Work Zone Barriers™

An Online Guide to Reducing Work Zone Intrusions Using Positive Protection

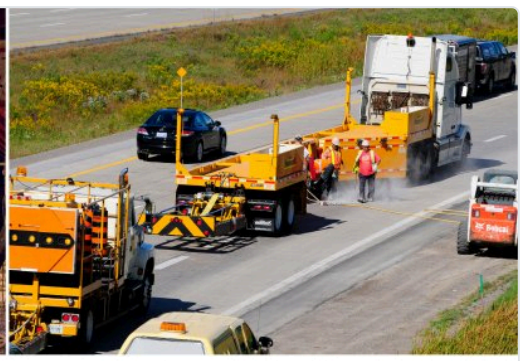
Highway Barriers for Work Zone Safety

Innovative Highway Barriers such as **Mobile Barriers, Movable Barriers, & Temporary Barriers enable engineers and contractors to accelerate highway projects,** increase roadway capacity to match daily traffic patterns, physically separate moving traffic and workers, minimize workzone footprints, and increase work zone safety.


Steel Barriers


Temporary Concrete Barriers


Movable Barrier System

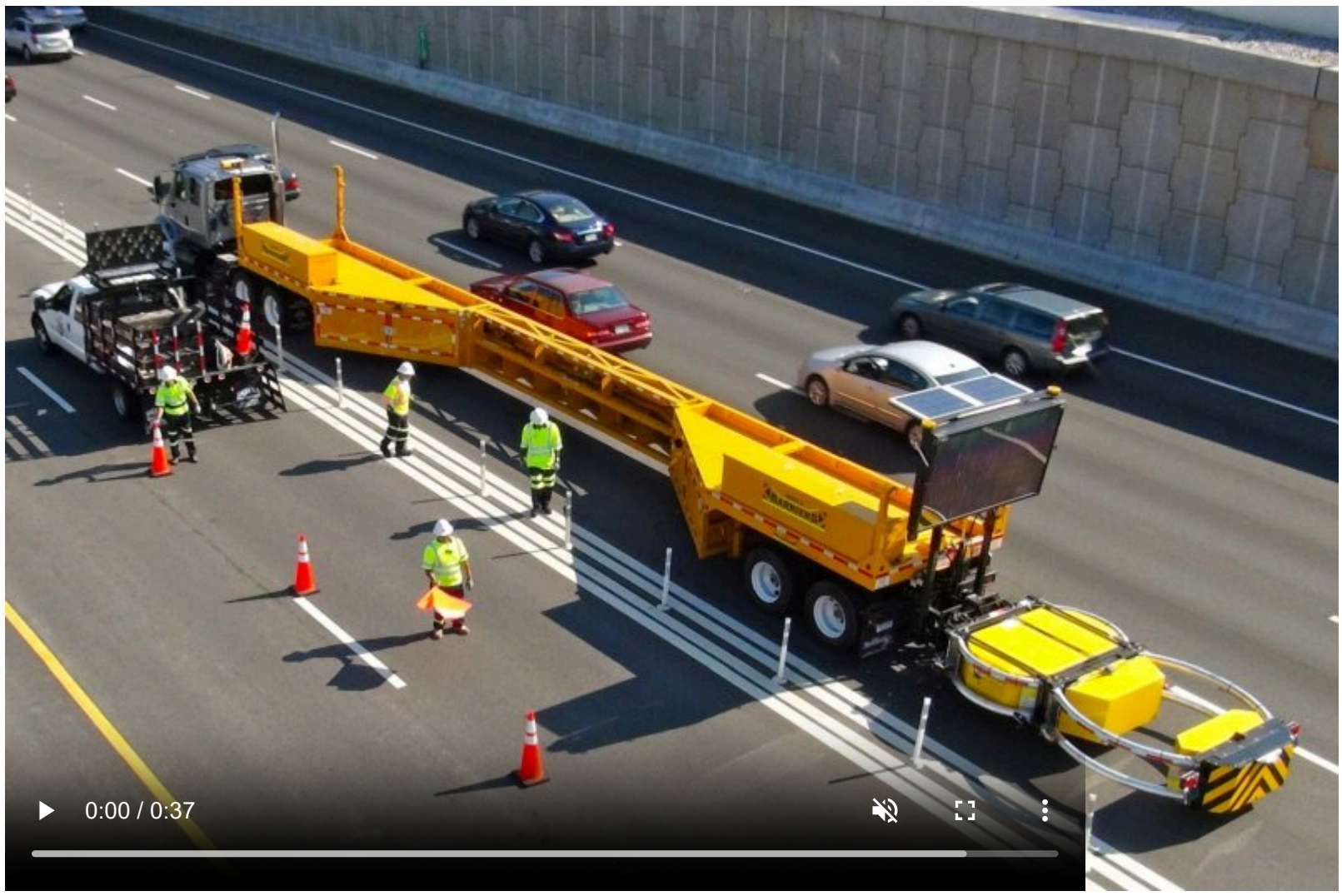

Mobile Barrier System

The serious hazards faced by highway workers, who are among the most "Vulnerable Road Users", makes it vitally important that engineers and contractors use Positive Protection work zone barriers to ensure worker safety. In a 2022 survey, 64% of highway contractors reported crashes into their work zones. [24] One FHWA study found that pedestrians have less than a 50% chance of surviving being struck by a moving vehicle traveling 30 mph or over. [27] In an earlier survey, 89% of highway contractors think Positive Protection barriers would help improve safety and prevent these horrific crashes. [4]

> "Roadway work zones are some of the busiest, and potentially most hazardous, work environments you can find, as workers perform tasks in close proximity to vehicles that are often traveling at high speeds."
>
> — American Society of Safety Professionals (ASSP), "4 Steps to Creating Safer Work Zones"

Where would **you want** your **office chair?**

What are the Types of Highway Barriers?



Image, Video

Mobile Barriers

Mobile Barriers MBT-1® is a innovative traffic barrier system for incident response & work zone safety. The mobility of the MBT-1® allows rapid work zone setup/removal and enables managers to reduce project duration & cost, schedule around peak traffic hours, and minimize roadway congestion. The MBT-1® has been called the "perfect tool" for various types of road, bridge, and tunnel work (e.g. pavement and approach slab replacement, guardrail and barrier repair, bridge deck and joint repair, loop detector installation, and full ramp closures preventing vehicles from entering).

This innovative highway barrier integrates equipment & supplies for comprehensive on-site logistics with 85,000 lbs (38500 kg) GVWR carry capacity, integrated crane & heavy lifting capabilities, generator, high lumen work lights, TMA, electronic signage, and more. Tested and accepted under NCHRP 350 & MASH for TL-2 and TL-3 usage.

Image, Video

Moveable Barrier - Concrete

Lindsay Transportation Solutions QMB Zipper: The Road Zipper System is designed to increase capacity and reduce congestion by making more efficient use of new or existing roadways & highways. This innovative highway barrier is used for managed lanes and construction applications to create safe, dynamic highways that offer real-time roadway reconfiguration while maintaining positive barrier protection between lanes. The Road Zipper System can be used to move barrier from one side of a lane to the other to create work space and reopen lanes again to restore capacity.

Moveable Barrier - Steel

Valtir's Vulcan® moveable steel barrier is comprised of lightweight, galvanized steel segments that offers real-time roadway reconfiguration. This highway barrier is tested to NCHRP Report 350 Test Level 3 and Test Level 4, and EN1317 H2 and N2 specifications. The Vulcan® Moveable Barrier is designed for easier movement with the Vulcan® Transfer Attachment (VTA) when connected to a skid steer or front end loader. The VTA is also designed to help the operator work from either side of the barrier.

Temporary Steel Barrier

Hill & Smith Zoneguard® temporary steel barrier, offers the road construction industry an innovative temporary highway barrier solution that provides superior protection. A cost-effective alternative to traditional concrete barrier, Zoneguard's lightweight configuration allows 750 feet to be hauled on one truck and up to 1500 feet to be installed in one hour. Zoneguard's low weight does not affect its performance, as it meets both NCHRP 350 (TL-3 & TL-4) and MASH (TL-3) crash test standards.

Traditional Concrete Barrier (TCB)

Traditional concrete K-rail or Jersey Barrier is generally considered a device for use on Long-Term Projects. With a weight of 4,000 lbs or more, concrete Jersey Barrier requires heavy equipment to install, rearrange, and remove at the end of a project. As a result, traditional concrete highway barrier is often left-in-place for the duration of a project, limiting roadway capacity & flexibility to respond to rush hour traffic congestion. Commonly cited challenges of using concrete Jersey Barrier or K-Rail include installation/removal time & cost, safety risks of installation/removal in live traffic, and impracticality for Short-Term and Short-Duration work zones and/or where it is desirable to reopen lanes and relieve congestion for rush hour highway traffic.

Why Proactively use Highway Barriers to Ensure Work Zone Safety?

> "...safety, health, and well-being are inherent rights of every worker."
>
> — American Society of Safety Professionals (ASSP), "Code of Professional Conduct"

Today, we have the technology, 'know how', and responsiblity to protect workers from errant vehicles by using Positive Protection work zone barriers. The USDOT Safe System Approach (based in part on the "Hierarchy of Controls" protocol) emphasizes that death/serious injury for highway workers is unacceptable and that safety is proactive (e.g. using Positive Protection barriers proactively).

> "Focus on the hierarchy of controls (risk treatments) to design a workplace where pedestrian employees do not encounter moving vehicles, materials and similar hazards."
>
> — American Society of Safety Professionals (ASSP), "On the Road to Improving Work Zone Safety"

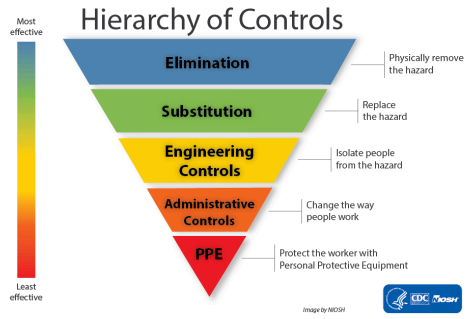
Professional safety protocols such as the "Safety Hierarchy", "Hierarchy of Controls" , and "High-energy control assessment (HECA)" prioritize hazard elimination followed by implementing direct controls (e.g. Positive Protection barriers) to address high-energy hazards (e.g. errant moving vehicles). *"Direct controls are actions that...reduce or eliminate the energy associated with these high-energy hazards... A barrier alongside a busy highway is a direct control for the kinetic energy of motor vehicles."* [20]

> "[H]ow can we apply the concept of the hierarchy of controls to reduce the risk of work zone intrusions?... **Use barriers, not barrels.** If traffic must pass by the work zone, employers should attempt to isolate workers from motorists as much as possible. The best way to do this in highway work zones is to use positive protection... Cones and barrels provide little or no protection from intrusions..."
>
> — Laborers' Health & Safety Fund of North America, "Solving the Work Zone Intrusion Problem"

ANSI Standard A10.47-2021 (§4.4) and Federal Law directs that positive protection "shall be used" in, at minimum, 5 circumstances. In 2021, the Infrastructure Investment and Jobs Act (IIJA) amended the Highway Safety Improvement Program (HSIP) to add protection for "Vulnerable Road Users", which includes road construction & highway workers on foot in work zones.

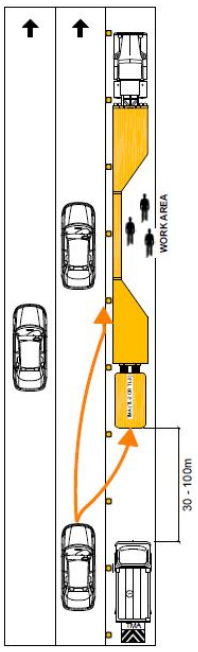
> "Creating a protective barrier between motorists and workers is an essential step. This enables workers to perform their tasks safely while motorists move about the roadway. Based on the established traffic control plan, decision-makers must determine which barriers will best protect motorists and workers.
>
> [ANSI Standard] A10.47[-2021 (§4.4)] states that positive protection measures need to be considered for each of these working conditions:
>
> - Working zones that provide no means of escape (e.g., tunnels, bridges) from external motorized traffic intruding into the workspace
> - Long duration work zones (e.g., two weeks or more) resulting in substantial employee exposure to motorized traffic
> - Projects with high anticipated operating speeds (e.g., at least 45 mph or 72 km/h), especially when combined with high traffic volumes (more than 20,000 vehicles per day)
> - Work operations that place employees within one-lane-width of travel lanes open to traffic
> - Roadside hazards, such as drop-offs or unfinished bridge decks, that will remain in place overnight or longer"
>
> — American Society of Safety Professionals (ASSP), "4 Steps to Creating Safer Work Zones"

In 2021, California launched its award-winning Caltrans Positive Protection Program which directs Caltrans design engineers and contractors to use Positive Protection to ensure worker safety. California research found a cost benefit for highly mobile barrier of $1.9 million per year, per barrier in 2008 ($2.87 million in 2025 dollars). [14]



[Hierarchy of Controls: Prioritizes hazard elimination and reduction followed by implementing direct controls (e.g. Positive Protection barriers) to address high-energy hazards (e.g. errant moving vehicles).]

Safe System Approach: Death/Serious Injury in Unacceptable, Safety is Proactive.



[Positive Protection provides separation and helps prevent longitudinal and lateral crashes into work zones.]

> *"A physical barrier provides one of the best possible protection solutions for workers exposed to the flow of traffic.* ***[Implementing Positive Protection] is a common-sense and cost-effective way for safety reform*** *that will prevent death and injuries of workers on roads and highways."*
>
> — [California Legislature's Committee on Transportation: "March 20, 2023 Hearing: Assembly Bill No. 752, Blanca Rubio. State highways: worker safety."]

Why is it so Important to Speak up about Work Zone Safety Issues?

Speaking up about work zone safety issues could reduce risk & save a life.

A National Safety Council (NSC) survey found 58% of Americans working in construction feel that productivity or speed is prioritized over safety. [21] A recent Construction Dive article reveals that one of structural engineers' biggest concerns (who are responsible for scructures and bridges across the nation) includes overly aggressive construction project timelines (42% respondants).

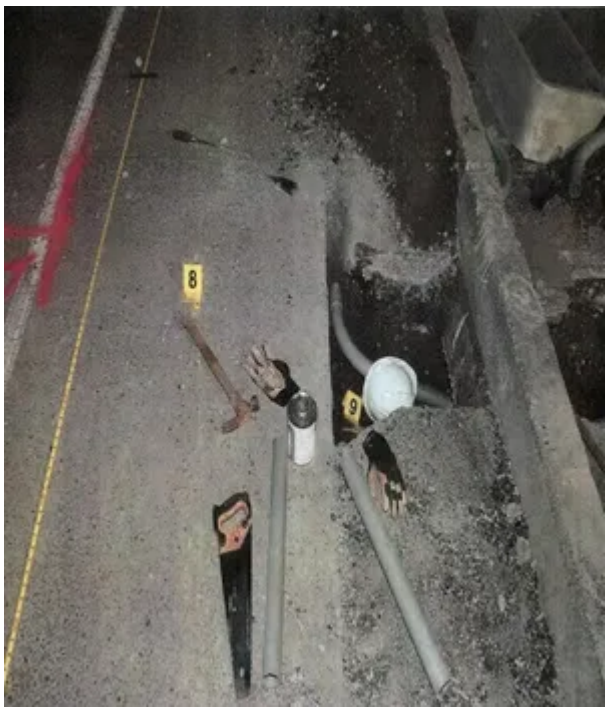
> "These issues represent **safety hazards**... The push to shorten project timelines can lead to **compounding errors** during construction... This **push** to go too fast and possibly **cut corners** can be **combatted by a strong safety culture.**"
>
> — Chris Cerino, National Council of Structural Engineers Associations in "The Need for Speed Can Lead to Problems on Projects, Engineers Say", ConstructionDive, Sept. 5 2024.

Improved road-user and worker safety is a proven benefit from using Positive Protection work zone barriers.

Compromising on safety can lead to severe injuries, fatalities, liability, and/or rework. [22] One example is a tragic and preventable 2011 incident which resulted in a serious injury resulting from engineers' choices to withhold Positive Protection. The incident and engineers' choices attracted statewide news coverage, numerous questions, concern for the safety of people constructing and maintaining the state's roads, and a $37.3 million settlement. This incident led to major safety reforms in 2019 through the enactment of a new law directing design engineers and contractors in the state to use Positive Protection to ensure worker safety.

In addition, recent studies have found that higher levels of injuries on highway and infrastructure projects are also associated with rework and quality issues. [27] According to some industry estimates, the direct costs of rework on infrastructure projects amounts to over 5.7% of a project's total cost. [23] [26] In addition, rework often adversely affects project schedules, leading to overruns and delays. [25] For large infrastructure projects, this can mean millions of dollars in unexpected expenses.

> "An undeniable feature that contributed to both NCRs [non-conformances and rework] and safety incidents was human error [on infrastructure, rail, and building projects]; the fragility of human beings inexorably ensures that errors will occur...
>
> In acknowledgment of this, ...there is therefore a need to **'anticipate what might go wrong'** and accommodate the likelihood of errors occurring **when undertaking a risk analysis prior to the commencement of construction**...
>
> When rework was required, for example, it was noted that people tended to take 'short-cuts'...and there may no longer be equipment in place that supports a safe work environment...
>
> People make mistakes, but organizations make it possible for them to be really serious."
>
> — Chris Cerino, National Council of Structural Engineers Associations in P. Love, P. Teo, J. Morrison, "Unearthing the Nature and Interplay of Quality and Safety in Construction Projects: An Empirical Study", Safety Science 103 (2018) 270-279.



Caltrans Agreed to Pay $37.3 million to Paralyzed Worker Struck in Trench in an Inadequately Protected Work Zone.

> "The project manager needs to constantly reinforce the message that safety will not be compromised for any reason, especially, cost or schedule reasons...A project that finishes on time and under budget should not be considered successful if a teammate is seriously injured...Projects having fewer safety problems usually have fewer quality problems."
>
> — Terrell, M.S., "The project manager's role as a safety champion", Paper presented at Project Management Institute Annual Seminars & Symposium, 2000.

> "Engineering has a direct and vital impact on the quality of life for all people. Accordingly, the services provided by engineers require honesty, impartiality, fairness, and equity, and must be dedicated to the protection of the public health, safety, and welfare."
> — National Society of Professional Engineers, "Code of Ethics for Engineers"

> "Members should hold paramount the health, safety, and welfare of the workplace and the public."
> — Construction Management Association of America, "Code of Professional Conduct"

> "Safety is a people profession. We want to help workers feel safe, contribute to organizational goals and return home healthy at the end of the workday."
>
> — Bradley D. Giles, P.E., CSP, STS, FASSP, GIOSH, 2021-2022 ASSP President, "Ethics and Our Profession"

Footnotes

[1] Temporary Traffic Control Devices, 23 U.S.C. § 112(g).

[2] Definitions, Subpart K - Temporary Traffic Control Devices, 23 C.F.R. § 630.1104.

[3] Positive Protection Measures Defined, 23 U.S.C. 112(g)(4).

[4] 2019 Associated General Contractors of America (AGC) Highway Workzone Safety Study.

[5] 2018 Associated General Contractors of America (AGC) Highway Workzone Safety Study.

[6] 2017 Associated General Contractors of America (AGC) Highway Workzone Safety Study.

[7] 2016 Associated General Contractors of America (AGC) Highway Workzone Safety Study.

[8] Estimated Total Crashes & Injuries Data: 2013-2015 data from NHTSA National Automotive Sampling General Estimates System (NASS/GES). NHTSA retired NASS/GES at the end of 2015. 2016-2017 data from NHTSA's replacement Crash Report Sampling System (CRSS).

[9] Fatalities Data: NHTSA Fatality Analysis Reporting System (FARS) Encyclopedia. 2018 is the last year with available data.

[10] Positive Protection Devices, Subpart K - Temporary Traffic Control Devices, 23 C.F.R. § 630.1108(a)(1-5).

[11] Payment for Traffic Control, Subpart K - Temporary Traffic Control Devices, 23 C.F.R. § 630.1108(f)(2).

[12] "Portable Positive Protection: A Guide for Short Duration and Short Term Work Zones", Updated by Mobile Barriers LLC, Based on Material Developed by ATSSA for the FHWA Work Zone Safety Grant Program (June 2016).

[13] U.S. Department of Transportation, "Guidance on Treatment of the Economic Value of a Statistical Life in U.S. Department of Transportation Analyses - 2016 Adjustment," (August 8, 2016).

[14] UC Davis/AHMCT, “A Risk Assessment and Cost Benefit Analysis for [Highly Mobile Barriers],” Technical Report Number UCD-ARR-08-09-30-01, (2008). Ibid, Attachment 3.

[15] Mobile Barriers LLC internal crash analysis for Washington D.C. located highly mobile barrier.

[16] Former Deputy Executive Director of the Texas Department of Transportation (TxDOT).

[17] 2013 Associated General Contractors of America (AGC) Highway Workzone Safety Study.

[18] 2014 Associated General Contractors of America (AGC) Highway Workzone Safety Study.

[19] 2015 Associated General Contractors of America (AGC) Highway Workzone Safety Study.

[20] Urbint, "High-Energy Control Assessments (HECA) — What They Are and How They Save Lives".

[21] "58 Percent of Construction Workers Say Safety Takes a Backseat to Productivity", EHS Today, May 18 2017.

[22] Forcada, Nuria & Rusinol, Gerard & Macarulla, Marcel. (2013). Rework in highway projects. Journal of Civil Engineering and Management. 20. 1-11. 10.3846/13923730.2014.893917.

Project 5:"In this particular project, a great number of unexpected issues appeared: ... an accident forced [the project management team] to include stricter safety systems [which required rework]." Project 8: "Incomplete project documentation such as extra safety conditions or enlargement of car protections in case of impact provoked rework activities."

[23] "The Impact of Rework on Construction & Some Practical Remedies", Construction Management Association of America.

[24] 2022 Associated General Contractors of America (AGC) Highway Workzone Safety Study. Study based on nationwide survey of approximately 538 highway construction firms.

[25] "8 Ways to Reduce Construction Rework", AutoDesk, July 1 2023.

[26] "Root Causes & Consequential Cost of Rework", XL Catlin, Insurance: North America Construction, 2015.
"Abdul-Rahman (1995) determined non-conformance costs in a highway projectto be 5% ofthe contract value (excluding material wastage and head office overhead). Abdul-Rahman specifically points outthat non-conformance costs may be significantly higher where poor quality management practices were implemented."

[27]Peden, World Health Organization, World Report on Road Traffic Injury Prevention, (2004); See also, DOT/FHWA Report, Leaf and Preusser, Literature Review on Vehicle Travel Speeds and Pedestrian Injuries Among Selected Racial/Ethnic Groups, (October 1999) (estimating “fatality rates of 40, 80, and nearly 100 percent for striking speeds of 30, 40, and 50 miles per hour or more respectively.”).

Work Zone Barriers

Defining Positive Protection

Types of Positive Protection

Benefits of Positive Protection

Work Zone Crash Data

Contractor Reported Crashes & Outcomes

Workzone Total Crashes & Injuries

Work Zone Crash Fatalities

Work Zone Pedestrian Fatalities

Firetruck and Emergency Response Collision Crash Data

Implementation

When are Positive Protection Barriers Appropriate?

What Federal Funding is Available for Positive Protection Barriers?

How Can Contractors Obtain & Use Positive Protection Barriers?

FHWA Repeals Proprietary Product Rule

California's Positive Protection Program