Oregon
John A. Kitzhaber, M.D., Governor

Department of Transportation
Director's Office
1158 Chemeketa St. NE
Salem, OR 97301

DATE: February 13, 2012

TO: House Committee on Transportation and Economic Development

FROM: Bob Pappe, P.E., PLS, State Traffic-Roadway Engineer

SUBJECT: Cable median barrier applications on state highways

Introduction

Many head-on and run-off road crashes result in fatalities or severe injuries. The Oregon Department of Transportation (ODOT) has traditionally used concrete or metal beam barriers to reduce the severity of these types of crashes on multilane highways with moderate to high volumes of traffic. However a major drawback to using concrete and metal beam barriers is that they are expensive to install. As transportation funding continues to decline, ODOT often lacks the resources to rapidly deploy these technologies to areas where vehicles frequently run off the road or cross over the adjacent medians.

Recent use of cable median barriers in Oregon has shown that cable median barriers can be effective in protecting against median crossover crashes, and when used in the right locations, can be less expensive than traditional concrete and metal beam barriers.

Background

ODOT installed its first cable median barrier along I-5 between Salem and Wilsonville in 1996. The initial installation was a low-tension cable median barrier which has been very effective in preventing head-on median crossover crashes but is very costly and time consuming to repair after it gets hit. Subsequent installations throughout the state have been high-tension cable median barriers that are just as effective but require much less financial and labor resources to repair and maintain.

Through December 2011 ODOT has installed approximately 63 miles of cable median barrier on state highways. ODOT plans to install another 31 miles during the 2012 construction season. (An attached list shows current inventory of cable barrier.)

Considerations for installation of median barrier and use of median cable barrier

There are several considerations that go into determining whether a particular segment of highway is a good candidate for the installation of median barrier:

- Crash history—Head-on crossover median crashes typically occur in random locations throughout a corridor so it is important to look for patterns or groupings of crashes on highway segments. These segments would typically indicate a higher risk of future head-on crashes.

- Access management—installing any median barrier restricts left turns, requiring U-turns at barrier openings and out of direction travel. This negative impact to homes and businesses is an important consideration and may be a necessary trade-off for improving the safety in a corridor.

- Reductions in crash severity traded for increases in crash frequencies—National research shows that almost all median barrier systems are effective in reducing fatal and serious injury crossover median crashes. However a key trade-off is a likely increase in lower severity crashes such as minor injury and property damage only crashes. (The median barrier may have prevented the cross-over; however the vehicle still crashed into the barrier.) A recent review of Oregon crash data for the experimental installation of cable barrier in a narrow median along the Mt. Hood Highway (US 26) supports this point.

- Median width—Current ODOT policy, based on national standards by the American Association of State Highway Transportation Officials (AASHTO), only allows cable median barriers to be installed in medians 30 feet or wider. A design exception process that justifies deviations from standards is required for narrower installations and such exceptions have been granted on an experimental basis on the Mt. Hood Highway (US 26) east of Sandy.

- Winter maintenance—Cable median barrier is not a good solution in areas with high amounts of snowfall. While snow plows can plow up against a concrete median barrier, they would damage a cable median barrier if they touched it, resulting in an accumulation of snow against the cable median barrier. Due to the potential for labor intensive repairs during heavy snow storms, and the additional time needed to dig cable median barrier out of accumulated snow, loose cables might constitute a significant hazard to drivers until the barrier can be repaired. In low to moderate snowfall areas such as immediately east of Sandy, cable median barrier does not have winter maintenance issues because snow does not accumulate and remain against the cable median barrier for long periods of time.

Experimental installation of cable barrier in a narrow median along the Mt. Hood Highway (US 26)

While typical cable median barriers are installed in medians 30 feet or wider, an experimental installation was installed in August 2007 along the Mt. Hood Highway (US 26) east of Sandy on two separate highway sections. At the time it was one of only two installations in the United States of cable median barrier in a narrow median. (The other known installation is in Utah along US 189 in Provo Canyon).

The primary concern with installing cable barrier in narrow medians is the potential for the cables to deflect into oncoming traffic when the barrier is hit. The median on the Mt. Hood Highway was only four feet wide prior to the installation of the cable barrier and had to be widened to eight feet by narrowing the outside shoulders by two feet in each direction. This resulted in less recovery area for run-off-road crashes which is a key trade-off when considering countermeasures to reduce head-on crossover median crashes.

In the first year after installation there were nine reported collisions with the cable barrier, with no reported injuries. This represented a significant reduction in injury crashes from prior years, but this also shows in an increase in reported crashes involving property damage only. ODOT Maintenance staff reports that repairs to the cable median barrier are neither difficult nor costly.

Oregon crash data shows that the number of (median related) crashes has doubled from 10 reported crashes for the four-year period prior to the cable median barrier installation (September

2003—July 2007) to 20 reported (median related) crashes for the four-year period immediately following the cable median barrier installation (August 2007—June 2011). Since the installation of the cable median barrier in this section, no high severity crashes, such as head-on/sideswipe, have occurred through June 2011.

The crash data findings from pre- and post installation are consistent with national research that shows cable median barriers are an excellent countermeasure for reducing fatal and serious injury median crossover crashes. However that reduction in severity comes with the trade-off of increased overall crashes, particularly the lower severity crashes involving minor injuries or property damage only crashes.

Proposed cable median barrier installations in the near future

Based on past success of cable median barriers installed at various locations throughout the state, additional installations are either being considered or have been programmed into future construction projects listed in the Statewide Transportation Improvement Program (STIP).

- Wide medians—Cable median barrier is either being considered or being installed along both I-5 and I-205 in wide median sections. Along I-5, cable median barrier is one of the alternatives for reducing head-on crashes through Salem between Market Street and Portland Road. It is also being installed along I-5 in several segments south of Eugene and north of Albany in upcoming construction seasons. Along I-205 cable median barrier is being installed this summer between Otty and Foster Roads.
- Narrow medians—Additional narrow median applications are being planned for two segments immediately west of the existing Mt. Hood Highway location. The two locations are from MP 28.4 to 29.2 and from MP 29.4 to 30.3. Cable barrier was also considered east of Rhododendron, however due to winter maintenance concerns from high amounts of snowfall, it was decided that cable median barrier was not appropriate. Concrete barrier is the preferred solution for this segment.

Summary

As an alternative to concrete and metal beam barriers, many states are turning to cable median barriers in areas where there is sufficient median width and a high potential for crashes. States such as Arizona, Colorado, North Carolina, Ohio, Oklahoma, South Carolina, Utah, and Washington State, have installed cable barriers in medians originally built without barriers. ODOT has installed approximately 63 miles of cable median barrier at various locations throughout the state and plans to install another 31 miles during the 2012 construction season. Experimental installations in narrow medians have shown promise in locations such as the Mt. Hood Highway (US 26) east of Sandy.

Cable median barriers generally have low installation and maintenance costs when using high-tension cable barrier systems. However several issues need to be taken account when considering the installation of median barriers including crash history, access management impacts, median widths, and winter maintenance concerns.

Attachments: Cable Barrier Installed and Planned
Cable Barrier Presentation

Cable Barriers Installed and Planned
February 2012

Route	Hwy Name	BMP	EMP	Length	Comments
I-5	Pacific Hwy	60.10	61.15	1.05	Existing
I-5	Pacific Hwy	130.50	131.17	0.67	Existing
I-5	Pacific Hwy	131.18	131.39	0.21	Existing
I-5	Pacific Hwy	132.00	133.21	1.21	Existing
I-5	Pacific Hwy	193.29	209.00	15.71	Existing
I-5	Pacific Hwy	260.24	261.88	1.64	Existing
I-5	Pacific Hwy	261.92	262.39	0.47	Existing
I-5	Pacific Hwy	262.42	263.47	1.05	Existing
I-5	Pacific Hwy	263.51	265.25	1.74	Existing
I-5	Pacific Hwy	265.28	266.52	1.24	Existing
I-5	Pacific Hwy	266.55	267.01	0.46	Existing
I-5	Pacific Hwy	267.02	267.53	0.51	Existing
I-5	Pacific Hwy	267.56	268.78	1.22	Existing
I-5	Pacific Hwy	268.82	270.44	1.62	Existing
I-5	Pacific Hwy	270.47	271.84	1.37	Existing
I-5	Pacific Hwy	271.88	273.20	1.32	Existing
I-5	Pacific Hwy	271.89	273.20	1.31	Existing
I-5	Pacific Hwy	273.25	274.67	1.42	Existing
I-5	Pacific Hwy	274.74	275.29	0.55	Existing
I-5	Pacific Hwy	275.30	276.33	1.03	Existing
I-5	Pacific Hwy	276.30	276.33	0.03	Existing
I-5	Pacific Hwy	276.49	277.35	0.86	Existing
I-5	Pacific Hwy	277.38	278.59	1.21	Existing
I-5	Pacific Hwy	278.74	280.59	1.85	Existing
I-5	Pacific Hwy	280.67	280.77	0.1	Existing
I-5	Pacific Hwy	283.37	283.87	0.5	Existing
I-5	Pacific Hwy	283.94	284.41	0.47	Existing
I-5	Pacific Hwy	284.10	285.81	1.71	Existing right shoulder
I-5	Pacific Hwy	284.51	284.88	0.37	Existing
I-5	Pacific Hwy	284.91	285.24	0.33	Existing
I-5	Pacific Hwy	285.29	286.43	1.14	Existing
I-5	Pacific Hwy	286.68	287.00	0.32	Existing
I-5	Pacific Hwy	287.01	287.41	0.4	Existing
I-5	Pacific Hwy	287.47	288.03	0.56	Existing
I-5	Pacific Hwy	288.23	288.47	0.24	Existing
I-5	Pacific Hwy	288.71	288.96	0.25	Existing
I-5	Pacific Hwy	289.03	289.13	0.1	Existing
I-5	Pacific Hwy	289.14	289.22	0.08	Existing
I-84	Old Oregon Trail	272.55	272.85	0.30	Existing - inside shoulder westbound
I-84	Old Oregon Trail	346.11	346.16	0.05	Existing
US 26	Mt Hood Hwy	30.56	31.31	0.75	Existing
US 26	Mt Hood Hwy	31.55	32.32	0.77	Existing
US 26	Sunset Hwy	57.20	64.20	7.00	Existing
US 26	Sunset Hwy	64.20	66.20	2.00	Existing
US 26	Sunset Hwy	66.20	67.60	1.40	Existing
OR 22	N Santiam Hwy	6.10	11.80	5.70	Existing
			Total	63.24	
I-205	East Portland Freeway	15.90	17.80	1.90	Future - 2012 construction
I-5	Pacific Hwy	174.75	188.10	13.35	Future - 2012 construction
I-5	Pacific Hwy	193.29	209.00	15.71	Future - 2012 construction
				30.96	

Use of Cable Barriers

Oregon Department of Transportation

Report to House Transportation and Economic Development Committee

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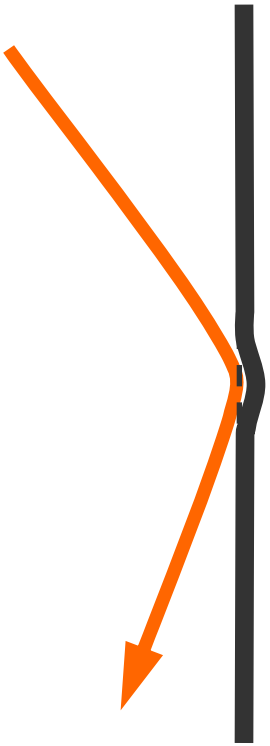
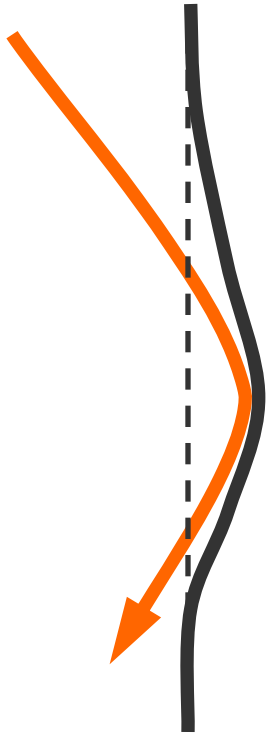
EXIT 7
214
Silver Falls
State Park

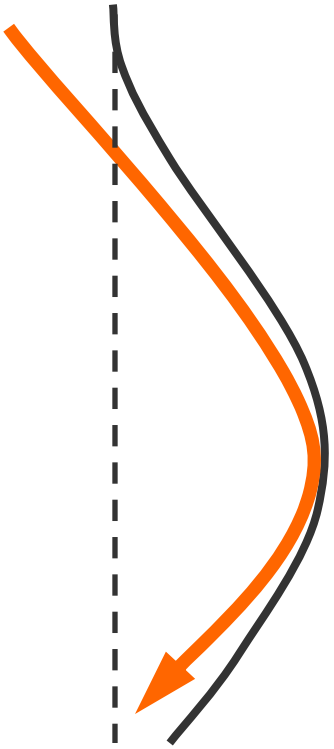
Barrier Deflections



Concrete
Δ=0-2 feet



Guard Rail
Δ=2-3 feet



Cable
Δ=6-12 feet

Deflection data: 2002 AASHTO Roadside Design Guide

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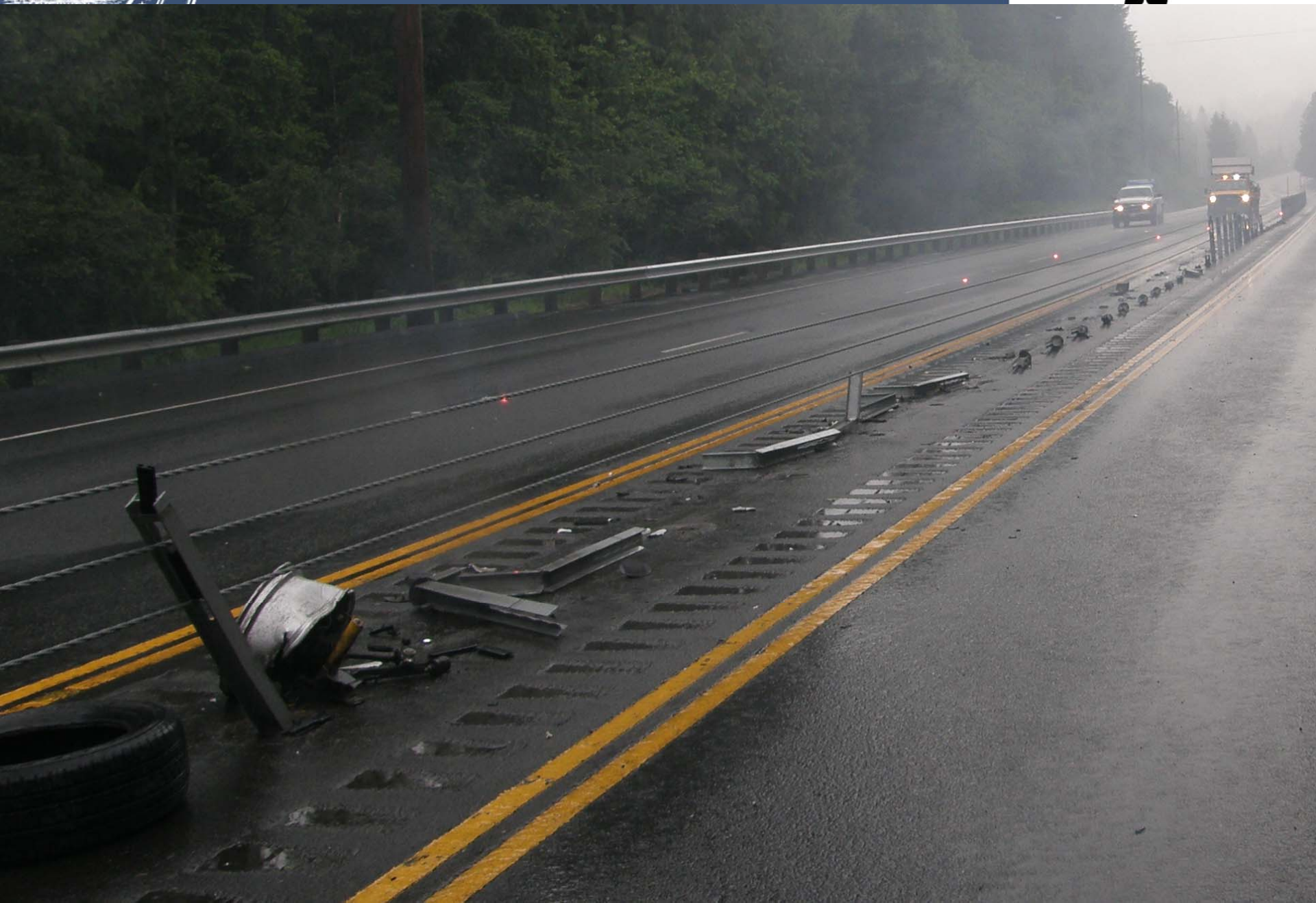


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