Design Standards Letter

Letter Number: **G-1999-08**

Letter Date: **05/28/1999**

Effective Date: **05/28/1999**

Section/Plan No.: **S606.00**

Subject: **Standard Plan 606.00 Clarification**

Body

It has been brought to our attention on many projects providing pier protection in medians of less than 60′ in width (Standard Plan 606.00), gradework and pipe quantities provided in the contracts may not be adequate to install a CAT-350 end terminal. To accommodate a CAT-350, the "Limits of End Terminal" dimension shown on Standard Plan 606.00 must be a minimum of 50′ in length. The 50′ allows for a 6′ - 3" Thrie beam to W-beam transition section, an additional required 12′ - 6" Type A guardrail between the transition section and the end terminal and the
31′ - 3" CAT-350 end terminal system.

On existing projects where the area for median fill or length of pipe for median drainage is insufficient at these locations, please issue a change order to provide payment for the increased quantities accordingly.

The Standard Plan 606.00AG is being revised to show the "Limits of End Terminal" to be a minimum of 50′ in length. Designers are requested to correct grading and pipe quantities accordingly on any plans currently being designed or completed plans that have yet to be let.

In addition, it has been brought to our attention recently by the manufacturer's of the CAT-350 and BRAKEMASTER, that these systems should not be installed at permanent paved locations. A new job special provision titled, "Crashworthy End Terminals DSP 99-09", has been written to address the limited use of these two systems and to incorporate the two current job special provisions on end terminals into one job special provision. The new job special provision is available in the job special provision database and is attached for informational purposes. The job special provision should be placed in projects not yet let.

On projects already under contract, it is requested contractors be informed of the limited use of these systems and, if applicable, arrangements be made to compensate the contractor for installing one of the other approved crashworthy end terminals listed in the project contract under the job special provision titled, "Type B Crashworthy End Terminals DSP 97-11".

If you have any questions, please refer them to Jim Carney at (573) 751-4675 or Pat McDaniel at (573) 526-2903.

pm/vh

Attachment

Title: Crashworthy End Terminal

Name: CRASH

ID Number: DSP-99-09

First Effective Bid Opening Date: 09/99

Last Effective Bid Opening Date:

Revision Date: 05/99

Explanatory Notes: This job special provision replaces DSP 97-11E and DSP 97-12D. It combines Type A and B end terminals under one special provision and reclassifies Type B end terminals into two category types, Type B and Type C. The CAT-350 and BRAKEMASTER are no longer allowed to be used at permanent paved locations.

Units: English/Metric

Section: 0606 - Guardrail and Guard Cable

CRASHWORTHY END TERMINALS DSP-99- 09

1.0 Description. This item provides for the furnishing and installation of crashworthy end terminals as shown on the plans or directed by the engineer.

2.0 Material. Only new materials shall be used in the fabrication of the end terminal. The major items of the installations shall be the best standard products of a manufacturer regularly engaged in the production of this type of end terminal and shall be of the manufacturer's latest approved design. After installation, the end terminal shall redirect traffic face side vehicle impacts within the prescribed performance crash test criteria ranges.

2.1 The assembled unit shall be capable of developing full tensile strength of the standard rail system and also have redirectional and end-on capabilities as per criteria identified in National Cooperative Highway Research Program Report 350 and supplements thereto. The assembled unit shall contain or permit controlled penetration of the vehicle into the system in an acceptable manner for vehicles in the 1800 pounds (820 kg) to 4400 pounds (2000 kg) classes.

2.2 The contractor shall furnish a manufacturer's certification that the units furnished are identical in materials and design to those tested for performance in accordance with Sec

2.1 of this special provision. Shop drawings shall also be submitted for approval prior to the fabrication and installation of any units.

2.3 The units listed below have met the performance criteria and may be used, provided satisfactory results are obtained in the field.

Non-Flared Type A Crashworthy End Terminals

Unit	Manufacturer	Additional Length of Type A Guardrail
ET-2000 (Option B)	Trinity Industries Co. 2525 Stemmons Freeway Dallas, Texas 75207	0' (0 m)
LET (Modified ET-2000)	Trinity Industries Co. 2525 Stemmons Freeway Dallas, Texas 75207	12.5' (3.81 m)
Beam Eating Steel Terminal (BEST)	Gregory Highway Products, Inc. 4100 13th St. S.W. P.O. Box 80508 Canton, Ohio 44708	12.5' (3.81 m)
SKT 350	Road Systems, Inc. 7631 New Castle Drive Frankfort, Illinois 60423	0' (0 m)

Flared Type A Crashworthy End Terminals

Unit	Manufacturer	Additional Length of Type A Guardrail
Slotted Rail Terminal (SRT-350) and Improved Slotted Rail Terminal (ISRT-3)	Trinity Industries Co. 2525 Stemmons Freeway Dallas, Texas 75207	12.5' (3.81 m)
SYRO ROSS-350	Trinity Industries Co. 2525 Stemmons Freeway Dallas, Texas 75207	12.5' (3.81 m)
Flared Energy Absorbing Terminal (FLEAT)	Road Systems, Inc. P. O. Box 2163 Big Spring, TX 79721	12.5' (3.81 m)
REGENT	Energy Absorption Systems Inc. One East Wacker Drive Chicago, Illinois 60601-2076	12.5' (3.81 m)

Type B Crashworthy End Terminals

C-A-T 350 (Crash-Cushion Trinity Industries Co.
Attenuating Terminal) 2525 Stemmons Freeway
Dallas, Texas 75207

Brakemaster System Energy Absorption Systems Inc.
One East Wacker Dr.
Chicago, IL 60601-2076

Type C Crashworthy End Terminals

QuadGuard System Energy Absorption Systems Inc.
One East Wacker Dr.
Chicago, IL 60601-2076

QuadGuard ELITE Energy Absorption Systems Inc.
One East Wacker Dr.
Chicago, IL 60601-2076

QuadGuard 69/90 Energy Absorption Systems Inc.
Low Maintenance Crash One East Wacker Dr.
Cushion (LMC) Chicago, IL 60601-2076

QuadTrend - 350 Energy Absorption Systems Inc.
One East Wacker Dr.
Chicago, IL 60601-2076

REACT 350 and Energy Absorption Systems Inc.
WIDE REACT 350 One East Wacker Dr.
Chicago, IL 60601-2076

Trinity Attenuating Crash Cushion Trinity Industries Co.
(TRACC) 2525 Stemmons Freeway
Dallas, Texas 75207

Adiem II Trinity Industries Co.
2525 Stemmons Freeway
Dallas, Texas 75207

2.4 Approval of other units may be requested by submitting the required information to the engineer. Acceptance will be based upon proof of equivalent crash test results as described under Sec 3.0 of this special provision and FHWA approval. However, regardless if the unit meets NCHRP 350 criteria and has received FHWA approval, the engineer reserves the right of final approval which is solely at the engineer's discretion. Pending approval of a unit shall not be assumed.

3.0 Construction. The end terminals shall be fabricated and installed in accordance with the manufacturer's approved shop drawings, recommendations and the details shown on the plans. Any end terminals damaged during the term of the contract shall be replaced

immediately at the contractor's expense.

3.1 The contractor shall not install flared Type A end terminals in medians or on curbs.

3.2 The contractor shall not install Type B end terminals on paved surface locations, unless the location is temporary and the paved area is to be resurfaced after removal of the system.

3.3 The contractor may use Type C end terminals where Type B end terminals are specified or shown on the plans.

3.4 Crashworthy end terminals located 12 feet (3.6 m) or less from the edge of the traveled way shall be furnished with a modified Type III object marker. The marker size, shape, method of attachment and placement shall be approved by the engineer prior to installation.

4.0 Method of Measurement. Measurement for the crashworthy end terminals will be made by each unit assembled, installed and complete in place. Certain Type A crashworthy end terminals will require an additional length of Type A guardrail, as specified in Section 2.3, to provide the necessary length of protection. If the contractor elects to use a flared Type A crashworthy end terminal, additional embankment must be provided as shown on the plans and will be at the contractor's expense. No compensation will be allowed for any additional length of Type A Guardrail required for installation of the crashworthy end terminals.

5.0 Basis of Payment. All labor, equipment and material to complete the described work will be paid for at the contract unit price for:

Item 606-30.15 Type A Crashworthy End Terminal Each

Item 606-30.16 Type B Crashworthy End Terminal Each

Item 606-30.17 Type C Crashworthy End Terminal Each

5.1 The contract unit price for the end terminal shall be considered full compensation for complete installation including any transition sections, backup assemblies, or other items necessary for proper installation of the end terminal.