

**A Guide to  
NCHRP 350  
Energy Absorbing  
Terminals that use  
Impact Heads**

**October 2000**

*There are currently 5 different guardrail end terminals that use an **Impact Head**. All have been approved to NCHRP 350.*

*The following information is intended to make it easier to identify the “**Impact Heads**”, “**Cable Anchor Brackets**” & “**First Rail Section**” for the 5 terminals.*

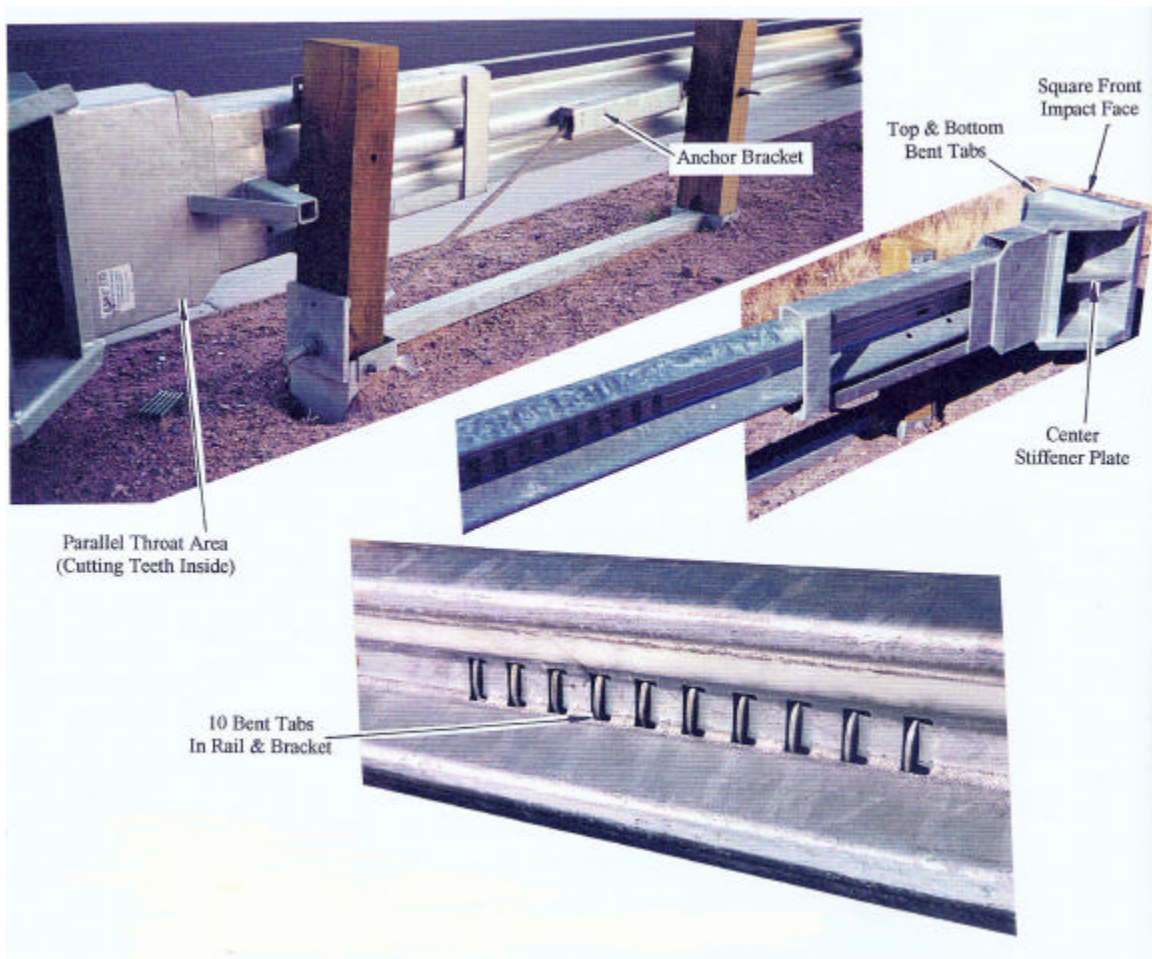
- BEST (tangent terminal)
- ET2000 / LET (tangent terminal)
- ET2000 Plus (tangent terminal)
- FLEAT (flared terminal)
- SKT (tangent terminal)

Notes:

- *Each end terminal should have a sticker placed on the impact head, which will identify the product name and the name of the manufacturer.*
- *Although several components for these terminals such as the posts, blocks, foundation tubes and some of the rail sections may be interchangeable, the Impact heads, Cable Anchor Brackets and the First Rail Section are not interchangeable, unless specifically indicated.*



*From a distance, these terminals may look alike to the untrained eye but upon closer review, they look very different and also function very differently.*



**Product Name** – **BEST**

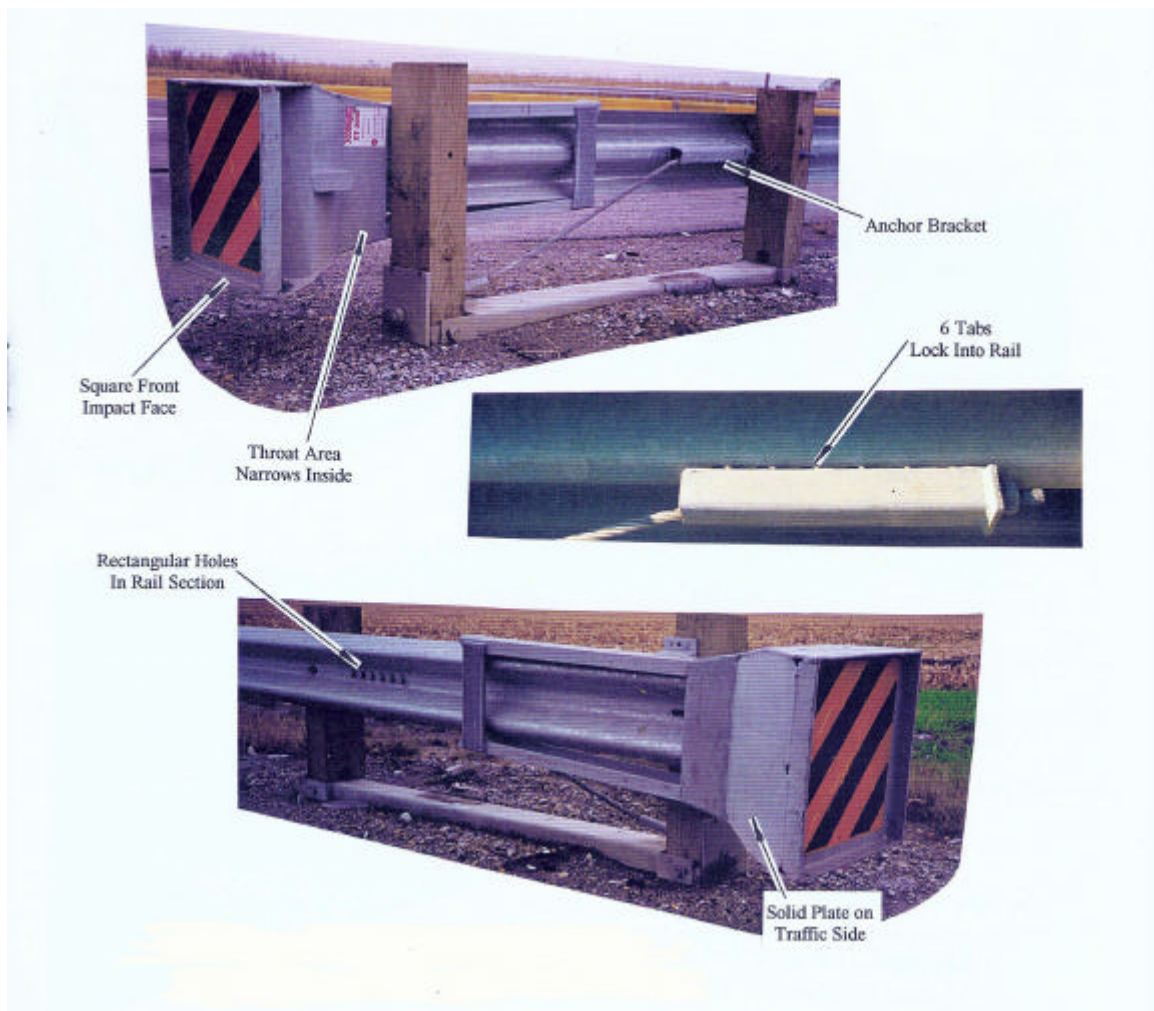
**Manufacturer** – Interstate Steel Corporation

**How it Works** – The impact head has 3 high strength steel cutting teeth welded on the inside. When impacted end-on, the vehicle pushes the impact head down the W-beam rail. The 3 cutting teeth in the impact head cut the rail section into 4 ribbons of steel.

**The Impact Head** – The front impact face is square. The impact head can be recognized by the bent tabs on the top and bottom side. The 3 cutting teeth can be seen when looking inside the impact head. The throat area (where the end of the rail section will bottom out) is parallel to the end piece as opposed to tapering downward, which is the case for all other impact heads. It is one of 3 impact heads that has a center stiffener plate between the top and bottom plates.

**The Cable Anchor Bracket** – The anchor bracket is unique to the BEST. It is a steel fabricated box with 10 bent tabs that lock into the bent tabs of the rail section.

**The First Rail Section** – The first rail section is unique to the BEST. It is 6” longer than a standard 25’-0” long rail section and it has 10 bent tabs that lock into the bent tabs of the cable anchor bracket. It also has 3 notches at the front end to fit into place with the 3 cutting teeth of the impact head.



**Product Name** – **ET2000 / LET**

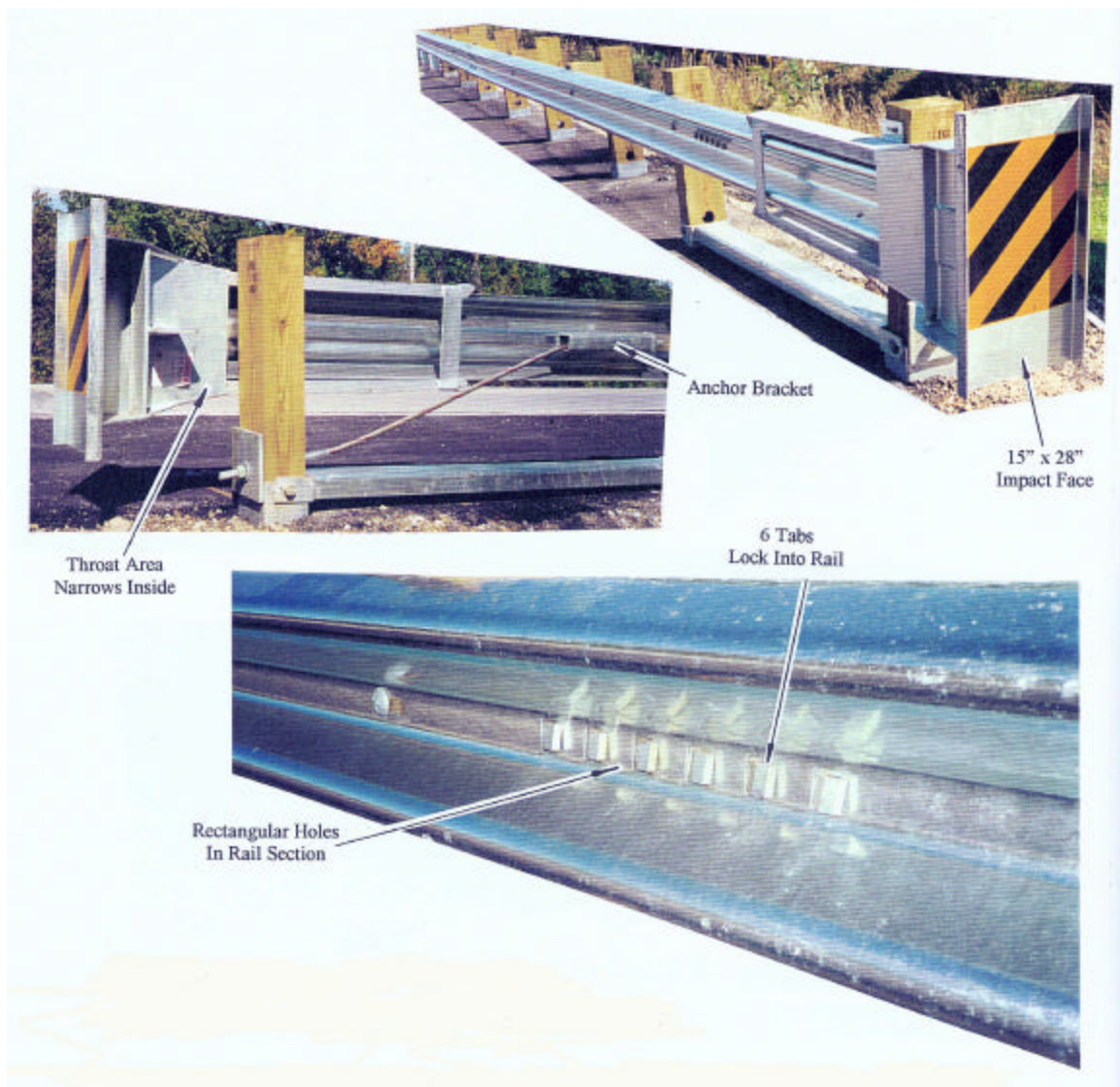
**Manufacturer** – Trinity Industries, Inc.

**How it Works** – The impact head has a throat area that narrows. When impacted end-on, the vehicle pushes the impact head down the W-beam rail. The rail section is extruded or squeezed causing it to be flattened.

**The Impact Head** – The front impact face is square. The impact head can be recognized by the solid plate and totally enclosed flat surface on the traffic side. The throat area that narrows can be seen when looking inside the impact head.

**The Cable Anchor Bracket** – The anchor bracket is used for the ET2000 / LET and the ET2000 Plus. It is a steel fabricated box with 6 tabs that lock into the rectangular holes of the rail section.

**The First Rail Section** – The first rail section is used for the ET2000 / LET and the ET2000 Plus. It has 6 rectangular holes that support the tabs of the cable anchor bracket.



**Product Name** – **ET2000 Plus**

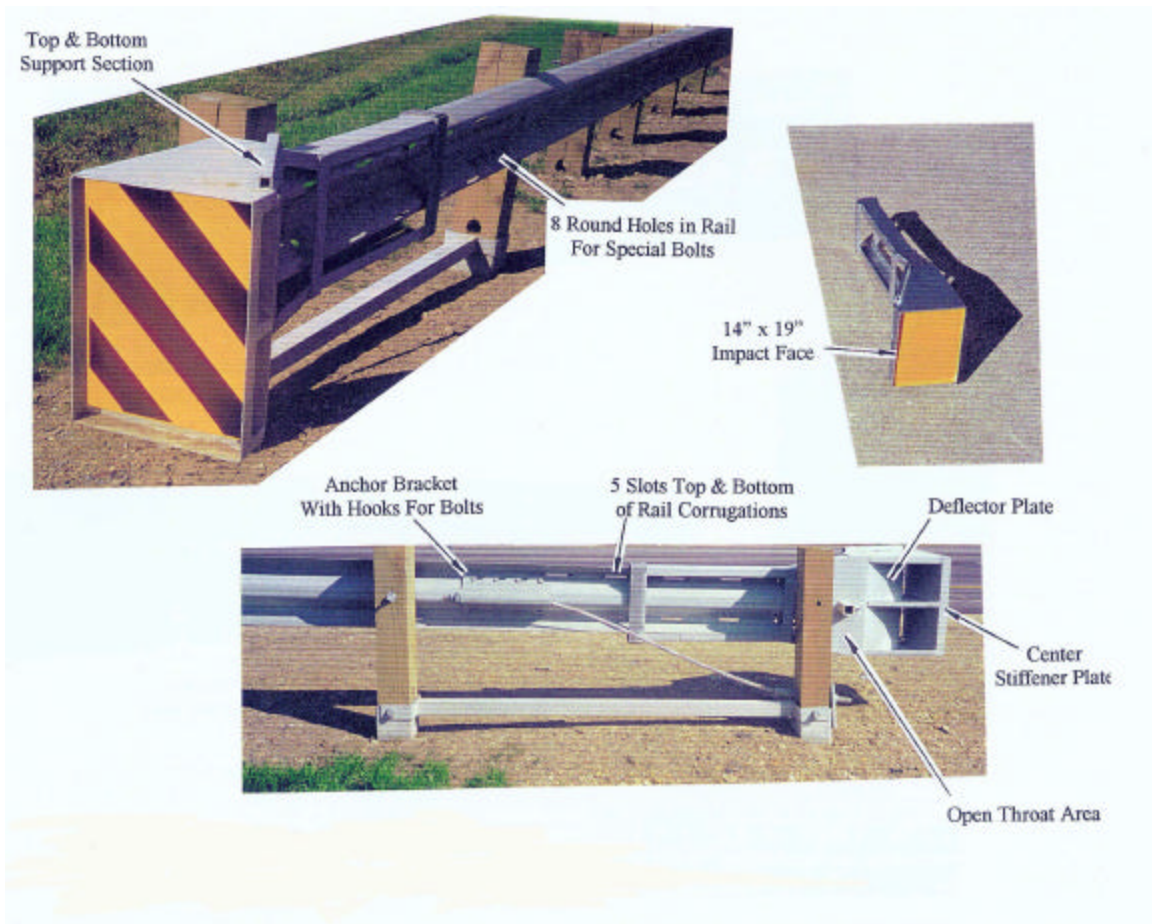
**Manufacturer** – Trinity Industries, Inc.

**How it Works** – The impact head has a throat area that narrows. When impacted end-on, the vehicle pushes the impact head down the W-beam rail. The rail section is extruded or squeezed causing it to be flattened.

**The Impact Head** – The impact head can be recognized by the 15' x 28' rectangular impact front face. The throat area that narrows can be seen when looking inside the impact head.

**The Cable Anchor Bracket** – The anchor bracket is used for the ET2000 Plus and the ET2000 / LET. It is a steel fabricated box with 6 tabs that lock into the rectangular holes of the rail section.

**The First Rail Section** – The first rail section is used for the ET2000 Plus and the ET2000 / LET. It has 6 rectangular holes that support the tabs of the cable anchor bracket.



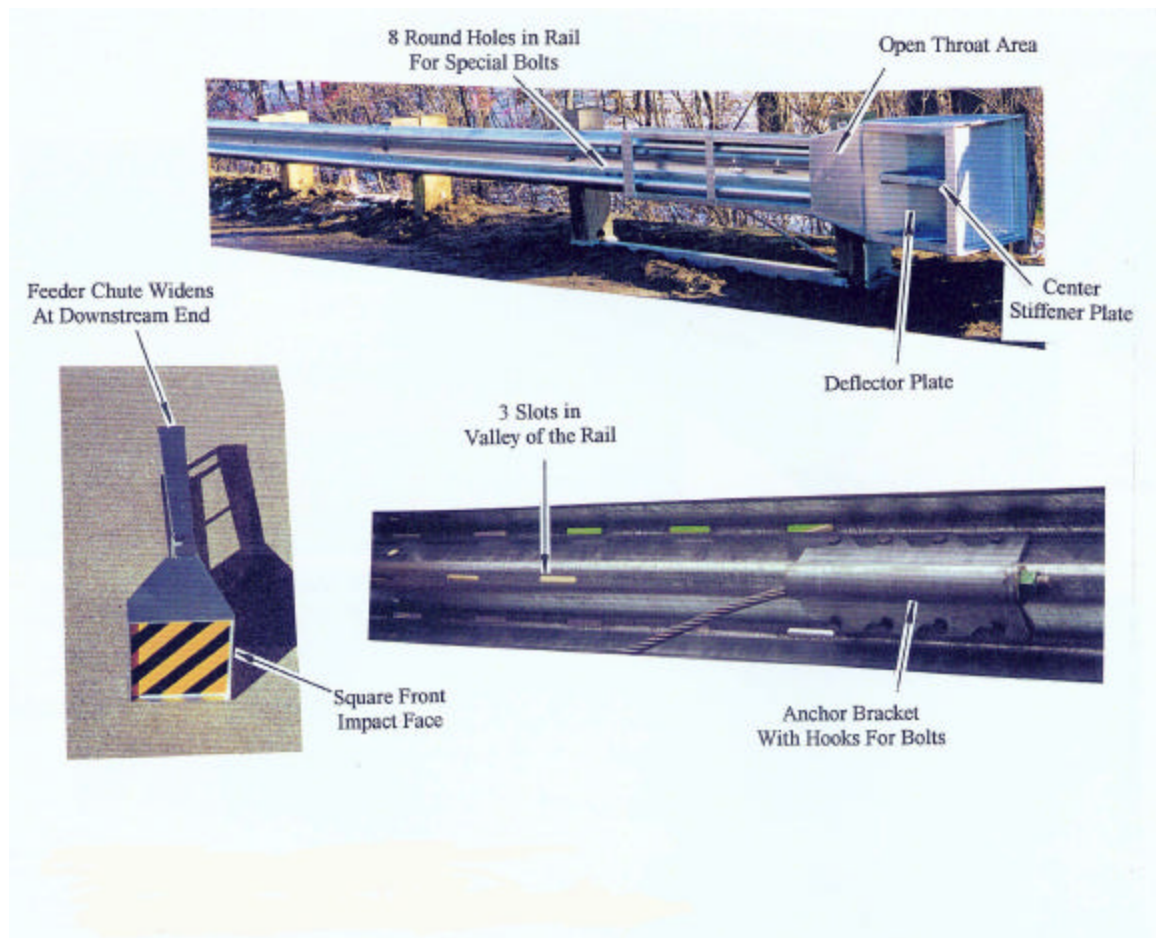
**Product Name – FLEAT**  
**Manufacturer – Road Systems, Inc.**

**How it Works** – The impact head has an open throat area and a bent deflector plate with a kinker beam. When impacted end-on, the vehicle pushes the impact head down the W-beam rail. The combination of the deflector plate and the kinker beam cause the rail to be sequentially kinked against the direction of the rail corrugations.

**The Impact Head** – The impact head can be recognized by the 14” x 19” rectangular impact front face. There is a support section welded along the edge of the top and bottom plate. It is one of 3 impact heads that has a center stiffener plate between the top and bottom plates.

**The Cable Anchor Bracket** – The anchor bracket is used for the FLEAT and the SKT. It is a steel V shaped plate with 4 hooks on each side that lock into special bolts. The bolts have an unthreaded shank portion and are bolted to the backside of the rail section.

**The First Rail Section** – The first rail section is used for the FLEAT and the SKT. It has 8 round holes for special bolts with an unthreaded shank portion to support the cable anchor bracket. The rail also has 5 slots (1/2” x 4” long) on both the top and bottom corrugations of the W-beam rail section. There may also be 3 additional (1/2” x 4” long) slots in the valley of the rail, which makes it interchangeable with the first SKT section.



Product Name – **SKT**

Manufacturer – Road Systems, Inc.

**How it Works** – The impact head has an open throat area and a bent deflector plate with a kinker beam. When impacted end-on, the vehicle pushes the impact head down the W-beam rail. The combination of the deflector plate and the kinker beam cause the rail to be sequentially kinked with the direction of the rail corrugations.

**The Impact Head** – The front impact face is square. It is the longest of all the impact heads at almost 7 feet long. It is the only impact head with a feeder chute (channel sections that surround the rail) that gets wider at the downstream end. It is one of 3 impact heads that has a center stiffener plate between the top and bottom plates.

**The Cable Anchor Bracket** – The anchor bracket is used for the SKT and the FLEAT. It is a steel V shaped plate with 4 hooks on each side that lock into special bolts. The bolts have an unthreaded shank portion and are bolted to the backside of the rail section.

**The First Rail Section** – The first rail section is used for the SKT and the FLEAT. It has 8 round holes for special bolts with an unthreaded shank portion to support the cable anchor bracket. The rail also has 3 slots (1/2" x 4" long) in the valley of the rail. There may also be 5 additional (1/2" x 4" long) slots on both the top and bottom corrugations of the W-beam rail section, which makes it interchangeable with the first FLEAT section.

**NCHRP 350 FHWA Terminal Approval Letters**  
(Test Level 3 Unless Noted)

FHWA ACCEPT. CODE	ACCEPT. LETTER DATE	MANUFACTURER OR SUPPLIER OF THE TERMINAL	DESCRIPTION OF THE DEVICE
CC-12	9/6/89	Syro, Inc. / Trinity	ET2000 Guardrail Extruder Terminal (230)
CC-12A	2/28/94	Syro, Inc. / Trinity	ET2000 (NCHRP 230) Minor Modification
CC-12B	4/26/95	Syro, Inc. / Trinity	ET2000 (NCHRP 230) Minor Modification
CC-12C	8/22/95	Syro, Inc. / Trinity	ET2000 Guardrail Extruder Terminal (350)
CC-12D	12/20/96	Syro, Inc. / Trinity	LET Guardrail Extruder Term (Alter. ET2000)
CC-12E	9/22/98	Syro, Inc. / Trinity	ET2000 Alternate Rail Element Length
CC-12F	9/02/99	Syro, Inc. / Trinity	ET2000 Breakaway Steel Post
CC-12G	1/18/00	Syro, Inc. / Trinity	ET2000 Plus Guardrail Extruder Terminal
CC-12H	2/18/00	Syro, Inc. / Trinity	ET2000 Test Level 2
CC-12I	4/10/00	Syro, Inc. / Trinity	ET2000 Alter. Ground Strut & Steel Post Use
CC-23	11/10/94	Interstate Steel Corp	BEST 230 Beam Eating Steel Terminal
CC-23A	8/22/95	Interstate Steel Corp	BEST (NCHRP 230) Minor Modification
CC-37	11/20/96	Interstate Steel Corp.	BEST 350 Beam Eating Steel Terminal
CC-37A	2/19/97	Interstate Steel Corp.	BEST Alternate Length CRT Posts
CC-37B	2/19/97	Interstate Steel Corp.	BEST Alternate Bearing Plate
CC-37C	4/01/97	Interstate Steel Corp.	BEST Various Options For Foundation Tubes
CC-40	4/02/97	Road Systems, Inc.	SKT 350 Sequential Kinking Terminal
N.A.	6/10/98	Road Systems, Inc.	SKT Foundation Tube & Blockout Options
CC-40A	2/04/00	Road Systems, Inc.	SKT Test Level 2
CC-46	4/02/98	Road Systems, Inc.	FLEAT 350 FLared Energy Absorb. Terminal
CC-46A	8/27/98	Road Systems, Inc.	FLEAT Variable Offset From 2'-6" - 4'-0"
CC-46B	5/21/99	Road Systems, Inc.	FLEAT Test Level 2
CC-61	8/27/99	Road Systems, Inc.	SKT & FLEAT Breakaway Steel Post

For additional information on the FHWA approval letters go to

[http://safety.fhwa.dot.gov/fourthlevel/pro\\_res\\_road\\_nchrp350.htm](http://safety.fhwa.dot.gov/fourthlevel/pro_res_road_nchrp350.htm)

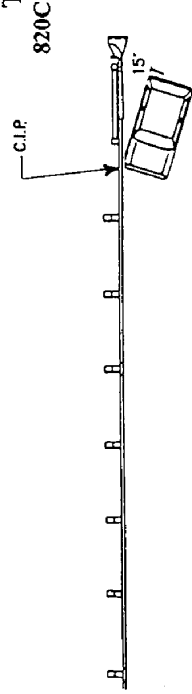


# NCHRP 350 TEST MATRIX END TERMINALS

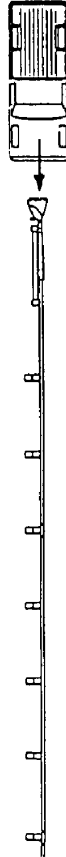
**TEST 3-30**  
820C / 100kph / 0 deg



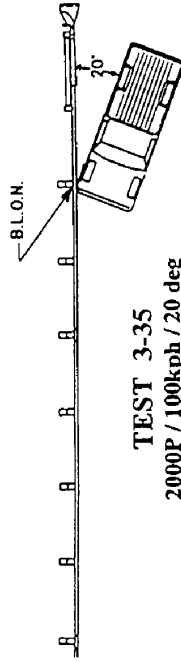
**TEST 3-34**  
820C / 100kph / 15 deg



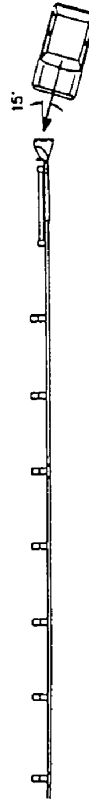
**TEST 3-31**  
2000P / 100kph / 0 deg



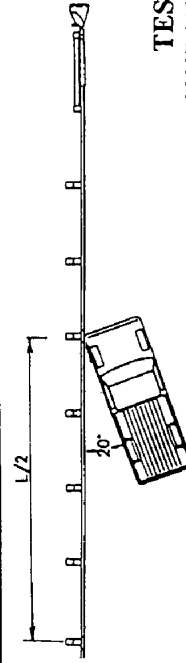
**TEST 3-35**  
2000P / 100kph / 20 deg



**TEST 3-32**  
820C / 100kph / 15 deg



**TEST 3-39**  
2000P / 100kph / 20 deg



**TEST 3-33**  
2000P / 100kph / 15 deg

