

HERCULES

Crash Cushion



SafeDirection
CRASH BARRIER SOLUTIONS

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Leading Safety

Compliance to MASH TL2 & TL3

Compliance with AS/NZS 3845.1 Road Safety Barrier Systems

Simplified Installation

Supplied as a preassembled unit

Design Benefits

Non-Gating, Fully Re-directive

Low maintenance

Just 590mm system width

Durable

All steel construction

Hot dip galvanised

1.0 Introduction

Hercules is a MASH compliant crash cushion designed to shield the blunt ends of concrete barriers and other hazards.

Featuring an all-steel construction, Hercules is supplied as a pre-assembled unit to facilitate rapid installation, limiting the time workers spend on the roadside and minimising disruption to traffic.

Hercules is available in lengths of 4.4m (MASH TL2) and 5.9m (MASH TL3) and measures just 590mm wide making it ideal for narrow medians.

Hercules is fully re-directive and non-gating, providing safe vehicle containment and ride-down decelerations.



2.0 Specifications

Crash Test Compliance:

MASH TL2 as per AS/NZS 3845.1

MASH TL3 as per AS/NZS 3845.1

System Length:

4.4m (MASH TL2)

5.9m (MASH TL3)

System Width:

590mm (both MASH TL2 & MASH TL3)

System Height:

867mm (both MASH TL2 & MASH TL3)

System Components:

Hot dip galvanised steel

System Mass:

760kg (MASH TL2)

1020kg (MASH TL3)

3.0 Crash Test Performance

Hercules has been fully crash tested and evaluated according to the AASHTO Manual for Assessing Safety Hardware (MASH). The MASH specification is an update to and supersedes NCHRP Report 350 for the purposes of evaluating new safety hardware devices.

The introduction of MASH follows changes to the vehicle fleet, researching of real-life impact conditions and updated criteria for evaluating barrier performance.

MASH is also the basis of testing procedures for road safety systems as stated in *AS/NZS 3845.1: 2015 Road Safety Barrier System and Devices*.



4.0 Design Considerations

4.1 Cross Fall

The maximum cross fall or side slope limit is 8% (5 degrees).

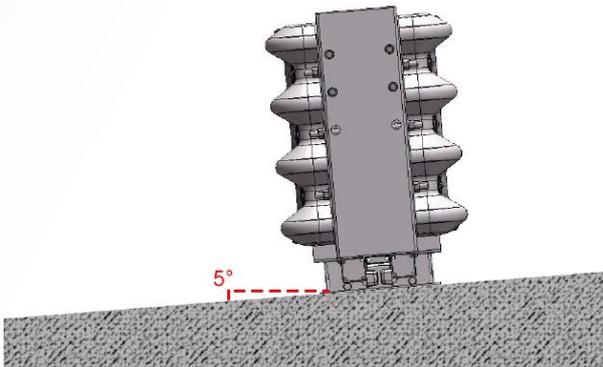


Figure 1: maximum allowable cross-fall

4.2 Clearance Behind the System

Hercules features crushable, energy absorbing steel cartridges surrounded by a framework of steel panels. During an end-on vehicle impact the side panels will slide as the cartridges deform.

Should the downstream concrete barrier exceed a width of 410mm, a clearance of 460mm is required between Hercules and the downstream barrier to facilitate sliding of the last set of side panels.

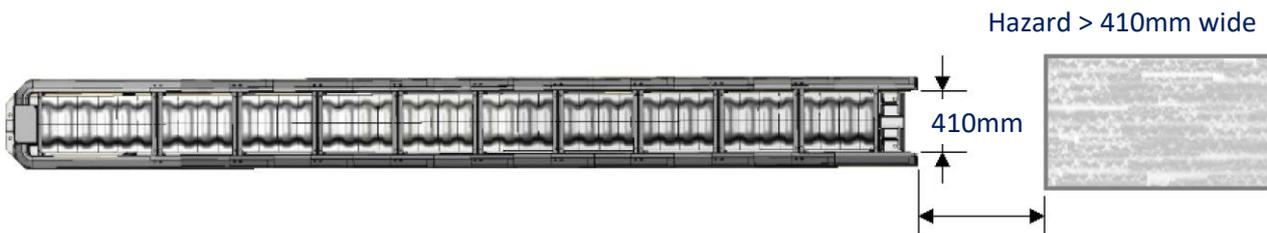


Figure 2: Clearance behind the system

4.3 Kerbs

Placing kerbs in front of crash cushions is not recommended. As an alternative, a shallow gutter in front of the terminal or subsurface grated drainage should be considered.

If installing on top of a kerb cannot be avoided, all system components must be free of obstruction.

4.4 Bi-Directional Impacts

Installation of a transition between Hercules and the downstream concrete barrier is dependant upon traffic flow. Where traffic travels in the reverse direction to the Hercules, a transition preventing pocketing at the interface between the systems is required. Refer to Safe Direction drawings.

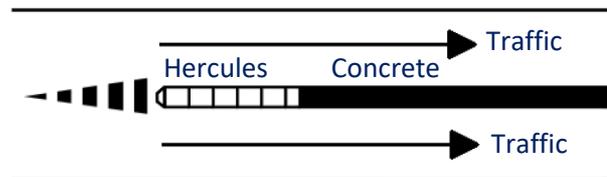


Figure 2: No Transition Required

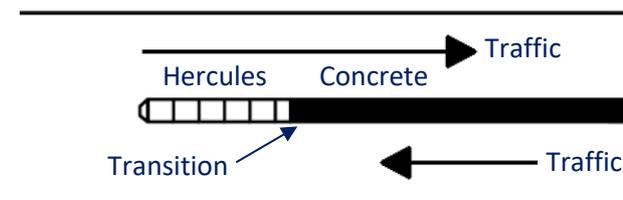


Figure 3: Transition Required

5.0 Hercules Component Identification



Hercules Pre-Assembled Unit



M24 Internally Threaded Sleeve



Anchor Hole Template



Fischer FIS V Mortar



M16 x 30 High Tensile Bolt & Washer

6.0 Tools Required

Tools required for the installation of Hercules include:

- Crane to suit Hercules mass;
- Hammer drill
- 24mm diameter masonry drill bit
- Tape measure;
- Slings or chains.
- Socket set

6.1 Recommended PPE

It is recommended that the following personal protective equipment (PPE) be provided for the safe installation of Hercules:

- Safety footwear;
- Hard hat;
- Gloves;
- Hearing protection; and
- High visibility clothing.

7.0 Site Establishment

7.1 Traffic Control

Prior to the commencement of any work, the site should be evaluated for risks to workers, pedestrians and other road users. The establishment of traffic control should provide safe travel for passing vehicles and/or pedestrians and appropriately protect workers near the roadside.

7.2 Underground Services

The installation of Hercules requires attachment to a reinforced concrete slab. Prior to any excavation, an investigation for potential underground hazards is recommended.

7.3 Overhead Obstructions

The site should be evaluated for potential overhead obstructions that may present a risk during the installation process. These obstructions typically include power lines, signage or trees.

Required clearance heights for crane lifts should be known prior to undertaking this evaluation.

7.4 Unloading Exclusion Zone

Only appropriate load-rated slings or chains should be used for safe unloading. It is recommended that an exclusion zone be maintained around the unloading process. This provides distance between moving machinery and workers in the event that goods or the machinery move unexpectedly.

Unloading and the storing of the product on a level surface is recommended. Storing product adjacent to the installation area eliminates the requirement for workers to carry items over long distances.

7.5 Site Preparation

Installation may take place by lifting Hercules directly from the delivery truck and into position. If however the barrier is to be installed at a separate time to delivery then a set down area will be required and should be prepared in advance.

If being stored, Hercules should be set down on a level surface.

8.0 Hercules Installation

The major steps in the installation of Hercules are as follows;

- Set-out;
- Constructing the concrete slab;
- Drilling the anchor holes using the template;
- Installation of the threaded sleeves;
- Lifting the Hercules into position;
- Anchoring the Hercules; and
- Installation of the transition (if required).

8.1 Set-out

After construction of the concrete slab, position the template at the proposed position of the Hercules unit.

Should the downstream concrete barrier exceed a width of 410mm, a clearance of 460mm is required between Hercules and the downstream barrier to facilitate sliding of the last set of side panels.

8.2 Drilling Anchor Holes

Potential Hazards: Use of hammer drill, contact with underground hazards, excessive noise, dust.

Recommended Control Measures: Observe the safe work instructions as per drill requirements, ensure the area has been inspected for underground hazards, wear appropriate hearing protection and dust mask.

Drill 24mm diameter holes to a depth of 165mm.

A TL3 Hercules will require 40 off anchors A TL2 Hercules will require 30 off anchors.

Once the holes are drilled, use an air gun or pump to ensure all holes are free of dust and debris.

8.3 Installing the Threaded Sleeves

Potential Hazards: Use of chemical anchor.

Recommended Control Measures: Read the FIS V.

Using the applicator provided, insert FIS V injection mortar into each hole.

Each 440ml tube will fill approximately 12 off holes.

Screw the M16 x 30mm bolts into each sleeve before inserting into each hole. This will assist in enduring each sleeve is vertically aligned. The top of each sleeve should not protrude above surface level.

The curing time for FIS V injection mortar is as follows:

Cartridge Temp.	Gelling Time	Temp. at Anchoring Base	Curing Time
0 - 5° C	13 min.	0 - 5° C	3 hrs
5 - 10°C	9 min.	5 - 10°C	90 min.
10 - 20° C	5 min.	10 - 20° C	60 min.
20 - 30° C	4 min.	20 - 30° C	45 min.
30 - 40° C	2 min.	30 - 40° C	35 min.

8.4 Anchoring the Hercules

Potential Hazards: *Falling of load, swaying of load, contact with above-ground hazards, poor communication and poor visibility*

Recommended Control Measures: *Observe the safe work instructions as per machinery requirements, ensure that all slings and chains are appropriately load rated, maintain a safe exclusion zone and establish a clear communication process.*

Hercules is supplied as a pre-assembled unit. The units should be lifted from two points by wrapping chains or slings around the body of the unit.

Once the FIS V mortar has cured, remove the M16 bolts.

Lower the Hercules unit over the threaded sleeves and align.

Insert a M16 bolt and washer at each hole location and tighten using a socket wrench.

8.5 Installing the Transition

Where traffic travels in the reverse direction to the Hercules, a transition preventing pocketing at the interface between the systems is required.

The transition panel is positioned underneath the side panels to allow the side panels to slide during a vehicle impact. The transition panel is bolted to the downstream concrete barrier with fixings as supplied by Safe Direction.

9.0 Maintenance

Periodic inspections of Hercules are recommended to assess the following;

- Nuisance impacts;
- Debris has not accumulated around the unit which may impede the function of the unit; and
- The unit is appropriately delineated.

10.0 Repair

In the event of a vehicle impact, Safe Direction should be notified to provide a damage assessment.

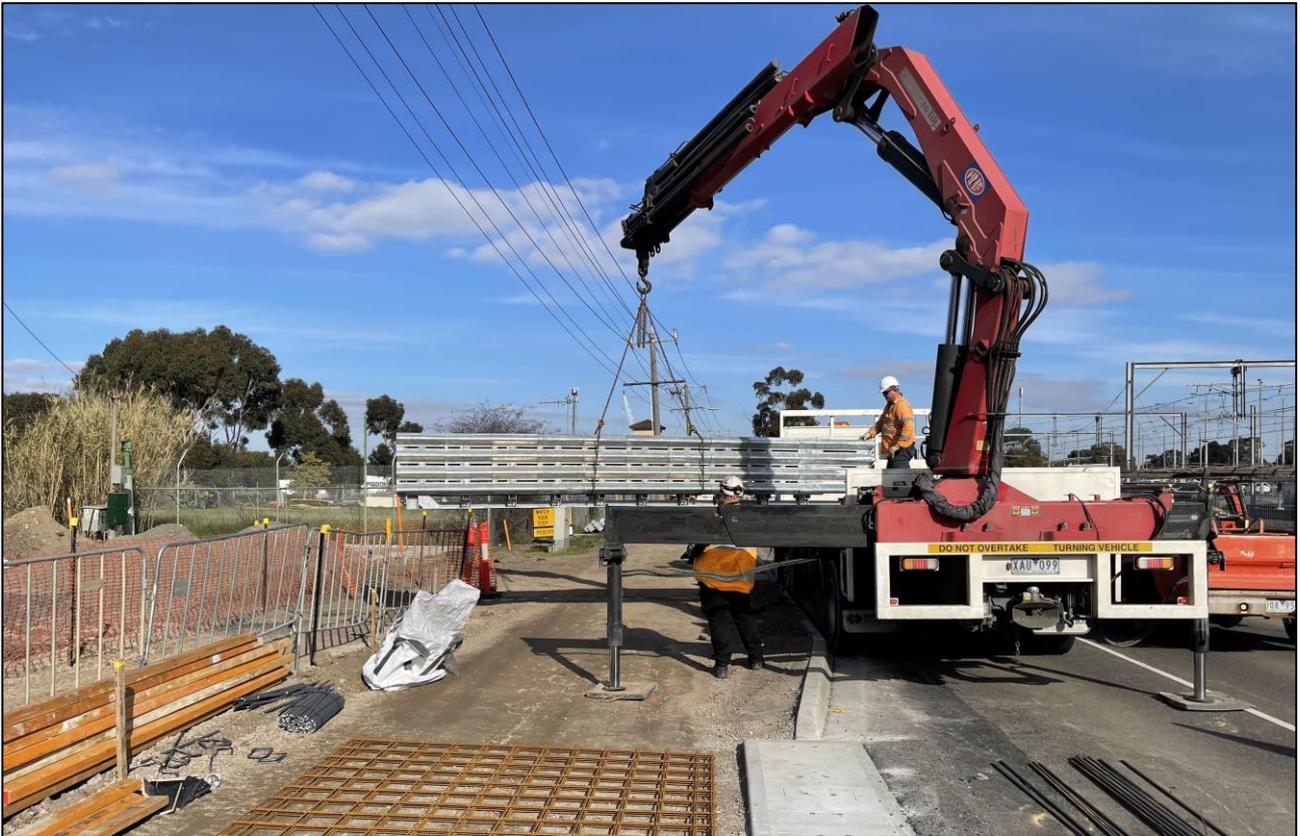
For minor impacts, side panels may be replaced onsite.

For major impacts, it is recommended that the damaged unit be removed and replaced allowing repairs to be undertaken in the safety of a workshop.













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