

CLOSEOUT REPORT

Submitted by the AASHTO TIG Lead States Team for
the following technology:

Cable Median Barrier

Lead States Team Members and Agencies:

Kevin Lacy, Chair, North Carolina DOT

Shawn Troy, North Carolina DOT

Dean Focke, Ohio DOT

Richard Albin, Washington DOT

Rory Meza, Texas DOT

Frank Julian, Federal Highway Administration

Date: January 21, 2009



DISCLAIMER

The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official view or policies of the American Association of State Highways and Transportation Officials (AASHTO) or any individual member organization of AASHTO.

Where the names of products or manufacturers appear herein, their inclusion is considered essential to the objectives of this report. AASHTO does not endorse products or manufacturers.

TABLE OF CONTENTS

	Page
Introduction.....	5
Marketing Activities	5
Presentations at Conferences and Meetings.....	6
Publications.....	7
Computer-Based Information	7
Performance Measurement	10
Lessons Learned.....	10
Transition Plan	12
Technology Transfer.....	13
Primary and On-going Implementation Responsibility	13
Comments	14
Final Expenditure Summary	14
Remaining Expense Claims	14
Total Expenses	14
Appendix A: CMB LST Work Plan	15
Appendix B: Marketing Media	19
Appendix C: Submitted Expense Claims.....	25

CLOSEOUT REPORT

Submitted by the AASHTO TIG Lead States Team for
the following technology:

Cable Median Barrier

Introduction

The Cable Median Barrier (CMB) Lead State Team (LST) held our kick-off meeting on July 29, 2005. A work plan and budget (Appendix A) were prepared and submitted to the AASHTO office in September. The LST received approval of the proposed work plan on October 12, 2005.

Primary LST efforts since that time have included developing Cable Median Barrier Best Practice Guidelines (CMBBPG), placing this information on the internet, contacting other states to include their information on this web site, and presenting CMB information at numerous conferences and meetings across the country. These activities were designed to provide helpful information to all state's who had not yet embraced the CMB technology on their freeways to prevent across-median crashes.

The CMBBPG is a one-stop-shop where states can access information about the experiences of all lead states using Cable Median Barrier. The available information is divided into the five information modules listed below.

- Background and Problem Identification
- Roadway Design Issues
- Maintenance Issues
- Benefits and Evaluation
- System Threats

The CMBBPG is now available to everyone on the AASHTO TIG web site.

Marketing Activities

Marketing activities, as identified in the LST work plan, included providing information through brochures, video, web-based documents, and LST member presentations at conferences and meetings. All of these vehicles were utilized except video. As the project progressed, the LST re-evaluated

producing videos and determined that due to the changing nature of CMB technology, videos would be outdated soon after production. Even today, CMB technology, performance, and application are changing. The LST decided the best way to publish up-to-date information would be on a web page created for this purpose.

Presentations at Conferences and Meetings

Date (in chronological order)	Conference or Meeting Name, Location	Presenter Name, Organization	Presentation Title	Written paper? (Y/N)
October 2005	Ohio Transportation Engineers Conference	Tom Arnold ODOT	Results of a Three Year In-Service Performance Evaluation	N
July 23, 2006	TRB AFB20 Workshop	Dean Focke ODOT	Ohio's Median Design Practices	N
May 16, 2006	Missouri Traffic and Safety Conference	Brian Murphy, NCDOT	Median Barriers in NC – Long Term Evaluation	N
January 23, 2007	TRB AFB20 Workshop	Dean Focke, ODOT	One State's Experience with Median Barrier Emergency Crossover Points	N
June 10 - 14, 2007	AASHTO Subcommittee on Design	Dick Albin, WSDOT	Cable Median Barrier TIG	N
July 10, 2007	TRB AFB20 Workshop	Dean Focke ODOT	See NC above	N
June 20, 2007	Low Cost Pooled Fund TAC Meeting	Shawn Troy, NCDOT	Low Cost Evaluations	N
July 9, 2007	TRB Committee AFB20 – Workshop on Cable Barrier Systems	Shawn Troy, NC DOT, Dean Focke, ODOT	Median Barriers in NC, One State's Experience with Cable Median Barrier	N
July 18, 2007	WASHTO-X Video Conference – Cable Median Barrier Systems	Shawn Troy, NC DOT, Dean Focke, ODOT	Median Barriers in NC, Median Barriers in Ohio	N
October 31, 2007	Tennessee DOT – Traffic Safety and Incident Management Conference	Shawn Troy, NC DOT	Median Barriers in NC	N

Publications

Date Produced	Publication Type	Total Number Produced	Recipients and Distribution Method
November 2007	Brochure	500	AASHTO subcommittees, TRB research committees, and state employees. Distributions made at conferences and meetings

A copy of the brochure has been included in Appendix B.

Computer-Based Information

Date Produced	Type	Number of Visitors	Known Use / Comments
September 2005	Web Site	Unknown	-

The original location for the CMBBPG was the North Carolina DOT web site. The information was later moved to the AASHTO TIG web site and may be viewed at <http://tig.transportation.org/?siteid=57&pageid=2197>. The home page is seen below.



This web page explains the need for and benefits of using CMB, gives case studies and state experiences, and provides design and specification information used by lead states. It is designed to give guidance thru every stage of the process of implementing CMB. It was also built to serve as a repository for information from other states, including those first using CMB. The text of the home page of the web site follows:

As traffic volumes and congestion rise, the demand for effective median safety features grows higher.

Cable median barriers (CMB) are life saving, adaptable traffic devices ideally suited for use in existing medians to prevent cross-over crashes, and are one of the most effective safety measures state transportation departments can deploy to protect motorists on today's congested highways. Across the country, agencies that have installed these barriers report a significant decrease in fatalities and in the severity of cross median crashes.

Cable median barriers work as a retrofit on existing, wide, relatively flat median areas and are also effective on sloped terrain. They generally cost less to install than other barrier systems, and repair and maintenance costs are easily offset by their life-saving and injury-reducing benefits.

Where to begin? [Background and Problem Identification](#) is an insight on how our Lead States Team began their CMB programs. Build your case using their experience as well as information from the Federal Highway Administration and other states that use cable median barriers.

Quick Links (located on the right hand side of the page) will take you to our Lead States Team, allow you to review general cable presentations, in-service and product evaluations as well as standard specifications and drawings.

TIG's "best practice" guidelines include roadway design and maintenance issues as well as CMB evaluations, benefits and system threats. Click on a **Key Topics** links (below) to guide you through issues and answers as you plan your CMB program.

You can contact a [CMB Focus Technology Experts](#) for expertise and advice from DOT representatives who can help you evaluate the use of cable median barrier in your State.

Policies, Specs & Drawings offers State standards, plans and guardrail drawings.

Look to the **CMB Library** for [crash and repair photos](#), videos, print articles and other materials concerning CMB. Just select a link below and browse.

If your agency is interested in add material to this website, visit [Add Your Agency's Information](#). This allows the site to grow with the technology, and it offers transportation agencies a greater range of information available on Cable Median Barrier.

What is Cable Median Barrier – or “CMB”?

- [Background and Problem Identification](#)

Key Topics

- [Barrier Design](#)
- [Roadway Design Issues](#)
- [Maintenance Issues](#)
- [Benefits and Evaluations](#)
- [System Threats](#)

CMB Focus Technology Experts

- [Lead State Team Contact Information](#)

Policies, Specs & Drawings

- [State Agencies](#)
- AASHTO (Coming Soon)

Case Studies (Coming Soon)

- Ohio
- North Carolina
- Texas
- Washington

CMB Library

- [Photos](#)
- [General Cable Presentations](#)
- [In-Service & Product Evaluation](#)
- [Brochure \(Nov 2007\)](#)
- Videos (Coming Soon...)
- Articles (Coming Soon...)
- Other Materials (Coming Soon...)

Performance Measurement

The CMB LST was formed prior to the development of LST guidelines for performance measurement. Therefore, a plan for measuring performance was not included in the approved work plan and performance measurement activities were not formally pursued. However, an NCHRP 20-7 task did conduct a survey of state DOTs in 2006, thereby providing a good snapshot of the degree to which CMB was being used. The survey showed that already in 2006 many states were not only aware of CMB but had by that time placed at least experimental sections. Of the 29 states responding to the survey, 27 reported having current installations of CMB.

Anecdotal implementation information listed below is a sampling of the beneficial results obtained from increased use of CMB.

- In 2006 it was reported in an FHWA *Priority, Market-Ready Technologies and Innovations* bulletin that annual cross-median fatal crashes in the State of Washington declined from 3.00 to 0.33 per 100-million miles of vehicle travel and that overall benefits of CMB were estimated at \$420,000 per mile annually.
- In 2007 another study of CMB use in the State of Washington reported that crossover median collisions decreased 74 percent after CMB installation. It was further estimated that 64 fatalities would be prevented over the next 10 years where CMB is installed in the state.
- In 2007 it was reported in a Missouri DOT *Research Pays Off* publication that by the end of 2008 they expected to have installed nearly 500 miles of CMB. Where CMB had already been installed on IH 70, annual cross-median fatalities had reduced from 24 in 2002 to 2 in 2006.
- In 2008 it was reported in a Texas Project Summary Report that during the first year of CMB placement in Texas that a reduction of 18 fatalities and 26 incapacitating injuries resulted at installation locations.

Lessons Learned

General Comments from LST Members

Cable Median Barrier knowledge and usage has grown greatly since this effort was begun in the summer of 2005. In fact, between the various topic areas that need answers within this technology and the abundance of research that has and is currently being done for this technology, one LST member notes that the TIG CMB effort seemed to always have been behind the curve of the state of the practice. The ever-changing nature of this technology may have made CMB a less suitable and more difficult technology for the TIG marketing process.

This team member also believes that a better documented process of TIG expectations should be given to Lead States Teams prior to their kick-off meetings. For this project it may have also been helpful if the team had not been coordinating with three different AASHTO TIG Liaisons over the course of the project. In looking back it seemed to this member as though the initial TIG Liaison provided insufficient incite and perspective in the early going about what was expected of the Lead States Team. The second TIG Liaison had to start from scratch and get up to speed with the overall TIG process prior to being able to assist our Lead States Team. Just when the second TIG Liaison was getting up to speed, a third TIG Liaison was hired. It seems we had to start from scratch again, with no offense meant to the current liaison.

The work plan that was approved resulted in the LST building a web page that could potentially serve as a central data warehouse for Cable Median Barrier information both now and in future years. The Lead States Team data is currently on this web page, but all information may not still be current. It appears that no other States have added information about their CMB experiences to the website. Since it appears no other States chose to add their information, we may consider this aspect of the project a failure. A remaining question is how can a LST get states to provide their information and data about a new technology? This is a question that needs to be figured out as other LSTs will run into this issue also. Again, this web page, this CMB technology, and the direction the team chose to go were probably of larger scope than TIG LSTs typically handle. One thing this project has been successful at is reducing the number of phone calls we receive concerning Cable Median Barrier use. And when we do get calls, the person calling has looked at the web page and has specific questions concerning the information and data that were seen there. However, the original vision of the LST that all states would place information about their CMB experiences on the web page would have been a better outcome.

Another LST member also notes that the initial direction of this effort was lacking and that the result was that little happened for a significant time. However, that when the current TIG Liaison came on, that he provided needed direction and focus. The web site product is good but needs to be maintained as knowledge increases.

It is also thought that an interim meeting might have been helpful. In addition, more CMB technology exposure could be gained if some additional presentations would be given around the country at different AASHTO and TRB events.

A third LST member, in addition to agreeing with earlier comments, states that their state's involvement in this TIG lead states team stemmed from two

factors, (1) we were desperately inexperienced in the modern use of cable products at a time when political pressure was growing to react to the seemingly exploding rates of cross-median accidents, and (2) our realization that in spite of (1) we were further ahead of the learning curve than most other states in this knowledge.

As the 1990's came to a close, most states reported a permanent spike in cross-median accidents, and our state was no exception. Our road design standards and our accident investigators could not explain the sudden jumps in crash rates. While efforts were underway to research our way to a solution, as is usually standard practice in highway engineering, negative media reports had the traveling public clamoring for immediate action. While the roadside safety community waited for what proved to be inconclusive research, our state turned to other states to assist us in addressing this problem. And as noted above by another state's member, states that had taken the lead in using CMB were inundated by phone calls from other states. I will say that without North Carolina's assistance, our own state's efforts would have been delayed even further.

So our purpose for joining the TIG was two-fold, first, to learn from the leaders and, second, to help teach others. The learning was beneficial to us in that it gave us knowledgeable contacts, allowing us to be reasonably sure that our CMB use was not going in a wrong direction. The teaching side was beneficial to us also, because we were not only able to educate the transportation agencies that contacted us about our successes, but we and they also learned from missteps seen along the way. We believe this learning and outreach between the states positively facilitated the implementation of CMB as median protection throughout the country. Thus, we believe the TIG CMB lead states team effort can be considered a success.

Our concern with the operation of the TIG process was its long developmental time frame. Much of the knowledge the team members gathered in the initial phases of lead states team activities seemed to be time-sensitive and by the time this information was distributed, much of the knowledge was either already known to the states or perhaps was outdated too. I would think this aspect could be improved so that future TIG lead states teams do not have this occur.

Transition Plan

The LST believes it necessary for the CMB use initiative to continue. During the project the LST found that the team was not only implementing technology, but it was also discovering new technology and finding that more research was still needed to determine the best performance of CMB. This research takes various forms. Several states have experimented with

CMB and have experiences yet to be shared with others. While the CMB lead states team has limited resources, and its efforts therefore must be concluded, the work of researching CMB must continue. The research results to be obtained in the future would be most valuable if compiled into a common location or “clearinghouse”.

Therefore, the CMB lead states team is proposing the following steps to conclude this project and yet promote the continuation of CMB learning and research.

1. Update the CMBBPG web-site to remove “(Coming Soon)” where this note is no longer applicable.
2. Maintain the CMBBPG web-site. Adapt it to become a state clearinghouse as needed and demanded by the states. This will require a champion agency and person as well as a long-term home for the website. The proposed web site home is the AASHTO web site, and proposed champions are the applicable AASHTO committee liaisons working jointly with the FHWA expert on this technology.
3. Launch an effort to gather input from more states about their experiences in applying and observing performance of CMB. A webinar for this purpose is suggested to outreach to applicable state DOTs and specifically to AASHTO committee representatives to SCOD, SCOTE, SCOHTS, SCOM, and others.

Technology Transfer

Contact	Office Name, Location	Phone	Email
Frank Julian	FHWA Resource Center	404.562.3689	frank.julian@fhwa.dot.gov

Primary and On-going Implementation Responsibility

Contact	Committee Name, Organization	Responsibility Discussed and Response
Kirk Steudle, Michigan DOT	SCOHTS	Maintain the CMB website with up-to-date info from states.
Carolann Wicks, Delaware DOT	SCOD	Maintain the CMB website with up-to-date info from states.
Delbert McOmie, Wyoming DOT	SCOTE	Maintain the CMB website with up-to-date info from states.
Carlos Braceras, Utah DOT	SCOM	Maintain the CMB website with up-to-date info from states.

Comments

From North Carolina's perspective the web page was a good idea and has some great information on it supplied by the lead states. However, it still lacks the addition of information from other states that also have experience with CMB. That information as well as links to CMB research information developed over the last several years need to be made available to others. For the project to be truly successful this additional information must be added to the web page. The web page most likely will need to be updated frequently, perhaps once each quarter, since CMB technology continues to evolve and advance. Possibly this effort needs to be taken over by an organization or group that can influence states more effectively to input data as new information emerges. This would apply to the research community as well.

Final Expenditure Summary

Remaining Expense Claims

Date of Expense	Service Type	Claimant	Estimated Claim Amount
TOTAL ESTIMATED REMAINING EXPENSE CLAIMS			\$ 0.00

Total Expenses

(Provide an estimate of the final total of expenses (to AASHTO TIG) which were incurred in executing the entire marketing plan.)

Attached in an appendix are copies of all expense claims which have been submitted to date by the lead states team.

Appendix A: CMB LST Work Plan

AASHTO TIG – Cable Median Barrier – Best Practice Guidelines

Work Plan

Goals and Objectives

Champion the development of Cable Median Barrier Best Practice Guidelines (CMBBPG) for all State's who have not yet embraced the Cable Median Barrier technology on their freeways to prevent Across Median Crashes. The CMBBPG would be a one-stop-shop where State's could access all Lead State Cable Median Barrier experiences through the following five (5) Information Modules: Background and Problem Identification, Roadway Design Issues, Maintenance Issues, Benefits and Evaluation, and System Threats. This format will enable a State to reference any one of the five (5) Information Modules within the CMBBPG during any stage of the Cable Median Barrier decision and installation process as well as providing additional guidance on questions and concerns that arise regarding the Cable Median Barrier Safety Countermeasure.

Proposed Work Plan

- Meetings to Discuss Production of Materials for CMBBPG –

Assume 2 meetings for travel and lodging:

8 out of state participants @ \$1,500 each	\$ 24,000
6 in state participants @ \$200 each	\$ 2,400

- Production of Marketing and Technical Materials for CMBBPG –

Brochures* - 500 color – Brochure will discuss a basic overview of the TIG-Cable Median Barrier Initiative and the Production of Videos and Information Modules for CMBBPG.

Development	\$ 1,000
Printing (\$2.00 ea. estimated)	\$ 1,000

Video* for Media/Public (in DVD or .mpeg format) – Video will be approximately 15-20 minutes in length and target a Non-Technical audience with a basic overview of the TIG-Cable Median Barrier Initiative and the Information Modules for CMBBPG.

Develop script	\$ 3,000
----------------	----------

Edit footage	\$ 3,000
Narrator and sound studio	\$ 3,000
Distribution	\$ 1,000

Video* for States (in DVD or .mpeg format) – Video will be approximately 15-20 minutes in length and target a Technical audience with a basic overview of the TIG-Cable Median Barrier Initiative and the Information Modules for CMBBPG.

Develop script	\$ 3,000
Edit footage	\$ 3,000
Narrator and sound studio	\$ 3,000
Distribution	\$ 1,000

Information Modules* to address the five (5) Emphasis Areas established by the TIG-Cable Median Barrier Initiative Workgroup. These Modules will consist of a Presentation of Lead State Cable Median Barrier Technical Issues and Experiences for each Emphasis Area as well as any supporting documentation that is discussed within each Module. The supporting documents may consist of photos, statistics, design standards, etc.

Background and Problem Identification	\$ 5,000
Roadway Design Issues	\$ 5,000
Maintenance Issues	\$ 5,000
Benefits and Evaluation	\$ 5,000
System Threats	\$ 5,000

* Note: The goal is to have all information above produced in electronic formatting (.mpeg, .ppt, .pdf, .dgn, .xls, .doc, .jpg, .tiff, etc) to be burned on a Compact Disc (CD) for mass distribution.

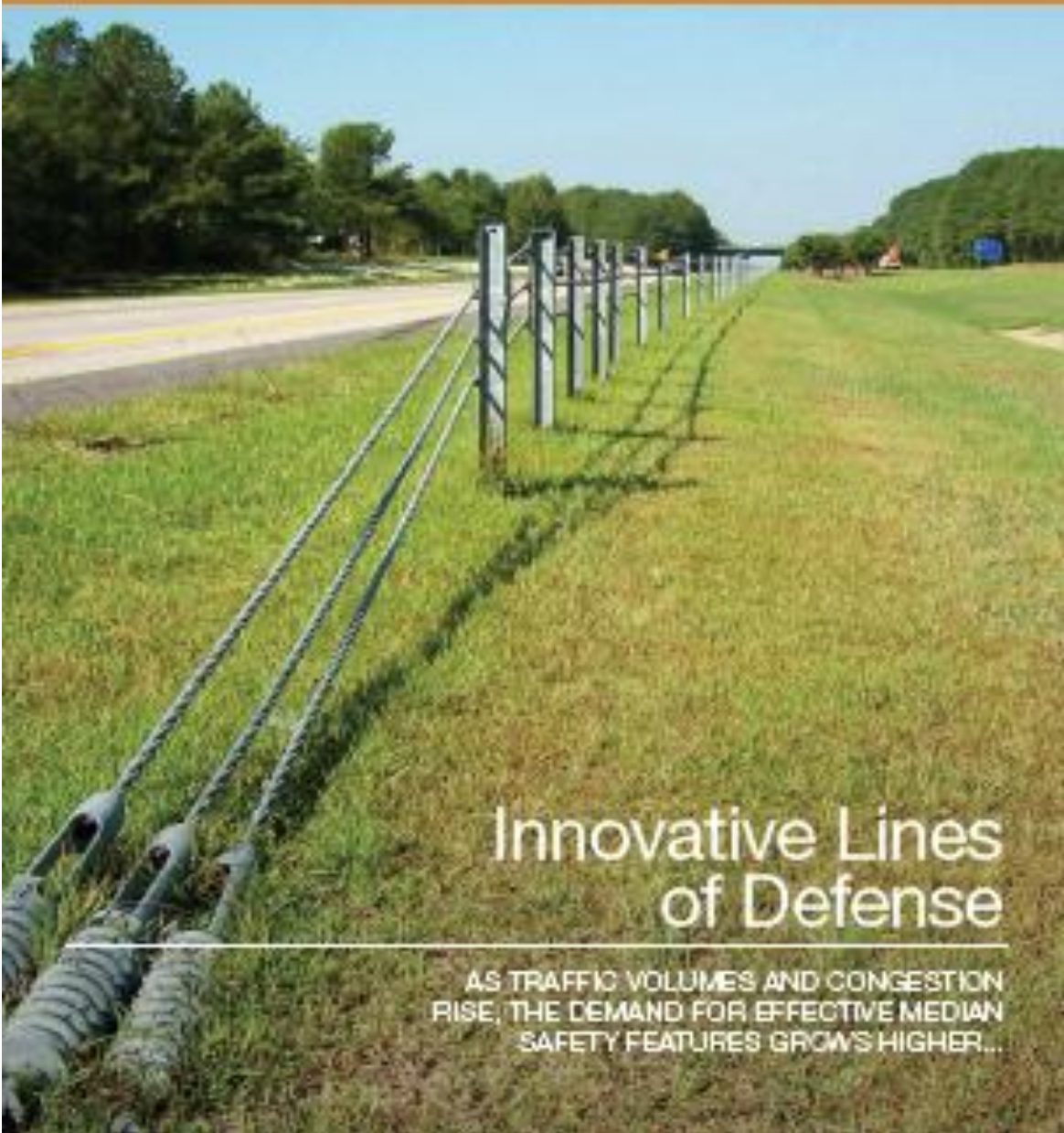
- Presentations at National Conventions by Workgroup Members –

Assume 8 conferences for travel and lodging:
 2 participants per conference @ \$1,500 each \$ 24,000

Total Proposed Budget \$ 97,400

Appendix B: Marketing Media

CMB | CABLE MEDIAN BARRIER



Innovative Lines of Defense

AS TRAFFIC VOLUMES AND CONGESTION
RISE, THE DEMAND FOR EFFECTIVE MEDIAN
SAFETY FEATURES GROWS HIGHER...

Cable median barriers (CMB) are a life saving, adaptable traffic device ideally suited for use in existing, reconstructed, or new medians to prevent cross-over crashes.

Why CMB? Why Now?

Cable median barriers are one of the most effective safety measures State transportation departments can deploy to protect motorists on today's congested highways. Across the country, agencies that have installed these barriers report a significant decrease in fatalities and in the severity of cross median crashes. Tests verify these results. When struck, a cable median barrier is more "forgiving" to the motorist. It deflects impact

laterally and reduces the force transmitted to vehicle occupants.

Cable median barriers work as a retrofit on existing, reconstructed, or new medians that are wide and relatively flat. They are also effective on sloped terrain. They generally cost less to install than other barrier systems. Repair and maintenance costs are easily offset by their life saving and injury-reducing benefits.



Fatal Crashes from Cross Median Collisions

	Before CMB	After CMB
NC ¹	4	2
WA ²	4.4	0.4
OH ³	0	0
TX ⁴	47	1

¹Analysis of 1301 miles of CMB installed in North Carolina from 1995 to 2000. Fatalities from cross median collisions decreased from 4 per year before to 2 per year after CMB installation. 1.7 years of data available for 2001 and 2002.

²Washington State Department of Transportation (WSDOT) data for 1995-2000. Fatalities from cross median collisions decreased from 4.4 per year before to 0.4 per year after CMB installation.

³Ohio State Department of Transportation (ODOT) data for 1995-2000. Fatalities from cross median collisions decreased from 0 per year before to 0 per year after CMB installation.

⁴Texas Department of Transportation (TxDOT) data for 1995-2000. Fatalities from cross median collisions decreased from 47 per year before to 1 per year after CMB installation.

TIG's Lead States Team on the project includes DOT representatives who can help you evaluate the use of cable median barrier in your State.

How do I learn more?

AASHTO's Technology Implementation Group – or TIG – is leading the effort to promote appropriate use of cable median barriers.

TIG's Lead States Team on the project includes DOT representatives who can help you evaluate the use of cable median barrier in your State. The team's goal is to develop "best practice" guidelines that include roadway design and maintenance issues as well as CMB evaluations, benefits and challenges. Contact team members for insight, expertise, and advice.

You can also visit www.aashtotig.org to explore cable median barrier research, analysis, program design, installation, and vendors.

Barrier Costs*

Cable Median Barrier
\$130,000-\$300,000 per mile

W-Beam Guardrail
\$250,000-\$600,000 per mile

Precast Concrete Barrier
\$300,000-\$2,700,000 per mile

* Based on Washington State DOT barrier installation costs, including preliminary and construction engineering, storm drainage, environmental mitigation, erosion control, traffic control and sales tax. Upper end of range reflects costs for extensive grading.

CMB: Breakthrough Team of Caltrans



CMB systems are available from several vendors, including:



U.S. Generic Low Tension Barrier



Thirty Cable Safety Systems (CASS)



Griffin Safety Fence



Gibraltar Cable Barrier



Nuzor Martin U.S. High Tension



Safence

About TIG

Dedicated to sharing high-payoff, market-ready technologies among transportation agencies across the United States, TIG promotes technological advancements in transportation, sponsors technology transfer efforts and encourages implementation of those advancements.

For more information visit
www.aashtoigtig.org

CMB Lead States Team

NORTH CAROLINA
Shawn Troy
(919) 771-0030
stroy@dot.state.nc.us

MICHIGAN
Dick Albin
(616) 705-7431
albin@erdc.state.mi.us

OHIO
Dean Focko
(614) 466-0347
dean.focko@dot.state.oh.us

TX
Rob Clayton
(817) 924-4321
robclayton@tsh.gov

TEXAS
Rory Maza
(214) 416-0076
rmaza@dot.state.tx.us



PUBLICATION DATE: NOVEMBER 2007

Appendix C: Submitted Expense Claims

(Copies of all submitted expense claims.)