



SMARTICLE™

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THE SAFE SYSTEM **APPROACH** Designing Safer Roads to Save Lives

Community Transportation Group

Sanbell

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Intelligent Infrastructure. Enduring Communities.



IN 2021 TRAFFIC ACCIDENTS CLAIMED 42,915 LIVES

IT'S TIME FOR THE UNIVERSAL ADOPTION OF THE *ZERO DEATHS* VISION

The impact of traffic collisions can be far-reaching. An estimated 42,915 lives¹ were lost on our roads in 2021. These were the lives of children, parents, grandparents, and friends.

Those who survive collisions often go on to live with enduring consequences such as physical impairments, emotional distress, and financial hardship. The repercussions can be profound and persist for a lifetime.

VISION ZERO AND THE SAFE SYSTEM APPROACH

In 1997, to address climbing rates of traffic-related deaths and injuries, Sweden created a Vision Zero philosophy for roadway safety. The concept provided a strategy to eliminate all traffic fatalities and severe injuries, while increasing safe, healthy, and equitable mobility for all.

Vision Zero was a shift in mindset and approach to roadway safety and inspired countries around the world to follow suit.

Recently, the Federal Highway Administration (FHWA) adopted its own zero deaths vision and a Safe System Approach to achieving the goal of eliminating fatalities and serious injuries for all road users. The Safe System Approach states that “humans make mistakes and that human bodies have limited ability to tolerate crash impacts. In a Safe System, those mistakes should never lead to death. Applying the Safe System Approach involves anticipating human mistakes by designing and managing road infrastructure to keep the risk of a mistake low; and when a mistake leads to a crash, the impact on the human body doesn’t result in a fatality or serious injury.”²

This paper provides an overview of the Safe System Approach and the steps your agency can take to design safer roads.

¹Media, National Highway Traffic Safety Administration. (2022, May 17). Newly released estimates show traffic fatalities reached a 16-year high in 2021. <https://www.nhtsa.gov/press-releases/early-estimate-2021-traffic-fatalities>

² U.S. Department of Transportation, Federal Highway Administration. (2023, March 28). Zero deaths and safe system. Zero Deaths and Safe System. <https://highways.dot.gov/safety/zero-deaths>





THE SAFE SYSTEM APPROACH

At the core of the Safe System Approach is the guiding principle that we should prevent crashes from happening and minimize the harm caused to those involved when they do occur. It acknowledges that humans make mistakes and that there is a limit of kinetic energy exchange that humans can physically tolerate. The Safe System Approach focuses on infrastructure, human behavior, oversight of the transportation and vehicle industry, and emergency response.

TRADITIONAL APPROACH

Traffic deaths are **INEVITABLE**
PERFECT human behavior
Prevent **COLLISIONS**
INDIVIDUAL responsibility
Saving lives is **EXPENSIVE**

SAFER SYSTEMS APPROACH

Traffic deaths are **PREVENTABLE**
Integrate **HUMAN FAILING** in approach
Prevent **FATAL AND SEVERE CRASHES**
SYSTEMIC approach
Saving lives is **NOT EXPENSIVE**

VS

FOUNDATIONAL PRINCIPLES

There are six foundational principles for understanding and applying the Safe System Approach.

01

DEATH AND SERIOUS INJURIES ARE NOT ACCEPTABLE

While no crashes are desirable, the Safe System Approach prioritizes the elimination of traffic incidents that result in death and serious injuries—no one should experience either when using the transportation system.

02

HUMANS ARE PRONE TO MAKE MISTAKES

Despite our best intentions and efforts, we are not infallible. The transportation system should be designed with this in mind.

03

HUMANS ARE VULNERABLE

The human body has limits to the crash forces it can tolerate before serious injury or death occurs. For this reason, it is essential to design and operate a transportation system that is human-centered and keeps impacts on the human body at tolerable levels.

04

RESPONSIBILITY IS SHARED

Preventing fatalities and serious injuries on our road requires the participation of all stakeholders, including transportation system managers, vehicle manufacturers, law enforcement personnel, traffic incident management personnel, and system users.

05

SAFETY IS PROACTIVE

It is important to use proactive tools to identify and mitigate safety risks in the transportation system, rather than a reactive approach to crashes.

06

REDUNDANCY IS IMPERATIVE

Reducing risks requires that all parts of the transportation system be strengthened so that if one component fails, the other parts will help compensate for that failure.



5 ELEMENTS FOR MITIGATING CRASH RISK

LAYERS OF PROTECTION AND SHARED RESPONSIBILITY PROMOTE A
HOLISTIC APPROACH TO SAFETY ACROSS THE ROADWAY SYSTEM

To mitigate the fallibility and fragility that leave humans susceptible on our roads, the Safe System Approach identifies five elements of crash risk that must consistently be evaluated and addressed.

1. Safe Road Users

Road users have a responsibility to operate, to the best of their ability, within the expectations and boundaries of the transportation system such as wearing seat belts and helmets, traveling at safe speeds, biking in the direction of traffic, not driving while impaired or distracted, acting within limits of road design, and obeying pedestrian traffic laws.

2. Safe Vehicles

The automotive industry continues to strive to make automobiles safer. Passive safety features such as shatter-proof glass, seat belts, and airbags protect occupants in the event of an accident. Active safety features such as lane departure warning, automatic emergency braking, and drowsiness detection systems work to prevent accidents from happening in the first place.



3. Safe Speeds

The laws of physics govern that higher speeds lead to more collisions with more harm, and that the greater the mass of the vehicle, the greater damage it can inflict. A direct relationship has been found in pedestrian crashes between the speed of a vehicle and the likelihood of survival for the pedestrian. Speed management involves the interplay of various factors, such as public attitudes, beliefs and behavior, vehicle performance, roadway features and design, speed limits, and strategies for speed enforcement. Collaboration among national and local agencies, and organizations such as FHWA, National Highway Traffic Safety Administration (NHTSA), and Institute of Transportation Engineers (ITE), is key to combating speeding as a safety problem.

4. Safe Roads

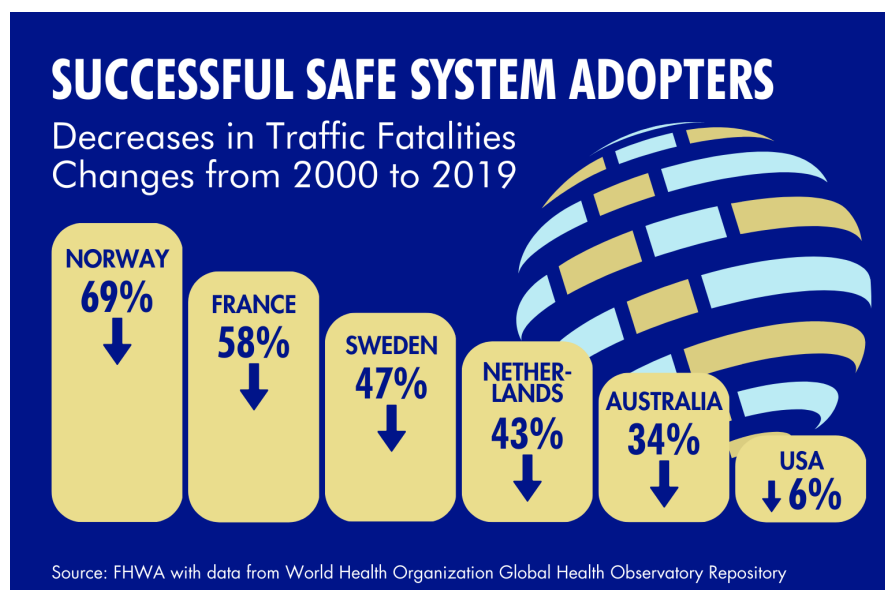
Small shifts in how we approach road design, construction, maintenance, and operations can have a big impact on user safety by separating users in space and time, and increasing users' attentiveness and awareness to help avoid crashes. Whether the appropriate

solution is limiting left turns, implementing buffered bike lanes, adding additional crosswalks, or creating landscaped medians, gathering traffic data and conducting traffic studies is necessary for identifying and implementing the most suitable solutions.

5. Post-Crash Care

Despite improvements in all components of the Safe System Approach—roads, vehicles, and road users—traffic collisions can still occur. Therefore, implementing a comprehensive and integrated post-crash care system can further reduce fatalities. The system should include essential components such as 911 emergency communications centers, first responders, highly trained EMS personnel, emergency departments, and trauma centers.

Combined, these five layers of protection and shared responsibility promote a holistic approach to safety across the entire roadway system.



The early adopters of the Safe Systems Approach are seeing results and saving lives.

THE DESIGNERS AND PLANNERS OF SAFE ROADS

IS YOUR ROAD DESIGN TEAM COMPLETE?



When there is a road to be built, transportation engineers are the professionals we turn to for planning and design. Transportation engineering is a specialized field and because it is intrinsically linked to the safety of the roads we move and travel on, it is essential that these engineers be highly trained and certified. The letters that follow their names matter. Advanced certifications to look for when building a road design team include:

PE - Professional Engineer

A PE is an individual who has obtained a license from a state board of registration to practice engineering. The PE designation represents the pinnacle of engineering competence and serves as a symbol of achievement and assurance of quality.

PTOE - Professional Traffic Operations Engineer

A PTOE possesses unique knowledge and skill in the specialized application of traffic operations engineering.

RSP - Road Safety Professional

RSP certification is offered to a broad audience of professionals (not solely engineers) whose decisions potentially impact the safety of the traveling public. If zero deaths is your agency's goal, including certified RSP transportation engineers on your design team is advantageous. Their knowledge of the Safe System Approach will ensure your roads are designed in such a way that enhances safety of all users.

As part of their training, RSPs become versed in:

- ▶ Elements of road safety
- ▶ Collection and application of crash data and associated safety measures
- ▶ Human factors and their impact on roadway safety
- ▶ Safety management and the use of countermeasures
- ▶ Development and implementation of strategic safety plans

RSPs COMPLETE THE TEAM!

In 2018, The Transportation Professional Certification Board (TPCB) created the Road Safety Professional (RSP) Certification to incentivize roadway safety education and establish a recognized level of practice and knowledge with regard to transportation safety. The RSP considers all safety-related disciplines (engineering, law enforcement, behavioral, and EMS communities) to design better, safer transportation systems. RSP certification recognizes road safety as a profession. Who better to trust safe road design to than an RSP-certified transportation engineer?



PREDICTING CRASH RATES WITH THE SPICE TOOL

Road Safety Professionals (RSPs) use a variety of tools in safety analysis and countermeasure development. The Federal Highway Administration's (FHWA) [Safety Performance for Intersection Control Evaluation \(SPICE\) Tool](#) is one of them.

One-fourth of all traffic fatalities and half of all traffic injuries occur at intersections. Therefore, every intersection project presents a valuable opportunity to improve safety and make progress towards the goal of eliminating deaths and severe injuries on our nation's roads.

The SPICE Tool provides an objective and quantifiable basis for comparing the safety performance of different intersection geometries and traffic control to help determine a preferred alternative for a given intersection project. The tool may be of use to traffic safety researchers and practitioners, transportation planners and engineers, and highway and street designers.



BE YOUR AGENCY'S CHAMPION

BE A PROPONENT OF SAFER ROADS AND SAVE LIVES

Roadway safety is a shared responsibility of the designers and owners of the transportation system. As a decision maker, planner, engineer, or project manager, you can champion the Safe System Approach within your state and agency. A great place to start is to get familiar with the Safe System Approach. One of our RSPs would be more than happy to walk you through it, or reference www.transportation.gov/nrss/safesystem.

THE NEXT STEPS

- 1 COMMIT TO ZERO DEATHS**
Review state-level programs.
- 2 PARTNER WITH RSPs**
Certified Road Safety Professionals will keep your team safety-focused through all phases of the project.
- 3 VISUALIZE IT**
Hire a visualization expert! Work with a firm that can help your agency and the public visualize proposed solutions.
- 4 DEVELOP AN LRSP**
Develop or review your agency's Local Road Safety Plan (LRSP). RSP traffic engineers can help you with this.
- 5 MONITOR & IMPROVE**
Monitor and continuously improve traffic safety with the help of PTOEs.

To implement the Safe System Approach, champion a fundamental shift in mindsets toward transportation safety and prioritize transportation investments accordingly. While achieving zero deaths is ambitious, it is a noble and necessary pursuit.

WORK WITH A SAFETY-FIRST DESIGN FIRM

Safety-first firms incorporate the zero deaths vision in the planning and design process. They have multiple certified Professional Traffic Operations Engineers (PTOE)s and Road Safety Professionals (RSPs) on staff and offer expertise and knowledge you can rely on to guide your agency in developing safer transportation systems for all road users. They will evaluate the safety of your roadways and pedestrian and bicycle facilities with predictive tools and recommend safety-focused solutions that will help prevent traffic deaths and serious injuries.

THE PUBLIC DESIRES TO ENGAGE

SHARE YOUR VISION AND CONSIDER THE COMMUNITY'S VOICE

Secure public buy-in and trust prior to breaking ground on your next road build or road improvement project.

Investing in community engagement and visualizations can pay significant dividends in terms of identifying potential issues or concerns early in the design process and to secure taxpayer buy-in.

Community Engagement

Conducted at the onset of a project, a community engagement campaign signals that the community's voice and preferences matter and are heard. From

surveys to public meetings to focus groups, community engagement takes many forms and can provide insightful data for use in planning and design.

Visualizations

As the old adage goes, a picture (or video) is worth a thousand words. Consider hiring a skilled visual artist to build a life-like 3D rendering or captivating fly-over video with selling power! Visualizations are a powerful tool for showcasing designs in a realistic and engaging manner and can make it much easier to communicate the benefits and features of the project to all stakeholders.



Proposed safety improvements after Sanbell's RSPs and PTOEs evaluated traffic, roadway, and crash data. Visualizations are a valuable educational tool for gaining professional and public input and consensus.

GOT QUESTIONS? WE HAVE ANSWERS.

Sanbell is a safety-first firm. The Zero Deaths vision is incorporated into our Complete Design process. With multiple certified PTOEs, RSPs, community engagement specialists, and visualization experts, we are able to deliver world-class service and safety-focused solutions.

¹ Media, National Highway Traffic Safety Administration. (2022, May 17). Newly released estimates show traffic fatalities reached a 16-year high in 2021. NHTSA. <https://www.nhtsa.gov/press-releases/early-estimate-2021-traffic-fatalities>

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