Protect Yourself

Barriers can't protect every driver in every situation.

The best way to protect yourself while driving on the highway is to take steps to avoid collisions. For example:

- Drive defensively.
- Adjust your driving for weather and traffic conditions.
- Allow adequate following distance.
- Never drive tired or under the influence of drugs or alcohol.
- Make sure that your vehicle's safety equipment is well maintained.

WSDOT will continue to install median barriers and take other steps to keep drivers safely on the road. These include:

- Installing Rumble Strips: Help alert drivers if they veer out of their lane toward the shoulder.
- Enforcement: Washington State Patrol troopers help assure that drivers obey speed limits and other safety laws.
- Speed Limits: Reduced speeds in some areas can save lives.
- Fixing Chokepoints: Traffic chokepoints can stop traffic, which may surprise some freeway drivers. They also can increase the amount of weaving and merging and frustrate some drivers. Highway improvements to fix chokepoints can help alleviate these problems.

For more information about traffic median barriers, contact:

Ted Trepanier, State Traffic Engineer, TrepanT@wsdot.wa.gov or

Dick Albin, Design Engineer, AlbinD@wsdot.wa.gov or

www.wsdot.wa.gov/maintenance/barriers/default.htm

Washington State Department of Transportation

Improving Highway Safety

Traffic median barriers

Highway crashes involving drivers who cross the median and enter the opposing lanes of travel are severe and often fatal. Safety is our main concern. We install barriers in highway medians to reduce the risk of these severe collisions.

Our first priority is to help drivers stay safely on the roadway. We design and operate our highways, ramps, and interchanges to help achieve this goal. Examples include providing room for drivers to merge, pavement stripes, reflectors, rumble strips, highway shoulders, speed limits, applying deicers and sand in winter, etc.

Our engineers carefully consider whether a median barrier would enhance safety and, if so, which type of barrier would work best for each location. The Washington State Department of Transportation (WSDOT) uses three general types of highway barrier. All the barriers are designed to protect drivers, though they do so in different ways, and meet or exceed federal and state safety standards.

Cable

- Flexes up to 12 feet.
- Best in locations where it can be used with wide medians.
- In conjunction with the median, allows drivers to safely stop the vehicle without reentering traffic.
- Allows water to pass underneath and snow and wind to pass through.

Concrete

- Little or no flexibility.
- Redirects drivers back into their lane or shoulder.
- Best in areas where there is traffic moving in opposite directions in close quarters, and there is no room for a median.

Guardrail

- Flexes up to three feet.
- Allows driver some control after impact.
- Often used to protect drivers from drop offs or fixed objects like bridge columns in areas with limited space.

More Median Barrier

To help reduce the number of serious accidents, WSDOT is working to install more median barrier in more places throughout the state.

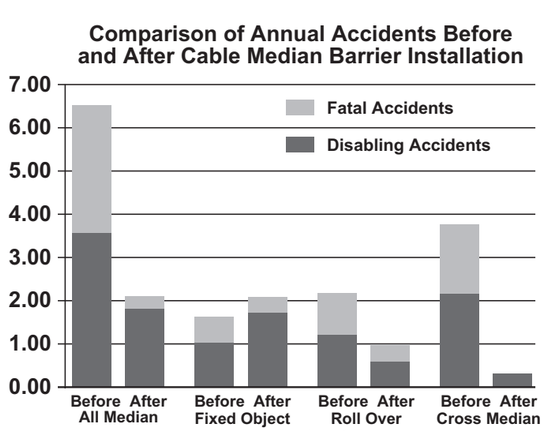
In 2001, we studied median barriers and found that they enhance safety. While the total number of collisions in the study areas nearly doubled after median barrier was installed (from 45 to 100, including collisions that only damaged property), the number of fatal and disabling collisions decreased significantly.

Median Accidents Before the Installation of Cable Barrier

	Annual Accidents	Accident Rate (100 mvmt)*	Annual Fatal Accidents	Annual Disabling Accidents	Annual Societal Costs (all severities in millions)
All	49.00	6.50	3.00	3.60	$13.58
Fixed Object	25.60	3.40	0.60	1.00	$6.45
Cable Barrier	na	na	na	na	na
Rollover	11.40	1.51	1.00	1.20	$4.50
Crossover	16.00	2.12	1.60	2.20	$7.13

Median Accidents After the Installation of Cable Barrier

	Annual Accidents	Accident Rate (100 mvmt)*	Annual Fatal Accidents	Annual Disabling Accidents	Annual Societal Costs (all severities in millions)
All	100.43	13.35	0.33	1.76	$3.32
Fixed Object	91.71	12.17	0.33	1.76	$2.48
Cable Barrier	58.56	4.05	0.33*	0.88	$3.44
Rollover	9.40	1.25	0.33	0.65	$1.71
Crossover	3.83	0.51	0.00	0.33	$0.18



We then reviewed the history of crashes that crossed the median on multi-lane state highways, identified and prioritized the specific locations where installing median barriers might save lives and prevent serious injuries. These primarily include locations where the median is 50 feet wide or less. We also changed state highway design standards to require installation of median barrier in narrow medians for all WSDOT projects that improve existing highways or build new highways.

Optimizing Safety Funds

We are now installing median barrier as money becomes available. Our engineers assess each location to determine which type of median barrier would best suit the site. When multiple types of barriers are suitable, they are encouraged to stretch our limited budget by selecting the most cost-effective barrier.

Costs for the different barrier types are shown below. The estimates include preliminary engineering costs, contingencies, sales tax, construction engineering, and associated bid items.

Barrier Type	Price per Foot	Price per Mile
Cable	$18-38	$94,680 to 199,880
Guardrail	$32-50	$168,320 to 236,000
Concrete	$43-72	$226,180 to 378,720

The cost difference between cable and concrete barrier allows WSDOT to treat 2.4 times as many miles with cable compared to concrete. To take this a step further, a $2 million investment would protect drivers on 21 miles of highway with cable versus 8.8 miles of highway with concrete. This means more lives would be saved.

How do our engineers decide which type of barrier will be most effective?

Our engineers consider many factors when deciding which type of median barrier will be most effective. They consider:

- traffic speeds
- amount of traffic
- curves (road geometry)
- available median and shoulder space
- accident history
- characteristics of each type of barrier
- installation and maintenance cost
- grade and median slope

Cable barriers have been used on the nation's highways since the 1930s or before. The modern system, which uses three cables supported by steel posts, was developed in the 1960s and is now in widespread use in several states.

I-5 Marysville/Arlington Cable Barrier

WSDOT installs median barriers because they reduce the number of deadly and disabling collisions. Our engineers carefully consider whether a barrier would enhance safety and, if so, which type of barrier would work best for each location. They consider a wide array of factors, including collision history, community and driver comments, traffic speeds, amount of traffic, curves, grade, available median and shoulder space, median slope, characteristics of each type of barrier, installation and maintenance cost. We use three general types of highway barrier; cable, guardrail and concrete. All of these barriers are designed to stop crossover crashes and protect drivers, though they do so in different ways, and all must meet federal and state guidelines.

Why did we install median barrier on I-5 between Marysville and Arlington?

As traffic and population grew on Interstate 5 between State Route 529 (Ebey Slough) and SR 530 (Arlington), congestion and conflicts between through traffic and local traffic grew. Drivers passing through the area at high speeds faced traffic slowdowns and drivers merging to or from increasingly busy interchanges and ramps. The number of crossover crashes increased. Given these conditions WSDOT enhanced safety by installing median barrier and other improvements in the late 1990s.

Why did we choose cable barrier?
We evaluated our barrier options and determined that cable rail was the best choice for this location because:

- it would stop vehicles from crossing over the median into oncoming traffic
- medians were 40 feet or wider
- the posted speed limit was 70 mph
- traffic volumes were considered moderate
- for drivers who hit the barrier, cable barrier would absorb more of the impact than more rigid barriers
- the relatively wide median and cable barrier were more likely to stop vehicles in the median rather than bounce them back into traffic
- The accident pattern was spread out and not localized. The lower cost of the cable barrier allowed more miles of highway to be protected for the same budget

When and where did we install the cable barrier?
In the late 1990s WSDOT engineers installed a series of cable rail barrier runs on I-5 between Marysville and Arlington. Construction engineers ensured that the barrier went in as it was designed. WSDOT maintenance crews regularly check the cable rail for strength. They also check the cable rail after a reported impact. Repairs and adjustments are made promptly if needed.

We also installed other safety features, including rumble strips, which alert drivers before they leave the road.

Where did we install concrete barrier and guardrail? Why did we install them?
WSDOT engineers chose concrete barrier and guardrail in some locations on I-5 between Marysville and Arlington because they would more effectively protect drivers in those locations. For example, we placed guardrail around some bridges because they are the best choice to protect drivers who might otherwise hit concrete bridge supports.

How has traffic changed on this stretch of I-5 in the past decade?

- Between 1994 and 2004, traffic volumes increased by 38 percent in the area of I-5 north of the Smokey Point rest area.
- Not surprisingly, the number of crashes have increased by 40 percent in this same time period.
- 80,000 vehicles use this stretch each weekday.

What is the crash history for the 9-mile stretch of I-5 between Marysville and Arlington?

Between January 1, 1999, and December 31, 2004, there were 719 reported crashes on mainline I-5 on this stretch of road: northbound crashes totaled 389 and southbound accidents totaled 330.

Although the number of crashes in this section of highway is growing, it remains below the statewide average for this type of highway.

For more information, go to www.wsdot.wa.gov/maintenance/barriers/default.htm

What kinds of collisions were they?

- vehicle collides with fixed object: 224
- vehicle rear-ends another vehicle: 182
- alcohol-related accident: 73
- overturned vehicle: 43
- opposite direction accident: 12

When did crossover accidents occur?

- 2000 – 2
- 2001 – 1
- 2002 – 2
- 2003 – 3
- 2004 – 2
- 2005 – 2

Why are there more crossover accidents on southbound I-5 near Smokey Point?

The three-mile stretch between the Smokey Point exit and the Smokey Point rest area is a challenge for drivers and traffic engineers. Drivers travel this stretch well above the posted speed limit. This fast-moving through traffic meets slow-moving and merging traffic from the Smokey Point interchange and the Smokey Point rest area. These two kinds of traffic are naturally in conflict and historically lead to accidents. The most frequently cited contributing causes for crashes in this area where a vehicle left the roadway are exceeding the speed limit, driving under the influence, driver inattention and aggressive driving.

What have we done to make this area safer?

WSDOT has done several things to make this area safer. We have:

- added cable guardrail
- added rumble strip to make drivers more aware of the lane edge
- worked with Washington State Patrol to make sure drivers obey posted traffic signs
- added incident response teams to patrol the area
- lowered the speed limit from 70 to 60 mph (July 4, 2005)

What is the speed history?

- I-5 north of the Smokey Point Rest area currently ranks second in the state for the number of drivers traveling 100 mph or more where we have sensors to analyze speed.
- In 2005, 56 percent of the northbound drivers drove above 70 mph and 47percent of the southbound drivers drove above 70 mph.

Has lowering the speed limit made a difference?

Washington State Patrol initiated emphasis patrols on July 1, 2005. By July 9 they had stopped 800 drivers. A WSDOT speed study shows speeds dropped an average of 4 mph after the emphasis patrols.

What else will we do to enhance safety?

WSDOT engineers have identified a three-mile stretch of I-5 (milepost 205 to 208) that statistically shows a higher rate of cross-median crashes. WSDOT engineers are working to determine why. They are:

- conducting speed studies to determine how drivers are adjusting to the new lowered speed limit
- working with Washington State Patrol to ensure continued speed limit enforcement
- seeking out other state departments of transportation to compare the effectiveness of cable guardrail in those states and learn of any problems they have encountered.
- evaluating engineering standards.
- looking at roadway geometry and other engineering factors to determine why we have more accidents at this location than others
- considering driver behavior and how to influence it to improve highway safety.
- analyzing all previous recorded crossover accidents in the area to find a common thread or clues
- researching and preparing options to enhance safety in the area. These will be implemented as soon as we can confirm that they will enhance, not threaten, driver safety and resources are available. Some proposed improvements will be low-cost and can be completed quickly, others may require more costly and time-consuming construction

Washington State Department of Transportation

WASHINGTON STATE PATROL