

Roads

Master Specification

RD-BF-C2 Wire Rope Safety Barrier Systems

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RD-BF-C2 Wire Rope Barrier System

1 General

- 1.1 This Part specifies the requirements for the supply and installation of Tensioned Wire Rope Road Safety Barrier (WRSB) Systems.
- 1.2 The following documents are referenced in this Part:
 - a) AS 1554 Welding of Steel Structures.
 - b) AS 3569 Steel Wire Ropes.
 - c) AS 3845 Road Safety Barrier Systems.
 - d) AS 4506 Metal finishing - Thermoset powder coatings.
 - e) AS 4534 Zinc and zinc/aluminium-alloy coatings on steel wire (f) AS 4680 Hot-dip galvanized (zinc) coatings on fabricated ferrous articles.
 - f) AS 9001 Quality Management Systems – Requirements.
 - g) Austroads AGRS09/08 Guide to Road Safety - Part 9: Roadside Hazard Management, available from: <https://austroads.com.au/>.
 - h) GD 300 “Accepted Safety Barrier Products” available from: <https://www.dpti.sa.gov.au/documents>.
- 1.3 Delineators shall comply with RD-LM-S3 “Supply of Guide Posts and Delineators” and RD-LM-C3 “Installation of Guide Posts and Delineators”.

2 Quality Requirements

- 2.1 At a minimum, the Contractor shall provide the following documents, procedures and / or instructions:
 - a) certification showing that all components comply with AS 3845 from a NATA accredited laboratory (a certificate from a non-NATA laboratory is not acceptable);
 - b) a copy of the Manufacturer’s instructions and any other procedures for the installation and maintenance of the Wire Rope Safety Barrier;
 - c) details of the country of manufacture;
 - d) evidence that the components comply with Clause 3 “Supply of Wire Rope Safety Barrier Components”; and
 - e) a copy of the current Calibration Certificate for the tensioning device.
- 2.2 If not provided beforehand, the documentation shall be submitted at least 14 days prior to the commencement of installation.
- 2.3 Provision of the documentation listed in this Clause shall constitute a **Hold Point**.

3 Supply of Wire Rope Safety Barrier Components

- 3.1 WRSBs shall comply with the requirements of this clause and be a Departmental accepted product (refer to GD 300).
- 3.2 Components of the WRSB shall be manufactured under a quality system certified to AS 9001 and in accordance with the specification for the proprietary barrier system. The components shall have a minimum design life of 20 years. The barrier system supplied shall have the same composition, mechanical properties and geometry as those used in the testing to AS 3845. The WRSB shall be a 4 rope system, complying with test level condition TL3 or TL4, as specified on the drawings or by the Principal.
- 3.3 All components of the installed WRSB shall be from the same WRSB system and components shall not be interchanged with other systems.

- 3.4 The rope used in the WRSB shall comply with the following:
- 19 mm diameter;
 - pre-stretched;
 - right hand lay;
 - galvanized at a minimum coating of 400g/m² measured in accordance with AS 4680 or coated with zinc-aluminium (zinc 95%, aluminium 5%) alloy to a minimum thickness of 270 g/m² measured in accordance with AS 4534; and
 - all fittings for joining ropes or connecting ropes to anchor points shall be swaged (i.e. cold pressed). Mechanical (wedge) fittings are not allowed.
- 3.5 The posts used in the WRSB shall comply with the following:
- hot dip galvanized in accordance with AS 4680;
 - powder coated to a minimum dry film thickness of 60µm in accordance with AS 4506;
 - meet all durability requirements for products exposed to Atmospheric Classification C as detailed in AS 4506;
 - stamped with date of manufacture, metal grade and the thickness of material; and
 - manufactured with welding certified in accordance with AS 1554.
- 3.6 The Contractor shall provide the original test certificates from the manufacturer to demonstrate compliance with the specified requirements for:
- mechanical properties of the steel in the wire ropes;
 - chemical composition analysis of the steel in the WRSB components; and
 - rope protective coating thickness.
- 3.7 The Contractor shall provide evidence (including details of the batch number displayed on the coil label) that the tests have been undertaken on samples which are representative of the materials supplied under this Contract.

4 Installation of Wire Rope Safety Barrier

General

- 4.1 Components shall be transported, handled and installed to prevent damage and shall not be left with splits, burrs or sharps after installation. The WRSB system shall be installed in accordance with the drawings and the manufacturer's instructions. The current Calibration Certificate for the tensioning device shall not be dated 12 months earlier than the Date of Acceptance of Tender.
- 4.2 Where the Contractor is unable to install the safety barrier in accordance with this Part (e.g. an obstruction prevents the installation of posts or anchor blocks), a **Hold Point** shall apply.

Location

- 4.3 The distance between the hinge of an embankment and post footings shall not be less than 0.6 m. The distance between the hinge of an embankment and anchor blocks shall not be less than 1.0 m. Where the footings are located between 1.6m and 0.6 m from the hinge point, the post spacing shall not exceed 2.0 m.
- 4.4 WRSB shall not be located at the bottom of V-drains.
- 4.5 WRSB shall not be connected to semi-rigid or rigid barriers, or bridge ends. However, WRSB may be interfaced with a more rigid barrier using an overlap system as approved by the manufacturer.
- 4.6 The operation of the WRSB shall not be compromised if installed on a horizontal curve with a radius of less than 600 m or a sag vertical curve with a radius less than 3000 m and the manufacturer's standard post spacing is used – refer to the manufacturer.

- 4.7 WRSB shall not be installed on a lateral slope greater than 1 in 10 without consulting the manufacturer.

Post Footings and Terminals

- 4.8 Concrete post footings and anchor blocks shall be constructed cast in place in accordance with the manufacturer's instructions and the requirements of this Clause.
- 4.9 The post footing size shall be 350 mm diameter x 950 mm long with concrete to be N32 with typical reinforcement recommended by each manufacturer. Anchor blocks shall be the maximum size specified by the manufacturer unless soil testing has been conducted to determine otherwise.
- 4.10 Following completion of the excavation for anchor blocks, and prior to pouring concrete, a **Hold Point** shall apply. Prior to pouring concrete for post footings and anchor blocks, the Contractor shall digitally record photographs which can clearly demonstrate that the required dimensions have been achieved.
- 4.11 Excavated material shall be removed off site or, where approved, incorporated in to the Works elsewhere.
- 4.12 Concrete shall be Grade N32 at a minimum and shall comply with ST-SC-S1 "Normal Class Concrete". Anchor block reinforcement shall comply with ST-SC-S6 "Steel Reinforcement" and the minimum clear cover to reinforcement shall be 50 mm. Anchor blocks and post footings shall be constructed such that they are free draining and that drainage water does not undermine the footing or anchor block.
- 4.13 Where soil tests have not been carried out, the Contractor shall conduct a pull-over test in accordance with the manufacturer's instructions.
- 4.14 After initial tensioning, movement of the anchor blocks shall be measured and then monitored at 6 month and 12 month inspections. The anchor block shall be removed, soil condition re-checked and a new anchor block designed and installed if:
- the total movement at any time exceeds 25 mm; or
 - at the 6 month or 12 month inspection, there is evidence that the blocks continue to move and exceeds 25 mm.

Post Colour and Delineation

- 4.15 Posts colour and delineators shall comply with Table RD-BF-C2 4-1.

Table RD-BF-C2 4-1 Post Colour and Delineation

Narrow Medians less than 4.5 m	Situations other than narrow medians less than 4.5 m
All posts to be white (G14 to AS 2700).	Post must be green (G61 to AS 2700) except for every fourth post, which must be white (G14 to AS 2700).
For posts spaced between 2 and 2.5 m, every fourth post must be affixed with a delineator	For posts spaced between 2 and 2.5 m, every white post must be affixed with a delineator.
For other post spacings, delineators must be affixed at 8 to 10.5 m intervals.	For other post spacings, delineators must be affixed at 150 m intervals.

Posts

- 4.16 Posts shall be installed so that:
- the alignment on plan of the completed barrier does not deviate by more than ± 20 mm at any point;
 - the alignment in elevation of the tops of the barrier posts does not deviate in any 10 m length by more than ± 10 mm from the line of sight along the tops of posts;
 - spacing of posts does not deviate by more than ± 50 mm;
 - the rounded edges of posts are presented to the direction of traffic flow; and

- e) excluder washers are fitted at the base of all posts to prevent soil ingress.
- 4.17 Drilling, cutting or welding of posts is not permitted. All posts shall be installed in sleeves in concrete footings. Driven sleeve posts shall not be used.

Tensioning

- 4.18 Tensioning shall be undertaken only when the ambient temperature is between 40°C and 0°C. All ropes shall be tensioned appropriate to the ambient temperature in accordance with the manufacturer's instructions. The Contractor shall undertake initial tensioning of each rope which shall not proceed until 14 days after pouring the last anchor block which will be affected by tension in the ropes. The Contractor shall complete a Tension Report.
- 4.19 6 months and 12 months after the initial tensioning of the WRSB, the Contractor shall undertake verification testing by checking the tension in each rope for compliance with the specified requirements. If necessary, the Contractor shall re-tension the ropes to comply with the manufacturer's instructions. Upon completion of the verification of tension, the Contractor shall complete a Tension Report.
- 4.20 Copies of the Tension Reports will be provided to the Principal. Approval of the reports by the Principal shall constitute a **Hold Point**.

Engagement at Anchors, Turn Buckles and Tension Fittings

- 4.21 Upon completion of verification of the tension, ropes shall be engaged in accordance with Table RD-BF-C2 4-2.

Table RD-BF-C2 4-2 Rope Engagement

Location	Measure of Engagement
Anchor point with threaded Swage	≥10 mm past the last nut.
Turn buckle	Maximum 30 mm and minimum 10 mm outside any nut.

- 4.22 The Contractor shall ensure all hot dip galvanized swaged ends and tension fittings are fully wrapped with Denso tape. Turn buckles shall be located at least 100 mm from any post.

Safety Check Ropes

- 4.23 Upon completion of verification of the rope tension, safety check ropes shall be placed in accordance with the manufacturer's drawings.
- 4.24 Safety check ropes shall be fully extended along the tensioned rope, clipped in place and secured to the anchor frame. Safety check ropes shall be clear of debris and not fouled by other ropes.
- 4.25 Safety check ropes shall consist of stainless steel Grade 304 or 316 with matching fittings. The ropes shall be 8 mm diameter made of 7 strands with 19 wires each (7x19) with the minimum breaking load for Grade 304 rope of 40kN and for Grade 316 of 34kN.

5 Removal of Existing Safety Barrier Systems

- 5.1 Unless specified otherwise, existing safety barriers removed prior to installation of the new wire rope barrier system shall become the property of the Contractor. The removed components shall not be disposed of in landfill.
- 5.2 If a hole is created or excavated as a result of the removal of an existing w-beam or wire rope post, the hole shall be backfilled and compacted with Type A material or PM 2/20 so that the permeability of the backfill is not less than the surrounding material. Compaction in layers not exceeding 150 mm at OMC to not less than 95% is deemed to meet this requirement. 1% Cement may be added to this backfill.

6 Hold Points

6.1 The following is a summary of Hold Points referenced in this Part:

Document Ref.	Hold Point	Response Time
2.3	Submission of Quality Documentation	7 days
4.2	Unable to Install Safety Barrier	
4.10	Excavation for anchor block	1 working day

7 Verification Requirements and Records

7.1 The Contractor shall supply the following records:

Table RD-BF-C2 7-1 Verification Requirements

Document Ref.	Subject	Record to be Provided
3.1 - 3.7	Properties of WRSB components	Test results of representative samples of components.
		Coil batch number (obtained from the coil label).
		Date of manufacture, grade and metal thickness stamped on the posts.
4.8 - 4.14	Post footing and anchor blocks	Pull Over Failure Load Results where applicable.
		Soil Test Results where Contractor proposes alternative size anchor block.
		Photographic records of anchor block and post footing dimensions.
		Anchor block movement report at initial tensioning and at 6 and 12 month inspections.
4.18 - 4.19	Tensioning	Tensioning Report at initial, 6 & 12 months