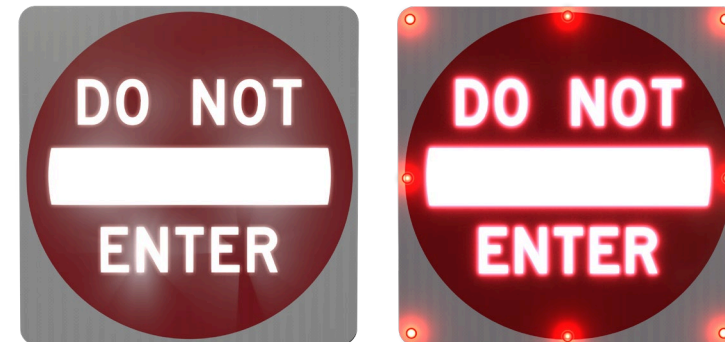
30" x 42" (Solar and AC Options Available)



LegendViz™ Traffic Sign

LegendViz™ BlinkerSign®

30" (Solar and AC Options Available)



LegendViz™ Traffic Sign

LegendViz™ BlinkerSign®

30" LegendViz™ LED STOP Sign (R1-1)

LegendViz™ Variations

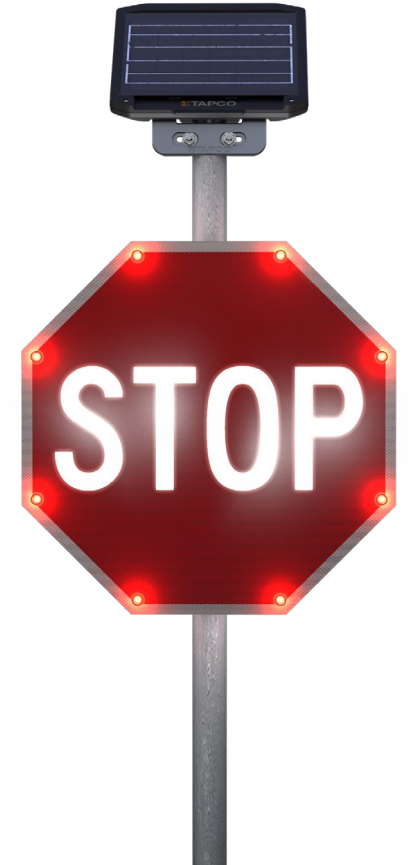
LegendViz™ Traffic Sign

- Legend illumination
 - White LEDs
 - Steady illumination
 - Offset legible
 - 300' readability
 - 500' visible
 - **Enhanced legibility**



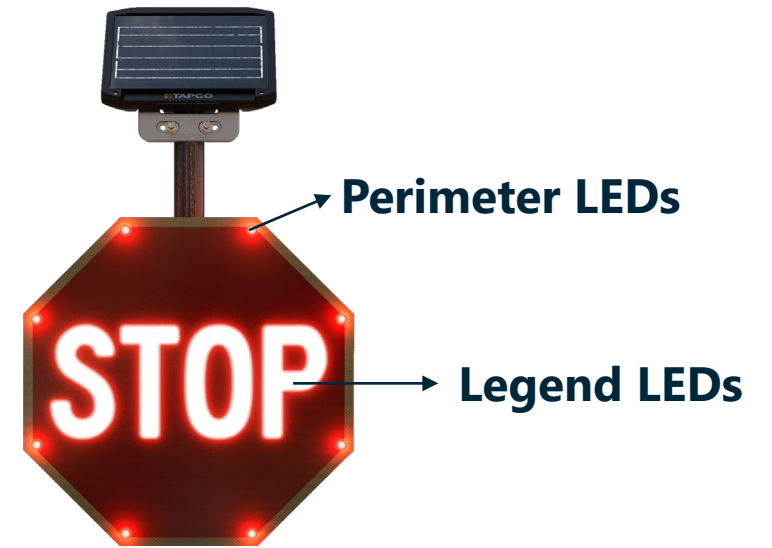
LegendViz™ BlinkerSign®

- Perimeter illumination
 - Red LEDs
 - Flashing illumination
 - Linear awareness
 - 1-2 miles of visibility
 - **Enhanced conspicuity**



Illumination Activation Options

- Dual sources of illumination affords new, enhanced logic not previously available
- Legend and perimeter LEDs are independently controllable with the IWS Controller
- Activation made feasible via third-party sensors (thermal, radar, loops, etc.)



ACTIVATION OPTIONS		
LegendViz™ BlinkerSign® Activations	Legend LEDs	Perimeter LEDs
Standard	Steady nighttime illumination from dusk 'til dawn	Flashing 24/7 or from dusk 'til dawn
Perimeter Activated	Steady nighttime illumination from dusk 'til dawn	Activated
Legend Activated	Vehicle-activated nighttime illumination	Flashing 24/7 or from dusk 'til dawn
Both Activated	Vehicle-activated nighttime illumination	Activated

LegendViz™ Traffic Sign Illumination

Marketing Video



Questions

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