

AUS-SPEC

Infrastructure Specifications

1194 Non-rigid Road Safety Barrier Systems

1194 NON-RIGID ROAD SAFETY BARRIER SYSTEMS

IMPORTANT: This document has been adapted from the NATSPEC suite of specification templates for use in the MidCoast Council area by both Council and industry. NATSPEC regularly updates the base templates (currently in April and October each year), and Council may incorporate changes into its version of AUS-SPEC from time to time. To assist in highlighting any changes made by Council to the NATSPEC templates, the following conventions are used.

- See ANNEXURE M at the end of this document which contains (where practical) MidCoast Council customisations (also known as 'office master' text). References to the Annexure are to also be inserted at relevant clauses in the main body of the document.
- Where content is added to the main body of the document, it is to be shown in brown text like this.
- Where content is deleted or excluded from the main body of the document, it is to be shown struck through like this. Such clauses are to have no effect.

Where there is a conflict between main body text and MidCoast Council specific clauses, Council's specific clauses shall prevail.

1 GENERAL

1.1 **RESPONSIBILITIES**

General

Requirement: Provide non-rigid road safety barriers and terminals, as documented. Designers are to refer to Austroads AGRD06 to determine hazard of unshielded objects and suitable barrier treatments.

1.2 CROSS REFERENCES

General

Requirement: This worksection is not a self-contained specification. In addition to the requirements of this worksection, conform to the following:

- 0136 General requirements (Construction).
- 0152 Schedule of rates (Construction).
- 0161 Quality management (Construction).
- 1101 Traffic management.
- 1195 Rigid road safety barrier systems.

1.3 STANDARDS

General

Road safety barrier systems: To AS/NZS 3845.1.

1.4 INTERPRETATION

Abbreviations

General: For the purposes of this worksection the following abbreviation applies:

- MELT: Modified eccentric loader terminal.

- MASH – Manual for Assessing Safety Hardware

Definitions

General: For the purposes of this worksection the following definitions apply:

- Anchor: Restraint used to transmit impact forces into the ground.
- Clear zone: Obsolete concept from former edition of Austroads AGRD06. The area adjacent to the traffic lane to be kept clear of obstructions that could be hazardous to errant vehicles. It includes the verge area and is measured from the nearside edge of the left-hand traffic lane (with exceptions). For divided roads, it is also measured from the offside edge of the right-hand traffic lane to the edge of the pavement for opposing traffic.

- End terminals: Device that protect vehicle occupants from injury in an impact with the end of the safety barrier. Can be either leading or departure end treatment.
- Gating terminal: A road safety barrier terminal designed to allow an impacting vehicle to pass through and behind the terminal.
- Non-gating terminal: A road safety barrier terminal that is designed to re-direct or contain an impacting vehicle and absorb part of the energy of the impacting vehicle at any point along the terminal without allowing it to pass through the device.
- Flexible road safety barrier system: A flexible barrier system where the barrier elements under an impact provide substantial movement, deformation and deflection to absorb much of the kinetic energy of the crash.
- Rock catch fence: Fence to prevent rocks landing on roads.
- Safety barrier system: A longitudinal structure which restrains and/or redirects, in a controlled manner, vehicles which are out of control. A safety barrier system includes one or more safety barriers with associated end treatments and transitions.
- Safety bollard: A heavy duty post designed to prevent vehicular access into a pedestrian area.
- Security fence: A fence designed to prevent pedestrian entrance to unsafe areas
- Semi rigid barrier: A barrier system where the barrier elements under an impact, manage and absorb kinetic energy by limited movement and yielding deformation, with the design intent to deflect or redirect the vehicle.
- Thrie beam: A semi-rigid road safety barrier system comprised of a triple corrugated beam.
- Transition: A type of interface used when less stiff longitudinal road safety barrier system is connected to a stiffer interface.
- W-beam: A semi-rigid road safety barrier system comprised of a double corrugated beam.
- Wildlife fence: Fence that prevents wildlife approaching a roadway and creating a hazard.
- Wire rope safety barrier: A flexible road safety barrier system consisting of wire rope cables under high tension that are supported on posts and anchored at the ends.

1.5 TOLERANCES

Concrete footings

Post foundations: To AS/NZS 3845.1 clause 3.2.13.

Post position

Line of the tops of posts: As per the manufacturer's instructions, or otherwise \pm 20 mm of the documented height or as accepted by the roads authority.

Steel posts

Ground movement: 3 mm maximum in any direction when force tested to AS/NZS 3845.1.

Steel components

Steel railing erection: To AS/NZS 3845.1 clause 3.2.11.

1.6 SUBMISSIONS

Execution details

Method statement: Before installation of road safety barrier system, submit details of the manufacture, supply and installation of road barriers and the roadside positional design. Only safety barriers that have been accepted by the Austroads Safety Barrier Assessment Panel (ASBAP) and TfNSW are acceptable for use in the MidCoast area.

- Submission time: 5 working days before erection.

Concrete or similar foundations: Provide bolt / plate and installation details in accordance with manufacturer's recommendations prior to proceeding.

Alternative methods of setting posts: If the documented depth cannot be achieved because of an underground obstruction, submit details of proposed alternative post setting method before carrying out the works. Any modifications must comply with AS/NZS 3845.1 clause 4.4, must include acceptance from the product manufacturer and be in line with the road authority acceptance conditions.

Steel post driving details: Submit details of driving equipment, helmets and procedures for preventing damage to posts.

Wire rope safety barrier systems: If horizontal radius and/or vertical curvature is unsuitable, submit proposal for alternative barrier system to be installed.

Operation and maintenance manuals

Installation and maintenance manuals: On completion, submit manuals for all proprietary barrier and end treatment systems used in the works.

Products and materials

Evidence of conformance: Submit evidence that materials, components and systems including steel and timber components conform to the requirements of this worksection.

Galvanized steel components: Provide evidence from the manufacturer that zinc coating mass conforms to AS/NZS 4680.

Records

Installation and maintenance manuals: provide for all proprietary barrier and end treatment systems used in the Works.

Work-as-executed drawings: Submit drawings with the following:

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

Tests

Tests: Submit results, as follows:

- Wire rope tension: Submit wire rope tension test certificate as evidence of conformity. Include the date, time, ambient air temperature, tension force and signature and name of the individual managing the work at the time.
 - . Submission time: 5 working days after erection.

Warranties

Manufacturer's warranty: Submit the manufacturer's published product warranties.

1.7 INSPECTIONS

Notice

General: Give notice so that inspection may be made of the following:

- Location of barriers: Completed section set-out of safety barriers and terminal sections.
- Erection of barrier systems:
 - . Posts set in natural ground: After completion of backfilling for posts.
 - . Posts fixed to concrete pavement: After completion of post fixings.
 - . Rectification of any damage to steel posts.
 - . Completed barrier system erection, including posts, rails, end treatments and wire ropes.
- Removal of existing safety barrier systems: Completed removal and disposal of barriers, and reinstatement of surrounding material including backfilling.
- Rectification of ground/pavement: Completed rectification of disturbed ground/pavement surrounding posts.

2 MATERIALS

2.1 GENERAL

Storage and handling

Protection: Store all materials at least 200 mm above ground, including those fabricated, to prevent damage and corrosion.

Steel for rejection: Rusted, bent or damaged.

Timber posts/blockout blocks: Not permitted. Do not store on top of steel sections.

2.2 STEEL COMPONENTS

Properties

W-beam and thrie-beam elements: To AS/NZS 1594. Steel components: To AS/NZS 3845.1 and as documented. Flat washers: To AS 1237.1 and AS 1237.2. Curving steel rail: Factory curved, as documented. Carry out curving without damaging the galvanizing.

Protective treatment

Treatment and galvanizing: After fabrication, treat surfaces of all ferrous metal components including posts, blockout pieces, rail elements, anchor plates, connectors and terminal pieces to AS 1627.4 or AS 1627.5 and hot-dip galvanize to AS/NZS 4680, unless recommended otherwise by the barrier system or device manufacturer.

Ferrous bolts, nuts, and washers: Galvanize to AS/NZS 1214.

Supply of bolts, nuts and washers: To Austroads ATS 5420.

High strength bolts: To AS/NZS 1252.1.

2.3 TIMBER COMPONENTS (NOT USED)

Properties

Application: Use timber posts only in W-beam terminal sections, as documented.

Surface: Smooth and free from obvious saw marks.

Finish

Preparation: Stop holes, cracks and other imperfections with white putty after applying primer coat. Paint coating system:

Undercoat: One coat of latex undercoat for exterior applications to AS 3730.18.

- Top coat: One coat of gloss latex for exterior applications to AS 3730.10.

Application: To AS/NZS 2311 Section 6.

Colour: Grey.

2.4 WIRE ROPE SAFETY BARRIER SYSTEMS

Proprietary item

Non-rigid road safety barrier systems with tensioned wire ropes: To AS/NZS 3845.1 clause 7.2.2 and as documented.

Wire rope for post and rail end treatments: To AS 3569.

2.5 PLASTIC COMPONENTS

General

Retroreflective materials: To AS 1906.1.

Delineators: To AS/NZS 1906.2.

Other plastic components: To the manufacturer's recommendations.

2.6 BACKFILL

Around steel posts: Clean, well-graded, granular material. Do not add cement. Around other posts: Clean, well-graded, non-cementitious granular material or excavated material from post holes.

3 EXECUTION

3.1 GENERAL

Traffic safety

Material storage: Locate temporary stacks of new or surplus material associated with the Works clear of traffic flow and behind the line of barriers being removed or being erected.

Works program: Manage the construction sequence so that there are no traffic hazards or safety issues for road users, including exposed ends of barriers and partially completed works at the end of the day.

Installation

Requirement: Install to AS/NZS 3845.1 Section 6 and 7 except where explicit departures are documented.

Waste disposal: Remove all waste material from the site to a licenced waste management or transfer facility. Do not burn, bury or dispose of other waste material on-site.

Welding or flame cutting: Do not weld or flame cut any components on-site, carry out in factory conditions to the manufacturer's recommendations where documented.

Damage to surrounding pavement: Do not damage beyond 100 mm of the post, including any soil plates attached to the post.

3.2 ESTABLISHMENT

Existing underground services

Services laid in close proximity to the barrier system: Locate and protect services from damage before placing footings and installing barriers.

Sequence of construction

Requirement: Erect road safety barriers after constructing the base on concrete pavements and after placing the initial layer of asphaltic concrete or sprayed seal on a flexible pavement.

Set-out

Location of barriers: Locate road safety barriers and terminal sections as documented. Peg or paint mark the start and finish points, line of safety barrier, transitions and terminals including the line of flare if applicable.

Post accuracy: Position posts vertically and space so that no post movement is required to align holes.

3.3 ERECTION OF STEEL POSTS

Positioning of posts

Location: As documented.

Top of the posts: Position posts to form a smooth line both horizontally and vertically.

Level of posts: Level the posts on terminal ends to the extended crossfall of the main pavement or as documented.

Post depths: Set the posts to the full documented depth.

Foundation post installation

Steel posts erection: By driving or as documented.

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

Post holes: Compact bottom of holes to achieve the same density as the surrounding soil.

Backfilling around posts: Support the posts true to line and level whilst the holes are backfilled. Compact backfill to achieve the same density as the surrounding material tested to RMS T166.

Damage to posts

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

Damage to galvanizing: Repair within 24 hours of damage to AS/NZS 4680 clause 8, using an organic zinc-rich primer.

Posts deemed excessively damaged: Replace.

3.4 ERECTION OF TIMBER POSTS (NOT USED)

Positioning of posts

Requirement: To ERECTION OF STEEL POSTS, Positioning of posts.

Polystyrene foam

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

Concrete footings

Minimum compressive strength at 28 days: 32 MPa.

Slump: 60 mm.

Footing size: 600 mm diameter.

Post foundations on natural ground: As documented.

Overbreak: Fill over-excavations and excessive depth with 32 MPa concrete.

Reinforcing fabric

Requirement: Wire fabric reinforcing, as documented.

3.5 ERECTION OF ROAD SAFETY BARRIER RAILS

Blockouts, rail laps and stiffening pieces

Steel blockout pieces: Erect with the open section or concave face pointing in the same direction as adjacent traffic.

Rail laps: Arrange in the same direction as adjacent traffic so that approach rail ends are not exposed to traffic, except as provided at Clause 3.6 below for end terminals likely to be a significant risk for the opposing traffic direction.

Stiffening pieces: 300 mm long on intermediate posts.

Damages to galvanizing

Handling and erecting: Prevent damage to the galvanizing of road safety barrier rails and blockout pieces.

Repairs of galvanizing: Repair within 24 hours of damage to AS/NZS 4680 clause 8, using an organic zinc-rich primer.

Rail or blockout pieces deemed excessively damaged: Replace.

Erection procedure

Rail attachment bolts and splice bolts: Initially tighten so that barriers can be erected.

Levelling rails: Make adjustments to rails using the slotted holes provided to produce a smooth regular line without any kinks or bumps.

Overall line of top of rails: Conform to the vertical alignment of the road pavement.

Splice bolt tightening: When vertically and horizontally aligned, fully tighten the splice bolts so that bolt head (not the shoulder) is in full bearing with the rail.

3.6 END TREATMENT OF ROAD SAFETY BARRIERS

Terminal sections

Leading and trailing terminals: Only MASH tested crash-worthy end terminals that have been accepted by the Austroads Safety Barrier Assessment Panel (ASBAP) and TfNSW are to be specified. Construct at both approach and departure ends of the road safety barrier, as documented. For trailing end terminals that present a significant risk (with reference to AGRD06) of collision by errant traffic travelling in the opposite direction, a crash-worthy end terminal is to be installed, and the terminal rail laps are to be arranged in the same direction as the opposing traffic so that the terminal can function as intended.

Double sided road safety barriers: Construct terminal sections at the approach and departure ends, as documented.

Acceptable crash-worthy end terminals

Requirement: Locate as follows:

- At the approach end locations of road safety barriers as documented.
- If departure end of a road safety barrier is within the clear zone of opposing traffic, construct an acceptable crash-worthy end terminal in place of a trailing terminal section.

Connections to rigid barriers

Requirement: Connect to rigid road safety barriers or bridge parapets as documented in conformance with the *1195 Rigid road safety barrier systems* worksection.

3.7 WIRE ROPE SAFETY BARRIER SYSTEMS INSTALLATION

General

Installation: To the manufacturer's recommendations.

Post installation: Install posts in concrete footings with appropriate sockets including covers to the sockets.

Intermediate blocks or tension bays: Install at the dimensions recommended by the manufacturer. Footing installation: Install footing of uniform shape to the manufacturer's recommendations.

Wire rope tension testing: On completion of installation, test wire rope tension to verify it conforms to the manufacturer's published requirements.

3.8 DELINEATORS

Fixing and location

Fixing: Fix delineators to road safety barriers with brackets to AS/NZS 1906.2 and only as approved during crash testing & evaluation to AS/NZS 3845.1.

Locations: As documented, starting at the first post.

Arrangement and colour: 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.

Delineators spacing table

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	
Over 365 (including straight road)	16th post	

3.9 EXISTING SAFETY BARRIER SYSTEMS

Removal of existing safety barrier systems

Removal and disposal: Conform to the following:

- Dismantle, extract and dispose of safety barriers and other components and materials including posts, transitions, end treatments, anchors and in-ground components, as documented.
- Remove and dispose of components and waste materials from site to a licenced waste disposal or transfer facility.
- Clean, backfill with material equivalent to the surrounding material, and mechanically compact excavations and holes formed by the extraction of posts, anchors and other in-ground components and materials.

Coordination and sequence of work: Minimise the exposure of incomplete safety barrier system to traffic. If practicable, start removal of barrier system from the departure end.

Backfilling and compaction of holes: In 150 mm layers using materials similar to existing surrounding layers. Compact backfill to not less than the density of the surrounding layers.

3.10 COMPLETION

Rectification of ground/pavement

Disturbed ground or pavement around post: Trim and compact to a dense, tight, smooth and sealed condition so that resistance to water penetration is similar to that of the adjacent surface.

4 ANNEXURES

4.1 ANNEXURE – SUMMARY OF HOLD AND WITNESS POINTS

For private developments, certain Hold and Witness Points where specifically noted below require representatives of both the Superintendent and the Principal Certifier (e.g. Council) to authorise release.

Clause and description	Туре*	Submission/Inspection	Submission/Notice details	Process held
SUBMISSIONS, Products and materials Evidence of conformance	Н	Evidence of material and component conformance.	5 days before erection	Material ordering and delivery
SUBMISSIONS, Products and materials	Η	Evidence of zinc coating conforming to AS/ZS 4680.	5 days before erection	Material ordering and delivery

Туре*	Submission/Inspection	Submission/Notice details	Process held	
H – Superintendent and Principal Certifier	Proposal for alternative barrier system if horizontal radius and/or vertical curvature is unsuitable.	5 days before erection	Barrier erection	
Н	Set-out for safety barriers and terminal sections.	5 days before inspection	Barrier erection	
H – Superintendent and Principal Certifier	Details of proposed alternative post setting method if required depth cannot be achieved.	5 days before erection	Setting of posts	
H	Details for driving steel posts.	5 days before erection	Erection of steel posts	
W – Superintendent and Principal Certifier	Completed post installation, rectification of damaged posts and completed barrier system.	3 days before inspection	-	
W	Removal and disposal of barrier system and reinstated surrounding material.	3 days before removal of barrier system	-	
W	Disturbed ground/pavement surround posts.	3 days before inspection	-	
	H – Superintendent and Principal Certifier H H – Superintendent and Principal Certifier H W – Superintendent and Principal Certifier W	H - Superintendent and PrincipalProposal for alternative barrier system if horizontal radius and/or vertical curvature is unsuitable.HSet-out for safety barriers and terminal sections.H - Superintendent and Principal CertifierDetails of proposed alternative post setting method if required depth cannot be achieved.HDetails for driving steel posts.W - Superintendent and Principal CertifierCompleted post installation, rectification of damaged posts and completed barrier system.WRemoval and disposal of barrier system and reinstated surrounding material.WDisturbed ground/pavement surround posts.	H -Proposal for alternative barrier system if horizontal radius and/or vertical curvature is unsuitable.5 days before erectionH -Set-out for safety barriers and terminal sections.5 days before inspectionH -Details of proposed alternative post setting method if required depth cannot be achieved.5 days before erectionHDetails for driving steel posts.5 days before erectionW -Completed post installation, rectification of damaged posts and completed barrier system.3 days before inspectionWRemoval and disposal of barrier system and reinstated surrounding material.3 days before inspectionWDisturbed ground/pavement surround posts.3 days before inspection	

4.2 ANNEXURE – PAY ITEMS

This Annexure applies to Council projects. For private development works use of this schedule is optional, at the Superintendent's discretion.

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. 	- The distance measured along the centreline of the rail, centre	All costs associated with the supply of components, fixings and activities associated with the erection of each type of road safety barrier.

Pay items	Unit of measurement	Schedule rate scope
 1194.1(6) Nested modified blockout thrie-beam. 1194.1(7) Single W/thrie-beam transition. 1194.1(8) Nested W/thrie- beam transition. 		
1194.2 Modified eccentric loader terminal (MELT)	Each MELT section supplied and erected.	All costs associated with supply and erection of MELTS as documented.
 1194.3 Terminal section 1194.3(1) Leading terminal 1194.3(2) Trailing terminal 	Each terminal section supplied and erected.	All costs associated with supply and erection of terminals as documented.
 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 connector supplied and erected.	All costs associated with supply and erection of RSB connectors as documented 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 centreline 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 documented.
1194.8 Concrete footings for posts	Each footing.	All costs associated with the supply and installation of concrete footings as documented.
Traffic management		To 1101 Traffic management.

4.3 ANNEXURE - REFERENCED DOCUMENTS

The following documents are incorporated into this worksection by reference:

AS/NZS 1214	2016	Hot-dip galvanized coatings on threaded fasteners (ISO metric coarse thread series) (ISO 10684:2004, MOD)
AS 1237		Plain washers for metric bolts, screws and nuts for general
		purposes
AS 1237.1	2002	General plan

AS 1237.2 AS/NZS 1252	2016	Tolerances for fasteners - Product grades A, C and F High-strength steel fastener assemblies for structural engineering - Bolts, nuts and washers
AS/NZS 1252.1	2016	Technical requirements
AS/NZS 1594	2002	Hot-rolled steel flat products
AS 1627		Metal finishing - Preparation and pretreatment of surfaces
AS 1627.4	2005	Abrasive blast cleaning of steel
AS 1627.5	2003	Pickling
AS 1906		Retroreflective materials and devices for road traffic control purposes
AS 1906.1	2017	Retroreflective sheeting
AS/NZS 1906.2	2007	Retroreflective devices (non-pavement application)
AS/NZS 2311	2017	Guide to the painting of buildings
AS 3569	2010	Steel wire ropes
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/exterior
AS/NZS 3845		Road safety barrier systems and devices
AS/NZS 3845.1	2015	Road safety barrier systems
AS/NZS 4680	2006	Hot-dip galvanized (zinc) coatings on fabricated ferrous articles
Austroads ATS 5420	2020	Supply of bolts, nuts and washers.
RMS T166	2012	Relative compaction of road construction materials

5 ANNEXURE M – MIDCOAST COUNCIL SPECIFIC CLAUSES

M1.	Variations to or non-conformances with Council's AUS-SPEC are to be evaluated with reference to the procedure in Council's <i>Development Engineering Handbook</i> . Acceptance is to be obtained in writing from:	Variation procedure
	 an authorised representative of Council's Director of Infrastructure and Engineering Services, or 	
	 b) an accredited certifier where they are the Principal Certifier and hold the relevant accreditation category for the type of work. 	
M2.	This specification applies in addition to any development consent (DA) conditions. If there is any inconsistency, the conditions of consent shall prevail.	DA conditions
M3.	Refer to the MidCoast Council <i>Development Engineering Handbook</i> for final inspection, works-as-executed and handover requirements.	

6 AMENDMENT HISTORY

0		First Published
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