

October 9, 2015

BY EMAIL AND U.S. MAIL

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Senior Assistant Attorney General
Chief, Construction Litigation Section
Office of the Attorney General
Commonwealth of Virginia
900 E. Main Street, 2nd Floor
Richmond, VA 23219

Re: VDOT Testing of the ET PLUS Tangent W-Beam Guardrail Terminal (GR-9)

Dear Richard:

Now that the VDOT crash testing of the ET Plus System at KARCO is complete, I am writing to summarize Trinity's observations regarding this arbitrary, non-standard exercise.

In stark contrast to the very transparent and well-documented work plan distributed by Trinity for the testing at Southwest Research Institute in late 2014 and early 2015, VDOT never provided a "work plan" or anything resembling a test protocol for its recent KARCO activities. At various times, you insisted that the KARCO work plan would be produced. Then you claimed that the plan is contained within NCHRP Report 350, the manufacturer's assembly instructions and/or VDOT's own specifications. Finally, you asserted that the plan would arrive with the KARCO test report (presumably, in 45 days or so). Regardless of the "plan" that might be drafted by KARCO after the fact, it is abundantly clear that VDOT failed to install the ET Plus System correctly for any of the six tests conducted between September 17 and October 2, 2015, and failed to conduct NCHRP Report 350 compliant tests. For example:

First, VDOT disregarded – twice a week, for three weeks – Trinity's observations and recommendations regarding KARCO's use of non-standard, soft and sandy soil for each test. The soil was not compacted and, for at least one test, VDOT left standing water around the test articles. Trinity reported on these fundamental soil issues every week, as VDOT requested, but your client refused to change course. To reiterate, here are the "Standard Soil" requirements found in NCHRP Report 350:

Impact performance of some features depends on dynamic soil structure interaction. Longitudinal barriers with soil embedded posts . . . are such

features. When feasible, these features should be tested with soil conditions that replicate typical inservice conditions. Unfortunately, soil conditions are known to vary with time and location, even within relatively small geographical areas. Therefore, *except for special test conditions, it is necessary to standardize soil conditions for testing.* In the absence of a specific soil, it is recommended that all features whose impact performance is sensitive to soil-structure interaction be tested with soil described in Section 2.2.1.1.

...

It is recommended that the *standard soil [should] meet AASHTO standard specifications for "Materials for Aggregate and Soil Aggregate Subbase, Base and Surface Courses," designation M 14765 (1990), grading A or B (see Appendix B, Part 1).* It *should be compacted* in accordance with AASHTO Guide Specifications for Highway Construction, Sections 304.05 and 304.07 (see Appendix B, Part 3). The *soil should be recompacted, as necessary, before each test* to meet density requirements of the Guide Specifications. The *soil should be well drained at the time of the crash test.* The test should not be performed if the ground is frozen or if the soil is saturated unless the test is specifically designed to evaluate these conditions (see next section).

NCHRP Report 350 § 2.2.1 ("Soil") (emphasis added).

The importance of soil conditions to the guardrail end terminals was also noted in the recent *Safety Analysis of Extruding W-Beam Guardrail Terminal Crashes, Report from Joint AASHTO-FHWA Task Force on Guardrail Terminal Crash Analysis* ("Task Force 2 Report"), which stated: *"seemingly insignificant site conditions such as curbs, slopes, and soft soil conditions can contribute to the unsuccessful performance of a safety feature for some impact conditions."* A copy of the Task Force 2 Report is available at <http://www.fhwa.dot.gov/guardrailsafety/safetyanalysis/> (emphasis added).

Second, with regard to VDOT's installation of the ET Plus System and specifically the guardrail posts, Trinity told VDOT no fewer than six times that it should (consistent with NCHRP Report 350) use an auger bit to drill a hole in the soil, insert the guardrail posts in the hole, and then back-fill/compact with NCHRP Report 350 standard soil around each post. In contrast, the desert sands at KARCO were neither compacted nor stabilized for guardrail post installation. VDOT's soil challenges were highlighted by the fact that your client insisted on hammering (rather than augering and backfilling with the appropriate soil) the majority of the metal posts into the KARCO sands. VDOT also used non-Trinity posts and components in certain tests, and seemed to face substantial challenges achieving a straight line and uniform post heights, which affected the alignment of the guardrail in the ET Plus System.

Third, for at least one of the small car tests, VDOT did not rigidly attach the ballast to the vehicle, but rather installed the ballast high on the front passenger seat. VDOT's method is contrary to NCHRP Report 350 standards. For the pickup truck tests, VDOT stripped out extensive components such as tailgates, fuel tanks, spare tires, rear bumpers and the entire exhaust system, which caused the trucks to ride high and substantially changed the weight distribution and balance of the vehicles. In sum, VDOT's haphazard ballast and weight reduction techniques affected the center of gravity and stability of all test vehicles.

Fourth, VDOT did not mount the accelerometer (test computer) consistent with best practices or NCHRP Report 350 requirements. Trinity cautioned VDOT that its chosen method could leave the accelerometer susceptible to erroneous readings. NCHRP Report 350 provides that "[a]ccelerometers should be mounted on a major structural element of the vehicle so that 'rigid' vehicular body motions are measured." NCHRP Report 350 § 4.3.3 ("Accelerometer Placement and Data Reduction for Test Vehicles"). VDOT failed to abide by this core requirement and chose to use a small platform mounted in various locations. As a result, any data readings from KARCO may be compromised.

Fifth, for the non-standard, shallow angle test originally set for October 1, VDOT attempted to use a test vehicle that had obvious, prior collision damage in the front end impact zone. Trinity discovered this damage based on its visual inspection of the vehicle. The damage was easily confirmed through a CarFax report costing \$39.95. After VDOT was caught in this apparent deception, it decided to cancel the October 1 crash test. Tellingly, VDOT already had a "replacement" vehicle on-site at KARCO. VDOT never explained *why it selected the previously damaged car* for its "critical" shallow angle test, rather than the replacement vehicle parked nearby. This attempt to use a previously damaged and weakened car belies VDOT's true motives with this non-standard crash testing: VDOT set up the test articles without regard to Report 350 requirements, VDOT impacted the test article outside Report 350 criteria, and VDOT (initially) selected a test vehicle that would have been rejected immediately by any reputable testing facility.

Sixth, VDOT insisted on excluding Trinity's counsel and its retained expert witness from inspecting the KARCO facility, test articles and vehicles. Yet VDOT welcomed the news media (20/20 and Bloomberg) to roam freely around the KARCO facility (with cameras rolling) while Trinity conducted its daily inspections.

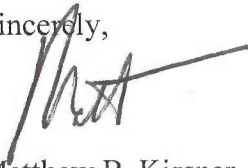
Finally, VDOT is not subjecting the other "GR-9" end terminal products (*e.g.*, the SKT, X-Tension and X-Lite) to the same series of tests recently conducted on the ET Plus System at KARCO. In separate correspondence, Trinity has provided VDOT with numerous examples of performance limitations that may affect these competing terminals. Task Force 2 also reported on these same common issues affecting all end terminals designed and tested pursuant to

NCHRP Report 350 criteria. Yet VDOT refuses to acknowledge Trinity's submissions, the Task Force 2 recommendations, or the hypocrisy of VDOT's inconsistent position of testing one (but not all) products.

In conclusion, VDOT was unable to demonstrate that any "safety" concerns exist with the ET Plus System through its testing at KARCO. The ET Plus System has been performing as expected on Virginia roadways for over ten years – just as VDOT previously admitted to the Federal Highway Administration.

I welcome the opportunity to discuss these issues further with you in the near future. Thank you.

Sincerely,



Matthew B. Kirsner

cc: Sarah R. Teachout, Esq.
Counsel of Record in Case No. CL13-698,
Circuit Court of the City of Richmond, VA