

## **Crash Cushion and End Treatment Selection Guide Device Summaries**

For more details about the individual devices, please click on their links.

### **Sand Barrel Arrays**

[CrashGard Sand Barrels](#): A non-redirective, gating sand barrel or crash cushion system designed to protect fixed objects whether permanent or temporary.

[Sand-Filled Plastic Barrels](#): A non-redirective crash cushion which can be used in gore, roadside, or median applications. The barrels are currently available under the trade names of Energite III and Fitch Barrel. This system is recommended for low frequency impact areas due to damage to the system when impacted. Sand barrels are commonly used for construction zone applications but occupy a significant amount of space (see chart). Because of the non-redirective quality of this system, care must be taken to minimize the likelihood of a vehicle striking the corner of the hazard. This system is easily damaged by maintenance activities. Staff Design has typical barrel details. Barrels may be set on a skid (4 in. high or less) to facilitate construction relocation.

[Big Sandy Sand-Filled Plastic Barrels](#): A non-redirecting crash cushion device at test level 3 (TL-3).

### **Barrier End Treatments**

[BRAKEMASTER 350](#): A bi-directional end treatment for Type 3 Guardrail in median or roadside locations. Several types of transition sections are available.

[FLEAT-350 \(Flared Energy Absorbing Terminal\)](#): The FLEAT-350 is a linearly flared W-beam terminal installed with offset between 2.5 and 4 feet. The FLEAT-350 has 8 posts and is currently one of CDOT's standards for flared terminals.

[SKT 350](#): The Sequential Kinking Terminal is an energy absorbing roadside barrier end treatment that dissipates vehicle energy by kinking and extruding guardrail as it is forced through the extruder terminal upon an end-on impact. Currently called for in M-606-1 as an acceptable nonflared terminal. This system allows for breakaway posts installed as CRT posts or foundation tubes with soil plates. It is designed to attach to W-beam, but can be used on rigid barrier with the proper transition section. It is particularly useful in limited embankment width locations.

[CAT](#): The Crash Cushion/Attenuating Terminal is bi-directional end treatment for Type 3 Guardrail in median or roadside locations. Several types of transition sections are available.

[Slotted Rail Terminal \(SRT-350\)](#): The SRT is a parabolic flared w-beam end treatment. The SRT has a series of slots that weaken the W beam guardrail. The parabolic 4' offset is identical to the 3E's in the superseded 1992 version of M-606-1. The SRT can be used as a retrofit to the BCT or older versions of the SRT. This is CDOT's current standard for flared end treatments. CDOT requires SRT's to be supplied with three rails, each 12 ft. – 6 in. in length.

[BEAT-SSCC](#) - For permanent or work zone roadside applications.

[FLEAT-MT](#) - The FLEAT-MT is a Median Terminal for use in wide medians. Attaches directly to median double-sided W-Beam rail. 37' 6" long for Test Level 3 design speed. Can be used with wood or steel breakaway posts.

[QUADTREND 350](#): Part impact attenuator and part terminal. This device was designed to function both as an end terminal and a transition element to a rigid barrier. The Quadtrend may offer a cost effective solution where a short crashworthy end is needed on a rigid rail (e.g. bridge rail termination where approach road limits transition and terminal use).

[REACT 350](#): The React 350 is a bi-directional redirective crash cushion/end treatment for hazards likely to be struck head-on. Its narrow width allows it to be utilized for narrow site hazards or a concrete barrier end treatment. The resilient polyethylene cylinders used in the React minimize repair after impacts. The complete item should include an anchoring pad and transition. The supplier should provide the transition hardware and proper backup device for attachment to obstacle. Currently allowed for permanent use by CDOT.

[QUADGUARD](#): The QUADGUARD is a bi-directional redirective crash cushion/end treatment for hazards likely to be struck head-on. Its narrow width allows it to be utilized for narrow site hazards or a concrete barrier end treatment. The replaceable cartridges allow the unit to be operational quickly after impact. The complete item should include an anchoring pad. The supplier should provide the transition hardware and proper backup device for attachment to obstacle.

## [QUADGUARD II](#)

QUADGUARD–WIDE: Bi-directional Quadguard that tapers from 2 feet to 60 inches or 90 inches for shielding wide hazards.

[QUADGUARD Elite](#): Available in Low Maintenance Cartridge (LMC) Systems for the 3'-wide and the 60" and 90" tapered sizes. The LMC replaces the crushable cartridge with a resilient elastometric cartridge. The Quadguard Elite is a low maintenance system that uses more economical HDPE cartridges. All Quadguard types are acceptable for permanent installation on CDOT highways.

[SCI 100 GM](#): A speed dependent Crash Cushion System that can vary stopping force according to speed and weight of the impact.

## **Impact Attenuators** (Construction Zone Only)

**QUEST SYSTEM** - The QUEST System is a simple redirective, non-gating crash cushion.

**N.E.A.T. System**: A portable crash cushion for unidirectional shielding in temporary work zones.

### **TRITON CET**

**QUADGUARD (CZ) (Construction Zone)**: Is available for temporary construction uses and can be re-used in a permanent installation or may be rented during construction. Anchoring pad should be constructed and supplier should include proper transition and backup device for attachment to obstacle.

### **ACZ - 350**

**ADIEM**: The Advanced Dynamic Impact Extension Module is a bi-directional, gating end treatment/crash cushion for concrete barrier. The unit is installed on top of paved surfaces. The replaceable cartridges allow the unit to be operational quickly after impact. Designer should ensure that the manufacturer can provide proper transition/connection to the barrier type being shielded. The Adiem is currently allowed by CDOT only in temporary construction zone areas.

**TRACC**: The Trinity Attenuating Crash Cushion is a bi-directional redirective crash cushion/end treatment for hazards likely to be struck head-on. Its narrow width allows it to be utilized for narrow site hazards or a concrete barrier end treatment. The complete item should include an anchoring pad. The supplier should provide the transition hardware and proper backup device for attachment to obstacle. The TRACC is currently allowed by CDOT only in construction zone areas.

**FASTRACC**: Another Tracc device that is a narrow Test Level 3 crash cushion with additional capacity for head-on impacts up to 70 mph.

**SHORTRACC**: Same as the TRACC but 8 feet shorter.

### **WIDETRACC**

**ABSORB 350**: This is a non-redirective gating, water-filled Crash Cushion System. It is available for design speeds ranging from 31 mph to 75 mph. It can be attached to the exposed ends of a portable or permanent concrete barrier without being anchored to the roadway surface. For temporary use only.

**TAU-II**: This is a fully redirective and non-gating Crash Cushion System for hazard widths up 8.5 feet wide, and for speeds from 30 mph to 62 mph.

## **Cable Barrier**

**Brifen Wire Rope Safety Fence**: is a cable barrier system with a NCHRP 350 crash test post spacing of 10.5 foot.

**SAFENCE**: is a NCHRP 350 TL-3 and TL-4 approved tensioned wire rope cable barrier system from Gregory Industries. SAFENCE provides controlled impact protection when used as a center roadway barrier, side barrier or slope barrier.

**Gibraltar cbs**: The Gibraltar TL-3 and TL-4 Cable Barrier Systems consist of a 3-strand or 4-strand high tension median cable barrier designed to contain and redirect errant vehicles from hazards.

**Trinity CASS**: is a cable barrier system with a NCHRP 350 crash test post spacing 6.5 to 20 foot.

## **Temporary Barrier**

**ARMOR GUARD STEEL BARRIER**: Designed for short term, short duration work zones where access points for vehicles and equipment are needed. Links (28 FT. long) are raised and lowered by using a hand crank or optional compressed air. The system has been fully tested in accordance with the evaluation parameters in NCHRP Report 350, Test Level 2 and 3.

**ZONEGUARD STEEL BARRIER**: An energy absorbing permanent and temporary steel barrier. The barrier can be installed within hours of call out, laying up to 1000 ft an hour.

**VULCUN STEEL BARRIER**: A portable steel longitudinal barrier that uses a vertical steel pivot pin to interlink each module allowing the system to follow curves of up to six degrees per four meter segment.

## **J-J HOOKS CONCRETE BARRIER**

**TRITON WATER-FILLED BARRIER**: The Triton Barrier is a portable, water-filled barrier. It consists of a number of interlocking, 6.5 ft. barrier sections made of polyethylene plastic and an internal steel framework. It exceeds NCHRP TL-2, 45 m.p.h., and can be considered for 62 m.p.h. applications at angles up to 15 degrees for passenger vehicles and lightweight pickup trucks.

**YODOCK BARRIER 2001**: A recyclable, portable energy disbursement cell intended to assist in the prevention of vehicular penetration of a work zone or gore area, street and road closures, as well as providing clear delineation for traffic channelization and pedestrian safety.

**YODOCK BARRIER 2001M**: A recyclable, portable energy disbursement cell intended to assist in the prevention of vehicular penetration of a work zone or gore area, street and road closures, as well as providing clear delineation for traffic channelization and pedestrian safety. Smaller than the YODOCK Barrier 2001.

SB-1-TL: For use in work zones and approved the FHWA.

## **Barrier Gate**

[ARMOR GUARD GATE](#): ArmorGuard Gate is a heavily reinforced steel barrier that is designed for emergency openings. It is ideally suited for permanent and stationary work zone barriers where emergency vehicles, maintenance crews and emergency evacuation access may be needed and positive barrier protection is required. The system can be quickly and easily opened or closed without expensive electrical power, supplies, or sophisticated control systems. Links are raised and lowered by using either compressed air or a manual jacking system. Positive security can also be provided. The system has been fully tested and approved in accordance with the evaluation parameters in NCHRP Report 350, Test Level 3 (100km/h).

[VULCAN GATE](#): Portable steel longitudinal barrier.

## **Miscellaneous**

[DRAGNET](#): The DRAGNET is crash cushion that uses wire mesh and supports to trap and special arrestor assemblies to gradually stop impacting vehicles. The DRAGNET may be useful during construction to close roadways and protect work zones. It may also offer a means to shield median traps created at grade separations. The anchor assemblies for the device must be treated as a vehicle obstacle and be shielded. Future use may include run away truck containment.

## **Truck Mounted Attenuators**

[ALPHA 70K TMA](#): This is a truck-mounted attenuator for use during construction or maintenance to 45 mph.

[SCORPION 70K TMA](#): This is a redirective, truck-mounted attenuator for use during construction or maintenance to 45

[ALPHA 70K TMA](#): This is a truck-mounted attenuator for use during construction or maintenance to 62 mph.

[SAFE - STOP TMA](#): This is a redirective, truck-mounted attenuator for use during construction or maintenance to 62 mph.

[SAFE - STOP 180 TMA](#): This is a redirective, bi-folding truck-mounted attenuator for use during construction or maintenance to 62 mph.

[SAFE-STOP Trailer TMA](#)

[VORTEQ TL3 Trailer TMA](#)

[CONNECTICUT TMA](#): This is a truck-mounted attenuator for use during construction or maintenance.

[VANDERBILT TMA](#): This is a truck-mounted attenuator for use during construction or maintenance to 62 mph.

[MPS-350 III](#): This is a truck-mounted attenuator for use during construction or maintenance to 62 mph.

[REN-GUARD 815 TMA](#): This a truck-mounted attenuator for use during construction or maintenance to 62 mph.

[U - MAD 100K TMA](#): This is a redirective, bi-folding truck-mounted attenuator for use during construction or maintenance to 62 mph.

If you have any comments or questions, please contact the Standards & Specifications Unit, at (303)-757-9021.