

# **Fleat 350™**

## **Flared Terminal End**



## **Product Manual**



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# Fleat™ 350 Flared Terminal End



## Features

- » Approved to NCHRP 350 TL-3
- » Flared energy absorbing terminal
- » Extrudes guardrail in end on impacts
- » Cost effective, life saving device
- » Variable offset of the Fleat™ 350 reduces need for costly site grading
- » High level of parts reusability
- » All components, apart from head, may be interchanged with SKT 350™
- » Length of need (LoN) starts at post 3
- » Impact head easy to remove from rail after impact

## Specifications

### NCHRP 350 TL-3

- » Speed: 100kph
- » Length: 11.4m (3 rails)
- » Offset: 760mm to 1220mm
- » Posts: 6 Breakaway (timber or steel)

### Common specifications

- » Run out – 22.5m x 6m
- » LoN – Post 3

### NCHRP 350 TL-2

- » Speed: 70kph
- » Length: 7.6m (2 rails)
- » Offset: 500mm to 820mm
- » Posts: 5 Breakaway (timber or steel)

### Common Specifications

- » Max Grade 10:1
- » Run out – 22.5m x 6.0m
- » All steel

More information on **Fleat™ Flared Terminal End** can be found at [www.cspacific.co.nz](http://www.cspacific.co.nz) or call **0800 655 200**

Leading road side and barrier systems supplier

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Columns



Multiplate



Retaining



Hire



Barriers



Traffic Control

## **Fleat™ 350** Flared Terminal End

### **Product Overview**



For end on impacts, the FLEAT™ 350 is energy absorbing and controls vehicles in a much more predictable manner than other parabolic end terminals.

The FLEAT™ 350 is the only flared, energy absorbing end terminal to meet NCHRP 350 test level 3. This ability to "flare" the terminal end reduces the length of rail required to provide the same protection of the hazard as compared to a tangent terminal.

In economic terms, the FLEAT™ 350 will cost less to supply, install and maintain.



## Product Features



- The straight flare improves redirection in traffic face impacts
- The variable offset of the FLEAT™ 350 reduces the need for costly site grading
- All components of the FLEAT™ 350, apart from the impact head, may be used interchangeably with the SKT™ 350 and FLEAT-MT systems also supplied by CSP Pacific
- High level of parts reusability after an impact
- Length of need starts at post 3
- Run out required is 22.5m x 6m

## Standards and Approvals

The NCHRP 350, test level 3, (100km/h) system is 11.4 m long with an offset between 760 mm to 1220 mm and uses 6 breakaway posts that may be wood or steel.

Also available, the NCHRP 350 test level 2, (70km/ph) system is 7.6 m long with an offset between 500mm to 820mm and uses 5 breakaway posts.

## Advantages



### Approved to NCHRP 350 TL-3

- Only flared energy absorbing terminal available
- Extrudes guardrail in end on impacts
- Cost effective, life saving device
- Variable offset of the **Fleat™ 350** reduces need for costly site grading
- High level of parts reusability
- All components, apart from head, may be interchanged with **SKT 350™**
- Length of need (LoN) starts at post 3
- Impact head easy to remove from rail after impact

## Technical Specifications



The NCHRP 350, test level 3 (100kph) system is 11.4 m long with an offset between 760 mm to 1220 mm and uses 6 breakaway posts that may be wood or steel.

Also available, the NCHRP 350 test level 2 (70kph) system is 7.6 m long with an offset between 500mm to 820mm and uses 5 breakaway posts.

## Frequently Asked Questions

**1. What is the post spacing for Fleat™ 350?**

Posts are at 1905mm centres

**2. How many posts are breakaway CRT?**

Posts numbered 1-7 are all CRT breakaway posts

**3. Does this system meet NCHRP 350 Test Level 3 test criteria?**

Yes and approved by Transit New Zealand

**4. Where does the length of need start from?**

Post number 3

**5. What is the total length of a TL3 system?**

From post number 1. Three lengths of rail, 11.43m long.

**6. Does this system need special guardrail?**

Yes, 1 length of special rail is used (sequential kinking rail).

**7. At what flare should the Fleat™ 350 be installed?**

The flare can be, between 760mm – 1220mm off the tangent over the 11.43m.

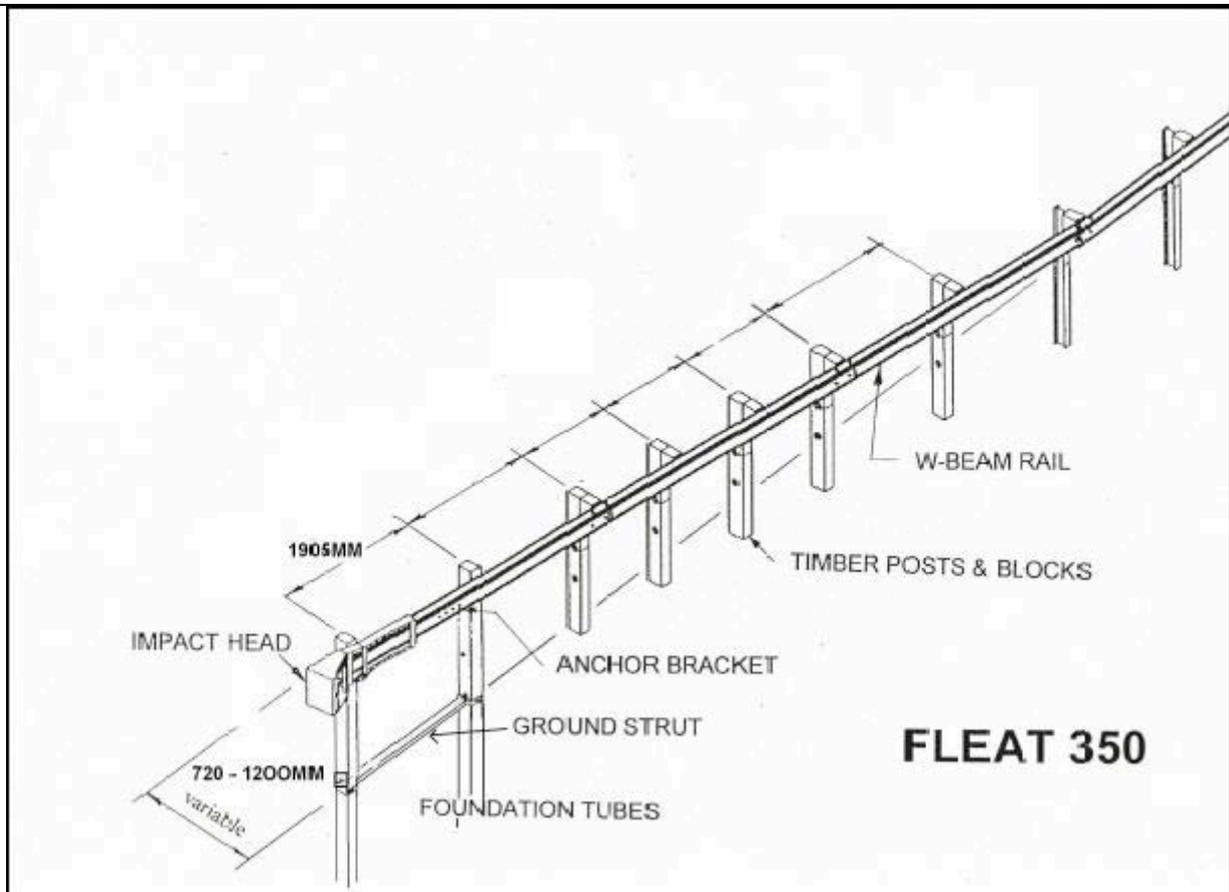
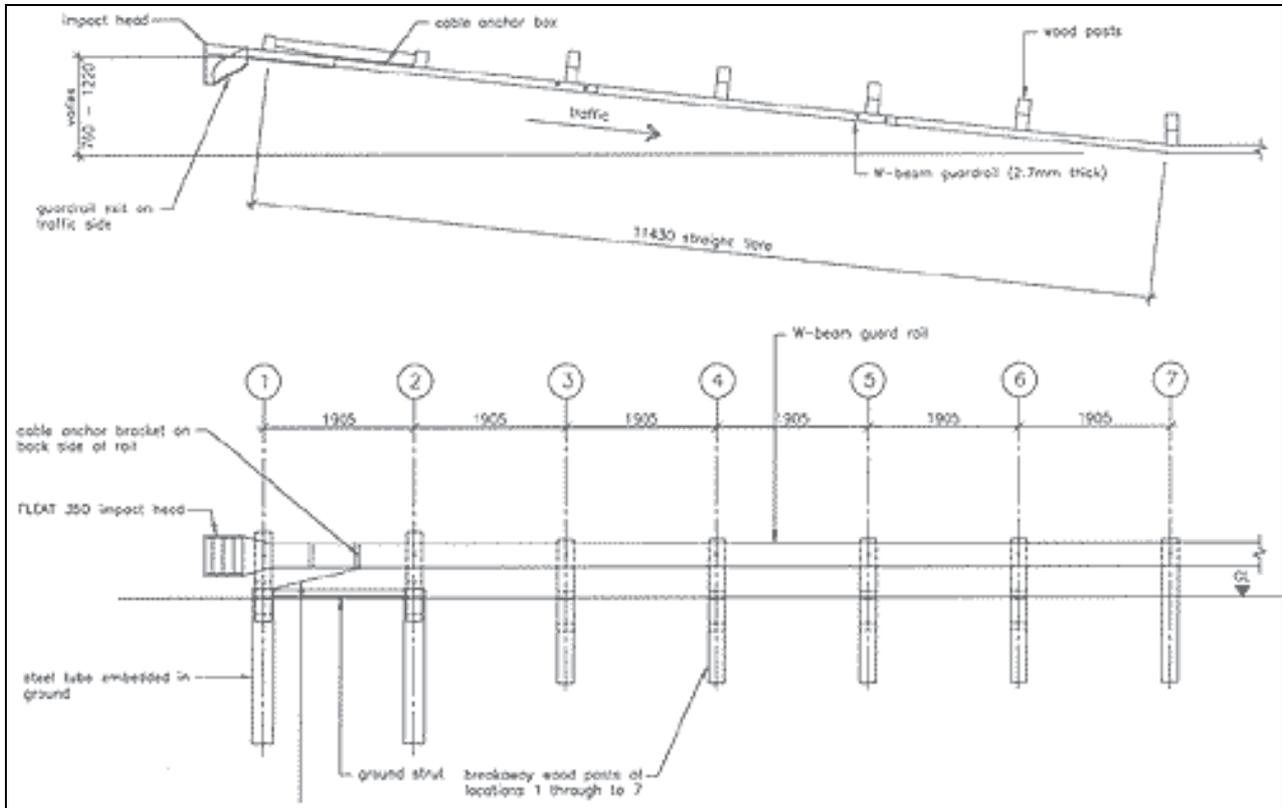
**8. Which side does the Fleat™ 350 extrude its rail out to when impacted?**

The rail will extrude towards the road in both a leading and trailing end installation.

**9. Would the extruded rail impose on the roadway in typical impact?**

The extruded rail should splay out on the road when installed on the correct flare as described by the manufacturer.

**FLEAT™** Plan & Elevation



## Summary



The FLEAT™ 350 combines the superior performance of the energy absorbing tangent terminals with the advantage of flared terminals in reducing impacts.

Combining interchangeable components, easy installation and maintenance the FLEAT™ 350 is a cost effective life saving device.

Contact CSP Pacific today for more information about the FLEAT™ 350 and other roadside safety products.

## Appendix A: Letters of Approval

March 8, 2005

Refer to: HSA-10/CC88

Mr. Kaddo Kothmann  
President  
Road Systems, Incorporated  
3616 Howard County Airport Road  
Big Spring, Texas 79720

Dear Mr. Kothmann:

On December 20, 2004, you requested Federal Highway Administration (FHWA) acceptance of modified versions of your original Sequential Kinking terminal (SKT), your reduced-length Sequential Kinking Terminal (SKT-LITE), and your Flared Energy Absorbing Terminal (FLEAT). The modifications were needed to match these terminals, which were originally tested as standard W-beam terminals, to the higher Midwest Guardrail System (MGS) which was formally accepted as an National Cooperative Highway Research Program (NCHRP) Report 350 test level 3 (TL-3) barrier on March 1, 2005 (acceptance letter B-133). To verify continued crashworthiness of the new designs, the Midwest Roadside Safety Facility (MWRSF) conducted the following four tests:

- Report 350 test 3-30 with the FLEAT-MGS terminal (Test FLEAT-8)
- Report 350 test 3-31 with the SKT-MGS terminal (Test SMG-1)
- Report 350 test 3-34 with the FLEAT-MGS terminal (Test FLEAT-6)
- Report 350 test 3-35 with the FLEAT-MGS terminal (Test FLEAT-5)

To match the MGS barrier design, similar modifications were made to the original SKT, SKT-LITE, and FLEAT designs. These were the following:

- The nominal height to the top of the rail increases from 700 mm (27-5/8 inches) to 787 mm (31 inches). For the anchor posts 1 and 2, the upright posts are increased to 804-mm (31.65 inches) and 842 mm (33.4 inches), respectively. The stub posts to which posts 1 and 2 are bolted are 1829-mm (72-inches) long and must be driven full-depth to provide adequate anchorage.
- All breakaway posts after posts 1 and 2 can be the same configuration as those originally tested, but are driven only 1019 mm (40 inches) deep to match the increased rail height noted above.
- The initial W-beam rail element is increased in length from 3.81 m (12.5 feet) to 4.79 m (15.625 feet) so all rail splices within the terminals fall at mid-span between adjacent posts as with the MGS barrier proper.
- Non-routed wood spacer blocks throughout the terminal are increased from 203 mm (8 inches) to 305 mm (12 inches), again to match the offset blocks used with the MGS barrier.

The NCHRP Report 350 requires up to seven crash tests to determine the adequacy of a traffic barrier terminal at TL-3. However, since the original designs for attachment to standard W-beam guardrail remain crashworthy, only those tests that are likely to be affected by the design changes noted above are considered necessary. You successfully completed test 3-31 (head-on into the SKT-MGS with the 2000-kg pickup truck) and test 3-35 (20-degree impact with the pickup truck at post 3 with a FLEAT terminal). Also with a FLEAT terminal, you conducted the small car head-on test and the Critical Impact Point (CIP) test. Summary sheets for each of these tests are shown in Enclosure 1 to this letter. English-unit drawings for steel-post versions of each of the tested applications are shown in Enclosure 2. I understand that corresponding drawings for wood-post designs are available from you upon request, as well as metric-unit drawings for each of the design configurations.

The modifications to the SKT and FLEAT terminals described above are acceptable and both terminals remain TL-3 designs that can be used on the National Highway System (NHS) when connected to the MGS barrier. While the barrier itself is non-proprietary, your terminals are proprietary and remain subject to the conditions stated in Title 23, Code of Federal Regulations, Section 635.411 when used on Federal-aid highway projects, except exempt, non-NHS projects.

Sincerely yours,

*/Original signed by/*

John R. Baxter, P.E.  
Director, Office of Safety Design  
Office of Safety

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