Work Zone Barriers™

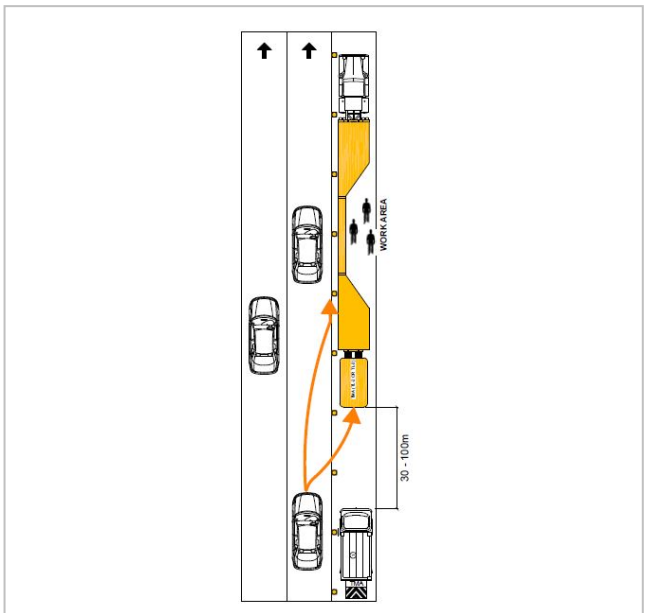
An Online Guide to Reducing Work Zone Intrusions Using Positive Protection

What is Positive Protection?

Positive Protection are measures “between workers and motorized traffic” which “contain and/or redirect vehicles" and meet applicable crashworthiness criteria . [1, 2]

Positive Protection may include highly mobile barrier, movable and temporary steel barrier, movable concrete barrier, traditional concrete barrier, associated cushions, and other strategies to avoid traffic accidents in work zones including full road closure. [3]

Mobile and other movable barriers enable field crews to quickly create work spaces that are physically separated from moving traffic and quickly removed from the roadway once the work is completed.



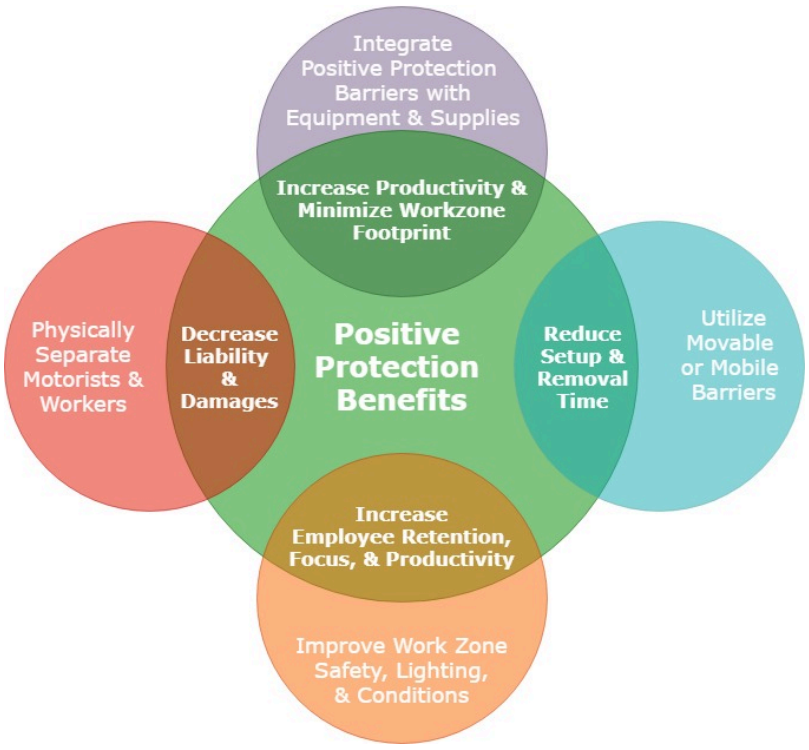
Positive Protection Barriers provide separation and help prevent longitudinal and lateral crashes into work zones.

"We have the technology and 'know how' to build our roadway system to anticipate user error. It can be designed, constructed, equipped, and operated to forgive the errant user and protect the innocent victim."

— ARTBA, "Every Life Counts: Improving the Safety of our Nation's Roadways"

Examples of Positive Protection Devices

Innovative types of highway barrier such as Mobile Barriers, Movable, & Temporary Barriers are enabling managers to accelerate highway projects, physically separate moving traffic and workers, minimize workzone footprints, and provide practical cost effective work zone safety. Benefits vary by product and application. For example, California research found a cost benefit for highly mobile barrier of $1.9 million per year, per barrier in 2008 ($2.72 million in 2023 dollars). [14] Commonly cited benefits of using Positive Protection include:



- Safeguarding Workers Against Intrusions
- Reducing Project Duration & Cost
- Maximizing Roadway Capacity
- Increasing Productivity with Onboard Tools and Supplies
- Increasing Efficiency/Saving Time
- Increasing Employee Retention
- Decreasing Liability, and Damages
- Reducing Risk and Exposure to Dangers of Live Work Zone

Highly Mobile Barrier

Mobile Barriers MBT-1® is a highly mobile 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 versatile MBT-1® 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.

Moveable Concrete Barrier

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. This technology 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 Steel Barrier

Valtir's Vulcan® moveable steel barrier is comprised of lightweight, galvanized steel segments that offers real-time roadway reconfiguration. It 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 a revolutionary temporary 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 Temporary Concrete Barrier (TCB)

Traditional concrete K-rail or Jersey barrier is generally considered a device for use on long term projects and requires heavy equipment to install, move, and remove. Commonly cited challenges of using traditional concrete barrier are the time necessary to install and remove, the risk of doing so in live traffic, and the associated impracticallity of using it for short term projects and/or where it is desirable to reopen lanes for rush hour traffic.

What are the Benefits of Positive Protection?

Improved road-user and worker safety is a proven benefit from using positive protection. New types of positive protection barriers can be used to meet regulations and standards, physically separate moving traffic and workers, and provide practical cost-effective work zone safety.

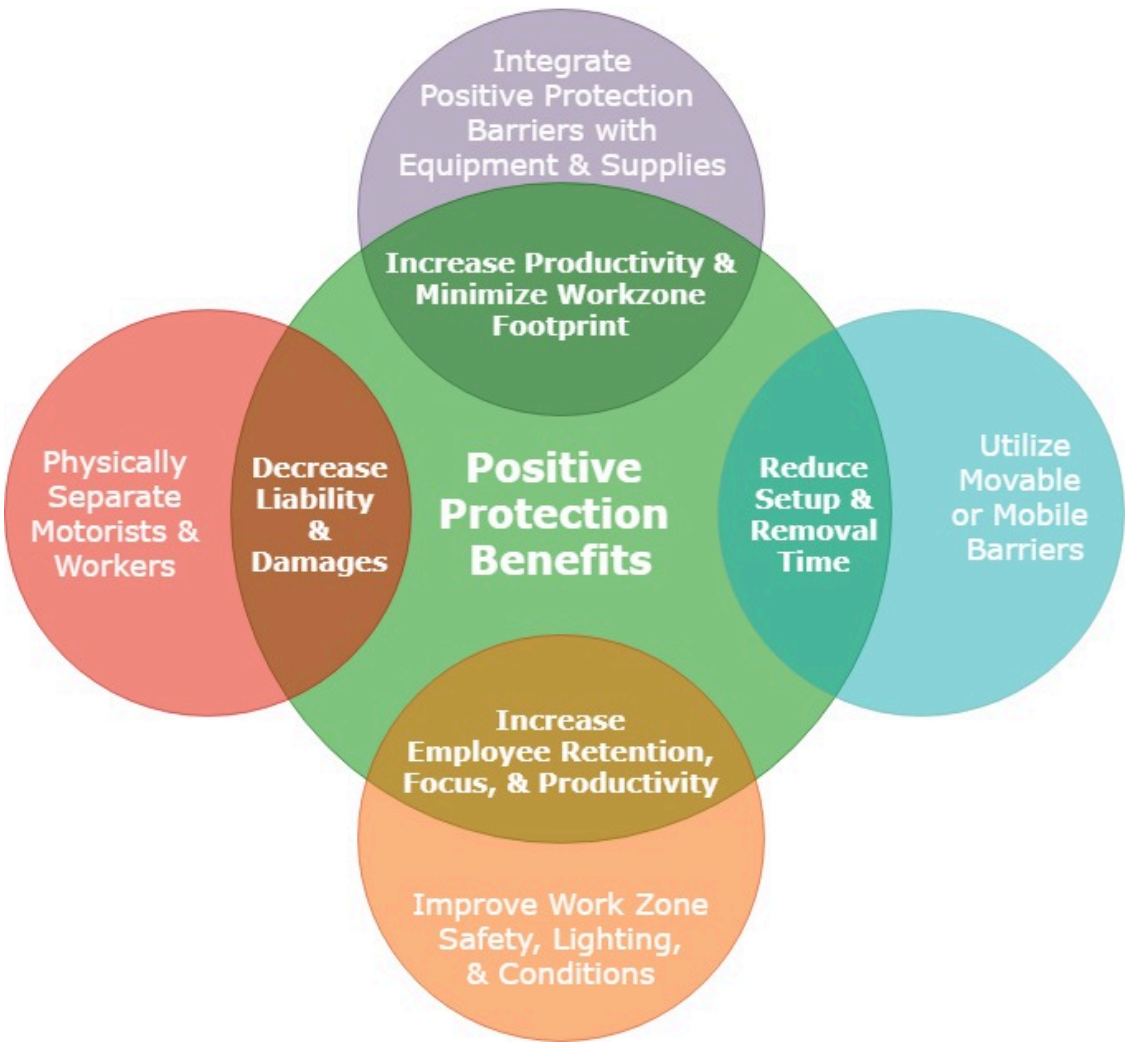
Cost Benefits

California research found a cost benefit for highly mobile barrier of $1.9 million per year, per barrier in 2008 ($2.72 million in 2023 dollars). [14] In 2021, USDOT set the value of a single life (VSL) at $11.8 million dollars. [13, 37] When comparing the cost of the life of a worker to positive protection's cost and 20 year expected term of use, the annual cost of using positive protection is minimal. Over 20 years of use, the barrier will most likely save one or more lives and help avoid even more injuries, accidents, and delays.

Commonly Cited Benefits

Benefits vary by product and application. Commonly cited benefits of using positive protection include:

- Safeguarding Workers Against Intrusions
- Increasing Worker Focus on Tasks
- Reducing Setup
- Increasing Productivity with Onboard Tools and Supplies
- Increasing Efficiency/Saving Time
- Increasing Employee Retention
- Decreasing Liability and Damages
- Reducing Risk and Exposure to Dangers of Live Work Zone



Benefits for Workers and the Public

Positive protection benefits workers & the traveling public by both improving safety and mobility in and around work zones.

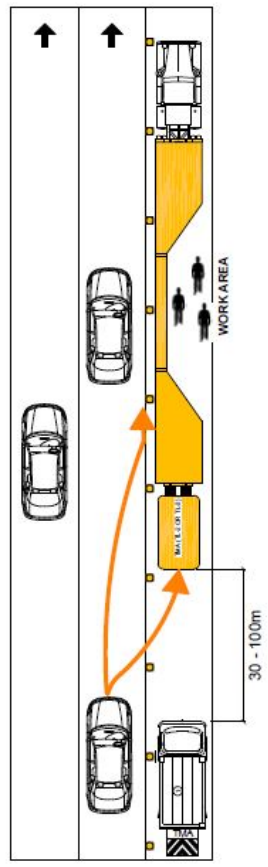
Truck or Trailer Mounted Attenuators (TMA) and warning devices (rumble strips, alarms, etc.) help but also permit motorists to

veer around these devices and swerve back into the work zone. At 50 mph, errant drivers may have less than 1 second to realize and correct their mistakes. In an analysis of impacts in one work zone location, 30-40% of the incidents involved direct rear impacts, and 60-70% of the incidents involved lateral incursions (with relatively tight TMA spacing). [15] Drivers make mistakes but mistakes need not be catastrophic – for drivers, workers, or others.

Positive Protection physically separates workers and motorists. Barriers are designed to prevent logitudinal and lateral crashes into work zone zones. Barriers help drivers better focus on the road ahead and help reduce the severity of mistakes and accidents. In many cases, errant drivers can regain control and continue on their way.

Extended lane closures with low work activity contribute to driver frustration. Traditional practices of taking buffer lanes are not needed and are becoming impractical with increasing traffic volumes. Positive protection helps reduce the number and duration of lane closures. Work and associated protection can be focused in one or more specific areas.

The highly mobile and movable types of barriers are designed to help reopen the roadway quickly to restore capacity. Roadways can be reopened daily to ease rush hour traffic otherwise congested behind work zones. Reducing congestion benefits both motorists & workers. Speed variance (i.e. congestion/slowdowns) is a significant contributor to accidents in and around work zones. Those accidents may cause additional crashes and/or spill over into work zones. Addressing congestion with positive protection can benefit workers, the public, and commerce by reducing accidents, injuries, fatalities, risk, delay, and interruption. These combined considerations accounted for much of the $1.9 million savings per highly mobile barrier per year found by California DOT research. [14]



Positive protection provides separation and helps prevent longitudinal and lateral crashes into work zones.

Case Study: California Bridge Project
3 year/$150-200 million project.

3x mobile barriers:
- 10-20% time savings per night.
- Lanes reopen daily.

1x movable barrier:
- Lane shifts improve traffic flow.

Benefits:
- Reduced project duration & cost.
- Optimal traffic flows.

An ongoing project in California illustrates even greater potential savings on projects and benefits for the public. Highly mobile barriers are saving an estimated 1-2 hours per night on setup/removal (a 10-20% savings in time and potential project duration). In one closed lane, they are using three barriers to work at different spots along that lane. On a three-year, $150-200 million project, that amounts to substantial reduction in project duration and cost. For the public, benefits are increased even further by shifting lanes around the work zone using movable concrete barrier. Used together, the highly mobile and movable barriers better maintain traffic flows and reduce overall project duration.

Work Zone Fatalities, Injuries, & Crashes

Between 2013 and 2023, work zone fatalities increased 50 percent. In 2023, over 898 work zone fatalities were recorded. [9] Stated another way, 898 work zone fatalities is the equivalent of 5 commercial domestic airliners. In 2021, over 105,000 work zone crashes were estimated to have occured resulting in over 42,000 injuries. [8,] Stated another way, 42,000 injuries is about the capacity of a football stadium.

Damages and losses from work zone crashes are estimated to reach over $38.9 billion annually (2025 dollars, comprehensive crash costs). [28, 29, 43] Cost savings from reducing the number crashes by implementing Positive Protection devices & barrier separation in work zones can be estimated at over $3.8-$8.9 billion annually (10%-23% of work zone crash costs, 2025 dollars). [42] Stated another way, $3.8 to $8.9 billion in annual cost savings is equivalent to 7 to 17 transportation "Major Projects". [47]

In 2020, during the COVID-19 pandemic, work zone crashes & fatalities climbed despite lower traffic volumes. [20, 21, 22, 23, 32, 33] For the first half of 2021, USDOT estimated another 18.4% surge in traffic fatalities over 2020 and the largest number of traffic fatalities since 2006. [35] In 2021, TxDOT reported that work zone fatalities in fact surged 33%. [36] For the first quarter of 2022, USDOT estimated a record increase in fatalities nationwide. [38] In early 2024, the Governor's Highway Safety Association (GHSA) found that the U.S. pedestrian fatality rate has jumped 48% from a decade ago. [34]

Work zone intrusions pose a significant hazard to highway workers. In a 2025 AGC survey, most highway contractors (60%) reported crashes into their work zones. [51] In 2025, 43 percent of highway contractors also reported that work zone crashes resulted in worker injuries or fatalities. [51] *"In 2015, 35 percent of all highway worker fatalities at road construction sites resulted from a vehicle striking a worker. By 2021, this alarming figure had increased to 63 percent"* notes Laborers' Health & Safety Fund of North America (LHSFNA). [44] Highway Workers died on the job 3.7 times more often than the average American worker & 19 times more often than Engineering & Office/Administrative workers each year. [39,40] A prior study found that 38% of "Pedestrian" fatalities in work zones were highway workers (i.e. road construction/maintenance workers, utility workers, and planning/surveying workers).

> "Injuries [from stuck by incidents] range from contusions and lacerations to fractures, crushing, and fatalities."
> — AGC, "Highway Worker Safety Program: Traffic Control Work: Struck By", pp. 10.

> "Most injuries [to pedestrians] arising from these vehicle and ground impacts in adults are trauma to the head, legs and pelvis., tibial plateau fractures and ligamentous injuries of the knee, as well as traumatic brain injuries, are all common."
> — "Pedestrian Injuries: Emergency Care Considerations", Cal J Emerg Med. 2007 Feb;8(1):15–21.

> "[T]he most common cause of death of pedestrians is head injuries...Among all concurrent injuries, lower extremity/pelvic injuries were observed in 216 patients (23.56%)... Over one-third of pedestrians had 4 simultaneous injuries, with an average cost of $243,992 [2023 dollars], which was 1.6 times more than the cost of a pedestrian with only one injured part"
> — "Epidemiology of head injuries in pedestrian-motor vehicle accidents", Scientific Reports volume 13, Article number: 20249 (2023).

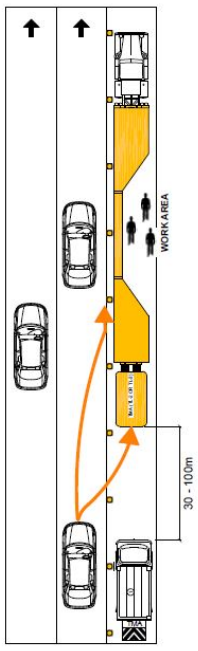
More motorists and road workers are being killed or injured in preventable work zone crashes. **Tunnel, culvert, bridge repair work zones, etc. are known to be especially hazardous** with high-speed traffic moving in close proximity to employees, roadside hazards, and/or little or no means for employees to escape from errant moving vehicles.

Traffic speed is also a known hazard to highway workers. 2023 NHTSA FARS data indicates that the speed limit was 45 mph or less for 40% of pedestrian fatalities inside work zones. [9] A December 2024 IIHS study found that during an impact with a modern taller SUVs and pickup, pedestrians (i.e. workers on foot) are at very high risk. When struck by a median U.S. pickup, a highway worker has an 85% likelihood of severe injury at just 33 mph and an 85% likelihood of dying at just 45 mph. [50] The thresold for a "safe" crash speed (risk of serious injury is 10% or less as commonly quoted in literature) occurred at about 15 mph for pedestrians (i.e. workers on foot).[50]

> “As crash speed increases from 15 mph to 35 mph, the risk of a serious injury [for a pedestrian] goes from 9% to 52% when a median-height car is involved. With a median pickup, the risk [of a serious injury for a pedestrian] shoots up from 11% to 91% [as crash speed increases from 15 mph to 35 mph]... **The findings point to the need for policymakers and traffic engineers to account for the makeup of the U.S. fleet.** A commonly used benchmark for a 'safe' crash speed is one at which the risk of serious injury is 10% or less.”
>
> — Insurance Institute for Highway Safety (IIHS), "A modern injury risk curve for pedestrian injury in the United States: the combined effects of impact speed and vehicle front-end height", December 2024.

A single work zone intrusion can have high consequence outcomes (e.g. multiple employee deaths, severe long-term employee injuries, project delays, damaged/totaled equipment, rework, and/or liability).

> "There’s no ‘pretty close’ when it comes to safety on the job. Almost safe means something needs to be corrected immediately before someone gets hurt or killed."
> — O'Sullivan T., **"Work Zone Intrusion Leaves Six Workers Dead, Shows Almost Is Not Good Enough"**, Laborers' Health & Safety Fund of North America.



Positive protection provides separation and helps prevent longitudinal and lateral crashes into work zones.

Fortunately, Positive Protection barriers can be used to directly control these hazards to highway workers, who are among the most "Vulnerable Road Users". The USDOT Safe System Approach (based in part on the "Hierarchy of Controls" protocol) emphasizes that "Death/Serious Injury is Unacceptable" and "Safety is Proactive" (e.g. implementing 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"

Federal law (23 CFR 630.1108(a)) and ANSI standards (A10.47-2021 §4.4) specify types of projects (e.g. tunnels, bridges, drop-offs, etc.) which require require Positive Protection devices & barrier separation in work zones. Positive Protection are devices placed "between workers and motorized traffic" which function to "contain and/or redirect vehicles" and which meet applicable crashworthiness criteria (see 23 U.S.C. § 112(g) and 23 C.F.R. § 630.1104).

MASH certified traffic barriers placed between workers and motorized traffic (i.e. Positive Protection) offer state-of-the-art safety for workers and motorists by physically preventing (i.e. containing and/or redirecting) high-speed motorized vehicles from colliding with workers and other dangerous obstacles inside a work zone. In a national survey, 89% of highway contractors think Positive Protection would help improve safety and prevent these horrific crashes. [4] Speaking up about work zone safety issues could reduce risk & save a life.

> "It is difficult to change the behavior of motorists...But we can and must institute protective measures like positive barriers and other available controls."
>
> — Laborers' Health & Safety Fund of North America, "Work Zone Intrusions Threaten Safety"

In 2015, Congress directed FHWA to "do all within its power to protect workers in highway work zones." [45] Federal law and ANSI Standard A10.47-2021 (§4.4) identify types of projects that require Positive Protection barriers. For such projects, a “separate pay item” for positive protection is required under federal law and regulations. [1, 11] The Infrastructure Investment and Jobs Act of 2021 (IIJA) amends the Highway Safety Improvement Program (HSIP) to increase funding & protection for "Vulnerable Road Users", which includes "highway workers on foot". [41] In 2021, USDOT set the value of a single life (VSL) at $11.8 million dollars. [13, 37]

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]

Today, we have the technology, 'know how', and responsibility to protect highway workers from errant vehicles by implementing Positive Protection barriers.

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

> "If a work zone has 'no means of escape' from motorized traffic, then no operating speed is truly safe. **An unprotected worker who cannot escape faces serious injury from motor vehicles at any speed, even walking speeds...** One study cited by FHWA show[ed] that the risk of a pedestrian crash fatality reaches 45% at 30 mph and 85% at 40 mph, and another study estimat[ed] that pedestrians have less than a 50% chance of surviving a crash with a vehicle traveling 30 mph or above... The risks posed to road workers will likely further increase as the size of vehicles in the U.S. continues to grow larger. According to a recent Insurance Institute for Highway Safety (“IIHS”) study, the average U.S. passenger vehicle has grown 4 inches wider, 10 inches longer, 8 inches taller, and 1,000 pounds heavier over the past 30 years. Significantly, the IIHS study found that vehicles with higher front ends (pickup trucks, SUVs and vans with a hood height greater than 40 inches) were 44% to 45% more likely to cause fatalities in crashes with pedestrians than smaller cars and trucks. "
>
> — Mobile Barriers: Comments on Work Zone Safety Rulemaking (November 2023).

"We have the technology and 'know how' to build our roadway system to anticipate user error. It can be designed, constructed, equipped, and operated to forgive the errant user and protect the innocent victim."

— ARTBA, "Every Life Counts: Improving the Safety of our Nation's Roadways"

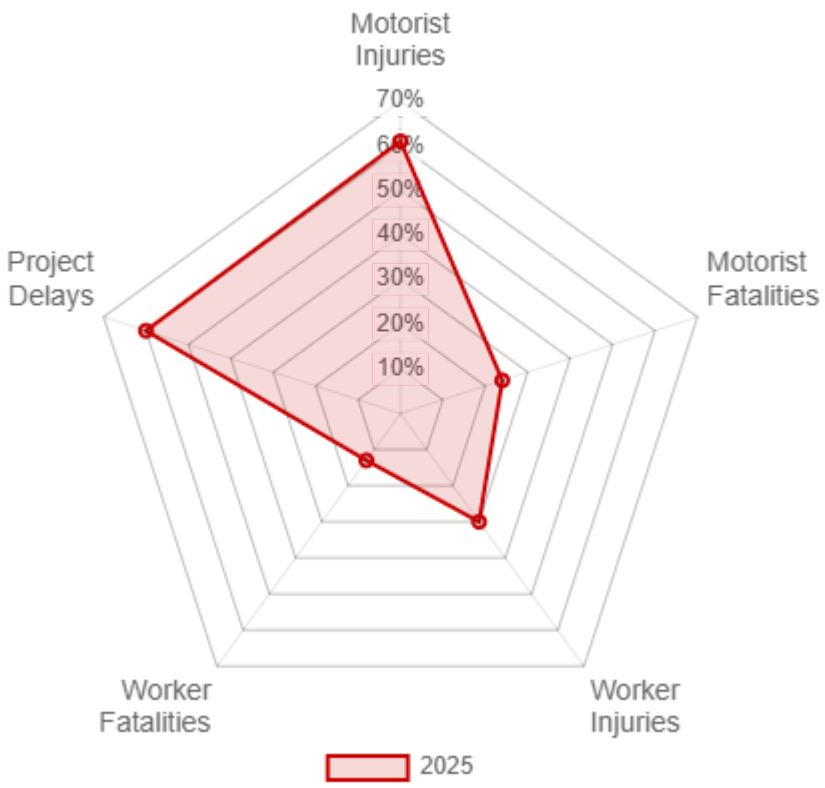
2025 Contractor Reported Work Zone Crashes, Project Delays, Injuries, & Fatalities

The Associated General Contractors of America's (AGC) 2025 nationwide study on highway work zone safety reveals that **60% of highway contractors reported work zone crashes** over the last year. As a result of these work zone crashes, 60% of firms reported project delays, 13% reported worker fatalities, 30% reported worker injuries, 24% reported public fatalities, and 61% reported public injuries. 98% of highway contractors also reported that the risk of highway work zone crashes is as great or greater than a year ago. [51]

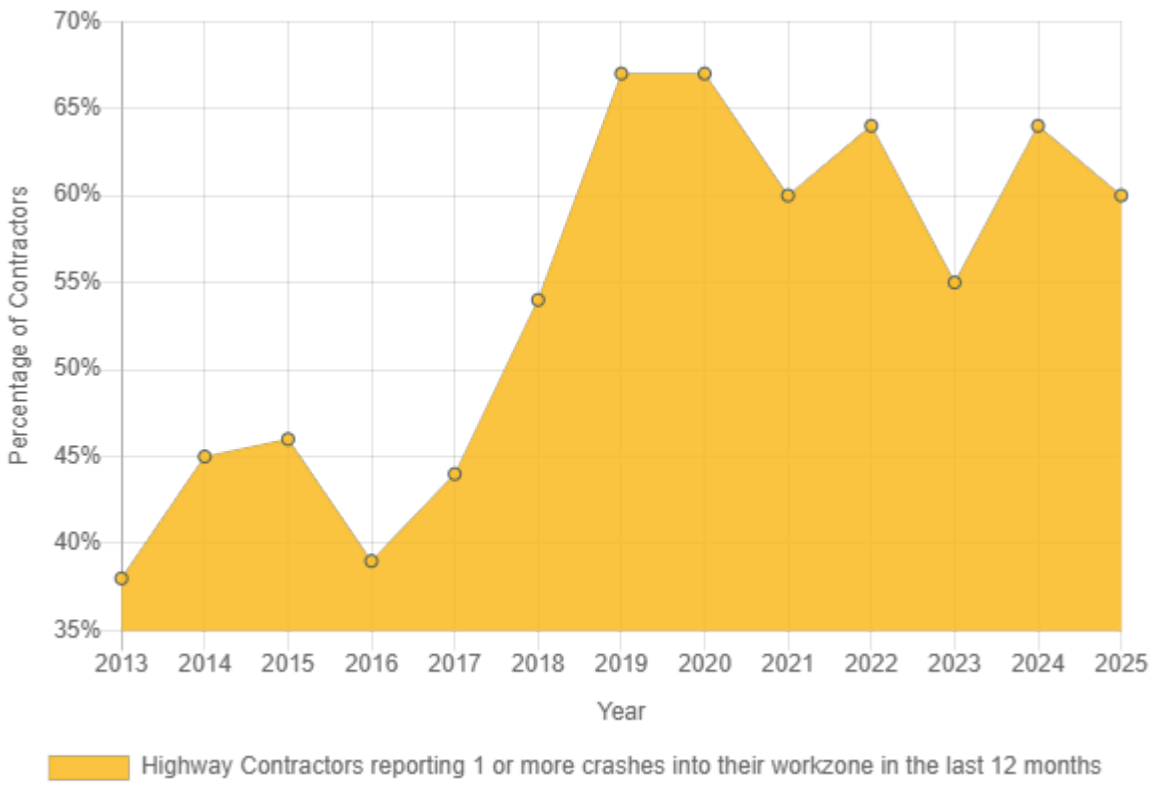
In 2025, 60% of Highway Contractors Reported Crashes into their Construction Work Zones

AGC Study - Outcomes of Work Zone Crashes [51,]

(Mouseover data points for details.)



AGC Study - Percentage of Highway Contractors Reporting Work Zone Crashes Over Time [51, 46, 45, 38, 26, 25, 4, 5, 6, 7, 19, 18, 17]



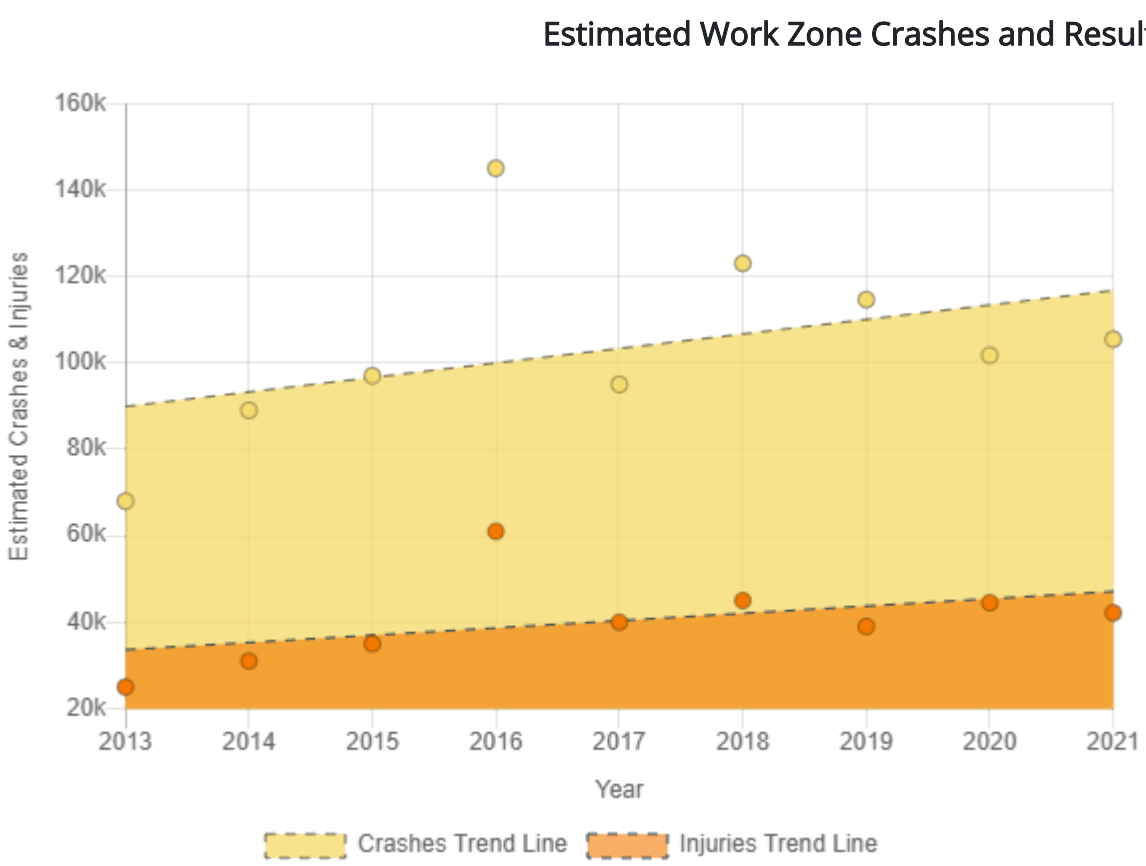
The 2019 AGC study revealed that an increasing percentage of contractors believe Positive Protection would improve safety on their projects.

- 89% of contractors report that increased use of Positive Protection barriers would help reduce injuries and fatalities on their projects.
  4

Estimated National Work Zone Crashes & Injuries [8]

The number of crashes in work zones and injuries resulting from those crashes has been increasing.

- In 2021, an estimated 105,000 crashes and 42,000 injuries were estimated to have occurred in work zones.



* Estimated Work Zone Crashes & Injuries Data are obtained from NHTSA statistical models (NASS/GES & CRSS). The NHTSA statistical models underestimate work zone crash fatalities by as much as 64% in 2019 (see Table 1 below). In general, the NHTSA FARS & CRSS crash report datasets underreport work zone crashes as well as resulting injuries and fatalities (see note †).

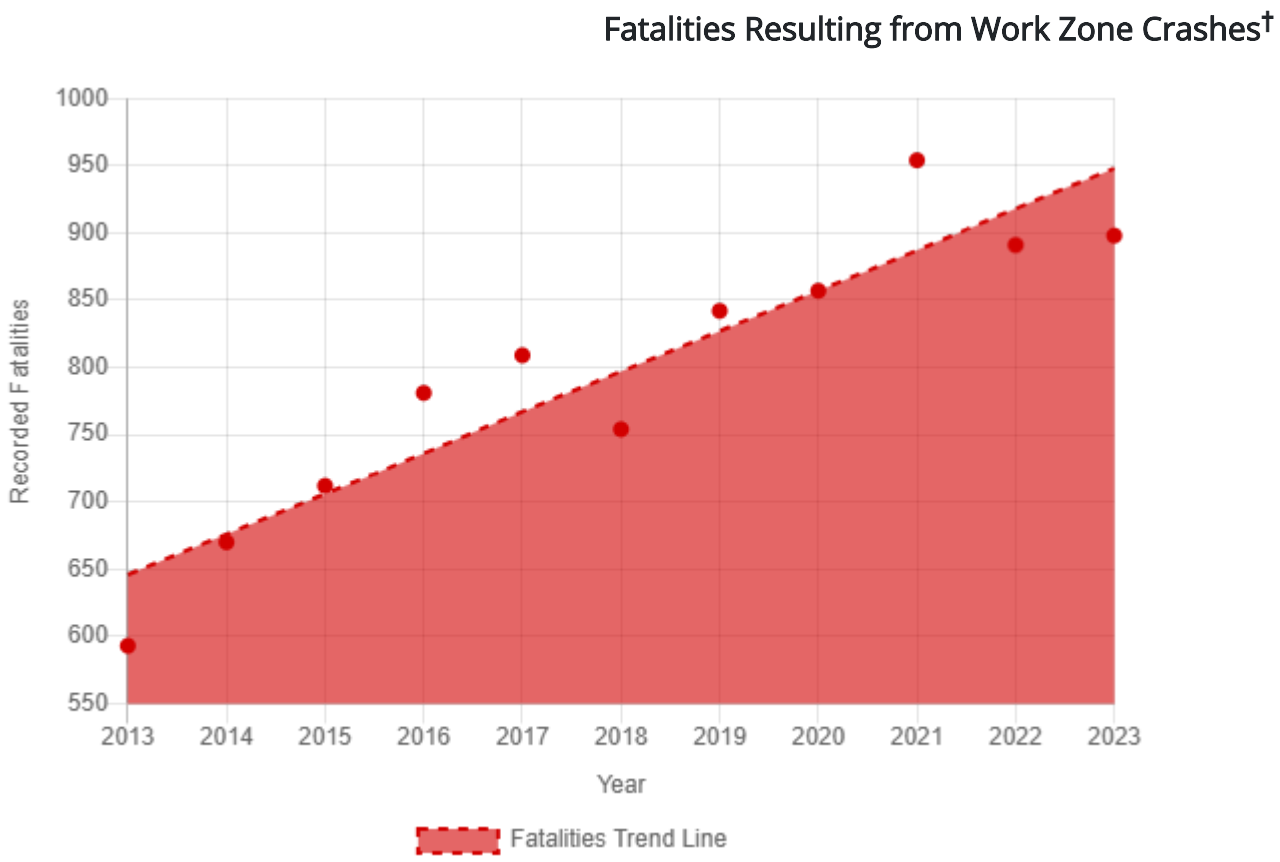
Table 1. NHTSA CRSS Statistical Model Percent Error:

	2015	2016	2017	2018	2019	2020	2021
Recorded Fatalities (FARS)	701	781	806	754	842	857	954
Estimated Fatalities (CRSS Statistical Model)	349	525	597	636	298	478	714
Percent Error (of CRSS Statistical Model)	-50%	-32%	-26%	-15%	-64%	-44%	-33%

National Work Zone Crash Fatalities [9]

Work zone crash fatalities have been on the rise nationally.

- 50% increase in fatalities since 2013.



† In general, the NHTSA FARS & GES/CRSS crash report datasets underreport work zone crashes as well as resulting injuries and fatalities.

The statistic for fatalities resulting from work zone crashes is obtained from NHTSA FARS dataset which attempts to aggregate various state police crash report datasets. However, crashes occurring inside work zones are not always properly classified by police as work zone related.

A cursory glance of NHTSA FARS data in 2018 quickly reveals examples of missed fatalities resulting from work zone crashes. A number of studies confirm that work zone crashes are underreported in crash report datasets. [31]

Pedestrian Fatalities in Work Zones

Pedestrian fatalities inside work zones encompass both workers and members of the public. A review of NHTSA FARS data confirmed that 38% of pedestrian fatalities inside work zones occurred while working in 2018. In 2023, 176 pedestrians were struck and killed inside a work zone. [9] *"In 2015, 35 percent of all highway worker fatalities at road construction sites resulted from a vehicle striking a worker. By 2021, this alarming figure had increased to 63 percent"* notes Laborers' Health & Safety Fund of North America (LHSFNA). [44]

> "So what can help protect against intrusions?... It is difficult to change the behavior of motorists...But we can and must institute protective measures like positive barriers and other available controls."
>
> — Laborers' Health & Safety Fund of North America, "Work Zone Intrusions Threaten Safety"

A single work zone intrusion can have high consequence outcomes (e.g. multiple employee deaths, severe long-term employee injuries, project delays, damaged/totaled equipment, rework, and/or litigation). **Tunnel, culvert, bridge repair work zones, etc. are known to be extremely hazardous** with high-speed traffic moving in close proximity to employees, roadside hazards, and/or little or no means for employees to escape from errant moving vehicles. Traffic speed is another well-known hazard to highway workers. 2023 NHTSA FARS data indicates that the speed limit was 45 mph or less for 40% of pedestrian fatalities inside work zones. [9] A December 2024 IIHS study found that during an impact with a modern taller SUVs and pickup, pedestrians are at very high risk. When struck by a median U.S. pickup, a highway worker has an 85% likelihood of severe injury at just 33 mph and an 85% likelihood of dying at just 45 mph. [50]

> *"As crash speed increases from 15 mph to 35 mph, the risk of a serious injury [for a pedestrian] goes from 9% to 52% when a median-height car is involved. With a median pickup, the risk [of a serious injury for a pedestrian] shoots up from 11% to 91% [as crash speed increases from 15 mph to 35 mph]... **The findings point to the need for policymakers and traffic engineers to account for the makeup of the U.S. fleet.** A commonly used benchmark for a 'safe' crash speed is one at which the risk of serious injury is 10% or less."*
>
> — Insurance Institute for Highway Safety (IIHS), "A modern injury risk curve for pedestrian injury in the United States: the combined effects of impact speed and vehicle front-end height", December 2024.

> "Pedestrian involvement in fatal work zone crashes overall does not appear to be overrepresented on facilities in urban areas but is on minor arterials and collectors/local roads in rural areas. Given the low pedestrian involvement in non-work zone crashes on these facilities in general, **it is likely that the overrepresentation reflects collisions with highway workers on foot on these facilities**. Based on U.S. Bureau of Labor Statistics (BLS) data, 45 percent of all worker fatalities at road construction sites involve a vehicle striking a worker on foot [2019]."
>
> — FHWA, "Identification of National Work Zone Safety Objectives and Activities: Summary Report", March 2023. Publication No. FHWA-HOP-22-059

Work zone pedestrian fatalities are often assumed to be members of the public who have fallen into complacency walking a routine route. However, in 2018, a review of NHTSA FARS data confirmed that **38% of pedestrian fatalities in work zones were actually on the job and primarily engaged in road work, utility work, and planning/surveying.**

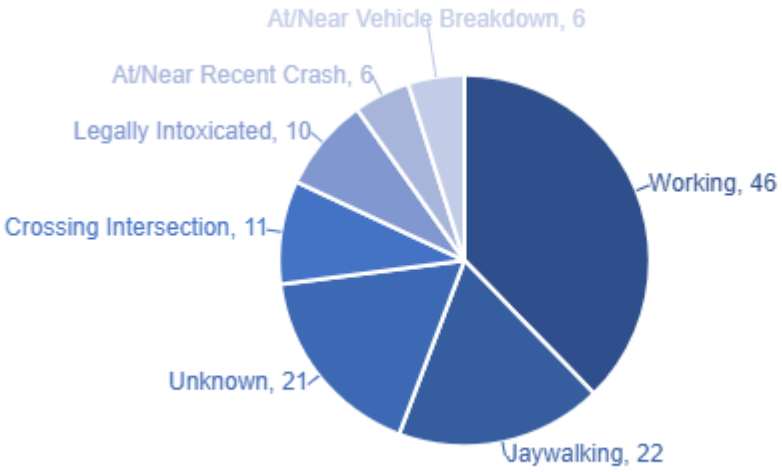
Work activities at the time of death include activities such as installing traffic signs, reopening a lane, flagging, picking up debris, replacing damaged concrete, paving operations, exiting a work vehicle, utility work, construction labor, DOT electrical work, DOT maintenance work, fence contracting, repairing guardrail, stringing cable guard rail, and repairing a bridge.

Based on a review of each work zone pedestrian fatality, it is found that

- **Activity:** Many Pedestrian Fatalities in Work Zones occurred while working (38%, 46 of 122).
- **Work Activity:** The majority of Working Pedestrian Fatalities in Work Zones were engaged in road work, utility work, planning/surveying (87%, 40 of 46 Working Pedestrians).
- **Work Hazard:** The majority of Working Pedestrian Fatalities in Work Zones were killed by motorist incursions (80%, 37 of 46 Working Pedestrians)
- **Location:** Few Pedestrian Fatalities in Work Zones occurred at/near intersections (15%, 18 of 122).

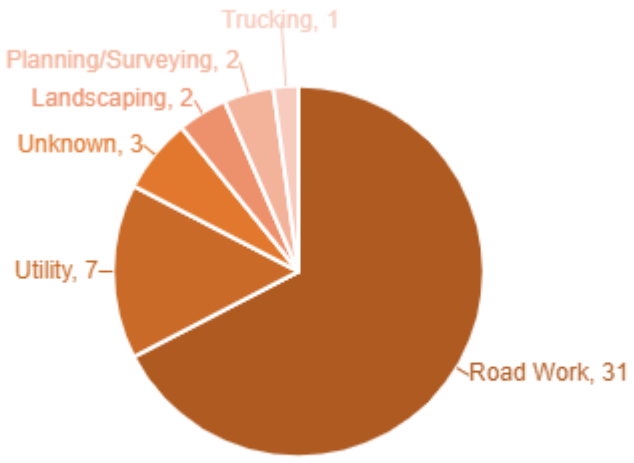
38% of Pedestrian Work Zone Fatalities occured while working.

Primary Activity of the 122 Pedestrian Work Zone Fatalities (2018)



87% of Working Pedestrians were engaged in Road Work, Utility Work, or Planning/Surveying.

Work Activity of the 46 Working Pedestrians in Work Zones (2018)



Road Work activities at the time of death include activities such as installing traffic signs, reopening a lane, flagging, picking up debris, replacing damaged concrete, paving operations, exiting a work vehicle, utility work, construction labor, DOT electrical work, DOT maintenance work, fence contracting, repairing guardrail, stringing cable guard rail, and repairing a bridge.

Methodology

Fatality data was obtained from the 2018 NHTSA FARS dataset [9] . Accident and Person datafiles were joined on 'ST_CASE' and filtered by 'WRK_ZONE'>=1 (ACCIDENT file records a work zone), 'INJ_SEV'==4 (PERSON file records a fatality for that person), and 'PER_TYP'==5 (Person type recorded as Pedestrian). Each fatality was then categorized by Activity, Location, Work Type, and Work Hazard based on FARS, News Article, & OSHA case record information.

When is Positive Protection Appropriate?

Federal Law & Standards

2005 - Congress calls for Positive Protection
Under section 1110 of SAFETEA-LU, Congress enacted 23 USC 109(e)(2) and 112(g) which call for positive protection “between workers and motorized traffic".

2007 - FHWA adopts Temporary Traffic Control Devices Rule ("Subpart K")
FHWA adopted Subpart K (23 CFR 630.1102 et seq.) pursuant to the mandate in SAFETEA-LU. 23 CFR 630.1108(a) of Subpart K lists 5 circumstances under which practitioners need to (“shall”) consider use of positive protection.

2010 - ANSI establishes National Standard for Work Zone Safety
ANSI Standard A10.47 (§4.4) provides that positive protection “shall be considered” in, at minimum, the 5 circumstances .

2021 - ANSI updates National Standard for Work Zone Safety
ANSI Standard A10.47-2021 (§4.4) provides that positive protection “shall be used” in, at minimum, the 5 circumstances .

Federal Law

The statutes and underlying regulations, read together, call for positive protection (barrier) “between workers and motorized traffic” which “contain and/or redirect” errant vehicles and meet applicable crashworthiness criteria . [1] , [2]

Circumstances under which positive protection needs to ("shall") be considered:

“ At a minimum, positive protection devices shall be considered in work zone situations that place workers at increased risk from motorized traffic, and where positive protection devices offer the highest potential for increased safety for workers and road users, such as:

1. Work zones that provide workers no means of escape from motorized traffic (e.g., tunnels, bridges, etc.);
2. Long duration work zones (e.g., two weeks or more) resulting in substantial worker exposure to motorized traffic;
3. Projects with high anticipated operating speeds (e.g., 45 mph or greater), especially when combined with high traffic volumes;
4. Work operations that place workers close to travel lanes open to traffic; and
5. Roadside hazards, such as drop-offs or unfinished bridge decks, that will remain in place overnight or longer." [10]

Separate Pay Items:

Federal statutes require a “separate pay item” for positive protection. [1] , [11]

ANSI Standards

ANSI Standard A10.47-2021 (§4.4) likewise provides that positive protection measures “shall be used (unless determined unnecessary)” when any of the following exist:

> 1. Work zones that provide employees no means of escape (e.g. tunnels, bridges, etc.) from external motorized traffic intruding into the work space.
> 2. Long duration work zones (e.g. two weeks or more) resulting in substantial employee exposure to motorized traffic.
> 3. Projects with high anticipated operating speeds (e.g. ≥ 45 mph, 72 km/h) especially when combined with high traffic volumes (> 20,000 vehicles per day).
> 4. Work operations that place workers within one lane width to travel lanes open to traffic.
> 5. Roadside hazards, such as drop-offs or unfinished bridge decks, that will remain in place overnight or longer.

ANSI Standard A10.47-2021 further notes that there might be other circumstances not listed that merit the use of positive protection.

ANSI Standard A10.47-2021 (§4.4.1) also notes that "positive protection may only be determined unnecessary if":

> a. There is a written analysis by the project sponsor supporting such a conclusion,
> b. And the project is outside an urban area,
> c. And the average daily traffic load of applicable road is less than 100 vehicles per hour.

Funding for Positive Protection

What Federal Funding is Available for Positive Protection?

The Infrastructure Investment and Jobs Act of 2021 (IIJA) amends the Highway Safety Improvement Program (HSIP) to increase funding & protection for "Vulnerable Road Users", which includes "highway workers on foot".

FHWA recently clarified that States can now use federal funds to acquire Mobile Barriers MBT-1 and other construction and safety equipment. States can use NHPP, STBGP or HSIP funds (e.g. leftover or otherwise available funds from most projects). States may find it advantageous to first transfer funds from NHPP or STBGP to HSIP under 23 U.S.C. 126, and then purchase barriers under the HSIP program. Barriers purchased under the HSIP program can be used for maintenance & construction on federal & state roads. The State share under HSIP is 10% (federal funds can be used for 90% of the purchase). The FHWA also clarified that States can directly purchase barriers (i.e. they do not have to purchase them through separate projects).

Federal funds can be used for up to 100% of the purchase when projects use "innovative project delivery" methods to improve work zone safety. IIJA amended the definition of "innovative project delivery" to include "provisions that provide safety contingency funds to incorporate safety enhancements to work zones prior to or during roadway construction activities". LHSFNA writes, "Safety Contingency Funding can address this issue by providing additional dollars for a range of interventions, including: Traffic control items such as mobile barriers…To make use of these safety contingency funds, state DOTs and contractors need to add a 'safety allowance' line item in their bid specifications."

How Can Contractors Obtain & Use Positive Protection?

Contractors have options on how to pay for and use positive protection. Options vary for different products. As one example, Mobile Barriers MBT-1 are available to buy, lease or rent.

Federal law and the national standards identify types of projects that need positive protection. For such projects, a “separate pay item” for positive protection is required under federal law and regulations. [1, 11] Contractors can urge States to include positive protection in their plans. States can spec in a separate pay item for positive protection, or otherwise, purchase it for their employees and contractors to use on these types of projects.

State personnel may not be aware of the recent changes in federal policy and may not realize they can directly purchase the barriers or that they can take the barriers back at the end of the contract for future use. Traditionally, that has not typically been allowed.

Under the new FHWA policy, states can directly purchase or spec-in and reclaim Mobile Barriers MBT-1 and other safety and construction equipment for use by their crews and contractors.

- **States can buy positive protection barriers directly, then allow their crews and/or winning contractors use them (i.e. buy and provide).** Direct purchases are specifically allowed under the new FHWA policy.
- **States can spec in barriers, allow winning contractors to use them, and then the States can take ownership and possession at the end of the term.** This allows all bidders to include them and later transfers the barriers back to the state for its own use and/or for use on the next contract.
- **States can spec in barriers, then allow winning contractors to rent or buy them at the end of the term.**

FHWA Repeals 103-Year-Old Patented & Proprietary Products Rule

September 27, 2019... This week, the Federal Highway Administration has formally lifted a 103-year-old regulation that has banned the use of patented or proprietary materials in Federal-aid highway projects.

h

FHWA Final Rule and News Coverage:

FHWA Final Rule: Promoting Innovation in Use of Patented and Proprietary Products

"Executive Summary: The FHWA is revising its regulations at 23 CFR 635.411 to provide greater flexibility for States to use patented or proprietary materials in Federal-aid highway projects. Based on a century-old Federal requirement, the outdated requirements in 23 CFR 635.411(a)-(e) are being rescinded to encourage innovation in the development of highway transportation technology and methods.

As a result, State Departments of Transportation (State DOTs) will no longer be required to provide certifications, make public interest findings, or develop research or experimental work plans to use patented or proprietary products in Federal-aid projects. Federal funds participation will no longer be restricted when State DOTs specify a trade name for approval in Federal-aid contracts. In addition, Federal-aid participation will no longer be restricted when a State DOT specifies patented or proprietary materials in design-build Request-for-Proposal documents."

FHWA Repeals 103-Year-Old Regulation That Banned Patented Materials in Construction

"This much-needed update of a century-old, obsolete rule will benefit state transportation infrastructure projects and save millions of taxpayer dollars," said U.S. Transportation Secretary Elaine Chao.

FHWA Administrator Nicole Nason added "This final rule promotes innovation by empowering states to choose which state-of-the-art materials, tools, and products best meet their needs for the construction and upkeep of America's transportation infrastructure."

FHWA Overhauls 103 Year Old Proprietary Product Rule

"As the number of deaths in our work zones steadily increases year after year, states are challenged with new ways of keeping workers safe. The repeal of the proprietary product rule will help considerably.

'One example of a safety device that protects the workers that isn't currently being used as much as it should be due to this proprietary rule is a mobile barrier,' [former U.S. Secretary of Transportation James Burnley] says . 'Instead of state DOT's having to use cones, which are basically worthless in terms of protection, these are moveable barriers that are mounted on truck wheels that can be driven up to a work zone and hooked together to extend the work zone. They create a 5-ft. stainless steel walls that is an impenetrable barrier that protects the workers and their use is being inhibited due to this rule. As a practical matter, it's basically impossible for states to use federal aid to purchase these products without going through a lot of steps and delay to get approval,' Burnley adds.

...'Repeal of the Proprietary Rule liberates state DOT's to use their own procurement procedures to acquire innovative products that will enhance safety, reduce congestion and enhance the resilience of our highways,' Burnley says."

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. 2016-2021 data from NHTSA's replacement Crash Report Sampling System (CRSS).

[9] Fatalities Data: NHTSA Fatality Analysis Reporting System (FARS) Encyclopedia. 2023 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] Work Zone Crashes Climb During Pandemic, Even as Traffic Ebbs, PEW Charitable Trusts, October 6, 2020.

[21] Missouri work zone crashes double despite half the traffic, Better Roads, September 1, 2020.

[22] Ohio DOT reports string of work-zone crashes despite less traffic, Better Roads, June 8, 2020.

[23] CDOT and CSP warn that not all workplaces are meant to zoom: Fatal crashes in work zones on the rise Journal Advocate, November 27, 2020.

[24] An Optimization Methodology to Improve Work Zone Safety within a Limited Budget in a Roadway Network, Promothes Saha, Ph.D., International Conference on Transportation and Development 2020 : Transportation Safety.

[25] 2020 Associated General Contractors of America (AGC) Highway Workzone Safety Study. Study based on nationwide survey of approximately 224 highway construction firms.

[26] 2021 Associated General Contractors of America (AGC) Highway Workzone Safety Study. Study based on nationwide survey of approximately 292 highway construction firms.

[27] Work Zone Fatalities at Highest Level Since 2006, New Data Shows, Roads & Bridges, April 28, 2021.

[28] An Optimization Methodology to Improve Work Zone Safety within a Limited Budget in a Roadway Network, Promothes Saha, Ph.D., International Conference on Transportation and Development 2020 : Transportation Safety.

[29] "Crash Costs for Highway Safety Analysis", FHWA-SA-17-071
"Economic costs (a.k.a., human capital costs) are the monetary impacts of crashes including goods and services related to the crash response, property damage, and medical costs...Comprehensive crash costs (a.k.a., societal crash costs) are the combination of tangible impacts (i.e., economic costs) and the monetized pain and suffering (i.e., QALY). Comprehensive costs are meant to capture all the impacts that result from crashes...It is critical to account for the comprehensive costs of crashes."

[30] Ullman, G. L., & Scriba, T. A. (2004). Revisiting the Influence of Crash Report Forms on Work Zone Crash Data. Transportation Research Record, 1897(1), 180–182. https://doi.org/10.3141/1897-23.

[31] Md Abu Sayed, Xiao Qin, Rohit J. Kate, D.M. Anisuzzaman, Zeyun Yu, Identification and analysis of misclassified work-zone crashes using text mining techniques, Accident Analysis & Prevention, Volume 159, 2021, 106211, ISSN 0001-4575, https://doi.org/10.1016/j.aap.2021.106211.

[32] Despite fewer drivers on the road, Texas work zone traffic deaths climb during pandemic CBS Austin, April 26, 2021.

[33] AGC: Work Zone Crashes Up Despite Pandemic Traffic Drop AASHTO Journal, June 4, 2021.

[34] Early 2024 U.S. Pedestrian Fatalities Up 48% From a Decade Ago , Governors Highway Safety Association (GHSA), 2024.

[35] USDOT Releases New Data Showing That Road Fatalities Spiked in First Half of 2021 , Secretary Buttigieg calls rising traffic deaths a crisis and calls for cooperation among all levels of government, industry, and advocacy to change course, October 28, 2021.

[36] Traffic Deaths Spike in Texas Work Zones , Texas Department of Transportation, April 4, 2022.

[37] U.S. Department of Transportation, "Departmental Guidance on Valuation of a Statistical Life in Economic Analysis," (March 23, 2021).
"Based on the methodology adopted in the 2013 guidance, price and real income changes since 2012 yield a current VSL estimate of $11.8 million for analyses using a base year of 2021."

[38] NHTSA Early Estimates Show Record Increase in Fatalities Nationwide , USDOT, August 17, 2022.
"NHTSA estimates that 9,560 people died in motor vehicle traffic crashes in the first quarter of 2022. This is an increase of about 7% as compared to the 8,935 fatalities projected for the same quarter in 2021. This would be the highest number of first-quarter fatalities since 2002."

[39] The Center for Construction Research and Training (CPWR), "Fatal Injuries at Road Construction Sites among Construction Workers", Second Quarter 2018.
Figure 14 shows for Road Maintenance occupations that there have been 13.6 fatalities per 100,000 full-time equivalent (FTE) workers on average.

[40] Forbes, "Fatal Employment: Men 10 Time More Likely Than Women to Be Killed at Work", Dec 19, 2018.
The national average was 3.5 workplace fatalities per 100,000 full-time worker equivalents (FTE). Architecture and engineering occupations had had a fatality rate of 0.7 fatalities per 100,000 full-time equivalent (FTE) workers. Office and administrative support occupations had a fatality rate of 0.6 fatalities per 100,000 full-time equivalent (FTE) workers.

[41] "Vulnerable Road Users" as defined in the Infrastructure Investment and Jobs Act (IIJA or BIL) includes road construction workers and people working on foot on or along our roadways. Sec. 11111 amends the Highway Safety Improvement Program (HSIP) to increase funding & protection for "Vulnerable Road Users".

- FHWA Guidance "Vulnerable Road User Safety Assessment Guidance" published October 21, 2022 states that "A **vulnerable road user** is a nonmotorist with a fatality analysis reporting system (FARS) person attribute code for pedestrian, bicyclist, other cyclist, and person on personal conveyance or an injured person that is, or is equivalent to, a pedestrian or pedalcyclist as defined in the ANSI D16.1-2007. (See 23 U.S.C. 148(a)(15) and 23 CFR 490.205). A vulnerable road user may include people walking, biking, or rolling. Please note that a vulnerable road user:
  • Includes a highway worker on foot in a work zone, given they are considered a pedestrian.
  • Does not include a motorcyclist."

[42] "Work Zone Intrusion Countermeasure Identification, Assessment, and Implementation Guidelines", FHWA/CA10-1102, pp. 4.
On average, 10% of work zone crashes are intrusion impacts with workers, equipment, or debris. An additional 13% of work zone crashes are non-intrusion impacts with workers, equipment, or debris "(e.g., a crash involving a worker conducting a task outside the actual work space)" but still occuring inside a designated work zone.

[43] "The Economic and Societal Impact of Motor Vehicle Crashes, 2019 (Revised)", DOT HS 813 403
Nationally, Comprehensive Costs for 33,244 fatal crashes "which includes both economic impacts and valuation for lost quality-of-life, was $1.37 trillion in 2019". Comprehensive Costs "represent the value of the total societal harm that results from traffic crashes". In 2019, there were 765 fatal work zone crashes (2.301% of all fatal crashes) resulting in an estimated $31.5 billion (2019 dollars) in comprehensive costs. Adjusted for inflation, comprehensive costs of work zone crashes are estimated at over $38.9 billion in 2025 dollars.

[44] Laborers Health & Safety Fund of North America - Comments on FHWA-2022-0017-0016, November 19, 2023. Available at: https://www.regulations.gov/comment/FHWA-2022-0017-0016 "In 2015, 35 percent of all highway worker fatalities at road construction sites resulted from a vehicle striking a worker. By 2021, this alarming figure had increased to 63 percent... The heightened risks underscore the specific vulnerability of highway workers, a concern acknowledged by Congress through the categorization of pedestrians, inclusive of workers operating on or along roadways, as Vulnerable Road Users (VRUs) in the BIL. This legislative move amended the Highway Safety Improvement Program to incorporate safeguards for VRUs. The DOT similarly recognizes highway workers as among the most vulnerable in its 2022 VRU Safety Assessment Guidance. The FHWA urges states and other funding recipients to prioritize safety for VRUs in all federal highway investments and relevant projects."

[45] 2023 Work Zone Awareness Survey Results: National Results , AGC, May 25, 2023.
Study based on nationwide survey of highway construction firms with approximately 901 responses from contractors.

[46] 2024 Work Zone Awareness Survey Results: National Results , AGC, May 23, 2024.
Study based on nationwide survey of highway construction firms with approximately 514 responses from contractors.

[47] "Major Projects", FHWA.
Prior to the enactment of SAFETEA-LU in August 2005, projects with over $1 billion in construction costs were designated as "Mega Projects". SAFETEA-LU lowered the monetary threshold from an estimated total cost of $1 billion to $500 million or greater, and the term "Mega Project" has since been eliminated and replaced with the term "Major Project".

[48] 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.").

[49] Hallowell, M., "The Energy Wheel: The Art & Science of Engergy-Based Hazard Recognition", Professional Safety, December 2021, pp. 27-33. Available at: https://www.safetyfunction.com/_files/ugd/3b3562_f842104d5fe64409ba6362d661eee21d.pdf

"The research by Hu et al. (2018) revealed very strong evidence that commonly identified hazards (e.g., gravity, motion) are identified instinctually and require comparatively low mental effort...requir[ing] very little oxygen and the cognitive processing occurs quickly. This suggests that gravity and motion hazards are processed in the amygdala, the location of the brain responsible for our fight or flight response and perception of core emotions (Cahill et al., 1996)... Alternatively, hazards that are most commonly missed (e.g., mechanical, pressure, chemical) are processed in more advanced locations of the brain and require much greater cognitive effort (Hu et al., 2018)...requir[ing] much longer processing times and elevated oxygen demand. This suggests that they are processed by the temporal lobe of the cerebrum, the part of the brain that is responsible for memory, sequencing and complex problem-solving (Banich & Compton, 2018). Simply put, the hazards

we see first and most often are processed instinctually with minimal cognitive effort and those that we commonly miss are identified through complex problem-solving that requires relatively high cognitive effort."

[50] IIHS, "Vehicle height compounds dangers of speed for pedestrians". December 10, 2024. Available at: https://www.iihs.org/news/detail/vehicle-height-compounds-dangers-of-speed-for-pedestrians#:~:text=As%20far%20as%20fatalities%20were,mph%2C%20it%20exceeded%2080%25.

[51] 2025 Associated General Contractors of America (AGC) Highway Workzone Safety Study. Study based on nationwide survey of approximately 675 highway construction firms.

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