



November 4, 2014

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Mr. Gregory Nadeau
Acting Administrator
Federal Highway Administration
U.S. Department of Transportation
1200 New Jersey Avenue, S.E.
Washington, D.C. 20590

Via Email

RE: In-Service Performance of the ET-PLUS

Dear Mr. Nadeau:

I am sure you agree that roadside safety policy should be based on the careful analysis of data and not bias studies, sensationalized new reports and self-serving commentary by competing manufacturers. Unfortunately, the discussion of the performance of the ET-PLUS in recent months has been dominated by the later and the former has been absent. I am hopeful that the FHWA can return good science and engineering to the decision making process.

I am the President of a small roadside safety research company in Canton, Maine and I have worked in the field of roadside safety for 30 years. The major of our work in recent years has been sponsored by the NCHRP but I also have performed litigation support work for Trinity Highway Products as well as many States and some plaintiff's attorneys. I was designated as an expert for Trinity in the trial recently concluded in Marshall, TX. I do not, however, have any royalty or ownership interest in any guardrail terminal product and have nothing to gain if ET-PLUS sales increase or decrease. My role has always been to assess the facts and render an opinion on the data available. My concern is larger than Trinity's problems with the ET-PLUS; I am concerned with how we make public policy decisions in the roadside safety community.

Based on recent news reports, as of today 27 States have removed the ET-PLUS guardrail terminal manufactured by Trinity Highway Products and developed by Texas A&M Transportation Institute from their qualified products list and the FHWA has demanded that eight crash tests of the ET-PLUS be performed to investigate its Federal Aid eligibility status.¹ Senator Blumenthal from Connecticut is calling for a congressional investigation on the matter and numerous sensationalized media reports on catastrophic and tragic crashes have circulated

¹ Cindy Galli and Brian Ross, "More than Half Country Bans Controversial Guardrail," ABC News, October 30, 2014 (see <http://abcnews.go.com/US/half-country-bans-controversial-guardrail/story?id=26577103>).

through the media.^{2 3} Highway safety policy decisions are now being based on the unsubstantiated claims of the media, plaintiff's lawyers and special interest groups. Absent from this conversation are actual facts about how the ET-PLUS or any other guardrail terminal actually performs on our Nation's roadways based on real, observable data. The States are making policy in the absence of any objective facts on how well guardrail terminals in general and the ET-PLUS in particular really perform under real-world conditions. It is my hope that the FHWA will put good engineering and scientific data analysis back in charge to make data-driven decisions on the public's safety policy.

On September 18, 2014 the Safety Institute released a study questioning the safety of the ET-PLUS guardrail terminal performed by Dr. Dean Sicking and Mr. Kevin Schrum of the University of Alabama, Birmingham.⁴ This rushed non-peer reviewed study contains serious methodological flaws and uses unusual unaccepted statistical methods. The results of such a study are a completely unreliable source for evaluating the differences in performance between the ET-PLUS and the ET-2000. This study is not an in-service evaluation at all and not an appropriate basis for developing policy. I know that the FHWA in particular and the US DOT in general have many fine highway safety statisticians and I would encourage you to have them review and critique this study and independently assess the appropriateness of its methods and conclusions.

More than 30 years ago, the authors of NCHRP Report 230 strongly recommended that in-service performance evaluations (ISPE) of roadside hardware be performed to determine how relevant our crash testing guidelines are to the performance of roadside hardware in the field.⁵ This recommendation was echoed in 1993 when NCHRP Report 350 was published and was re-echoed as recently as 2009 when the AASHTO Manual for Assessing Safety Hardware (MASH) was adopted.^{6 7} ISPEs have been called for over and over again by the roadside safety community because investigation of real crash events is needed to improve crash testing procedures and determine how effective our roadside designs actually are when installed on the Nation's highways. A comprehensive study of real-world crashes would allow testing guidelines to evolve such that tests more accurately mirror impact conditions observed in the field rather than using guesses and assumptions.

² Susan Hogan, "US Senator Calls for Expedited Guardrail Investigation," WPRI News, Providence, RI, October 21, 2014 (see <http://wpri.com/2014/10/21/senator-calls-for-expedited-guardrail-investigation>).

³ Cindy Galli and Brian Ross, "Outrage Over Guardrail Crashes Tied to Lost Limbs, Deaths," AC News, 20/20, September 18, 2014 (see <http://abcnews.go.com/US/outrage-guardrail-crashes-tied-lost-limbs-deaths/story?id=25594344>).

⁴ K. Shrum, "In-Service Evaluation of FHWA-Accepted Guardrail Terminals," The University of Alabama, Birmingham, Birmingham, AL, September 18, 2014. (see <http://www.thesafetyinstitute.org/wp-content/uploads/2014/09/In-Service-Evaluation-of-FHWA-Accepted-Guardrail-Terminals.pdf>).

⁵ J. D. Michie and M.E. Bronstad, "Recommended Procedures for the Safety Performance Evaluation of Highway Appurtenances," National Cooperative Highway Research Program Report 230, Transportation Research Board, Washington, D.C., 1981.

⁶ H. E. Ross, Jr., D. L. Sicking, R. A. Zimmer and J. D. Michie, "Recommended Procedures for the Safety Performance Evaluation of Highway Features," National Cooperative Highway Research Program Report 350, Transportation Research Board, Washington, D.C., 1993.

⁷ AASHTO TCRS, "Manual for Assessing Safety Hardware," American Association of State Highway and Transportation Officials, Technical Committee on Roadside Safety, Washington, D.C., 2009.

Despite 30 years of encouragement, relatively few in-services evaluations have been performed and even those few are typically extremely limited. Manufacturers complain that they do not have the crash, maintenance and inventory data needed to do such evaluations and States complain that they do not have the funding or man-power to collect it. I was the principal investigator on NCHRP Project 22-13 which developed guidelines and procedures for performing in-service evaluations that were published in NCHRP Report 490 in 2003.⁸ These guidelines have been largely un-used by the FHWA, AASHTO and the States and few in-services evaluations have been performed. In 2013, after the emergence of the allegations regarding the performance of the ET-PLUS, AASHTO’s Standing Committee on Research at last approved a problem statement aimed at performing a comprehensive in-service evaluation of guardrail terminals. The NCHRP formed an expert panel, solicited proposals and a contractor was selected when suddenly, the project was dropped. When will the FHWA, NCHRP, AASHTO or the States simply perform the necessary study so that policy decisions can be based on facts and data rather than sensationalized allegations by competitors, attorneys and the media?

I reviewed the 2002-2012 crash data from the State of Ohio as well as ODOT’s guardrail inventory collected from 2009 through 2011. The crash reports include an “event code” for guardrail end and impact attenuator/crash cushion to indicate a collision with a guardrail terminal. The guardrail inventory includes a category called “Type E” to indicate all the tangent terminals (i.e., the ET-2000, the ET-PLUS and the SRT). While I do not know the exact distribution of types of tangent terminals in OH, based on several surveys I have conducted in Ohio the majority of the tangent terminal inventory in Ohio are ET-PLUS guardrail terminals. I used the crash and inventory data to match crashes to terminals using the mile post information common to both datasets. While this is a broad-brush approach it at least gives an indication of how tangent terminals perform in the field. The results are summarized in the last row of Table 1.

Table 1. Police Reported Crash Severity of Guardrail Terminals where the First and Only Impact Event is a Guardrail Terminal.

Years/State/Terminal	A+K Crashes		B+C Crashes		PDO Crashes		Total
	No.	%	No.	%	No.	%	No.
1992-1996 [§] OH ET2000 ⁹	4	4.1%	35	36.1%	58	69.8%	97
2001-2005 WI ET2000 ¹⁰	6	5.2%	32	28.1%	76	66.7%	114
2002-2012 OH Tangent [†]	8	2.8%	61	21.1%	220	76.1%	289

† The Ohio guardrail inventory data classifies all tangent w-beam guardrail terminals as Type E. There is an unknown mixture of ET2000, ET-PLUS with 5” guide channels, ET-PLUS with 4” guide channels and SKTs included in this category.

§ Crash data was collected for a 42-month period between October 1, 1992 and February 28, 1996.

⁸ M. H. Ray, “In-Service Performance of Traffic Barriers,” National Cooperative Highway Research Program Report 490, Transportation Research Board, Washington, D.C., 2003.

⁹ D. Focke, “Safety Performance of the ET-2000 Guardrail End Terminal in Ohio,” Ohio Department of Transportation, Columbus, OH, July 24, 1996.

¹⁰ D. A. Noyce, J.A. Waheed, A.R. Bill and K. Santiago, “The Operational and Safety Impacts of Run-Off-Road Crashes in Wisconsin: Object Hits and Ramp terminals Turn Down Guardrail End Hits in Run-Off-Road Crashes in Wisconsin,” Report No. FHWA/WisDOT, University of Wisconsin-Madison, Madison, WI March 2008.

Guardrail terminal performance has been examined in Ohio before as shown in Table 1. ODOT performed a study of the then-new ET-2000 based on 1992-1996 crash data. Wisconsin performed a similar study published in 2008 with similar results as shown in Table 1. In the 20 years after the ET-2000 was first installed in Ohio, it appears from the most recent crash data that the newer tangent terminals, primarily the ET-PLUS, are performing better than the original ET-2000 since the proportion of severe and fatal crashes involving first and only impacts with a terminal have decreased by over 30 percent in Ohio.

A study was also recently performed in New Brunswick, Canada which is summarized with the original Ohio study, the Wisconsin study and my own analysis in Table 2. Again, the New Brunswick study agrees with my own study of recent ET-PLUS performance and both show that the ET-PLUS performance is somewhat better than the original ET-2000.

Table 2. Police Reported Crash Severity of Guardrail Terminals where the First and Only Impact Event is a Guardrail Terminal.

Years/State/Terminal	Fatal		Injury		PDO		Total
	No.	%	No.	%	No.	%	No.
1992-1996 [§] OH ET2000 ¹¹	0	0.0%	39	49.2%	58	59.8%	70
2001-2005 WI ET2000 ¹²	1	0.9%	37	32.4%	76	66.7%	114
2002-2012 OH Tangent [†]	0	0.0%	69	23.9%	220	76.1%	289
2003-2010 NB ET-PLUS	1	1.1%	15	15.8%	62	79.5%	78

[†] The Ohio guardrail inventory data classifies all tangent w-beam guardrail terminals as Type E. There is an unknown mixture of ET2000, ET-PLUS with 5” guide channels, ET-PLUS with 4” guide channels and SKTs included in this category.

[§] Crash data was collected for a 42-month period between October 1, 1992 and February 28, 1996.

The results summarized in Tables 1 and 2 are strikingly at odds with Sicking and Schrum’s findings that the ET-PLUS is more than six times more likely to be involved in a fatal crash than its immediate predecessor, the ET-2000. This simply does not agree with the data shown from the 2002-2012 Ohio data I analyzed, the 2003-2010 New Brunswick data or the 2001-2005 Wisconsin data. How is it that Sicking and Schrum’s values are so very different? Certainly Sicking and Schrum’s unconventional analysis techniques come to mind as does the fact that Dr. Sicking’s guardrail terminals are competitors of the ET-PLUS. Can we rely on a rushed study that uses unconventional techniques? Can we rely on a study performed by a biased competitor of the studied device? Can we believe one flawed study and ignore four others that used similar and widely accepted methods?

The time has truly come to do a comprehensive fair and unbiased in-service performance evaluation (ISPE) of all w-beam terminals. In fact, such a study is long overdue. Even after decades of use the roadside safety and highway design communities have little understanding of how any of these units function in the field. The driving public deserves and should demand

¹¹ D. Focke, “Safety Performance of the ET-2000 Guardrail End Terminal in Ohio,” Ohio Department of Transportation, Columbus, OH, July 24, 1996.

¹² D. A. Noyce, J.A. Waheed, A.R. Bill and K. Santiago, “The Operational and Safety Impacts of Run-Off-Road Crashes in Wisconsin: Object Hits and Ramp terminals Turn Down Guardrail End Hits in Run-Off-Road Crashes in Wisconsin,” Report No. FHWA/WisDOT, University of Wisconsin-Madison, Madison, WI March 2008.

public policy that is based on real scientific evidence and not flashy media coverage. It is time to take our responsibility for public safety as engineers seriously and make scientific decisions based on solid data from comprehensive in-service performance evaluations.

I do not know what the results of an in-service evaluation of guardrail terminals might ultimately reveal. I suspect that the ET-PLUS performs as well as any of the other similar guardrail terminals available but is it not time to find out what the real truth is? I urge you to direct the States to perform comprehensive in-service studies on all of their guardrail terminals in accordance with the study protocol documented in NCHRP Report 490. I urge the FHWA to take a pro-active role in ensuring that the necessary data are collected to support these important decisions. These studies must be based on crash data, maintenance records, roadside inventories and traffic data. It is time to start basing roadside safety policy on real data rather than guess work and speculation and I am hopeful that the FHWA would take the lead in such an endeavor.

Sincerely,

A handwritten signature in black ink, appearing to read 'M. H. Ray', written over a horizontal line.

Malcolm H. Ray, P. E., Ph.D.

Cc: Mr. Jeffery Paniati, FHWA
Mr. Tony Furst, FHWA
Mr. Micheal Griffith, FHWA
Mr. Nicholas Artimovich, FHWA