TRINITY HIGHWAY PRODUCTS

NEWS
1st Crash Cushion
CE
Certificate 0402-CPD-495801

EuroTRACC

www.highwayguardrail.com

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About EuroTRACC and the Family of TRACC Products

The EuroTRACC (Trinity Attenuating Crash Cushion) is a redirective, non-gating, bi-directional, energy absorbing crash cushion designed to protect motorists from impacting the unprotected ends of concrete barriers, bridge parapet rails, bridge piers and other hazards in both permanent and temporary work zone locations. The EuroTRACC is developed from the original TRACC which has been accepted by the United States Department of Transportation´s Federal Highway Administration (FHWA) for use on the National Highway System regardless of design or posted speed. EuroTRACC is approved in most of the EC countries.

The TRACC Family

The TRACC System is available in three design speed options and two versions, National Highway Research Program (NCHRP) Report 350 (USA) and European Norm (EN) 1317 (Europe).

NCHRP 350 (US)

The compact Test Level 2 SHORTRACC is an economical solution for applications where design speed is 70 km/h or lower.

The standard Test Level 3 TRACC is available for all speeds above 70 km/h.

The Test Level 3 FASTRACC was specifically designed and is available for roadways with speed limits of
110 km/h and higher. Although testing guideline contained in (NCHRP) Report 350 do not include impact speeds over 100 km/h, Trinity has developed and successfully crash-tested the FASTRACC with a 2000 kg pickup truck at 112 km/h. FHWA has accepted the FASTRACC not only as a Test Level 3 crash cushions, but also one which has demonstrated additional capacity for head-on crashes with the 2000 kg pickup truck at higher speeds than recognized by NCHRP Report 350.

EN 1317 (Europe)

The EuroTRACC, a slightly modified version of the TRACC, has been successfully tested to EN 1317-1,3 in Class 80 and110. EuroTRACC 80/110 can be delivered as a parallel version with a width of 610 mm (effective inside width) or as a wide version with an effective inside back-up width of up to 1 800 mm. EuroTRACC 80/110 in parallel versions meets Severity Index A for all tests. EuroTRACC Family hold´s a CE Certificate (0402-CPD-49 58 01) in accordance to EN 1317-5.

Why specify TRACC

The TRACC System is a very low maintenance roadside safety feature. Except for repairs due to impact, there is virtually no maintenance required for the system. It is recommended that an annual drive-by inspection be performed to ensure that no minor impacts went undetected and that debris has not accumulated around the system.

Product Overview EuroTRACC

Dimensions

	Length	Width (inner to inner)	Height
EuroTRACC 80	5 000 mm	610 mm	815 mm
EuroTRACC 80 Wide	5 000 mm	≤1 800 mm	815 mm
EuroTRACC 110	7 950 mm	610 mm	815 mm
EuroTRACC 110 Wide	7 950 mm	≤1 800 mm	815 mm

Energy Absorbing Technic

The TRACC system includes six major components: Sled, Frames, Base, Rip Plates, Cutting Blades and Panels. During an end-on impact, the impacting vehicle pushes the Sled along the Base. The Base is constructed by two beams and anchored into foundation. Each beam is assembled from two U-profiles connected through by Rip Plates. The Sled of the crash cushion is equipped with Shredder Bolts at the Base. As the Sled moves along the Base, during an end-on impact, it sequentially contacts the Frames and pushes them forward, causing the Panels to telescope. Energy is absorbed through the Shredder Bolts sliding along the Base and cutting the thin Rip Plates which vary in thickness along the length of the Base. All parts involved in the energy-absorbing process are made of hot-dip galvanized steel.

All components and material of the system are suitable for use in different climate conditions and are not susceptible to damage or deterioration in various temperatures or by exposure to direct sunlight.

Throughout the TRACC system length, an angled impact into the steel Side Panels of the TRACC
system causes the Side Panels, Frames and Base to interact and redirect the vehicle in the same manner as a longitudinal safety barrier, thereby qualifying the TRACC system as a redirectional, non-gating crash cushion.

Test Result

The EuroTRACC 80/110 in parallel versions successfully passed all tests with an ASI of ≤ 1,0 (Class A) in accordance to EN 1317-1,3.

EN 1317-3 states on page 8, §5.4, Impact Severity:

“Impact severity level A affords a greater level of safety for the occupants of an errant vehicle than level B and is preferred.”

The Impact Severity A Classification, combined with the ease of repair, high re-usability, designates EuroTRACC as the best choice of crash cushions and a **State-of-the-art product** from all perspectives.

Full Scale Crash Tests

The TRACC-family has been subjected to a very comprehensive test program. It is impossible to report all figures and information in a document like this. Following is a short review of some of the test results. There are some differences in configuration of the tested systems due to when and to which standard/level the test was conducted.

Test	Level	Speed	Mass	Angle	
EuroTRACC 110					
TC 1.3.110	110	110 km/h	1 500 kg	0	(head-on-centre)
TC 4.3.110	110	110 km/h	1 500 kg	15	(side impact)
TC 5.3.110	110	110 km/h	1 500 kg	165	(reversed side impact)
TC 3.3.110	110	110 km/h	1 500 kg	15	(on the nose)
TC 1.1.100	110	100 km/h	900 kg	0	(head-on-centre)
TC 2.1.100	110	100 km/h	900 kg	0	(nose ¼ offset)
EuroTRACC 110 Wide					
TC 1.1.100	110	100 km/h	900 kg	0	(head-on-centre)
TC 4.3.110	110	110 km/h	1 500 kg	15	(side impact)
EuroTRACC 80					
TC 1.2.80	80	80 km/h	1 300 kg	0	(head-on-centre)
EuroTRACC 80 Wide					
TC 4.2.80	80	80 km/h	1 300 kg	15	(side impact)

The system has been tested to EN 1317-1, 3. In all above-mentioned tests, EuroTRACC has passed by meeting or exceeding the testing criteria.

For more detailed information regarding test values please contact Trinity. Trinity can submit both videos and high-speed films from the tests if required. TRACC-Family can be designed for speeds from 50-130 km/h and for vehicles from 800-2,050 kg.

Typical Crash Sequence

Crash Test No. 50518-1 (TC 3.3.110) at VTI, Sweden.








Photos of Installation

Photos after Impact

EuroTRACC
System Manual

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CUSTOMER SERVICE

Trinity Industries, Inc. is committed to the highest level of customer service. Comments regarding the quality and workmanship of our products, their installation procedures, supporting documentation, and roadside performance are welcome. Our goal is to enhance highway safety through continuous improvement and innovation. More information can be obtained in the following ways:

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EuroTRACC DESIGN INFORMATION

General Information

Product Overview

The EuroTRACC (European Trinity Attenuating Crash Cushion) meets EN1317-1, 3. All TRACC crash cushions are fully redirective, non-gating, bidirectional, energy absorbing crash cushions designed to protect motorists from impacting the end of concrete barriers and bridge parapet rail, bridge piers and other hazards in both permanent and temporary work zone locations.

Maintenance Overview

The EuroTRACC is designed to be a very low maintenance roadside safety feature. Except for repairs due to impact, there is virtually no maintenance required for the system. It is recommended that an annual drive-by inspection be performed to ensure that no minor impacts went undetected and that debris has not accumulated around the system.

Crash Performance

EuroTRACC meets EN-1317-1, 3. The EuroTRACC will redirect vehicles that impact along its side at angles up to 15° with the axis of the system as specified in EN 1317-1,3. The EuroTRACC will also stop vehicles that impact the ends of the systems at angles up to 15° as specified in EN 1317-1,3. Testing was performed at speeds up to 110 km/hr making the EuroTRACC an appropriate choice for **ALL** design speeds or posted speed limits.

The EuroTRACC 80 and 110 successfully passed all tests in their respectively Class (80 and 110 km/h) in accordance with EN 1317-1,3. EuroTRACC 80 and110 (parallel) has passed by meeting or exceeding the testing criteria as well as:

An Impact Severity Level of Class A in <u>all</u> tests meaning an ASI of <u>≤</u> 1,0.

Low-Risk Repair Options

EuroTRACC is designed for field repair or rapid replacement of the entire unit.

The energy absorbing segments of the EuroTRACC system Base can be replaced in stages depending on the extent of the impact. Because EuroTRACC systems are delivered fully assembled, it is extremely practical to replace the entire damaged system on the roadside and then perform the necessary repairs safely and accurately in the maintenance shop away from traffic dangers. Many of the EuroTRACC system´s components remain undamaged after most impacts, making refurbishment simple and economical.

NOTE: EuroTRACC CRASH CUSHION ARE **NOT** DISPOSABLE. COMPLETE REPLACEMENT ON THE ROADSIDE AFTER AN IMPACT IS A CONVENIENT - BUT NOT REQUIRED - WAY TO PROTECT WORKERS BY LIMITING EXPOSURE TO TRAFFIC. UP TO 98% OF A EuroTRACC SYSTEM IS REUSABLE AFTER DESIGN IMPACTS REGARDLESS OF WHETHER THE REPAIR IS PERFORMED IN THE FIELD OR IN THE SAFETY OF THE MAINTENANCE YARD.

Location Requirements

Unidirectional Application

Installation of a EuroTRACC System and its transitions depends on the traffic pattern and the backup structure at the particular location. Unidirectional traffic (one side or both) requires no transition. See Figures 1 and 2. The backup frame can be attached to any solid structure including a square cast-in-place concrete pillar, a vertical concrete wall, or the end of a New Jersey-style barrier. The backup frame provides a hole pattern that may require adaptation to the backup structure. For “free-standing” installations 2 std guardrail posts should be driven and attached to the back-up frame. Trinity can provide an adaptor to allow direct attachment of the backup frame to a variety of concrete barrier profiles. Call Technical Service at +1 330 545 4373 or your local Trinity representative with questions regarding this and other types of installation.

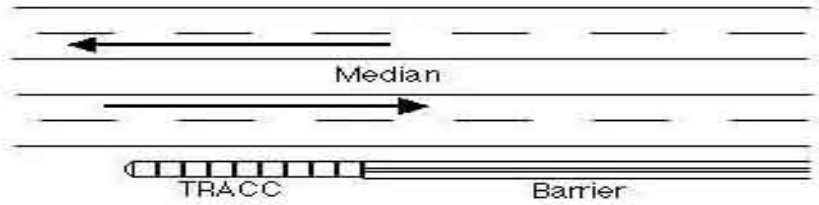

Figure 1. Unidirectional Traffic Flow - One Side - Requires No Transition.

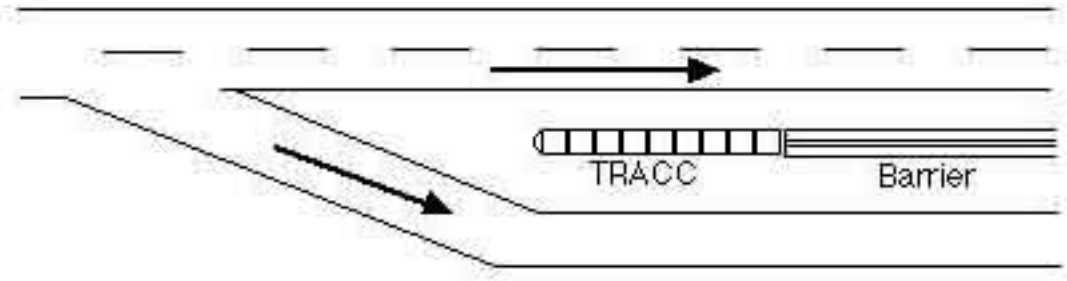

Figure 2. Unidirectional Traffic Flow - Both Sides - Requires No Transition.

Bidirectional Application

For installations that face oncoming traffic from the reverse direction (see figure 3), appropriate transitions should be installed on the end of the backup structure.

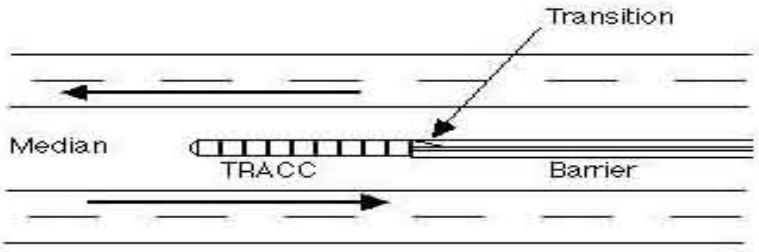

Figure 3. Bidirectional Traffic Flow - Requires Transition on One Side.

Approach Zone and Clear Zone

The EuroTRACC System should not be placed directly behind a raised curb. The approach area in front of the system in the direction of traffic flow should slope at a rate no different than than 10:1 from the surrounding area. The cross slope should differ from the surrounding area by no more than 12:1. The clear zone behind the EuroTRACC should be consistent with the area behind the downstream Length-of-Need of the barrier.

Downstream Zone

The TRACC should be installed so that a 1 000 mm clear space will exist on both sides of the backup structure for the side panels to retract during an end-on impact (see figure 4).

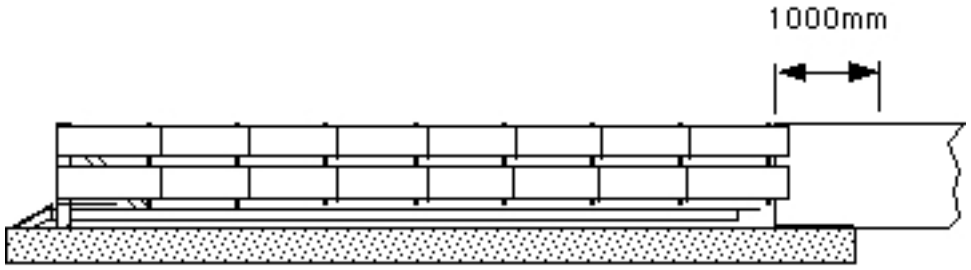

Figure 4. Clear Space for Panel Retraction

Installation Options

Foundations

During an impact, the stopping force provided by a EuroTRACC System is **NOT** transferred to the backup structure beyond the cushion. All the stopping loads pass to the foundation **BELOW** the system through the anchor bolts that attach the system to the foundation.

EuroTRACC Systems can be anchored to combinations of asphalt, concrete, and compacted subbase as shown in Table 1 below.

Table 1. Foundation Options

150 mm Reinforced Concrete

200 mm Unreinforced Concrete

75 mm Asphalt over 75 mm Minimum Concrete

150 mm Asphalt over 150 mm Compact Subbase

200 mm Minimum Asphalt

Backup Support and Transition Options

The EuroTRACC with its sliding Side Panels can be attached or transitioned to an appropriate backup structure capable of supporting the last Frame. For “free-standing” installations 2 standard guardrail posts should be driven and attached to the back-up frame. Drawings showing attachment and transition to downstream structures can be obtained from your local Trinity representative.

Nose Delineation Options

The EuroTRACC is intended for use on either shoulder or in the median in both unidirectional and bidirectional traffic situations. To provide the greatest level of safety, the delineation of the plastic nose section can be customized for any particular location. Reflective tape is provided with the EuroTRACC and can be used to delineate left shoulder, right shoulder, and gore applications. **Note**: Consult local transportation authorities for delineation requirements.

EuroTRACC

INSTALLATION GUIDELINES

Trinity Industries, Inc.
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E-mail: TRACC.info@trin.net
Internet: www.highwayguardrail.com

Drawings and Bills of Material

Drawings and bills of material for EuroTRACC System options are available by contacting your Trinity Industries Representative.

Recommended Tools and Equipment

1. Forklift or Crane (2 000 kg capacity)
2. Lifting Slings or Chains
3. Air hammer/drill and appropriate power source
4. Rock drill bit 18x400 mm with 750 mm extender
5. Socket and Ratchet Set or Flat Wrenches - 10 to 32 mm
6. Traffic control equipment
7. Gloves, safety goggles, and back protection for lifting
8. Dispensing Gun and Mixing Tubes for Hilti HY-150 Adhesive

NOTE: HILTI anchors supplied with EuroTRACC systems require 18 mm holes for installation. Dispensing gun and mixing tubes for HY-150 adhesive are available from Trinity Industries or directly from Hilti, Inc.

Safety Instructions

Always use appropriate safety precautions when operating power equipment, mixing chemicals, and moving heavy equipment. Gloves, safety goggles and back protection should be used.

Safety measures incorporating appropriate traffic control devices should also be used to protect personnel while at the installation site. Trinity offers an economical and effective truck mounted attenuator, the MPS-350, for the protection of workers in work zones. For more information on the MPS-350 call +1 214 589 8140 or visit with your local Trinity representative.

Installation of System

To facilitate accurate communication regarding the parts of the EuroTRACC, Figure 6 shows the system with Side Panels removed and major parts labeled.

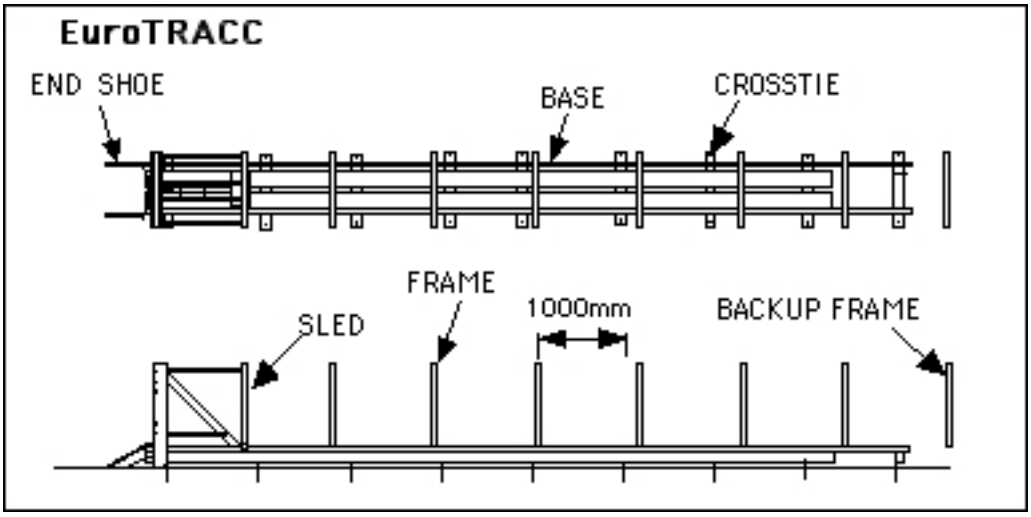

Figure 6. Major Components of the EuroTRACC. (The Side Panels have been removed from the outside of the system for clarity.)

Lifting the System

EuroTRACC Systems can be lifted as complete units by threading lifting chains or slings directly through the tops of the frames. Someone should maintain control of the system by guiding the end as it is lifted and moved. Care should be taken to ensure that the system can be handled safely prior to moving.

Anchoring the System

EuroTRACC Systems can be installed on combinations of asphalt and concrete. Table 2 shows the types of foundations that can be used and the anchoring studs that are required. In general, concrete installation can be performed using 180 mm anchor studs while asphalt installation requires 460 mm anchor studs. Holes should be drilled 40 mm less than the overall length of the anchor stud to ensure proper embedment.

EuroTRACC Systems can be placed directly onto the foundation as a complete unit. The system should be aligned within 1° of the downstream barrier according to the approach and downstream zone requirements set forth in the section entitled, “Location Requirements”. Holes for the anchor studs can be drilled into the foundation using the system as a template. Because of the open design of the EuroTRACC systems, it is not necessary to disassemble any portion of the system in order to drill the anchoring holes.

After the holes are drilled, the adhesive system can be dispensed into the hole and then the anchor stud should be suspended by its nut and washer through the crosstie. Figure 7 shows how the anchor stud should pass through the crosstie suspended by its nut and washer. The stud should hang in the uncured adhesive with no threads showing above the nut. Final tightening of the anchor nuts should be done after the adhesive has properly cured. Performance of the EuroTRACC is not sensitive to the torque of the nuts. However, it is important that all anchor nuts are tightened enough to flatten the lock washers. (See adhesive manufacturer´s instructions for cure times under various environmental conditions.)

Table 3. Anchor Stud Selection Table

Foundation	Anchor Stud Size
150 mm Reinforced Concrete	16 mm d x 180 mm long
200 mm Unreinforced Concrete	16 mm d x 180 mm long
75 mm Minimum Asphalt over 75 mm Min.Concrete	16 mm d x 460 mm long
150 mm Asphalt over 150 mm Compact Subbase	16 mm d x 460 mm long
200 mm Minimum Asphalt	16 mm d x 460 mm long

NOTE: If asphalt is located over a minimum of 150 mm of concrete, the 460 mm anchor studs can be cut off to a total length equal to the asphalt thickness plus 190 mm.

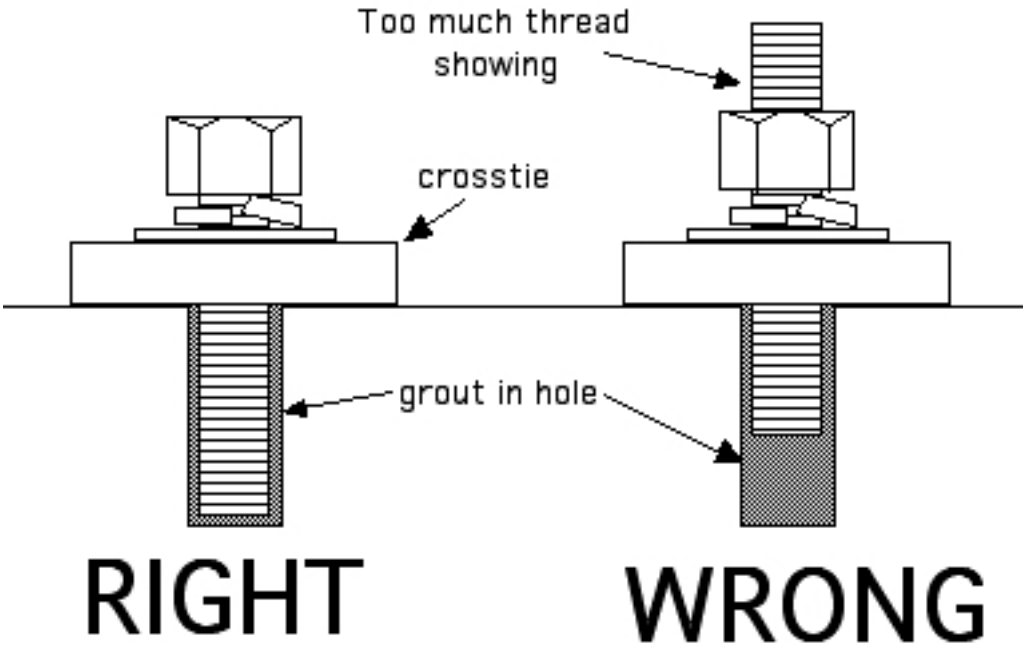

Figure 7. Suspending the Anchor Studs in the Uncured Adhesive.

Attaching Backups and Transitions

The last support frame on a EuroTRACC System must be attached to an appropriate backup structure in order to support the Side Panels and any required transition panels. While no direct stopping forces are transmitted into the backup support structure, its presence is important for possible redirecting impacts. For “free-standing” installations 2 standard guardrail posts should be driven and attached to the back-up frame. For more information about specific installation options including installation drawings contact your local Trinity representative.

Attaching Plastic Nose and Delineator

The EuroTRACC System is intended for use on either shoulder or in the median in both uni-directional and bi-directional traffic situations. To provide the greatest level of safety, the delineation of the plastic nose section can be customized for any particular location. Reflective sheeting is provided with each EuroTRACC System and can be used to delineate left shoulder, right shoulder, and gore applications. The plastic nose should be attached to the front of the EuroTRACC System using the side panel attachment hardware already located on the system.

NOTE: Consult local transportation authorities for delineation requirements.

EuroTRACC REPAIR AFTER IMPACT

Low-Risk Repair Options

EuroTRACC systems are designed for field repair or rapid replacement of the entire unit.

The energy absorbing segments of the EuroTRACC system Base can be replaced in stages depending on the extent of the impact. Because EuroTRACC systems are delivered fully assembled, it is extremely practical to replace the entire damaged system on the roadside and then perform the necessary repairs safely and accurately in the maintenance shop away from traffic dangers. Many of a EuroTRACC systems components remain un-damaged after most impacts making refurbishment simple and economical.

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Types of Damage

EuroTRACC Systems are designed to withstand end-on impacts and redirecting side impacts. Side impacts, depending on the severity, may only cause cosmetic damage to the system. Any system that has been impacted along its side should be examined to make sure that the damage is only cosmetic and that any damage that might hinder subsequent function of the system is repaired.

During some severe high-speed redirecting impacts with heavy vehicles, a EuroTRACC System may become permanently twisted. If the deformation of the Base causes a portion of one side of the system to be raised more than one 30 mm when compared to the other side of the system, then the damaged portion of the Base should be replaced.

Field Repair

The EuroTRACC Crash Cushion is specifically designed for rapid field repair. Removal and replacement of the system remains a valid option for those who prefer to work on the system away from the roadside.

EuroTRACC Systems can be repaired in the field by replacing the parts that have been damaged. The first step for repair will be to disconnect the Sled and its attached Side Panels from the remainder of the system and pull them back to their original upstream location. To facilitate this it may be necessary to release the Shredder Bolts from the sled and to partially remove the Straps that brace the lower part of the Sled. Don´t forget to replace the Shredder Bolts and reattach the Straps once the Sled is relocated to its original position.

After the sled is relocated, the damaged rip plates can be replaced by removing the three bolts that hold down each rip plate doubler. Please refer to the assembly drawings to ensure that the new rip plates are properly located.

The Side Panels and Frames can now be redistributed along the length of the system. It may be necessary to loosen some of the Side Panel attachment hardware in order to facilitate respacing. The reassembled Sled and its Side Panels can be reattached to the remainder of the system and all the hardware tightened to complete the repair job.

The EuroTRACC system is now ready to help save another life.

Removal / Replacement of System

The EuroTRACC can be removed from its foundation by releasing the Anchor Nuts that hold down the Crossties. Flat wrenches may be required to access the Anchor Studs under the displaced Frames and Sled. Once released, the system can be lifted as a unit and transported back to a maintenance facility for repair. A new or reconditioned EuroTRACC can be positioned on the existing Anchor Studs and firmly attached using the appropriate Nuts and Washers.

In some impacts, a small number of Anchor Studs may become bent or fractured. In these cases it will be necessary to remove the old Anchor Stud, drill out the adhesive in the old hole, and replace the removed Anchor Stud with a new Anchor Stud and adhesive.

Repair at Maintenance Facility

In general, the procedure for repairing a EuroTRACC at a Maintenance Facility will be the same as a field repair. Should you encounter technical difficulties, help is available by calling your local Trinity Industries Representative.

The first step for repair will be to disconnect the sled and its attached side panels from the remainder of the system and pull them back to their original upstream location. To facilitate this it may be necessary to release the shredder plates from the sled and to partially remove the straps that brace the lower part of the sled. Don´t forget to replace the shredder plates and reattach the straps once the sled is relocated to its original position.

After the sled is relocated, the damaged rip plates can be replaced by removing the three bolts that hold down each rip plate doubler. Please refer to the assembly drawings to ensure that the new rip plates are properly located.

The side panels and frames can now be redistributed along the length of the system. It may be necessary to loosen some of the panel attachment hardware in order to facilitate respacing. The reassembled sled and its side panels can be reattached to the remainder of the system and all the hardware tightened to complete the repair job.

The EuroTRACC system is now ready to be redeployed on the roadside to save another life.

Annex 1

Drawings

Annex 2

In-service Evaluation
of
TRACC (NCHRP 350 Version)

EuroTRACC is a modified version
meeting the requirements of EN 1317-1,3

Field Performance of the TRACC

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January 11, 2000

The Trinity Attenuating Crash Cushion (TRACC), a product of Trinity Industries, Inc., has been on the market since January of 1999. Since its introduction to the market-place, approximately 200 units have been sold to contractors, rental companies, and departments of transportation for installation in permanent and temporary locations. Seventeen units are known to have sustained reportable damage due to impact from errant vehicles during the first year of availability. This report summarizes the steps taken and the costs incurred in repairing the TRACC system after these impacts.

A TRACC installed in a Toronto, Canada Construction Zone

The TRACC is delivered to customers completely assembled and can be installed on an acceptable pad location (see TRACC installation manual for details) in less than one hour. Replacement of a damaged system with a fully functional standby unit can be accomplished in about 30 minutes. Repair of the system through the replacement of damaged components can then be done safely and accurately in a maintenance facility away from the dangers of traffic. For minor impacts involving very little part replacement, repair can be accomplished on the roadside without removing the damaged unit. The decision to repair or replace in the field is left to the maintenance crew and should be based on the best interest of the repair crew and the driving public.

Of the seventeen impacts that have occurred, five can be considered major because the damage sustained by the system indicates an impact speed in excess of 50 miles per hour (80 km/h). The remaining twelve impacts ranged from very minor bumps to significant head-on impacts at speeds lower speeds. No deaths have occurred and no significant injuries have been attributed to the seventeen impacts with the TRACC system to date.

The first major TRACC impact occurred in Toronto, Canada, in a temporary construction zone. The TRACC was anchored to the existing roadway and attached to a temporary concrete barrier. A Dodge Neon drifted off the road and impacted the system head-on almost perfectly centered at a speed estimated to be 60 miles per hour (100 km/h). The driver got out of the car and walked away from the accident with no significant injuries. The photos below show the damaged Dodge Neon and the damaged TRACC.

Damaged Dodge Neon

Damaged TRACC Prior to Replacement

The contractor was called to replace the system within hours of the impact. He transported a new TRACC to the scene on the back of a flatbed boom truck, replaced the damaged unit, and then transported the damaged unit back to his repair facility for repair at a later date. The parts to repair the system cost approximately 900 USD and the repair was accomplished by two men in about four hours. The photo below shows the replacement in progress.

TRACC Replacement in Progress

In all but one of the seventeen cases, the TRACC was replaced on the roadside with a new or reconditioned unit. Contractors report that such a replacement can be performed in as little as 30 minutes. In one case, the contractor safely replaced the damaged parts in the field during a period of low traffic volume.

In Boise, Idaho, a TRACC was hit on the end, off-centered at a very sharp angle. The estimated impact speed was in excess of 60 miles per hour (100Km/h). The driver of the Honda Prelude sustained leg injuries but recovered within a few days. He even provided the local TRACC installer with photos of the damaged TRACC. (He had returned to the scene to see what it was that stopped him when he left the roadway in the middle of the night. See his photo below.)

Damaged TRACC in Boise, Idaho

Replacement of the TRACC was accomplished as described above. The contractor did not worry about what parts to transport to the accident scene. He simply loaded a ready TRACC to replace the damaged one. Repair of the TRACC was done later in his repair facility.

Because of the off-centered and angled nature of the impact, more parts were damaged than in the Toronto impact. The approximate cost of the parts was 3 975 USD for complete repair. The repair process required two workers about four hours in the safety of their own workshop.

Several of the seventeen reported impacts involved low-speed head-on collisions that resulted in less than 54" (1 370mm) of stroke of the system. In those cases, the plastic nose and the first stage of rip plates had to be replaced at a typical cost of US$350 for parts. The time required to repair such an impact is generally less than two hours. In one case, a contractor performed the repair on the roadside without removing the damaged unit.

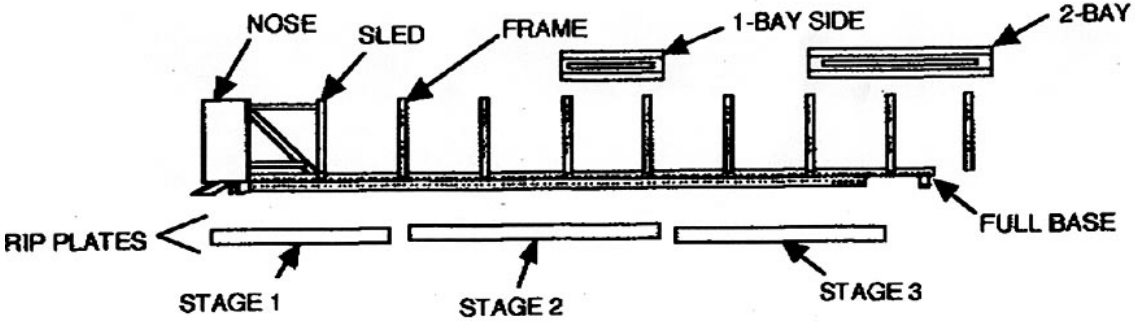
TRACC field performance to date has been excellent. A wide range of impacts have occurred with no significant injuries to report. In fact, the range of field tests has included several impacts that would have resulted in major injuries or death had an approved crash cushion not been present. Repairs to the TRACC have been accomplished with minimal difficulty and at very reasonable costs. Overall, the TRACC has met or exceeded all expectations in its first year of service.

For more information, please contact James R. Albritton, P.E., or Trinity Highway Products L.L.C. at +1-214-589-8140.

TRACC Damage Matrix

NOTE: This chart provides an indication of the type and severity of impacts experienced by the TRACC system. The costs that have been applied to the repair parts are generated from a standard price list (as of 7-5-00) and do not reflect variations by customer or region.

Impact	Location	Sled	1-bay Side	2-bay Side	Frame	Nose	Stage 1	Stage 2	Stage 3	Base Weldment Section	Full Base	Parts Cost
1	Toronto	0	0	0	0	1	1	0	0	0	0	375
2	Toronto	0	0	0	0	1	1	1	1	0	0	1085
3	Toronto	0	0	2	2	1	1	1	0	0	0	1452
4	Toronto	0	0	4	0	1	1	0	0	0	0	1055
5	Toronto	1	0	4	0	1	1	1	1	0	0	3665
6	Toronto	0	0	3	0	0	1	0	0	0	0	735
7	Toronto	0	0	4	0	1	1	1	0	0	0	1342
8	Toronto	0	0	4	0	1	1	1	0	0	0	1342
9	Toronto	0	0	0	0	1	1	1	0	0	0	662
10	Toronto	0	0	2	0	1	1	1	0	0	0	1002
11	Idaho	1	0	1	1	1	1	1	1	0	0	3380
12	Montana	0	0	0	0	1	1	1	0	0	0	662
13	Nevada	0	0	0	0	1	1	0	0	0	0	375
14	Nevada	0	0	0	0	1	1	0	0	0	0	375
15	Pennsylvania	0	0	0	0	1	1	0	0	0	0	375
16	Virginia	1	0	2	0	1	1	1	1	0	0	3325
17	Colorado	0	0	0	0	1	1	0	0	0	0	375
18	Toronto	0	0	0	0	1	1	1	0	0	0	662
19	Arkansas	1	0	2	1	1	1	1	0	0	0	3127
20	Nevada	0	0	0	0	1	1	1	1	0	0	1085
21	Utah	0	0	0	0	1	1	1	0	0	0	662
22	Utah	0	0	0	0	1	1	1	0	0	0	662
23	Utah	0	0	0	0	1	1	1	0	0	0	662
24	Utah	0	0	0	0	1	1	1	0	0	0	662
25	Utah	0	0	0	0	1	1	0	0	0	0	375
26	Arkansas	1	0	2	1	1	1	1	0	0	0	3127
27	Utah	0	0	0	0	1	1	1	0	1	0	1242
28	Utah	1	0	2	1	1	1	1	0	0	0	3127
29	Tennessee	0	0	0	0	1	0	0	0	0	1	3950
										Total		$40,925
										Average		**$1,411**



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July 5, 2000