
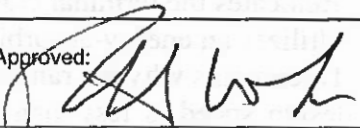


<p>SUPERSEDED BY EI 17-008 EFFECTIVE 1/1/18</p>		<p>New York State Department of Transportation ENGINEERING INSTRUCTION</p>	<p>EI 12-018</p>
<p>Title: DESIGN GUIDANCE FOR USE OF ENERGY-ABSORBING END TERMINALS FOR CORRUGATED BEAM SYSTEMS</p>			
<p>Target Audience:</p> <p><input type="checkbox"/> Manufacturers (18)</p> <p><input checked="" type="checkbox"/> Local Govt. (31)</p> <p><input checked="" type="checkbox"/> Agencies (32)</p> <p><input type="checkbox"/> Surveyors (33)</p> <p><input checked="" type="checkbox"/> Consultants (34)</p> <p><input checked="" type="checkbox"/> Contractors (39)</p> <p><input type="checkbox"/> _____ ()</p>		<p>Approved: </p> <p>Richard W. Lee, P.E. Acting Deputy Chief Engineer (Design)</p> <p>8/10/12 Date</p>	

ADMINISTRATIVE INFORMATION:

- This Engineering Instruction (EI) is effective beginning with projects submitted for the letting of January 10, 2013.
- This EI supersedes EI 99-032, "Design Speed for Barriers, End Terminals, and Crash Cushions".
- The revisions issued with this EI will be incorporated into the next update of Chapter 10 of the Highway Design Manual.

PURPOSE: The purpose of this EI is to provide guidance on the use of three new standard specifications for NCHRP350/MASH-compliant energy-absorbing end terminals for weak post corrugated beam guide rail, HPBO corrugated beam guide rail, and for HPBO median barrier.

TECHNICAL INFORMATION:

- This EI is being issued concurrently with EI 12-017 *Energy-Absorbing End Terminals for Corrugated Beam Systems*.
- The standard specification items issued via EI 12-017 are:
 - 606.26 Corrugated Beam Guide Railing End Terminal (Energy Absorbing)
 - 606.27 Heavy Post Blocked-Out Corrugated Beam Guide Railing End Terminal (Energy Absorbing)
 - 606.28 Heavy Post Blocked-Out Corrugated Beam Median Barrier End Terminal (Energy Absorbing)

Each item allows the contractor the option of choosing from a number of proprietary products on the Approved List.

- EI 12-017 also disapproves all previous special specification items for terminals for weak post corrugated beam guide rail, HPBO corrugated beam guide rail, and for HPBO median barrier.
- Energy-absorbing terminals should typically be specified for the ends of corrugated beam systems exposed to approaching medium- and high-speed traffic at locations where the terminals will not be set back close to the limit of the clear zone for that direction of traffic.
- Ramped Anchorage Units may continue to be used for corrugated beam systems, provided the ends may be set close to, at or beyond the limit of the clear zone. In special circumstances, such as when there is little safety benefit from using the more expensive

energy-absorbing terminals, ramped anchorage units may be used closer to the shoulder, but they should always be flared back as far as practical and the decision should be documented as an exception.

- Where an existing ramped Anchorage Unit is present well within the limits of the clear zone on a facility with a design speed of 45 mph or greater and a project is proposed whose scope would appropriately include guide rail changes, designers should prepare a design that, in decreasing order of preference:
 - Eliminates the need for the run of corrugated beam,
 - Relocates the terminal close to, at, or beyond the limit of the clear zone,
 - Utilizes an energy-absorbing terminal, or
 - Documents why the ramped anchorage unit was retained.

If the design speed is less than 45 mph, the same options should be considered. The option of retaining the ramped Anchorage Unit, provided the point of redirection for the run is appropriate, should be considered more acceptable at lower speeds. If the location of the terminal will be changed, continued use of a ramped Anchorage Unit located well within the clear zone would not be a preferred option and the rationale for using a ramped Anchorage Unit should be appropriately documented.

- As of this issuance, all of the accepted energy-absorbing end terminals for corrugated beam systems are proprietary. As unique products, each design tends to have different lengths for the terminal. To allow the treatment of the various options as equivalent choices for design and bidding, the following assumptions are imposed.
 - The Point of Redirection for each system will be taken as being 15 feet from the outer end of the terminal, (regardless of any crash test results showing better performance).
 - The payment limit for the energy-absorbing HPBO corrugated beam end terminals will be set at a point 50 feet from the outer end of the terminal. This will not match the various lengths of the products supplied by the terminal manufacturers. Where the terminals are shorter, the contractor will have to provide HPBO to make up the difference between the product length and the payment length.
 - The payment limit for the energy-absorbing weak post corrugated beam end terminals will be set at a point 100 feet from the outer end of the terminal. At present, two of the terminal product options are actually designed as HPBO terminals and must be backed by as short stretch of HPBO posts before transitioning to the weak post system. Because of the need to include the transition as part of the assembly, the 100 foot payment limit is needed. The third product option can connect directly to the weak post system, so the actual length of terminal will be much shorter and the contractor will have to provide about 60 feet of weak post corrugated beam guide rail to make up the difference between the product length and the payment length.
- If the site conditions permit, the designer should specify a terminal placement that will put the terminal's Point of Redirection at or in advance of the Point of Need for the shielded feature.
- For estimating and payment purposes, the lengths of the corrugated beam guide rail items must exclude rail that will be included as part of the 50 or 100 foot pay limits for the end assemblies. As sold by the vendors, an energy-absorbing terminal costs about \$3000, compared to around \$1300 for a ramped anchorage.

IMPLEMENTATION:

- Projects submitted for lettings on or after January 10, 2013 should follow the above-stated guidance. Application of the guidance to projects with earlier letting dates is encouraged where it is convenient to do so.

TRANSMITTED MATERIALS: None.

BACKGROUND: Traditional, non-energy-absorbing terminals have remained acceptable for use when placed close to the limit of the clear zone. Terminals placed closer to the shoulder typically need to be energy-absorbing. Until recently, there were only a couple of energy-absorbing terminals that the Department considered acceptable for use as HPBO terminals, and none that were directly usable for weak post corrugated beam guide rail. Recently, a new terminal option came onto the market. As all of the terminals are proprietary systems, it was decided to create items to permit designers to call out a standard item number without needing to be concerned about the proprietary nature of the specific terminals that would be installed. Each standard item relates to a specific approved list of the acceptable terminals.

EI 99-032 has been superseded because it has ceased to be relevant. The EI provided guidance on determining speeds related to TL-2 barrier selection, but, with the advent of the Modified G2 Weak Post Corrugated Beam Guide Rail, essentially all barrier systems that NYSDOT has accepted for highways (not bridges) are now rated for TL-3. The EI also urged selection of attenuators or terminals for freeways that were good for speeds in excess of the standard TL-3 crash test condition of 100 km/h (62 mph). However, no item numbers exist to specify the use of a higher-than-TL3-speed proprietary product.

CONTACT: Direct questions regarding this issuance to Terry Hale of the Design Quality Assurance Bureau at (518) 485-7009 or via e-mail at Terry.Hale@dot.ny.gov.