

1194 NON-RIGID ROAD SAFETY BARRIER SYSTEMS

1 GENERAL**1.1 RESPONSIBILITIES****Objectives**

General: Provide non-rigid road safety barriers and terminals as documented.

Performance

Requirements: Supply and erect non rigid safety barriers and terminals to AS/NZS 3845 as shown on the drawings or as directed to conform with *0161 Quality (Construction)*.

1.2 CROSS REFERENCES**General**

Requirement: Conform to the following:

- *0136 General requirements (Construction)*.
- *0152* Schedule of rates – supply projects.
- *0161 Quality (Construction)*.
- *0167 Integrated management*.
- *0319 Minor concrete works*.
- *1101 Control of traffic*.
- *1163 Rigid road safety barrier systems*.

1.3 REFERENCED DOCUMENTS**Standards**

General: The following documents are incorporated into this worksection by reference:

AS 1214-1983	Hot-dip galvanised coatings on threaded fasteners (ISO metric course thread series)
AS 1237	Plain washers for metric bolts, screws and nuts for general purposes
AS 1237.1-2002	General plan
AS 1237.2-2002	Tolerances
AS/NZS1594:2002	Hot-rolled steel flat products
AS 1627	Metal finishing – Preparation and pre-treatment of surfaces
AS1627.4-2005	Abrasive cleaning of steel
AS1627.5-2003	Pickling
AS/NZS 1906	Retroreflective materials and devices for road traffic control purposes
AS/NZS 1906.2:2007	Retroreflective devices (Non pavement application)
AS 2858-2008	Timber–softwood – visually stress-graded for structural purposes
AS 2311-2009	Guide to the painting of buildings
AS 3730	Guide to the properties of paints for buildings
AS 3730.10-2006	Latex – Exterior – Gloss
AS 3730.18-2006	Undercoat / Sealer – Latex - Interior
AS/NZS 3845:1999	Road safety barrier systems
AS/NZS 4680:2006	Hot-dip galvanized (zinc) coatings on fabricated ferrous articles

1.4 STANDARDS**General**

Standard: To AS/NZS 3845.

1.5 INTERPRETATION**Abbreviations**

General: For the purposes of this worksection the abbreviations given below apply:

- MELT: Modified eccentric loader terminal.

Definitions

General: For the purposes of this worksection the definitions given below apply:

- Clear zone: The horizontal width of space available for the safe use of an errant vehicle which consists of the verge area and is measured from the nearside edge of the left-hand traffic lane. In the case of a divided road, it is also measured from the offside edge of the right-hand traffic lane to the edge of the pavement for opposing traffic.
- MELT: A public domain gating terminal.
- Non-rigid road safety barrier system: A road safety barrier system where elements are designed to move substantially in a crash, and where energy is absorbed by movement of the road safety barrier system and deformation of the vehicle.
- Thrie-beam: The triple corrugated beam component of a public domain non-rigid road safety barrier system.
- Transition beam: The corrugated beam used for the changeover from a thrie-beam road safety barrier system to a W-beam road safety barrier system.
- W-beam: The double corrugated beam component of a public domain non-rigid road safety barrier system.

1.6 SUBMISSIONS

Approval

Submissions: To the Superintendent's approval.

Documents

Submit the following for approval:

- Drawings:
 - . Set out details
 - . As built drawings
- Materials:
 - . Steel.
 - . Timber.
 - . Wire rope safety barrier systems.
 - . Plastic.
- Manuals: Installation and maintenance manuals for all proprietary barrier and end treatment systems used in the works.

~~Design: [complete/delete]~~

~~Proprietary items: [complete/delete]~~

~~Samples: [complete/delete]~~

~~Prototypes: [complete/delete]~~

~~Technical data: [complete/delete]~~

~~Evidence of type tests: [complete/delete]~~

~~Warranties: [complete/delete]~~

1.7 HOLD POINTS AND WITNESS POINTS

Notice

General: Give notice so that the documented inspection and submissions may be made to the **HOLD POINT table** and the **WITNESS POINT table**.

HOLD POINTS table

Item/Clause title	Requirement	Notice for inspection	Release by
Steel			
Certificates of compliance	Provide documentary evidence of conformity of steel components	1 week prior to erection	<i>Principal Certifying Authority</i>
Protective treatment	Provide manufacturers certificate of compliance for galvanising	1 week prior to erection	<i>Principal Certifying Authority</i>
Timber			
Certificates of compliance	Provide documentary evidence of conformity of timber components	1 week prior to erection	<i>Principal Certifying Authority</i>
Wire rope safety barrier systems			
Proprietary item	Submit compliance certification	1 week prior to erection	<i>Principal Certifying Authority</i>
Existing underground services			
Location	Locate services underground	5 working days prior to erection	<i>Principal Certifying Authority</i>
Establishment			
Method statement	Process description for the installation of road safety barrier systems	1 week prior to erection	<i>Principal Certifying Authority</i>
Location of barriers	Set out to drawings or as directed	2 working days prior to erection	<i>Principal Certifying Authority</i>
End treatment of road safety barriers			
MELT	Submit alternative MELT locations	1 week prior to ordering	<i>Principal Certifying Authority</i>
Installation of wire rope safety barrier systems			
Manufacturers published requirements	Submit tension certificates and testing	Same day as tensioning	<i>Principal Certifying Authority</i>

WITNESS POINTS table – On-site activities

Item	Requirement	Notice for inspection
Establishment		
Sequence of construction	Erection after pavement activities	1 week before installation – progressive
Alternative method of setting posts	Alternative method due to obstructions	1 week before setting posts
Erection of steel posts		
Driving equipment	Equipment and procedure for erection	1 week before installation
Damage to posts	Assessment by Superintendent for replacement	3 working days before removal of damaged post
Erection of road safety barrier systems		
Excessive damage to rails	Assessment and rejection by Superintendent	1 working day after perceived damage

2 PRE-CONSTRUCTION PLANNING

2.1 CERTIFICATES OF COMPLIANCE

Certificates of compliance

Certificates of compliance: Provide certificates from a NATA registered laboratory. All phases of any particular test to be performed at one laboratory. All relevant test results to accompany the Certificate and be within twelve months of the submission date.

2.2 SCHEDULING

Program of works

Requirement: Program the works as follows:

- Plan set out procedure and document.
- Identify underground services and submit any alternatives required for post re-location.
- Plan proprietary products and program availability.

3 MATERIALS

3.1 STEEL

Certificates of compliance

Certificates of compliance: Do not erect steel road safety barrier components until the Contractor has produced documentary evidence that the steel components conform to the requirements of this worksection. This is a **HOLD POINT**

Quality

Standard: W-beam and Thrie beam elements to AS/NZS 1594.

Steel components: Supply all steel components for public domain non-rigid road safety barrier systems, W-beam and Thrie-beam, to AS/NZS 3845 and of the type shown on the Drawings.

Flat washers: To AS 1237.1 and AS 1237.2.

Curving steel rail: Factory curved to conform with drawings. Carry out curving so that the galvanizing is not damaged.

Protective treatment

Treatment and galvanising: Unless otherwise stated for a specific proprietary safety barrier system or device, treat all surfaces of all ferrous metal components including posts, blackout pieces, rail elements, anchor plates, connectors and terminal pieces after fabrication to AS 1627.4 or AS 1627.5 and finish by hot-dip galvanizing to AS 4680. Galvanize all ferrous bolts, nuts, and washers to AS 1214, unless otherwise specified as high strength bolts.

Certificate of compliance: For galvanized steel components provide a manufacturers certificate of compliance certifying that the zinc coating mass conforms to AS/NZS 4680 or, for components of proprietary safety barrier system's or devices, to the manufacturer's recommendations. This is a **HOLD POINT**.

W-beam and Thrie-beam barriers

Standard: To AS/NZS 3845.

Storage

Protection: Store all materials, whether fabricated or not, so that damage and corrosion are prevented as follows:

- Store at least 200 mm above ground on platforms, slabs or other supports.
- Storage to prevent 'white rust' from freshly galvanised material.

Rejection: Rusted or bent or damaged steel will be rejected.

3.2 TIMBER

Certificates of compliance

Certificates of compliance: Do not erect timber road safety barrier components until the Contractor has produced documentary evidence that the timber components conform to this worksection. This is a **HOLD POINT**.

Quality

Location: Use timber posts only in W-beam terminal sections, as shown on the drawings.

Standard: Type, grade, size and treatment level to conform with AS/NZS 3845.

Quality: All surfaces smooth and free from obvious saw marks.

Storage: Do not store any timber posts/blockout blocks on top of the steel sections.

Finish

Preparation: Stop holes, cracks and other imperfections with white putty after the primer coat.

Paint: Conform to the following:

- Undercoat: Undercoat, latex exterior, one coat: To AS 3730.18.
- Top coat: Gloss latex exterior, one coat: To AS 3730.10.

Application: To AS 2311 Section 6.

Colour: Grey.

3.3 WIRE ROPE SAFETY BARRIER SYSTEMS

Proprietary Item

Conformance: Supply tensioned wire rope barrier systems as shown in the drawings.

Certification: Submit compliance certification by the manufacturer that the proposed wire rope barrier system meets all specified criteria. This is a **HOLD POINT**.

3.4 PLASTIC

General

Standard: Retroreflective materials to AS 1906.

Other items: Other plastic components to comply with the manufacturer's recommendations.

4 EXECUTION

4.1 EXISTING UNDERGROUND SERVICES

Location

Services laid in proximity to the barrier system: Locate prior to placement of footings and protect services from damage. This is a **HOLD POINT**.

Location: DIAL 1100 BEFORE YOU DIG is a free service, from anywhere in Australia, for locating underground pipe and cables (possible within two working days). See www.1100.com.au.

4.2 PROVISION FOR TRAFFIC

General

Requirement: To *1101 Control of traffic*.

Material stacks: Locate any temporary stacks of new or surplus material associated with the works clear of the traffic flow and behind the line of the safety barrier system being removed, under construction or for construction.

Works program: Manage the sequence for construction to ensure that there are no traffic hazards or safety issues for road users. This includes exposed ends of barriers and when leaving partially completed works at the end of the day.

4.3 QUALITY REQUIREMENTS

General

Standard: Construct non-rigid road safety barrier to AS/NZS 3845 except where explicit departures are shown on the drawings.

Waste: Remove all waste material from the site. Burning, burial or other disposal of waste material on site is not permitted.

4.4 ESTABLISHMENT

Sequence of construction

General: Erect road safety barriers after the construction of the base on concrete pavements and after the placing of the initial layer of asphaltic concrete or sprayed seal on a flexible pavement, unless otherwise approved. This is a **WITNESS POINT**.

Method statement

Submit: Prior to the installation of any road safety barrier system, submit a process description for the installation of road safety barrier systems. This is a **HOLD POINT**.

Location of barriers

Set out: Locate all road safety barriers and terminal sections to conform with the drawings or as directed by the Superintendent. Peg or paint mark the start and finish points and line of safety barrier, transitions and terminals including the line of flare if applicable. This is a **HOLD POINT**.

Post accuracy: Stand posts vertically and space so that no post movement is necessary to align holes or for any other reason when the safety barrier is erected.

Alternative methods of setting posts

Post depths: Set the posts to the full depth as shown on the drawings.

Alternative: If this is not possible due to the presence of an underground obstruction, submit an alternative method of setting the posts prior to carrying out the works. This is a **WITNESS POINT**.

4.5 ERECTION OF STEEL POSTS

Positioning of posts

Location: As shown on the drawings.

Top of the posts: To AS/NZS 3845 unless otherwise shown on the drawings.

Level of the posts: On terminal ends, level the posts to conform to the extended crossfall of the main pavement unless otherwise shown on the drawings.

Tolerance: Line the tops of posts within ± 20 mm of the heights specified. Ensure a smooth line both horizontally and vertically.

Foundation and testing

Foundations: Erect steel posts by driving, or by other means as directed, to AS/NZS 3845.

Open section: Point the open section of the post in the same direction as adjacent traffic.

Post holes: Compact the bottom of the holes to achieve the same density as the surrounding soil. Support the posts true to line and level whilst the holes are backfilled with clean, well graded, non-cementitious sub-base or base course granular material and compact to achieve the same density as the surrounding material.

Ground tolerance: 3 mm maximum movement in any direction when force tested to AS/NZS 3845.

Driving equipment

Equipment: Submit proposed details of driving equipment and helmet for driving steel posts and procedure to prevent damage to posts if installing by driving, for approval. This is a **WITNESS POINT**.

Damage to posts

Acceptable condition: No obvious deformation as a result of driving.

Repairs: Repair any damage that occurs to the posts within 24 hours using an organic zinc-rich primer to conform with the repair requirements of Clause 8 of AS/NZS 4680.
 Rejected posts: Replace any post deemed excessively damaged and rejected by the Superintendent. This is a **WITNESS POINT**.

4.6 ERECTION OF TIMBER POSTS

Positioning of posts

Location: As shown on the drawings.

Top of the posts: To AS/NZS 3845 unless otherwise shown on the drawings.

Level of the posts: On terminal ends, level the posts to conform with extended crossfall of the main pavement unless otherwise shown on the drawings.

Tolerance: Line the tops of posts within ± 20 mm of the heights specified. Ensure a smooth line both horizontally and vertically.

Polystyrene foam

Wrap posts: Wrap the section of the timber posts to be cast into a reinforced concrete footing in 12 mm thick polystyrene foam sheeting before concrete casting.

Concrete Footings

Minimum compressive strength: 32 MPa at 28 days to conform with *0319 Minor concrete works*.

Footing size: 600 mm diameter to AS/NZS 3845.

Tolerance of footing: - 0 to + 50 mm depth.

Overbreak: Fill over-excavation and excessive depth with 32 MPa concrete at no cost to the Principal.

Reinforcing fabric

Specification: Wire fabric reinforcing as shown on the drawings.

4.7 ERECTION OF ROAD SAFETY BARRIER RAILS

Blockouts, rail laps and stiffening pieces

Blockouts: Erect steel blockout pieces with the open section pointing in the same direction as adjacent traffic.

Rail laps: Arrange all rail laps in the same direction as adjacent traffic so that approach rail ends are not exposed to traffic.

Stiffening pieces: 300 mm long, on intermediate posts.

Minor damage to galvanising

Protection: Handle and erect road safety barrier rails and blockout pieces to prevent damage to the galvanising.

Repairs: Repair any minor damage to the galvanising within 24 hours using an organic zinc-rich primer to conform with the repair requirements of Clause 8 of AS/NZS 4680.

Excessive damage to rails or blockout pieces

Rejected: Replace any road safety barrier rails or blockout pieces deemed excessively damaged and rejected by the Superintendent. This is a **WITNESS POINT**.

Erection procedure

Initial tightening: Tighten road safety barrier rail attachment bolts and splice bolts sufficiently to erect the barrier.

Levelling: Make adjustments to the rails using the slotted holes provided to produce a smooth regular line, free of any kinks or bumps.

Top of rails: Overall line of the top of the safety barrier rails to conform with the vertical alignment of the road pavement.

Splice bolt tightening

Tightening: When the alignment both vertically and horizontally is obtained fully tighten the splice bolts. The bolt head (not the shoulder) must be in full bearing with the rail.

4.8 END TREATMENT OF ROAD SAFETY BARRIERS

Leading, trailing terminals

Locations: At both approach and departure ends of the road safety barrier, as detailed on the drawings.

Terminal sections

Locations: The approach and departure ends of double sided road safety barriers, as detailed on the drawings.

MELT

Locations: At approach end locations of road safety barriers as shown on the drawings.

Variation: Where the departure end of a road safety barrier is within the clear zone of opposing traffic, construct a MELT in place of a trailing terminal section. Submit locations prior to ordering. This is a **HOLD POINT**.

Double sided safety barrier

Terminal sections: Locate terminal sections at the approach and departure ends of double sided road safety barriers as detailed on the drawings.

Connections to rigid barriers

Construction details: Connect non-rigid road safety barrier connections to rigid road safety barriers or bridge parapets as detailed on the drawings and specified in *1163 Rigid road safety barrier systems*.

4.9 INSTALLATION OF WIRE ROPE SAFETY BARRIER SYSTEMS

Manufacturer's published requirements

Installation: Install Wire Rope safety barrier systems to conform with the manufacturers specified requirements.

Concrete footings: Install all posts in concrete footings with suitable sockets including covers to the sockets. Do not use driven posts.

Intermediate blocks or tension bays: Install intermediate blocks or tension bays at the dimensions recommended by the manufacturer.

Footings: Installation to conform with the following:

- The manufacturers published requirements.
- Uniform shape.
- Unless specified otherwise by the manufacturer, no protrusion above the finished surface level by more than 20 mm.

Wire rope tension: Submit certification that the wire rope has been tensioned to conform with the manufacturer's published requirements. The certificate must include the date, time, ambient air temperature, tension force and signature and name of the individual managing the work at the time. This is a **HOLD POINT**.

4.10 DELINEATORS

Fixing

Standard: To AS 1906.2.

Locations: Fix delineators with brackets to the road safety barrier, to the details and at the locations shown on the drawings beginning at the first post and then to conform with the

Table Location of delineators.

Table Location of delineators

Radius of curve m	Spacing of reflectors on barrier every
30–90	3rd post
90–180	5th post
180–275	8th post
275–365	11th post

Radius of curve m	Spacing of reflectors on barrier every
over 365 (including straight road)	16th post

Arrangement and colour

Direction of traffic: Arrange the delineators so that drivers approaching from either direction will see only red reflectors on their left side, and white reflectors on their right.

4.11 AS BUILT HANDOVER REQUIREMENTS**General**

Manuals: Provide installation and maintenance manuals for all proprietary barrier and end treatment systems used in the works.

As built drawings: Include:

- Drawings.
- Proprietary safety barrier systems or end treatments: Detail the system, name and post spacing.
- Non proprietary end treatments: Detail the end treatment name and post types. If timber posts are used, detail the timber species and stress grade.

4.12 LIMITS AND TOLERANCES**Application**

Summary: The limits and tolerances applicable to this worksection are summarised in **Summary of limits and tolerances table**.

Summary of limits and tolerances table

Activity	Limits/Tolerances	Worksection Clause/ subclause
Vertical alignment		
Tops of steel posts.	± 20 mm	Erection of steel posts
Tops of timber posts	± 20 mm	Erection of timber posts
Post movement	≤ 3 mm	Erection of steel posts
Concrete footings		
Diameter	0 to 50 mm	Erection of timber posts

5 MEASUREMENT AND PAYMENT**5.1 MEASUREMENT****General**

Payments made to the Schedule of Rates: To *0152 Schedule of rates – supply projects*, this worksection, the drawings and Pay items **1194.1 to 1194.7** inclusive.

Lump Sum prices: Not acceptable.

Unpriced items: For each unpriced item listed in the Schedule of Rates, make due allowance in the prices of other items.

Methodology

The following methodology will be applied for measurement and payment:

Concrete footings for timber posts: To conform with this worksection and not *0319 Minor concrete works*.

Miscellaneous minor concrete work not included in **Pay items** in this worksection: To conform with **Pay items** in *0319 Minor concrete works*.

Traffic control: To conform with *0319 Minor concrete works*.

5.2 PAY ITEMS

Pay items	Unit of measurement	Schedule rate scope
1194.1 Single sided road safety barrier - 1194.1(1) Single W-beam. - 1194.1(2) Nested W-beam. - 1194.1(3) Single Thrie-beam. - 1194.1(4) Nested Thrie-beam. - 1194.1(5) Single Modified Blockout Thrie-beam. - 1194.1(6) Nested Modified Blockout Thrie-beam. - 1194.1(7) Single W-Thrie-beam Transition. - 1194.1(8) Nested W-Thrie-beam Transition.	Linear metre. - The distance measured along the centre line of the rail, centre to centre of posts, excluding terminal sections and connectors to rigid safety barriers or bridge parapets.	All costs associated with the supply of components, fixings and activities associated with the erection of each type of road safety barrier.
1194.2 Modified eccentric loader terminal (MELT)	Each - Each MELT section supplied and erected	All costs associated with supply and erection of MELTS as detailed on the drawings.
1194.3 Terminal section - 1194.3(1) Leading Terminal - 1194.3(2) Trailing Terminal	Each - Each terminal section supplied and erected	All costs associated with supply and erection of terminals as detailed on the drawings.
1194.4 Connectors to rigid road safety barriers (rsb) or bridge parapet - 1194.4(1) W-beam to RSB - 1194.4(2) W-beam to Thrie-beam to RSB - 1194.4(3) Thrie-beam to RSB	Each - Each connector supplied and erected	All costs associated with supply and erection of RSB connectors as detailed on the drawings excluding the anchorage assemblies cast into the rigid road safety barrier or bridge parapet.
1194.5 Delineator brackets	Each	All costs associated with s & e delineator brackets.
1194.6 Double sided road safety barrier - 1194.6(1) Single W-beam - 1194.6(2) Nested W-beam - 1194.6(3) Single Thrie-beam - 1194.6(4) Nested Thrie-beam - 1194.6(5) Single Modified Blockout Thrie-beam - 1194.6(6) Nested Modified Blockout Thrie-beam - 1194.6(7) Single W-Thrie-beam Transition - 1194.6(8) Nested W-Thrie-beam Transition	Linear metre. - The distance measured along the centre line of the rails, centre to centre of posts, excluding terminal sections and connectors to rigid safety barriers or bridge parapets.	All costs associated with the supply of components, fixings and the erection of each type of road safety barrier.
1194.7 Double sided road safety barrier terminal section	'Each' terminal section supplied and erected	All costs associated with the supply and erection of double sided road safety barrier terminal sections as detailed on the drawings.