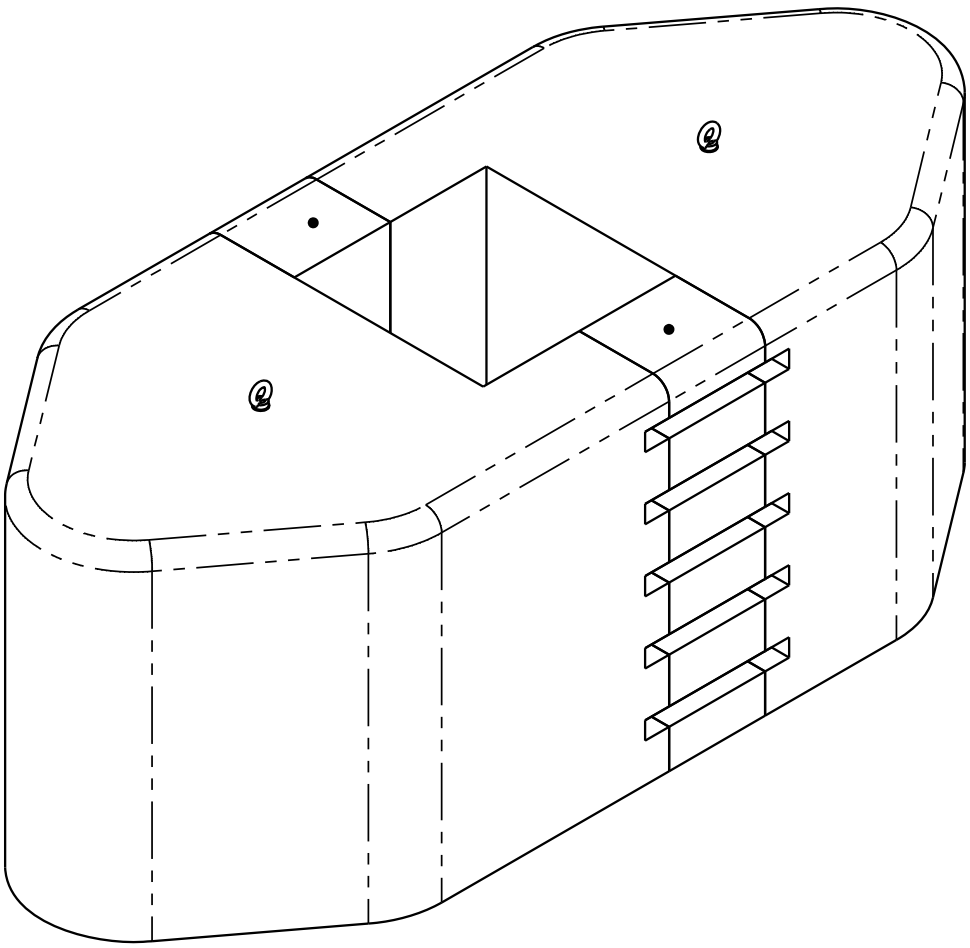
RAPTOR®

NCHRP 350 TL-1 Pole & Tree Attenuator



BARRIER SYSTEMS®
BY LINDSAY

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Introduction

The RAPTOR™ 300 and 600 have been designed and tested to meet SOME of the evaluation criteria of NCHRP 350.
The systems have been tested to the guidelines in NCHRP 350 for a gating, non re-directive crash cushion with testing MODIFIED so that the impact speed was ONLY 80kph (50mph). When correctly installed, the system is capable of stopping, containing, or re-directing an errant vehicle.
The RAPTOR™ is the world's first device aimed at reducing the severity of errant vehicle impacts with a utility pole or tree. The unique RAPTOR™ technology is a fully recyclable, highly compact solution rather than a full scale crash cushion. It is capable of being installed at many sites, otherwise regarded as lacking in space to protect in the traditional manner. It offers exceptional vehicle control and energy absorbing capabilities in head on impacts, where the energy is absorbed by internal plastic cartridges. It is also capable of redirecting a vehicle in side on angled impacts.

System Overview

The RAPTOR™ is designed and constructed to provide acceptable structural adequacy, minimal occupant risk and safe trajectory as set forth in NCHRP 350 Crash Cushions.
When impacted head on with a 900kg (1980lbs) vehicle at a speed of 80kph (50mph), the impacting vehicle is brought to a controlled stop. It is also capable of redirecting a vehicle under the same conditions in a safe manner at an angle of 20 degrees on the side of the system.

Before Installation

Placement and use of the RAPTOR™ should be done in accordance with the guidelines and recommendations set forth by the local road authority and local standards.
Depending on the application and circumstances at the site, installation and assembly of the system should take a two person crew less than half an hour.
The RAPTOR™ is a highly engineered safety device made up of a relatively small number of parts. Before starting installation ensure that one is familiar with the make up of the system.

RAPTOR™ Introduction (continued)

Limitations and Warnings

The RAPTOR™ has been rigorously tested and evaluated per SOME of the evaluation criteria in the NCHRP 350 guidelines for gating crash cushions, at the REDUCED speed of 80kph (50mph). The impact conditions recommended in NCHRP 350 are intended to address typical in-service collisions.
Although conditions were MODIFIED the RAPTOR™ passed all re-direct and head on tests evaluation criteria. The EXCEPTION being that during the head-on impact only, the maximum allowable g-forces on the ride down were BRIEFLY exceeded.
Vehicle impacts that vary from the NCHRP 350 impact conditions described for gating crash cushions may result in significantly different results than those experienced in testing. Vehicle impact characteristics different than or in excess of those encountered in NCHRP 350 testing (speed and angle) may result in system performance that may not meet the NCHRP 350 evaluation criteria.

Safety Statements

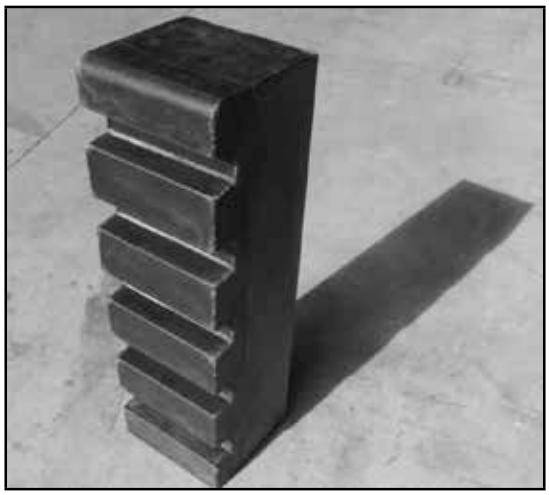
- General Safety
All required traffic safety precautions should be complied with. All workers should wear required safety clothing (high visibility vests, steel capped footwear, gloves, hard hats, safety glasses etc.)

Only Authorized trained personnel should operate any machinery. Where overhead machinery is used, care must be taken to avoid any overhead hazards.
Gloves should be worn at all times.
- RAPTOR™ Safety Statements

Each shell weighs 110kg (240lbs) so lifting of the shells must not be attempted manually. Only use a crane truck or fork hoist to lift the shells and always use the lifting eye.
DO NOT attempt to lift using lifting straps around the plastic shell as the plastic is slippery and straps may slide off.
Avoid placing hands or fingers in and around moving parts when components are being lifted and manoeuvred into place. (i.e. around connection holes etc.)
Do not stand on top of the shells to assist the installation at any time.

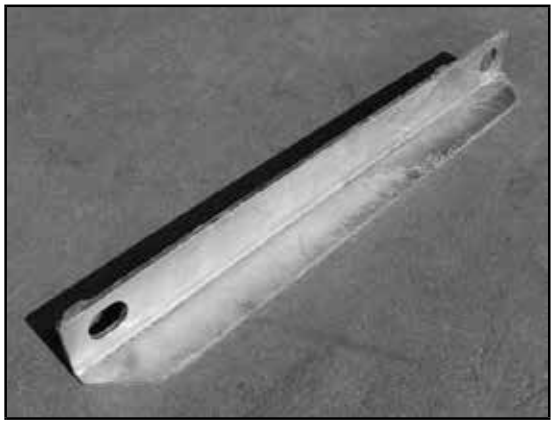
RAPTOR™ - Parts Identification

Shell
(2 required on each system)



Packer Piece
(2 required on 600 system)

Short Connector
(10 required on 300 system)



Long Connector
(10 required on 600 system)

Fixing
(20 required on each system)

RAPTOR™ - Installation Preparation

Getting Started

Two RAPTOR™ systems are available which have different void sizes. Determine which will be required for the site.

- 300mm x 590mm (12” x 23”) void (**RAPTOR™ 300**)
- 600mm x 590mm (24” x 23”) void (**RAPTOR™ 600**)

Preparation

Before installing a RAPTOR™, ensure that all materials required for the system are on site and have been identified. See bill of materials for the particular application and parts identification sheet.

Ensure that the area where the RAPTOR™ is to be installed is flat enough so that the shells will sit flat on the ground. A maximum side angle of 10 degrees is allowable. Minor site grading may be required.

Tools Required

A crane truck or fork hoist will be required to lift the shells into place.

To position and assemble you will require the following tools:

- 32mm (5⁄8”) socket and a minimum 50mm (2”) extension.
- Pry bar
- 2 Tonne (4400lbs) ratchet tie down, commonly used to strap freight onto trucks.

Bill of Materials

RAPTOR™ 300

- 2 x Shells
- 10 x Short Connectors
- 20 x Fixings

RAPTOR™ 600

- 2 x Shells
- 2 x Packers
- 10 x Long Connectors
- 20 x Fixings

RAPTOR™ - Installation Instructions

Step 1 - Set Out

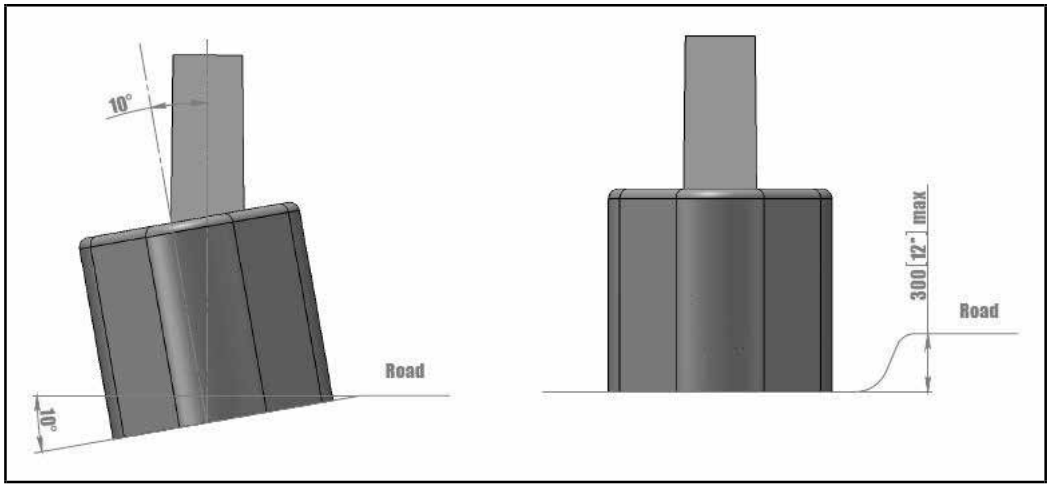
Site Preparation

The RAPTOR™ is not attached to the hazard it is protecting OR anchored to the ground in any way.

It is preferred that the RAPTOR™ be installed on flat, level ground. The area around the hazard should be leveled over a 1500mm (60”) cord on either side of the hazard.

If this is not possible with some site grading, then the following maximums apply.

Cross Slope – maximum of a 10 degree cross slope – see LH side drawing below.
Lower than road level – maximum of 300mm (12”) lower than road – see RH side drawing below.



RAPTOR™ - Installation Instructions

Step 2 – Installation

Shell Placement

Using a crane truck or fork hoist, lift the first shell into the approximate finished position. (Be careful of overhead cables and ensure a hard hat is worn during the lifting process) Repeat for the second shell.

Final positioning can be done using a pry bar.

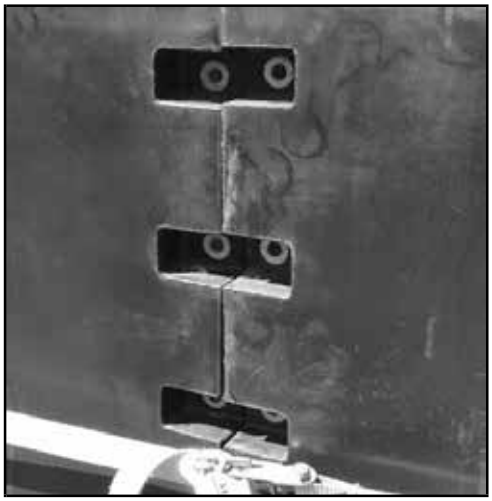
RAPTOR™ - Installation Instructions

RAPTOR™ 300

Step 3 – Connecting the Shells (No Packer Piece)

Connect Shells Together

Using a 2 Tonne (4400lbs) ratchet tie down, pull the two RAPTOR™ shells tightly together and align vertically using a pry bar.
Hold Short Connector bars in place and fix using two M16 x 40mm (⅝" x 1⅔") hex head bolts and washers supplied.



Repeat for all 10 connectors required. (5 on each side)

Tighten with socket

RAPTOR™ - Installation Instructions

RAPTOR™ 600
Step 3 – Connecting the Shells (Two Packer Pieces)

Insert Packer and Connect Shells Together

Place packer piece between the Shells with notches to the outside as shown.

Using a 2 Tonne (4400lbs) ratchet tie down, pull the two RAPTOR™ shells tightly together and align vertically using a pry bar.
Hold Long Connector bars in place and fix using two M16 x 40mm (⅝" x 1⅔") Hex Head bolts

and washers supplied.
Repeat for all 10 connectors required. (5 on each side)

Tighten with socket

RAPTOR™ - Installation Instructions

Installed RAPTOR™ 300

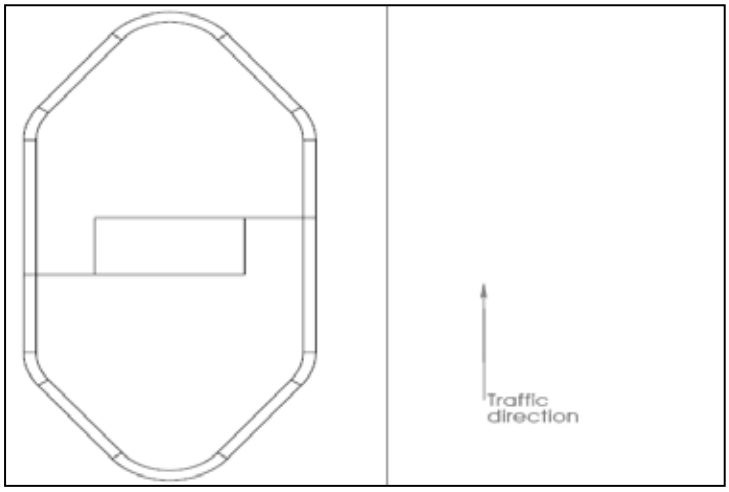
Installed RAPTOR™ 600

INSTALLATION CHECKLIST
RAPTOR™ 300 and **600** SYSTEMS

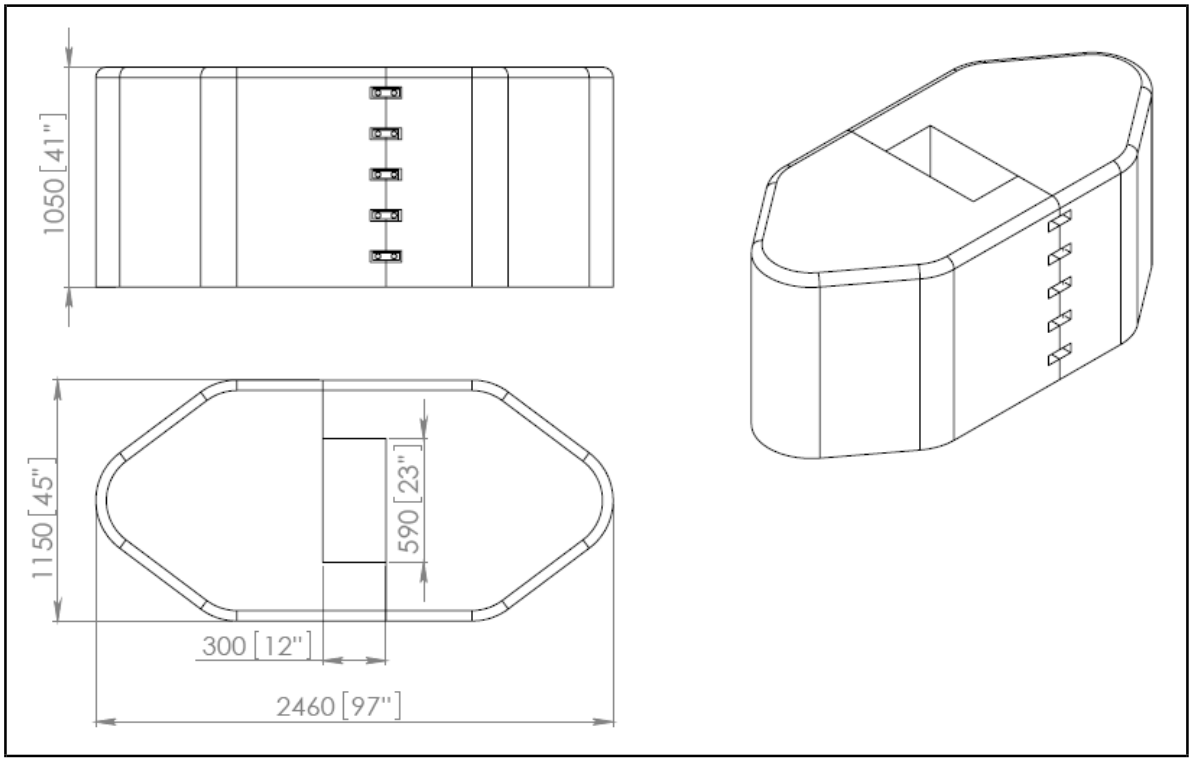
Location			
Installed By		***Date***	
Inspected By		***Date***	

	Y/N	***N/A***
General		
Ground is level for a 1500mm (60”) cord around hazard		
RAPTOR™ is oriented to face direction of traffic (see below)		
RAPTOR™ 300		
The Short Connectors are installed and bolts tight		
RAPTOR™ 600 – As above plus:		
The Packer is placed between the Shells correctly		
The Long Connectors are installed and bolts tight		

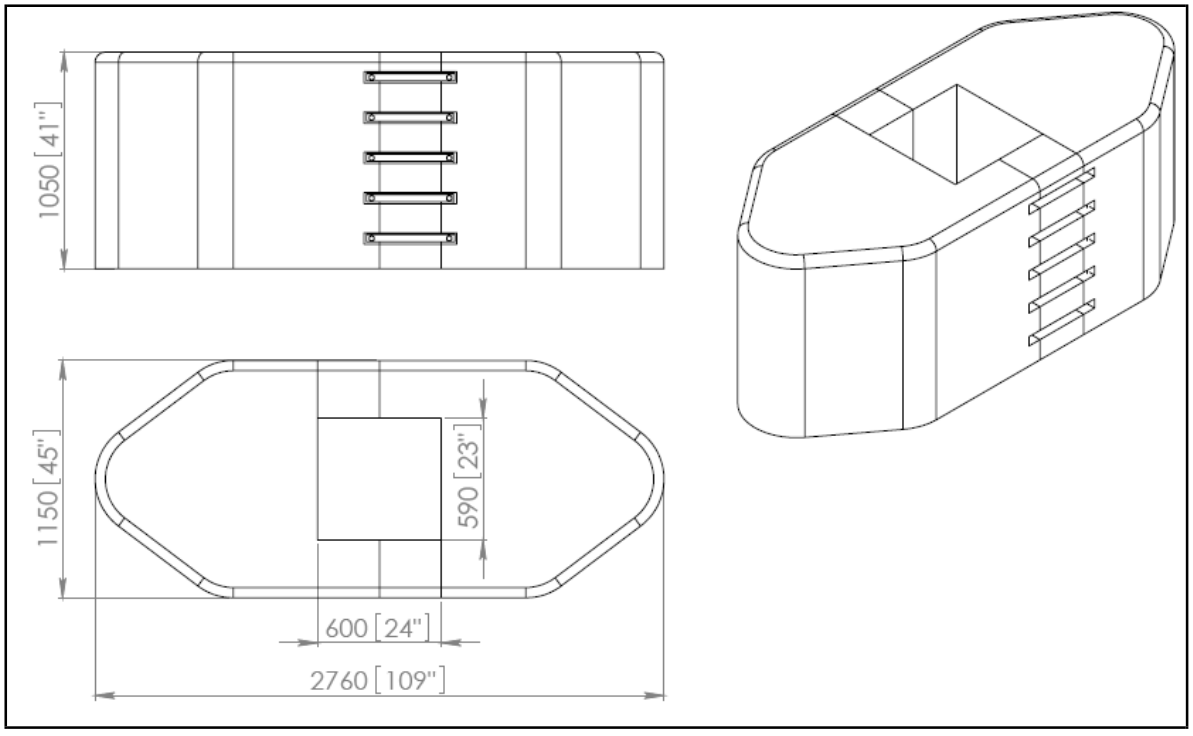
Comments:



Technical Drawings



RAPTOR™ 300 – 300mm x 590mm (12” x 23”) Void



RAPTOR™ 600 – 600mm x 590mm (24” x 23”) Void

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