**DEPARTMENT *of* INFRASTRUCTURE, ENERGY *and* RESOURCES**
TASMANIA ROADWORKS SPECIFICATION

R61 - ROAD SAFETY BARRIER SYSTEMS
October 2009

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## R61.1 SCOPE

This specification sets out the requirements for:

- The supply and installation of Road Safety Barrier Systems, including terminal assemblies and delineators.
- The removal, storage and re-use of existing road safety barrier components.

## R61.2 OBJECTIVE

To provide a Road Safety Barrier System that minimises risk to road users resulting from vehicles running off the road, colliding with fixed roadside objects or colliding with safety barriers.

## R61.3 REFERENCES

- AS 1720.2 Timber Structures Code, Timber Properties
- AS/NZS 1906.2 Retroreflective Materials and Devices for Road Traffic Control Purposes - Part 2 Retroreflective devices (non pavement application).
- A.S. 3845 Road Safety Barrier Systems.
- A.S. 4506 Metal Finishing Thermoset Powder Coatings
- A.S. 4680 Hot dipped galvanised (zinc) coatings
- MASH08 Manual for Assessing Highway Safety Features as adopted by FHWA (USA) or NCHRP350 in the transition period.
- BS EN 1317 Parts 1 and 2. Road Restraint Systems. Performance clauses, impact test acceptance criteria and test methods for Safety Barriers. (Also known as CEN pr 1317)
- Australian Paint Approval Scheme (APAS) specification 0014/1.
- DIER Road Safety Barrier Design Guide.
- RTA NSW administered Safety Barrier Assessment process.

## R61.4 BARRIER TYPES

Road safety barrier systems shall consist of the following types:

- Rigid - Concrete barriers with type F profile
- Non Rigid
  - W-beam profile
  - Thrie-beam profile
  - Tensioned wire rope

All barrier systems shall comply, as a minimum, with the requirements of the relevant References (R61.3 above) and with the requirements of this Specification.

## R61.5 Contract Management Plan (CMP)

The Contractors Contract Management Plan shall include:

- Details of the product including name, supplier, test conditions and criteria.
- Cross references between lot numbers allocated and the unique product number in accordance with Specification Clause G2.4.4.
- Alternative installation solutions when rock is encountered.
- Evidence that the Contractor has been trained by the product supplier to install proprietary products.

## R61.6 MATERIALS AND PRODUCTS

### *R61.6.1 General Provisions*

All components shall comply with the requirements of the relevant References (R61.3 above), the Standard Drawings and the following Clauses.

All systems and components, both proprietary and public domain, will require evidence of acceptance under the RTA NSW administered Safety Barrier Assessment process.

This is a Hold Point.

Where assessment acceptance is at variance with DIER's Standard Specifications and Drawings, the DIER documents will take precedence. However for all proprietary steel beam terminal assemblies, the Certificate of Compliance from the supplier shall be accepted.

Where the Contractor or Product supplier identifies the need for components not detailed in this specification or on the DIER standard drawings (e.g. shelf brackets or cable bearing plates), the requirements of other Australian State Road Authorities may be accepted on the provision of evidence to the Superintendent.

### *R61.6.2 Evidence of Compliance*

Evidence of Compliance shall include Certificates of Compliance (CoC), details of the product including name, supplier, test conditions and criteria and evidence that the Contractor has been trained by the product supplier to install their proprietary products.

A CoC signed by the Contractor's Representative and/or the product supplier, shall be provided certifying that all products, prior to and after installation, meet the requirements of this specification.

This is a Hold Point.

### *R61.6.3 Tensioned Wire Rope Safety Barrier (TWRSB)*

TWRSB systems including both approach and departure terminals shall:

- Be tested to MASH08 (NCHRP350) and have
  - Maximum dynamic deflection = 1.6m
  - Minimum test vehicle mass = 1500Kg
  - Minimum impact speed = 100Km/h
  - Minimum Angle of Impact = 20 Degree
- be a proprietary product
- conform to the test level defined in the Specification
- have, where provided, securely fixed-in-place post caps
- have reinforced concrete post footings
- not have sharp edges on posts facing the oncoming traffic
- be tensioned in accordance with the manufacturer's recommendation/design, when the concrete in the anchor blocks and post foundations have reached the design strength. Evidence of tensioning shall be provided.
- be re-tensioned to the stress recommend by the manufacturer between 28 days and 56 days of the initial tensioning.

When tensioning is fully complete swaged fittings on the ends of every rope shall be treated in accordance with the Manufacturer's recommendations. All swaged fittings shall be in accordance with the Manufacturer's installation manual.
The maximum length between anchor blocks shall be 600 metres. The length shall be measured from the attachment points on the anchor frame of the furthest end anchor blocks.

A CoC shall be provided for each length of TWRSB installed. The CoC shall include evidence detailing that the product will meet the above requirements over the length to be installed. Acceptance of the Manufacturers advice by DIER does not negate the Manufacturer of full liability for the performance of the product.

Terminals on overlapping installations at sites that are longer than the maximum length of barrier allowed (600m) shall be compliant approach/departure terminals. Overlaps shall be in accordance with the DIER design guide. The product supplier shall identify the relationship between the "points of need" of the overlapping barriers in the site specific design and provide evidence of how the "continuity of containment" is to be maintained. As a minimum, the points of need shall be longitudinally aligned.

With respect to design, the Certificate shall include certification from the product supplier that the proprietary product has been tested to the test level defined in the Project Specification and the requirements of this Specification.

With respect to installation, the Certificate shall include certification that the installation meets with the manufacturer's recommended installation practices including swaging, particularly for lateral location of the barrier in relation to the hazard and the road shoulder, and the following tensioning details:

- date of tensioning,
- ambient air temperature when tensioned,
- residual tension reading of each tensioned rope
- calibration details and
- the signature of the operator and Contractor's Representative.

### *R61.6.4 Concrete*

Concrete for rigid barriers and anchor blocks shall comply with Specifications B10 and B11.
Concrete for post footings shall comply with Specification R81.

### *R61.6.5 Posts and Blockouts*

(i) Steel - Posts and blockouts for W-Beam and Thrie beam barrier shall be either 178x76x6 mm channel section or shall be manufactured to the details and dimensions shown in Australian Standard AS3845.

(ii) Steel - Posts and blockouts for slip-based w-beam terminals shall be as detailed on the DIER Standard Drawings.

(iii) Plastic - Plastic blockouts-shall be manufactured to the details and dimensions shown in Australian Standard AS3845 and may only be used in proprietary end terminal assemblies.

(iv) Timber -Where timber posts are indicated on the drawings they shall be:

- manufactured to the details and dimensions shown in Australian Standard AS3845 after placement refer Table R61.2.
- seasoned hardwood of minimum strength grade F7 and maximum strength grade F17 to AS 1720.2.
- have a surface moisture content of less than 30%.
- durability class 3
- Defect areas shall comprise less than 5% of total surface area of each post.

Timber posts in slotted breakaway cable terminals shall have weakening holes as shown on the Standard Drawings or as detailed in AS3845.

The following timber species are those preferred for use. Other species may be submitted for the approval of the Superintendent.

**TABLE R61.1 - ACCEPTABLE TIMBER SPECIES**

| STANDARD TRADE COMMON NAME | STANDARD REFERENCE NAME | LOCAL NAME | STRENGTH GROUP | DURABILITY CLASS |
|---|---|---|---|---|
| Ash, Silvertop | Eucalyptus sieberi (E. sieberiana) | Silvertop | S3 | 3 |
| Gum, Tasmanian Blue | Eucalyptus globulus | Southern Blue Gum | S3 | 3 |
| Messmate | Eucalyptus obliqua | Messmate Stringybark | S4 | 3 |

**TABLE R61.2 – IN GROUND TOLERANCES FOR TIMBER**

| Cross-section | Length | 80mm Hole | 20mm Holes | Surface Moisture Content |
|---|---|---|---|---|
| +/- 5mm | +/- 20mm | Dia +/- 5mm<br>Location +/- 10mm | Dia +/- 2mm<br>Location +/- 10mm | +/-5% |

**TABLE R61.3 – EVIDENCE OF COMPLIANCE FOR TIMBER**

The following shall be provided with the evidence of compliance ref Clause R61.6.2.

| Type/species of timber | Location of timber source | Date of milling | Milling size | Delivery date | Moisture at delivery |
|---|---|---|---|---|---|
| | | | | | |

***R61.6.6 Galvanising***

All steel components shall be galvanised. Galvanising shall be not less than 600g/m$^2$. All steel components shall be inspected at the time of delivery to the Site. Any components that have damage to the galvanising shall not be included in the Works. The steel components shall be stored in a manner that ensures the galvanising is not damaged. The Contractor shall give the Superintendent two days notice of when the materials will be on site prior to installation.

This is a Hold Point.

If Tensioned Wire Rope (TWR) steel posts are to be coated then it shall be with a decorative polyester powder coat finish to AS 4506 to an approved colour.

***R61.6.7 End Treatments and Crash Attenuators***

The requirements and principles of AS3845 and the DIER design guide shall be adhered to for leading and trailing terminals, both gating and non-gating, whether redirective of non-redirective, for all road safety barrier systems.

All proprietary and public domain terminal systems shall not extrude components towards the traffic lanes when impacted by a vehicle.

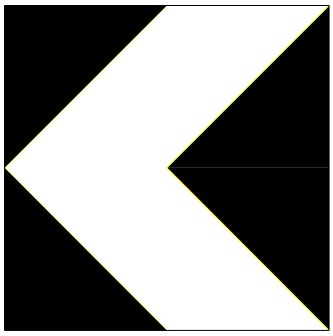
***R61.6.8 Delineators***

Delineator mounts shall be flexible, manufactured for the purpose and certified for a 10-year exposure life.

Delineators shall comply with AS/NZS 1906.2.

Delineators on end impact terminal plates shall be alternate black and white bands i.e. white arrow/black surrounds hazard board in accordance with AS1742.2, i.e. D4-1-2.

D4–1–2



### *R61.6.9 Removal and re-use of Materials*

(i) Removal

Prior to the removal of a safety barrier, the Superintendent shall inspect all rails, posts, blockouts, stiffener plates and cables and determine which of these components are undamaged.

This is a Hold Point.

Any components damaged by the Contractor after this inspection shall be replaced at the Contractor's expense. Bolts, nuts washers and delineator mounts shall not be re-used.
Terminal footings may remain in place provided that they pose no safety hazard and are not proud of the ground surface.
Where footings, post foundations and anchor blocks are removed, the removal and backfilling shall be in accordance with Specification Clause R22.3.3.

(ii) Storage

The steel components shall be stored on site in a manner that ensures the galvanising is not damaged.

(iii) Re-use

All undamaged rails, posts, blockouts, stiffener plates and cables of the existing safety barrier which comply with this Specification shall be reused in the installation of new road safety barrier systems.

(iv) Repair Of Damage To Bridge Structures

Where the removal of existing bridge fences and the installation of safety barrier and/or its components results in damage to the bridge structure, repairs shall be undertaken in accordance with DIER Standard Bridgeworks Specifications B15 – Concrete Repairs and B25 – Bridge Fence and Miscellaneous Steelwork.

### *R61.6.10 Motorcycle Impact Attenuator Systems*

All Motorcycle Impact Attenuator systems shall be in accordance with the requirements of this specification with evidence of compliance to include test results to TB11/EN1317.

## R61.7 INSTALLATION

### *R61.7.1 Installation Design of Tensioned Wire Rope Safety Barrier*

The Contractor shall provide a design from the product supplier for each specific safety barrier location detailing how the installation of the product will meet the requirements of this Specification and the site requirements.

The locations shall be as defined in the Specification and/or as shown on the Project Specific Drawings. Sight distances and other design matters shall be considered in the design.

The Contractor shall provide evidence that the ground conditions encountered will not have an adverse impact on the fence as installed. The completed foundation shall be capable of resisting the required bending moment in accordance with the manufacturer's specification.

The product suppliers design should cover existing ground conditions in particular how the fence height is to be maintained with the certificate of compliance providing evidence that this is so.
Where the existing profile of the road shoulder/verge is undulating and the profile of the fence to be kept consistent, the verge shall be built up in accordance with Specification R43.

This is a Hold Point.

### *R61.7.2 Set Out*

The locations of road safety barrier systems shall be setout in accordance with the relevant Australian Standard, the Standard Drawings and the product supplier's design at the positions in the Specification and/or as shown on the Project Specific Drawings. The barrier shall be adjusted to form a smooth line, both horizontally and vertically, in accordance with the dimensions shown on the Project Specific Drawings or the manufacturer's requirements.

This is a Hold Point.

### *R61.7.3 Galvanising Repairs*

Any damage to the galvanising shall be shall be repaired within 24 hours with cold galvanising paint complying with the Australian Paint Approval Scheme (APAS) specification 0014/1.

### *R61.7.4 Concrete*

All concrete work for posts and anchor blocks shall be in accordance with Specification R81 and trowelled and finished with no vertical faces proud of the adjacent surface. The surface of the concrete shall be free draining.
The manufacturer's dimensions for post and anchor block foundations shall be achieved within the existing surface.
Where placed in paved areas, concrete used in patching around postholes is to be coloured to match the adjacent pavers.

### *R61.7.5 Timber Posts*

Timber posts shall have timber grease applied to the top surface following installation to enhance durability.

### *R61.7.6 Terminals*

Terminals shall be installed at the end of each road safety barrier system installation.
The Hazard Free Zone, identified in AS 3845 and assessed using the DIER Road Safety Barrier Design Guide must be available for all gating end treatment installations.

(i) Slotted Breakaway Cable Terminals

Slotted Breakaway Cable Terminals (slotted BCTs) shall be installed in accordance with the Standard Drawings and AS 3845.

(ii) All Other Terminals and End Treatments

The terminals shall:

i) be a proprietary or public domain product.
ii) meet the requirements of NCHRP350 Test Level defined in the Project Specification.

iii) meet the requirements of AS 3845.
iv) have a certificate of approval from the RTA NSW administered Safety Barrier Assessment process.
v) not extrude components towards the traffic lanes when impacted by a vehicle.

### *R61.7.7 Delineators*

Delineators shall be installed at the spacing and details given in AS/NZS1906.2. Spacings are to be halved when installed on curved surfaces.

### *R61.7.8 Bridge Fences*

Where the existing bridge fences are removed, the fences shall be removed in such a way as to ensure the continuing structural integrity of the structure.

Where any reinforcing steel is exposed, repairs shall be undertaken in accordance with DIER Standard Specification B15 – Concrete Repairs

Where components of the guard fence are attached to any concrete structure, they shall be bolted so as not to interfere with any reinforcement.

### *R61.7.9 Tolerances*

Post spacing shall be within ±100mm of the design spacing. The centre of tensioned wire rope safety barriers and the face of all other barriers shall be within –0mm and +50mm of the design distance to the edge of the road pavement. The height of all barriers shall be within ±20mm of the height shown on the Project Specific Drawings or Standard Drawings.

### *R61.7.10 Rock in Ground Conditions*

Where the ground conditions comprising hard, solid beds or masses which cannot be removed without use of pneumatic picks, hammers or wedges, then this material shall be classified as rock for the purposes of payment subject to the Superintendent's approval. Where rock is encountered the Contractor shall provide alternative solutions as detailed in the CMP.

### *R61.7.10 Motorcycle Impact Attenuator Systems*

Motorcycle impact attenuator systems shall be installed in accordance with the product suppliers design requirements and the following:

- installation shall only be on nominated curved sections of barrier;
- steel rails shall not be used within BCT assemblies;
- steel rails are to be placed in line with the face of the steel barrier rail;
- steel rails shall be placed in accordance with the requirements for steel safety barrier;
- the bottom of steel rails shall be a minimum of 65mm above the ground.

## R61.8 PAYMENT

### *R61.8.1 Safety Barrier System*

Payment for the supply and installation of safety barrier shall be per metre length of barrier shown as "Standard Installation" on the Standard Drawing and shall include the design of tensioned wire rope safety barriers, assessment of ground conditions for tensioned wire rope safety barrier anchor blocks and the tensioning and re-tensioning of tensioned wire rope safety barrier.

Any extra costs in provision of guard fence panels to suit curves shall be deemed to have been included within the rates shown in the Schedule of Rates. The extra cost of posts to suit spacing requirements shall be deemed to have been included within the rates shown in the Schedule of Rates.

Payment shall also include the cost of any additional concrete and for filling around footing structures so that no vertical surfaces of the concrete are exposed. Payment shall also include the cost of repairs to existing structures.

### *R61.8.2 W-beam and Thrie-beam Terminal and Transition Assemblies*

Payment for the supply and installation of slotted BCT leading and trailing terminal assemblies and transition sections shall be per assembly.
Payment for supply and installation of all other new end terminals and crash attenuators shall be per terminal.

### *R61.8.3 Removal of Existing Safety Barrier Systems*

Payment for the removal of existing barrier systems shall be per metre measured to include the removal of terminals, removal of delineator mounts from existing safety barrier, disassembly of the components and extraction of posts, foundations and anchor blocks and backfilling of footings, post foundations and anchor blocks.

### *R61.8.4 Re-use of Salvaged Components*

Payment for installing removed components of safety barrier and terminals and supply and installation of bolts, nuts and washers shall be per metre.
A Provisional Quantity has been provided for the replacement of damaged steel posts for W-beam and Thrie-beam safety barrier. Payment for the replacement of damaged steel posts shall be per number installed and shall be an extra over item.

### *R61.8.5 Connection to Bridges and Structures*

Payment for the connection of non-rigid safety barrier to bridges or rigid barrier shall be per connection.

### *R61.8.6 Delineators*

Payment for the supply and installation of delineators and delineator mounts shall be per delineator and shall include the supply and installation of fixings.

### *R61.8.7 Rock in Ground Conditions*

Payment for extra costs of installation where rock is encountered shall be at cost. Details shall be provided with the next progress payment claim.
This shall include the cost of disposal of surplus excavated material.

### *R61.8.8 Road Shoulder/Verge Preparation*

The cost of verge build-up shall be at Schedule of Rates Item 4.09 for each site and shall include the cost of the supply, placement and compaction of all material.

## R61.9 HOLD POINTS

The following hold points have been identified in this Specification.

| Hold Point | Works not to Proceed | Reference |
|---|---|---|
| Evidence of Acceptance of all proposed systems and components by RTA NSW | Installation of Road Safety Barrier System or component | Clause R61.6.1 |
| Provision of Certificate of Compliance for all products | Installation of Road Safety Barrier System or component | Clause R61.6.2 |
| Provision of Certificate of Compliance for the Installation of each length of Tensioned Wire Rope Safety Barrier prior to Practical Completion. | Payment for each installation | Clause R61.6.2, Clause R61.6.3, Clause R61.8 |
| Advice to Superintendent of delivery of steel components to the Site | INSTALLATION OF ROAD SAFETY BARRIER SYSTEM OR COMPONENT | Clause R61.6.6 |
| Inspection of all existing safety barrier components. | Removal of existing safety barrier. | Clause R61.6.9 |
| Provision of Installation Design for TWRSB | INSTALLATION OF ROAD SAFETY BARRIER SYSTEM OR COMPONENT | ClauseR61.7.1 |
| Set out road safety barrier system | Installation of Road Safety Barrier System or component | Clause R61.7.2 |
| Rock in Ground Conditions | Installation of Road Safety Barrier System or component | Clause R61.7.9 |