SPECIFICATION 603

SAFETY AND TRAFFIC BARRIER SYSTEMS

Copyright MAIN ROADS Western Australia
<table>
<thead>
<tr>
<th>Clause Number</th>
<th>Description of Revision</th>
<th>Authorised By</th>
<th>Issue Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Page Nos 21 to 37</td>
<td>Date of Publication in Header amended</td>
<td>SCO</td>
<td>21/04/2017</td>
</tr>
<tr>
<td>Whole document</td>
<td>Reformatted</td>
<td>SCO</td>
<td>18/04/2017</td>
</tr>
<tr>
<td>Clause 603.34.11</td>
<td>Minimum foundation depth for road safety barrier systems</td>
<td>PDE</td>
<td>08/08/2016</td>
</tr>
<tr>
<td>Annexure 603A</td>
<td>Ingal Civil Product Part No. deleted and limit of dynamic deflection revised for Ingal Flexfence 4-Wire Rope barrier</td>
<td>PDE</td>
<td>29/08/2014</td>
</tr>
<tr>
<td>Annexure 603D</td>
<td>Details of Approved Solid Blockouts amended</td>
<td>PDE</td>
<td>15/08/2012</td>
</tr>
<tr>
<td>Annexure 603B</td>
<td>Notes numbered</td>
<td>PDE</td>
<td>14/11/2011</td>
</tr>
<tr>
<td>Annexure 603A and Guidance Notes</td>
<td>Sentryline II 4-Wire Rope Safety Barrier approved</td>
<td>PDE</td>
<td>03/11/2011</td>
</tr>
<tr>
<td>603.12</td>
<td>Specification for Posts and Steel block-outs changed</td>
<td>PDE</td>
<td>02/08/2011</td>
</tr>
<tr>
<td>603.14</td>
<td>Use of galvanized pre-stressing strands permitted</td>
<td>PDE</td>
<td>24/02/2011</td>
</tr>
<tr>
<td>603.12</td>
<td>Item 9 – amended the requirement to use approved solid block-out on W-Beam Item (b) amended, new item (c) added Additional information added for Ingal Block and APC Blocks</td>
<td>SAME</td>
<td>19/05/2009</td>
</tr>
<tr>
<td>603.14</td>
<td>Items 6 &amp; 7 added Sub clause f added Item 6 added Sub clause c added ACP Solid block-out added to list of approved block-outs.</td>
<td>SAME</td>
<td>20/08/2008</td>
</tr>
<tr>
<td>603.31</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>603.32</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>603.33</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annexure 603A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annexure 603D</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## CONTENTS

<table>
<thead>
<tr>
<th>Clause</th>
<th>Page No</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GENERAL</strong></td>
<td></td>
</tr>
<tr>
<td>603.01 Scope</td>
<td>5</td>
</tr>
<tr>
<td>603.02 References</td>
<td>5</td>
</tr>
<tr>
<td>603.03 Definitions</td>
<td>6</td>
</tr>
<tr>
<td>603.04 – 603.10 NOT USED</td>
<td>7</td>
</tr>
<tr>
<td><strong>PRODUCTS AND MATERIALS</strong></td>
<td>7</td>
</tr>
<tr>
<td>603.11 General</td>
<td>7</td>
</tr>
<tr>
<td>603.12 W-Beam and Thrie-Beam Barriers</td>
<td>8</td>
</tr>
<tr>
<td>603.13 Wire Rope Safety Barrier Systems</td>
<td>8</td>
</tr>
<tr>
<td>603.14 Concrete Barriers</td>
<td>9</td>
</tr>
<tr>
<td>603.15 Steel Rail Barriers</td>
<td>9</td>
</tr>
<tr>
<td>603.16 Transitions and End Treatments</td>
<td>9</td>
</tr>
<tr>
<td>603.17 – 603.20 NOT USED</td>
<td>10</td>
</tr>
<tr>
<td><strong>FABRICATION</strong></td>
<td>10</td>
</tr>
<tr>
<td>603.21 General</td>
<td>10</td>
</tr>
<tr>
<td>603.22 W-Beam and Thrie-Beam Barriers</td>
<td>11</td>
</tr>
<tr>
<td>603.23 Wire Rope Safety Barrier Systems</td>
<td>11</td>
</tr>
<tr>
<td>603.24 Steel Rail Barriers</td>
<td>11</td>
</tr>
<tr>
<td>603.25 Transitions and End Treatments</td>
<td>12</td>
</tr>
<tr>
<td>603.30 NOT USED</td>
<td>12</td>
</tr>
<tr>
<td><strong>INSTALLATION</strong></td>
<td>12</td>
</tr>
<tr>
<td>603.31 General</td>
<td>12</td>
</tr>
<tr>
<td>603.32 W-Beam and Thrie-Beam Barriers</td>
<td>13</td>
</tr>
<tr>
<td>603.33 Wire Rope Safety Barrier Systems</td>
<td>14</td>
</tr>
<tr>
<td>603.34 Concrete Barriers</td>
<td>15</td>
</tr>
<tr>
<td>603.35 Steel Rail Barriers</td>
<td>17</td>
</tr>
<tr>
<td>603.36 Transitions</td>
<td>18</td>
</tr>
<tr>
<td>603.37 End Treatments</td>
<td>18</td>
</tr>
<tr>
<td>603.38 – 603.80 NOT USED</td>
<td>19</td>
</tr>
<tr>
<td><strong>AS BUILT AND HANDOVER REQUIREMENTS</strong></td>
<td>19</td>
</tr>
<tr>
<td>603.81 As-Built Information</td>
<td>19</td>
</tr>
<tr>
<td>603.82 – 603.90 NOT USED</td>
<td>19</td>
</tr>
<tr>
<td><strong>CONTRACT SPECIFIC REQUIREMENTS</strong></td>
<td>19</td>
</tr>
<tr>
<td>603.91 – 603.99 NOT USED</td>
<td>19</td>
</tr>
<tr>
<td><strong>ANNEXURE 603A</strong></td>
<td>20</td>
</tr>
</tbody>
</table>
Approved Wire Rope Safety Barrier Systems ................................................................. 20

ANNEXURE 603B ................................................................................................................. 21
Road Safety Barrier Systems Requirements .................................................................. 21

ANNEXURE 603C .................................................................................................................. 24
Concrete Class for Concrete Barriers ............................................................................. 24

ANNEXURE 603D .................................................................................................................. 25
Approved Solid Blockouts ............................................................................................... 25

ANNEXURE 603E .................................................................................................................. 26
Principals' Storage Area ..................................................................................................... 26

ANNEXURE 603F .................................................................................................................. 27
Principal Supplied Items .................................................................................................... 27
GENERAL

603.01 SCOPE

1. The work under this specification consists of the supply, fabrication, protective treatment and installation of permanent road safety barrier systems and traffic barriers for structures as shown on the Drawings and in accordance with AS/NZS 3845.

2. Except where this Specification states otherwise, where this Specification refers to road safety barrier systems the requirements shall also apply to traffic barriers for structures.

603.02 REFERENCES

1. Australian Standards, MAIN ROADS Western Australia Standards and MAIN ROADS Western Australia Test Methods are referred to in abbreviated form (e.g. AS 1234, MRS 67-08-43 or WA 123). For convenience, the full titles are given below:

**Australian Standards**

- AS 1111 ISO Metric Hexagonal Bolts and Screws
- AS 1112 ISO Metric Hexagon Nuts
- AS 1163 Structural Steel Hollow Sections
- AS 1214 Hot Dipped Galvanized Coatings on Threaded Fasteners
- AS 1237 Flat Metal Washers for General Engineering Purposes (Metric Series)
- AS 1252 High strength steel bolts with associated nuts and washers for structural engineering
- AS 1310 Steel wire for tendons in pre-stressed concrete
- AS 1311 Steel Tendons for Pre-stressed Concrete 7 Wire Stress Relieved Steel Strand for Tendons in Pre-stressed Concrete
- AS 1313 Steel tendons for pre-stressed concrete - Cold-worked high-tensile alloy steel bars for pre-stressed concrete
- AS 1379 Specification and Supply of Concrete
- AS 1553.1 Low Carbon Steel Electrodes for Manual Metal Arc Welding
- AS 1554 Structural Steel Welding
603.03  DEFINITIONS

1. The following definitions shall apply:

AS 1594  Hot-Rolled Steel Flat Products
AS 1595  Cold Rolled, Unalloyed Steel Sheet and Strip
AS 1604  Timber – Preservative-treated – Sawn and round
AS 1720  Timber Structures
AS 2082  Visually Stress Graded Hardwood for Structural Purposes
AS 2203  Cored Electrodes for Arc Welding
AS 2858  Timber Softwood Visually Stress Graded for Structural Purposes
AS 3610  Formwork for Concrete
AS 3678  Structural Steel - Hot Rolled plates, floor-plates and slabs
AS 3799  Liquid Membrane-Forming Curing Compounds for Concrete
AS 3679.1 Hot Rolled Bars and Sections
AS 4100  Steel Structures
AS 4680  Hot-Dip Galvanized Coatings on Fabricated Ferrous Articles

Australian/New Zealand Standards
AS/NZS 3845  Road Safety Barrier Systems
AS/NZS 4671  Steel Reinforcing Materials

MAIN ROADS Standard Drawings
0530-0686 – Treatment of Posts in Rock

Main Roads Specifications
Specification 201  QUALITY SYSTEMS
Specification 302  EARTHWORKS
Specification 501  PAVEMENTS
Specification 820  CONCRETE FOR STRUCTURES
Specification 831  MINOR STEEL ITEMS
Specification 835  PROTECTIVE TREATMENT OF STEELWORK
Specification 901  CONCRETE – GENERAL WORKS
a. Road safety barrier systems are all barriers not attached to a structure.

b. Traffic barriers for structures are all barriers attached to a structure.

c. This Specification does not cover temporary barrier systems.

d. Road safety barrier systems shall be W-beam, Thrie-beam, Wire Rope or Concrete, as nominated on the Drawings.

e. Traffic barriers for structures shall be as nominated on the Drawings.

f. Structure shall include bridges, tunnels, culverts, retaining walls and any associated approach slabs.

g. The meaning of terms and definitions in this specification shall be as defined in AS / NZS 3845.

h. Snug-tight is the tightness attained by a few impacts of an impact wrench or by the full effort of a person using a standard podger spanner in accordance with AS 4100.

**603.04 – 603.10 NOT USED**

**PRODUCTS AND MATERIALS**

**603.11 GENERAL**

1. All materials supplied by the Contractor shall be new.

2. Unless otherwise specified, all steel plate, bars and sections used in the Works shall be as a minimum Grade 300 in accordance with AS 3678 or AS 3679 as appropriate.

3. All bolts and nuts shall comply with AS/NZS 1111 and AS/NZS 1112 commercial grade bolts, except those shown on the Drawings as high strength, which shall comply with AS/NZS 1252, Grade 8.8.

4. Flat washers shall comply with AS 1237.

5. The Contractor shall retain the test certificates showing that materials used in the Works conform to the specified standards for the Superintendent’s inspection as required.

6. All materials used in the Works shall be identified with the test certificates. The Contractor shall establish and maintain a comprehensive system of identification records. Copies of these records shall be forwarded to the Superintendent on request.

7. All materials, whether fabricated or not, shall be stored in such a manner that damage and corrosion are prevented. Generally, storage at least 200 mm above the ground on platforms, slabs, or other supports under cover will be satisfactory. Rusted or bent or damaged steel shall be rejected. The Contractor shall store components in such a manner that the freshly galvanized surfaces are protected from the attack of "white rust".
8. Any timber posts and/or block-out blocks shall not be stored on top of the steel sections.

9. The Contractor shall ensure that loading, transport, unloading, stacking and handling operations before and after fabrication are carried out in such a way that the items are protected from distortion and that galvanized surfaces are protected from damage.

603.12 W-BEAM AND THRIE-BEAM BARRIERS

1. Corrugated W-beam and Thrie-beam beam elements and buffered ends shall be formed from steel grade HA 350 or equivalent in accordance with AS/NZS 1594.

2. W-beam and Thrie-beam road safety barrier posts shall be formed from steel grade HA 300 or equivalent in accordance with AS/NZS 1594.

3. Posts for traffic barriers for structures shall be formed from Grade 300 steel to AS 3679.1 for side-mounted application. Posts mounted on top of kerb shall be Universal Columns formed from Grade 300 steel to AS 3679.1 attached to a Grade 250 steel base-plate to AS 3678.

4. W-beam and Thrie-beam steel road safety barrier block-outs shall be formed from steel grade HU 300 in accordance with AS/NZS 1594.

5. Steel block-outs for traffic barriers for structures shall be formed from steel Grade HU 300 in accordance with AS/NZS 1594.

6. Any hardwood timber posts and/or block-outs used in the Works shall be Western Australia Jarrah (Eucalyptus Marginata). All timber shall be Structural Grade No. 3. Structural grading shall be in accordance with AS 2082.

7. Any softwood timber posts and/or block-outs used in the Works shall be Pinus Radiata preservative treated to hazard level H4 in accordance with AS 1604. All timber shall either be Structural Grade No. 1 or Structural Grade No. 3 providing the timber has a stress grade of not less than F8 and no more than F14. Structural grading shall be in accordance with AS 2858 and stress grading to AS 1720.

8. The Contractor shall submit written documentation indicating the type of timber to be used for posts and/or block-outs and its structural grading to the Superintendent prior to installation.

9. Approved solid block-outs as listed in Annexure 603D shall be used on W-beam road safety barriers.

10. The Contractor shall not use solid block-outs on proprietary end treatments unless specifically approved by the Supplier of the end treatment system.

603.13 WIRE ROPE SAFETY BARRIER SYSTEMS

1. Only tensioned Wire Rope Barrier Systems detailed in Annexure 603A shall be used in the Works.
2. The Contractor shall submit written certification by the manufacturer that the proposed Wire Rope Barrier System will meet the deflection criteria and perform satisfactorily on the curve radii and for the K values detailed in Table 603B.1 to the Superintendent prior to the purchase of any Wire Rope Barrier System.

HOLD POINT

3. Proprietary Wire Rope Barrier Systems shall be in accordance with the manufacturer’s published requirements.

603.14 CONCRETE BARRIERS

1. Concrete class for barriers shall be in accordance with Annexure 603C unless otherwise detailed on the Drawings.

2. All N class concrete shall be in accordance with Specification 901 - CONCRETE - GENERAL WORKS.

3. All S Class concrete shall be in accordance with Specification 820 - CONCRETE FOR STRUCTURES.

4. All reinforcing bar and fabric used in the Works shall comply with the requirements of AS 4671. Reinforcing bars shall be Grade N and fabric shall be Fabric Grade SL.

5. All pre-stressing strand used in the Works shall comply with the requirements of AS 1311. All steel stressing wire, tendons and stress bars shall conform to the requirements of AS 1310, AS 1311 or AS 1313 as appropriate. Galvanized pre-stressing strands are permitted.

6. In accordance with AS 1379 Clause 1.5.3.2 (b) the slump at the point of acceptance shall be 20 mm.

7. Water-reducing admixtures shall not be used.

603.15 STEEL RAIL BARRIERS

1. Structural steel hollow sections shall conform to the requirements of AS 1163 and shall be grade C350.

2. Unless otherwise specified all structural steel sections shall be a minimum Grade 250 in accordance with AS 3679.

3. Each rail and post shall be marked with durable identification marks with its relevant identification number as shown on the Drawings. This number shall be used on all related schedules and documents.

603.16 TRANSITIONS AND END TREATMENTS

1. Materials for non-proprietary transitions and end treatments shall comply with the Products and Materials requirements of the Specification.

2. Materials used in proprietary end treatments (including transitions) shall be in accordance with the manufacturer’s published requirements.

3. Proprietary end treatments to be used for each barrier shall meet the Test Level specified in Table 603B.3 in Annexure 603B.
4. Only those end treatments specified in Table 603B.3 and in the configuration nominated in Table 603B.4 shall be used.

5. The Drawings may indicate a nominated proprietary end treatment with the wording or similar approved product or a generic name for the end treatment. Similar approved end treatments are those contained in Table 603B.3.

6. Prior to the purchase of any proprietary end treatment the details of the proposed system shall be provided to the Superintendent for approval.

FABRICATION

603.21 GENERAL

1. All steelwork shall be fabricated in accordance with the requirements of Specification 831 MINOR STEEL ITEMS and AS 4100, except as varied by this Specification.

2. Cut edges shall be finished as specified in AS 4100. The edge surface preparation shall conform to the requirements specified for galvanizing. Unless shown otherwise on the Drawings, all corners on cut edges shall be rounded to a radius of approximately 1.5mm, except where such edges are subsequently to be welded.

3. After fabrication all burrs, weld splatter and slag shall be removed by suitable mechanical means and all sharp edges and rough welds rounded off.

4. All elements shall be fabricated such that the final erected barrier complies with the tolerances specified.

5. All bolt holes shall be to a diameter 2mm larger than the diameter of the bolt unless otherwise shown on the Drawings. All holes shall be cylindrical and perpendicular to the face of the member. Holes shall be made by mechanical means.

6. Unless otherwise shown on the Drawings, all steel components covered by this Specification with the exception of reinforcement where the cover is 40mm or greater shall be hot dip galvanized in accordance with Specification 835 PROTECTIVE TREATMENT OF STEELWORK.

7. All galvanized and/or painted surfaces shall be smooth to the touch and free from runs, blisters and irregularities.

8. Any damage to galvanizing, both before and after installation, shall be repaired using zinc rich epoxy paint. Repairs shall be completed within 24 hours of the damage having occurred.

9. Welding of or onto any steel barrier rail elements or any site welding shall not be permitted.
603.22 W-BEAM AND THRIE-BEAM BARRIERS

1. Where W-beam and Thrie-beam safety barriers are shown on the Drawings to be installed at a radius of 45m or smaller, they shall be shop curved to form the required radius. Larger radius may be curved on site by forcing the rail against the posts. The Contractor shall use a method for curving the rails such as not to damage the posts, or distort the rail or damage the material. Any posts that are damaged or pushed out of tolerance shall be rectified at no cost to the Principal.

2. Notwithstanding the requirements of Clause 603.22.1, where the W-beam is used to form the parabolic flare of the WAMELT end terminal, the panel shall not be pre-bent, but shall be forced against Posts 1 to 7 to form a series of kinks in the panel at the post locations.

3. The Contractor shall only use one block-out type for the entire barrier system excluding the end treatment.

4. On any W-beam system only one type of block-out shall be used i.e. either steel or solid. Block-out types shall not be mixed.

603.23 WIRE ROPE SAFETY BARRIER SYSTEMS

1. All fabrication of wire rope safety barrier systems shall comply with the requirements specified in the manufacturer’s published requirements.

603.24 STEEL RAIL BARRIERS

1. The Contractor shall prepare Shop Drawings to show details of fabrication for steel rail barriers, which are not explicit in the Drawings. Details required include dimensions, angles, cambering profiles, splice locations, weld preparation details and any special requirements as detailed under Contract Specific Requirements.

2. Four copies of the shop Drawings certified by the Contractor, as complying with the above requirements shall be submitted to the Superintendent seven (7) working days before fabrication commences.

3. The Contractor shall be responsible for the correctness of the Shop Drawings. Acceptance of the Shop Drawings by the Superintendent shall not relieve the Contractor of his responsibility.

4. All posts shall be vertical as shown on the Drawings. The Contractor's attention is drawn to the need to detail individually angled brackets and joints to ensure that this requirement is met.

5. Posts and rails shall not contain welded splices. The location of any bolted splices required in the rails additional to those shown on the Drawings shall be subject to approval by the Superintendent.

6. Where the rails are shown on the Drawings to be curved, they shall be shop curved to form that shape without distorting the section or damaging the material.
7. All welding shall be in accordance with AS 1554.1. All welds shall be Category SP unless otherwise shown on the Drawings. All electrodes used for manual welding shall conform to AS 1553. Flux cored electrodes used for semi-automatic welding shall conform to AS 2203.

603.25 TRANSITIONS AND END TREATMENTS

1. Fabrication of non-proprietary end treatments shall be in accordance with the requirements of the Specification.

2. Fabrication of proprietary end treatments shall be in accordance with the manufacturer’s published requirements and the appropriate standards.

603.30 NOT USED

INSTALLATION

603.31 GENERAL

1. Prior to the installation of any road safety barrier system the Contractor shall certify to the Superintendent that all fabrication and surface protection of the barrier system has been completed in accordance with the Specification.

2. The Contractor shall supply to the Superintendent for approval a process description for the installation of road safety barrier systems a minimum of seven (7) days prior to the installation of any road safety barrier. This requirement does not apply for traffic barriers for structures.

3. Prior to the installation of any road safety barrier system, the Contractor shall certify to the Superintendent that all foundation preparation for the road safety barrier system has been completed in accordance with the Specification. This requirement does not apply for traffic barriers for structures.

4. Prior to the installation of any road safety barrier system the Contractor shall certify to the Superintendent that the setting out details for the road safety barrier system and end treatments conform to the details shown on the Drawings and Annexure 603B.

5. Permanent road safety barrier systems shall not be erected until after all earthworks, pavement and backfill works have been completed.

6. Permanent road safety barrier systems other than concrete barriers shall be erected after all bituminised surfacing works have been completed. The Contractor shall ensure that the installation process of the barriers does not damage the bituminised surface.

7. The visual appearance of the installed barrier system shall have a smooth profile, free of kinks and abrupt changes.
8. Barriers shall generally be erected with their principal axes vertical. However, if the cross-fall on the road is greater than 4.5%, they shall be erected perpendicular to the pavement unless specified otherwise on the Drawings.

9. When a road safety barrier system or traffic barriers for structures is being constructed adjacent to traffic, the Contractor shall make suitable arrangements to minimize the hazard to road users from the incomplete barrier, particularly, the exposed ends of barriers, and particularly when leaving a partially constructed barrier at the end of a day’s work. This may involve managing the sequence of construction such that the leading end treatments and any transitions between barrier systems are constructed first and barrier construction progresses in the direction of traffic flow in conjunction with the use of temporary safety barriers.

### 603.32 W-BEAM AND THRIE-BEAM BARRIERS

1. All laps in W-beam and Thrie-beam panels shall be arranged as shown on the Drawings.

2. During installation, W-beam and Thrie-beam panels shall not be cut.

3. Posts shall be installed by driving, provided there is no distortion or damage which may reduce their effectiveness.

4. Posts shall be installed to their full design depth. If site conditions dictate that the posts cannot be driven, then the posts shall be installed in holes to the dimensions shown on Drawing 0530-0686. The bottom of the holes shall be adequately compacted to achieve the same density as the surrounding soil. The posts shall be supported to true line and level whilst the holes are backfilled with clean, well-graded, non-cementitious sub-base or basecourse granular material and compacted to achieve the same density as the surrounding material.

5. The foundation of any post shall be deemed complying when the displacement at ground level does not exceed 3mm when a 1kN force is applied 200mm below the top of the post in any direction. For any posts failing the test, the Contractor shall take remedial measures and retest the rectified post plus one other similar post, at no cost to the Principal.

6. Prior to the installation of any W-beam or Thrie-beam barrier system where non standard post lengths or other special measures are proposed to be used, the Contractor shall provide details of the measures proposed and evidence that the effectiveness of the barrier system will be maintained, to the Superintendent for approval.

7. During installation of cables in the end anchorages of W-beam railing the Contractor shall ensure that no twisting of the cable occurs.

8. When cable assemblies are used, all nuts shall be tightened to a minimum torque of 50Nm on the assemblies.

9. All bolts used in W-Beam and Thrie-beam systems other than nuts on cables assemblies, shall be tightened to a snug-tight condition.
10. All bolt heads on the traffic side of W-beam and Thrie-beam safety barriers shall be flush with the rail.

11. W-beam and Thrie-beam safety barriers shall be erected to the following tolerances:

   a. Variation from true plan position of posts ±20mm
   b. Variation of line of rails from specified vertical profile ±10mm
   c. Variation of line of rails from specified horizontal alignment ±20mm
   d. Variation of posts from vertical 1 in 50
   e. Orientation of block-out / and or post to rail + 0mm, -15mm (Measured at the point of greatest offset between the block-out or post to the rail)
   f. Dimensions of holes -0mm, +50mm
   g. Top of bolt head relative to rail -0mm, +5mm

603.33 WIRE ROPE SAFETY BARRIER SYSTEMS

1. Installation of Wire Rope safety barrier systems shall comply with the requirements specified in the manufacturer’s published requirements except where varied by this Specification.

2. All posts shall be installed in concrete footings with suitable sockets including covers to the sockets. Driven posts shall not be used.

3. Intermediate blocks or tension bays shall be installed at the dimensions recommended by the manufacturer.

4. Footings shall be installed in accordance with the manufacturer’s published requirements. Footings shall be of a uniform shape and unless specified otherwise by the manufacturer shall not protrude above the finished surface level by more than 20mm.

5. Anchor blocks shall be installed in accordance with the manufacturer’s published recommendations. The maximum spacing between anchor blocks shall be no longer than 1 km.

6. If the ground conditions are such that the required depth of footing cannot be installed, then it is acceptable to reduce the depth of the footing providing that the completed footing can resist a bending moment of 6kNm. This shall be tested by placing a post into the completed concrete footing and using a lever hoist and load cell anchored to a truck. A force of 10kN shall be applied to the post at a height of 600mm above ground level. Providing the footing withstands this with a movement of less than 3mm at ground level then footing shall be considered acceptable.
7. Prior to the reduction of any depth of footing the Contractor shall notify the Superintendent of the use of reduced footings and shall construct a sample footing and subject it to the testing requirements prior to its implementation in the Works.

8. In certain geotechnical conditions the Superintendent may order testing of the footings to confirm that they can resist a bending moment of 6kNm. For any footings failing the test, the Contractor shall take remedial measures and retest the rectified post plus one other similar post at no cost to the Principal.

9. Excavations for concrete post foundations and anchor blocks must have vertical sides. This shape shall be maintained up to and during pouring of the concrete. Where installed adjacent to or within bituminous surfacing the bituminous surfacing shall be protected so that no concrete spills onto the surfacing.

10. All concrete for the post foundations and anchor blocks shall be in accordance with the manufacturer’s published recommendations or otherwise shall be N32 and conform to the requirements of Specification 901 CONCRETE - GENERAL WORKS.

11. Wire rope safety barrier systems shall be erected to tolerances specified in the manufacturer’s published requirements, or if none available:
   a. Variation from true plan position of posts ± 20mm
   b. Variation in height above finished surface level from specified dimension - 0mm – +20mm
   c. Variation from true plan position of barrier ± 20mm
   d. Footings (length, width and depth) ± 20mm
   e. Anchor blocks (length, width and depth) ± 20mm
   f. Position of post relative to centre of footing ± 50mm

12. The Contractor shall provide certification to the Superintendent that the wire rope has been tensioned in accordance with the manufacturer’s published requirements. The certificate shall include but not be limited to the date, time, ambient air temperature, tension force and signature with printed name of the individual managing the work at the time of the complete installation of each wire rope.

603.34 CONCRETE BARRIERS

1. Construction shall be by placing concrete in fixed forms, or by slip forming.

2. Formwork design and construction shall be in accordance with AS 3610.

3. The Contractor shall submit evidence to the Superintendent that the proprietary extrusion machine to be used will extrude the barrier shape to the requirements of the Specification and Drawings prior to extruding any concrete safety barrier.
4. The start and end of any barrier length installed in a continuous process during a day shall be at a construction joint.

5. Expansion joints shall be straight, square to the line of the barrier and to the width and spacing specified on the Drawings.

6. Contraction joints shall be straight, square to the line of the barrier and shall be 50 ± 5mm deep. Contraction joints shall be spaced at a maximum of 2.5m centres.

7. Formed and extruded concrete surfaces shall conform to Class 2 in accordance with AS 3610.

8. All unformed concrete surfaces shall conform to a U2 finish in accordance with Specification 901 CONCRETE – GENERAL WORKS.

9. All welding of reinforcement bars, including tack welds shall be in accordance with AS 1554.3. Welding of stressing wires, tendons and stress bars shall not be permitted. All electrodes used for manual welding shall conform to AS 1553. Flux cored electrodes used for semi-automatic welding shall conform to AS 2203.

10. The foundation of the barriers shall be finished to the levels detailed in the Drawings. The barrier construction process must avoid disturbing the material below foundation level and all loose material shall be removed prior to the placement of the concrete.

11. For road safety barrier systems but not for traffic barriers for structures, the foundation for barriers shall be a minimum 200mm thickness of pavement material compacted as a minimum to the density in accordance with the requirements for pavements as detailed in Specification 501 PAVEMENTS as shown on the Drawings or unless otherwise detailed.

12. The Contractor shall construct trial section(s) for each proposed extruded concrete barrier system of at least 5 metres in length including contraction and construction joints in accordance to the requirements of the Drawings and the Specification for the Superintendents inspection and testing as required. The trial concrete barrier section shall be approved and accepted by the Superintendent, prior to the construction of the concrete barrier.

13. Concrete shall be conveyed to its final position using methods, which will prevent segregation and/or loss of material. All concrete shall be placed in its final position within 90 minutes of water having been added to the mix.

14. Concrete shall be placed in a continuous operation between construction joints and shall be thoroughly vibrated to remove all voids and air bubbles.

15. Freshly placed concrete shall be protected from the elements and prevented from drying out too quickly. All concrete surfaces shall be cured by one or a combination of the following methods for not less than five (5) days:
   a. Continuous wetting.
b. Spraying with an approved curing compound complying with the requirements of AS 3799. Such curing compound shall be applied in accordance with the manufacturer's published requirements.

c. Wrapping with polythene or similar film to provide an airtight cover.

d. Maintaining the formwork in position for the curing period.

The Contractor shall ensure that the method of curing shall not result in any staining of exposed surfaces of concrete.

16. Constructed concrete barriers shall be protected from impact by general traffic for a period of seven (7) days.  

Protection from Traffic

17. If contraction joints are not formed in the wet concrete they must be saw cut within 12 hours of the concrete barrier being cast.  

Contraction Joints

18. Concrete barriers shall be erected to the following tolerances:

Tolerances

   a. Concrete cover to reinforcement - 0mm, + 5mm

   b. Variation of cross-section dimensions (except height) ±5mm

   c. Variation from vertical or specified batter (1 in 500)

   d. Variation from grades indicated on Drawings (1 in 1,000)

   e. Departure from plan position ±25mm

   f. Departure from vertical profile ±10mm

      (The vertical profile of the top of the barrier is defined as the specified road profile + the barrier height).

   g. Surface irregularities nil abrupt or 5mm in a 3m template

19. In addition to the above tolerances the Contractor shall take every care to ensure that the barrier is erected to smooth curves, which reflect the design profiles of the barrier.

603.35 STEEL RAIL BARRIERS

1. Handling and temporary supports of the steel barrier and its components shall be in a manner that avoids damage to the surface finish. Any damage to the surface finish shall be rectified in accordance to Specification 835 PROTECTIVE TREATMENT OF STEELWORK at no cost to the Principal.

Handling and Temporary Supports

2. All bolts shall be snug tightened to the requirements of AS 4100, unless otherwise noted on the Drawings.

Bolting

3. The finished steel rail barrier shall be erected to the tolerances set out below:
a. Variation from true plan positions of posts + 5mm
b. Variation between any three adjacent posts + 3mm
c. Variation of dimensions in elevation + 3mm
d. Variation of line of rails from specified vertical and horizontal profile + 5mm

4. In addition to the above tolerances the Contractor shall take every care to ensure that the barrier is erected to smooth curves, which reflect the design profiles of the barrier. In particular the Contractor shall ensure that a smooth profile is maintained in the top rail after all site connections have been completed.

5. Where barrier posts are installed in cast-in sockets and prior to pouring epoxy into post sockets, the Contractor shall certify, in writing to the Superintendent that the barrier has been installed to the correct lines and levels as shown on the Drawings and to the tolerances specified in this Specification.

6. Prior to installing “dry pack” mortar under the base plates of barrier posts with bolted down connections, the Contractor shall certify, in writing to the Superintendent that the barrier has been installed to the correct lines and levels as shown on the Drawings and to the tolerances specified in this Specification.

7. All deleterious dust and/or metal filings shall be removed from the surface of the barrier system to prevent staining and/or pitting or corrosion of the surface finish. Any damage to the surface finish shall be rectified in accordance to Specification 835 PROTECTIVE TREATMENT OF STEELWORK at no cost to the Principal.

603.36 TRANSITIONS

1. Transitions between barrier types shall be constructed as shown on the Drawings to the tolerances specified.

2. Where transitions consist of either W-beam or Thrie-beam components the tolerances given in Clause 603.32 shall apply.

603.37 END TREATMENTS

1. End Treatments shall be constructed as shown on the Drawings to the tolerances specified.

2. Proprietary end treatments shall be installed to the tolerances detailed in the manufacturer’s published requirements. If no tolerances are specified in the manufacturer’s published requirements the tolerances stated in this Specification shall apply.

3. For proprietary crash attenuators the tolerances for the footing / foundation shall be as manufacturer’s published requirements, or if no tolerances are specified in these requirements the following tolerances shall apply:
a. Variation of foundation cross-section dimensions and length ±20mm

b. Height of foundation relative to adjacent finished surface levels ±5mm

603.38 – 603.80 NOT USED

AS BUILT AND HANDOVER REQUIREMENTS

603.81 AS-BUILT INFORMATION

1. The Contractor shall provide the Superintendent with the installation and maintenance manuals for all proprietary barrier and end treatment systems used in the Works.

2. As-Built Drawings shall include the following information at all locations:

   a. Proprietary safety barrier systems – detail the system name and post spacing.

   b. Proprietary end treatments other than crash attenuators – detail the end treatment name, installed on a flare or parallel to the roadway, posts types used and where applicable model number. In instances where no model number is available the length of the end treatment shall be provided.

   c. Non proprietary end treatments – detail the end treatment name and posts types. If timber posts are used then the timber species and stress grade shall also be shown.

   d. Crash attenuators - detail the system name, back-up type and transitions used and where applicable model number. In instances where no model number is available the length of the crash attenuator shall be provided.

603.82 – 603.90 NOT USED

CONTRACT SPECIFIC REQUIREMENTS

603.91 – 603.99 NOT USED
ANNEXURE 603A

APPROVED WIRE ROPE SAFETY BARRIER SYSTEMS

The following wire rope safety barrier systems (WRSB) are approved for use in the Works:

1. Brifen 4-Wire Rope Safety Barrier

The Brifen 4-Wire Rope Safety Barrier is approved for use in the following configuration:

   a. Post spacing of 2.4m apart.
   b. The two upper wire ropes located at a mean height of 675mm above the ground.
   c. The lower two ropes located at a height of 580mm above the ground, are crisscrossed between every post spacing.
   d. 6 mm “Z posts” 100mm x 32mm.

Under Test Level (TL) 3 test conditions the dynamic deflection was 1.65m.

2. Ingal Flexfence 4-Wire Rope Safety Barrier

The Ingal Flexfence 4-Wire Rope Safety Barrier is approved for use in the following configuration:

   a. Sigma posts
   b. Post spacing of 2.5m apart.
   c. Wires mounted at 480, 560, 640 and 720mm height from the ground.

Under TL 3 and TL 4 test conditions the dynamic deflection was 1.90m.

3. Sentryline II 4-Wire Rope Safety Barrier

The Sentryline II 4-Wire Rope Safety Barrier is approved for use in the following configuration:

   a. Flat sided oval posts.
   b. Post spacing of 3.0m apart.
   c. Wires mounted at 530, 650, 770 and 790mm height from the ground.

Under TL 3 test conditions the dynamic deflection was 1.54m.

Under TL 4 test conditions the dynamic deflection was 1.65m.

For all wire rope safety barrier installations a mechanically swaged coupling system shall be used to join sections of wire rope.
# ANNEXURE 603B

## ROAD SAFETY BARRIER SYSTEMS REQUIREMENTS

### TABLE 603B.1 WIRE ROPE SAFETY BARRIER SYSTEMS

<table>
<thead>
<tr>
<th>Start Chainage</th>
<th>End Chainage</th>
<th>Test Level ¹</th>
<th>Max Deflection (m) ²</th>
<th>Radius (m) ² +ve concave -ve convex</th>
<th>Note Locations where Crest/ Sag K Values &lt; 30 ³</th>
<th>Reference Line</th>
<th>Side</th>
<th>Offset</th>
<th>Details of Position of Leading End Treatment ⁴</th>
<th>Details of Position of Departure End Treatment ⁴</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**

1. Refer Table 2.3.19 of AS / NZS 3845:1999
2. This information controls the post spacing and the need for any special treatment.
3. Wire rope barriers are typically not used in these situations. If k values are > 30 then this column can be deleted.

4. If relevant information is shown on the drawings then it can be deleted from the table e.g. Details of position of leading and end treatment and start chainage. However it is critical that the design deflection be indicated as well as horizontal curvature.

(Notes 1 to 4 should be deleted from the final document, as should the numbers in the table heading referring to the notes)

**TABLE 603B.2 ROAD SAFETY BARRIER SYSTEM REQUIREMENTS OTHER THAN WRSB**

<table>
<thead>
<tr>
<th>Start Chainage</th>
<th>End Chainage</th>
<th>Barrier Type</th>
<th>Reference Line</th>
<th>Side</th>
<th>Offset</th>
<th>Type of Leading End Treatment</th>
<th>Set-out for Leading End Treatment</th>
<th>Type of Departure Treatment</th>
<th>Set-out for Departure End Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### TABLE 603B.3 SPECIFIED END TREATMENTS

<table>
<thead>
<tr>
<th>Chainage</th>
<th>Test Level</th>
<th>Type</th>
<th>Side</th>
<th>Installation Offset</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### TABLE 603B.4 ACCEPTABLE END TREATMENTS CONFIGURATIONS

<table>
<thead>
<tr>
<th>Classification</th>
<th>Test Level</th>
<th>Length (m)</th>
<th>Post Details</th>
<th>Other Requirements</th>
<th>Suppliers Drawing Number</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## ANNEXURE 603C

### CONCRETE CLASS FOR CONCRETE BARRIERS

<table>
<thead>
<tr>
<th>Barrier</th>
<th>Concrete Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road</td>
<td>N32</td>
</tr>
<tr>
<td>Traffic Barriers for Structures</td>
<td>S40</td>
</tr>
</tbody>
</table>

*(NOTE: THE ABOVE CONCRETE CLASSES ARE DEFAULT CLASSES. REFER GUIDANCE NOTES, AND DELETE THIS NOTE)*
ANNEXURE 603D

APPROVED SOLID BLOCKOUTS

The following solid block-outs are approved for use in road safety W-beam systems:

Ingal Block, produced by Ingal Civil Products, as shown on Ingal Drawing C1422 with nominal block dimensions of 350 x 100 x 150mm. The block is to be made from M40060S High Density Polyethylene which is UV stabilised.

ACP Plastic Blockout, produced by Australian Construction Products, as shown on ACP Drawing BPLAS1. The block is 150mm deep x 360mm high x 122.5mm wide and made from UV stabilised and fire retarded polypropylene with a product code of PCM050B.
ANNEXURE 603E

PRINCIPALS’ STORAGE AREA

Removed and reusable safety barrier components shall be transported, unloaded and neatly stacked at the Principal’s storage area nominated below:
### ANNEXURE 603F

**PRINCIPAL SUPPLIED ITEMS**

<table>
<thead>
<tr>
<th>Description</th>
<th>Number</th>
<th>Location</th>
<th>Time of Availability (Weeks after Commencement of Contract)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1. EXCAVATION OF ROCK

1.1 If there is any likelihood that rock will be encountered in installing the barrier this should be brought to the Contractor’s attention and if fill is being done as part of the Works then restrictions may need to be placed on the use of oversize material within the area that barrier system foundations may be placed. Insert an appropriate clause in CONTRACT SPECIFIC REQUIREMENTS to cover the situation.

2. W-BEAM AND THRIE BEAM BARRIERS (CLAUSE 603.22)

2.1 If curved panels with a radii less then 45m are required they should be measured separately and require a Schedule of Rates / Bill of Quantities item. Note panels are not to be pre-bent for the WAMELT.

3. REMOVAL OF EXISTING BARRIERS (CLAUSE 603.91)

3.1 Where removal of existing barriers and end treatments are required, Clause 603.91 should be added under CONTRACT SPECIFIC REQUIREMENTS.

3.2 Annexure 603E – Details the location of where any re-useable barrier sections or end treatments shall be delivered to. If not required then delete and add the words “NOT USED” to the Annexure title.

3.3 In considering if existing barriers or end treatments are to be salvaged and retained by MRWA the value of the components to be salvaged should be taken into account. For example, it may not be worth salvaging 2-3 W-beam rails but it would be worth salvaging a crash attenuator some of which cost in the order of $15,000.

3.4 Appropriate Schedule of Rates / Bill of Quantities item(s) should be included to cover loading, delivery and unloading of salvaged components to the Principal’s storage area.
3.5 When installing a road safety barrier system other than as part of a roadworks contract other clauses may be required to cover any clearing, earthworks or other works required to install the barrier. Suitable pay item(s) should be included accordingly, discuss with Main Roads Quantity Surveyor.

4. DOUBLE SIDED RAIL BARRIER AND TWO AND THREE RAIL BARRIERS (CLAUSE 603.92)

4.1 These barriers are no longer accepted barrier types. However, it may be necessary to extend existing, double sided and/or two and three rail barriers. If so, include Clause 603.92 under CONTRACT SPECIFIC REQUIREMENTS.

5. SUPPLY OF MATERIALS BY PRINCIPAL (CLAUSE 603.93)

5.1 If as part of the Works the Principal is supplying materials Clause 603.93 should be added.

5.2 If the Principal is not supplying any materials then delete the table in Annexure 603 F and add the words “NOT USED” to the Annexure title.

6. PAINTING OF STEEL RAIL BARRIERS (CLAUSE 603.94)

6.1 Steel rail barriers on urban bridges are often painted as required by the Asset Manager. If painting is required then Clause 603.94 should be added under CONTRACT SPECIFIC REQUIREMENTS.

6.2 An appropriate pay item should also be added in the Schedule of Rates / Bill of Quantities.

7. ANNEXURE 603A – ROAD SAFETY SYSTEM BARRIER REQUIREMENTS

Where guide posts would normally be required and a wire rope barrier system is to be installed, instead of installing guide posts either in front or behind the barrier an alternative is for the posts or post caps of the systems to be marked with Class 1A reflective tape as suitable for each system. The location of the markings shall be in accordance with the Main Roads Guide to the Design of Guide Posts.

In this case the following text shall be added beneath the list of approved barrier systems.

Posts or post caps to be marked at suitable intervals based on post spacing to approximate 25 m intervals. For Brifen and Flexfence, post caps shall be marked with 100 mm (wide) x 50 mm (high) Class 1A reflective tape. For Sentryline II posts shall be marked with 50 mm (wide) x 150 mm (high) Class 1A reflective tape. The location and colouring of the markings shall be in accordance with the Main Roads Guide to the Design of Guide Posts.

8. ANNEXURE 603B – ROAD SAFETY SYSTEM BARRIER REQUIREMENTS

8.1 The Designer must complete ANNEXURE 603B as appropriate for the particular project.

Table 603B.1

Wire rope safety barriers systems (WRSB) come in a number of different post spacing. The post spacing affects the amount of deflection where wire rope barrier is proposed. The Designer shall nominate in Annexure 603B the deflection that has been allowed for in the design, the test level and if the barrier is to be installed on a curve the radius of the curve and identify it as concave or convex and if installed on a vertical curve if K < 30.
More guidance on the design of WRSB can be found in the Main Roads Guides to the Design of Road Safety Barriers.

Table 603B.2

This is to be completed for barrier types other than WRSB e.g. W-Beam, Thrie-beam, barriers for structures etc. they are typically specified to be installed in accordance with Main Roads Standard Drawings and therefore the test level is irrelevant.

Likewise for the concrete barriers the test level is set by the height and foundation type of the concrete barriers if nominated on the Drawings, as it should be, the test level is therefore not relevant.

Barriers for structures are similarly treated. Some of these details may be shown on the Drawings and therefore can be removed from Table 603B.2.

Table 603B.3 End Treatments

For the leading and departure end treatments for barrier systems other than wire rope either proprietary or public domain end systems can be used.

The only public domain systems that are currently approved for use, by MRWA are the WAMELT (refer to Drawings 0330-1647-1651 inclusive), which is deemed to comply with TL 3 and the trailing terminal (refer to Figure F10 of AS / NZS 3845 for limitations on the use of this).

The WA MELT has to be installed on a flare and uses timber breakaway posts. There have been issues associated with the supply of the timber posts in terms of quality and availability and the costs for the terminal has matched or exceeded the proprietary systems which use steel breakaway posts.

Guidance on the use of the WA MELT was amended in July 2007 with the following statement being added “The timber posts have associated supply and durability issues and the parabolic flare creates installation difficulties. Designers are advised to utilise the other approved crashworthy terminals available.”

If a proprietary end treatment is to be used then the Designer shall specify the Test Level and the type of end treatment, i.e.:

Re-directive gating

If an extruder type end treatment is required e.g. SKT-350 or ET 2000 Plus then this should be identified in the table and any requirements such as install on a flare should be shown on the Drawings or included in Table 603B.2 or

Re-directive non-gating

Wire rope systems have their own end treatments, which are deemed to comply with TL3.

For W-beam barriers there are a number of acceptable end treatments that can be used. The Designer may have chosen a particular product but in many cases other products may be acceptable. To ensure that no supplier is disadvantaged designers shall nominate in Table 603B.3 the end treatment that has been used for the basis of the design and in Table 603B.4 the accepted Main Roads configuration as well as other acceptable alternatives.

Some of the proprietary end treatments have different configurations and not all of these are acceptable to Main Roads. Details of approved systems and their configurations can be found in the end treatment design sheets at Appendix H of the Guide to the Design of Road Safety Barriers.
Designers are to copy and paste the accepted configuration into Table 603B.3. An example is given below.

Either contained in the table or preferably shown on the Drawings shall be details of how the end treatment shall be set-out. This is particularly relevant to the extruding gating end treatments which can be installed either on a flare or parallel to the road.

If the end treatment is public domain i.e. WAMELT or the trailing terminal no test level is required and configuration details are required as the standard drawings have all the necessary information.
## EXAMPLE OF TABLE 603B.3

<table>
<thead>
<tr>
<th>Classification: Extruder Gating End Treatment</th>
<th>Test Level</th>
<th>Length (m)</th>
<th>Post Details</th>
<th>Other Requirements</th>
<th>Suppliers Drawing</th>
</tr>
</thead>
</table>
| ET 2000 Plus*                                 | 2          | 7.62       | Post 1: Steel hinged breakaway post  
Post 2-4 Steel Yielding Posts (SYTP)   | Sticker on the impact head which is 700 mm x 350 mm to be Black bands on White Class 2 reflective backgrounds with the width marker pattern as shown in Australian Standard Sign D4-3 (L,R). | SKT-5-TL2-2M Date Revision 01/03/00 |
| SKT 350                                       | 2          | 11.84      | No 1: W150 x 13.5 BCT Steel Post  
1080mm long in solid foundation tube with modified ground-line strut to post 2. No 2: W150 x 13.5 BCT steel post 1830mm long in solid foundation tube with modified ground line strut and 200 x 150 x360 routed timber block.  
No 3-5: W150 x CRT steel posts 1830mm long W1200 x 150 x 360 routed timber block. | The sticker on the impact head which is to be Black bands on White Class 2 reflective backgrounds with the width marker pattern as shown in Australian Standard Sign D4-3 (L,R). | SKT-5-TL2-2M Date Revision 01/03/00 |
A similar approach is to be taken for Crash Attenuators. Below is an example. Some of this information may be shown on the Drawings. The Designer also needs to specify foundation typically this would be shown on the Drawings. As with other end treatments, Main Roads preferred configuration can be found in Appendix H of the Guide to the Design of Road Safety Barriers.

In place of the test level on some projects it may be more appropriate to specify the design speed.

<table>
<thead>
<tr>
<th>Name</th>
<th>Test Level</th>
<th>Model No.</th>
<th>Length (m)</th>
<th>Configuration</th>
<th>Backstop</th>
<th>Transition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quad-guard</td>
<td>3</td>
<td></td>
<td>6.74</td>
<td>Units are to have the yellow flexi-belt nose</td>
<td>Tension Strut Back-up</td>
<td>End Shoe connector</td>
</tr>
<tr>
<td>TAU-II</td>
<td>3</td>
<td></td>
<td>8.2</td>
<td>Compact backstop</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>
9. ANNEXURE 603C – CONCRETE CLASS FOR CONCRETE BARRIERS

The annexure contains default concrete strengths for concrete barriers.

In situations where road concrete barriers make up a small proportion of the total concrete barriers then to avoid having two classes on concrete on site the Designer may elect to change to concrete class on the road barriers to match the concrete barrier on the structure. Annexure 603C would need to be changed accordingly.

If the Drawings indicate the class of concrete then the table in Annexure 603C can be deleted and the Annexure marked as Not Used.
CONTRACT SPECIFIC REQUIREMENTS

The following clauses are to be placed under the CONTRACT SPECIFIC REQUIREMENTS, as required. After inserting the clause, change the clause number and heading to style “H2 SP” so it appears in the Table of Contents.

603.91 REMOVAL OF EXISTING BARRIERS AND END TREATMENTS

1. Where shown on the Drawings, existing road safety barrier systems and traffic barriers for structures including transitions and end treatments shall be removed.

2. Prior to the removal of a road barrier system or traffic barriers for structures the Superintendent shall identify and nominate any components that shall be salvaged for re-use.

3. Barriers shall be removed in such a manner as to minimise any damage. Any damage to the galvanising of the components of the barrier system that are proposed to be reused shall be repaired as approved by the Superintendent.

4. Salvaged components in good condition, which meet the requirements of the Specification, may be used by the Contractor as part of the new barrier or end treatments. Alternatively, they shall be delivered to the Principal's storage area if so nominated in Annexure 603E.

5. The Contractor shall dispose of barrier components damaged or unusable barrier components to an off-site tip.

603.92 DOUBLE SIDED RAIL BARRIER / TWO AND THREE RAIL BARRIERS

1. Materials, fabrication and erection shall be in accordance with MRWA standard drawings numbers. 9130-0346, 0030-001 & 0030-002 for double sided rail barriers, 9130-0280, 9930-1047 & 9930-1048 for two rail barriers and 9630-0631,9630-0632 for three rail barriers.

2. Posts shall not be driven, but shall be placed in holes excavated to the required depth with the bottom of the holes adequately compacted to achieve the same density as the surrounding soil. The posts shall be supported to true line and level whilst the holes are backfilled and compacted.

3. Doubled sided rail barriers / two and three rail barriers shall be erected to the following tolerances:
   a. Variation from true plan position of posts ± 20mm
   b. Variation of line of rails from specified vertical and horizontal profile ±20mm
   c. Variation of posts from vertical 1 in 50
603.93  SUPPLY OF MATERIALS BY PRINCIPAL

1. The Principal will make available free of charge to the Contractor materials as listed in Annexure 603F.

2. The Contractor shall provide for all cranage, handling, loading and transportation to the site for the items.  

3. The items will be available as nominated in Annexure 603F.

4. The Contractor shall supply all other material necessary for completing the Works.

603.94  PAINTED TRAFFIC BARRIERS FOR STRUCTURES

1. Where specified, steel barriers shall be painted in accordance with Specification 835 PROTECTIVE TREATMENT OF STEELWORK.

2. The kerbside vertical face of all steel rails shall be painted upon completion of installation and shall receive one coat of an etch primer complying with Government Paint Committee Specification number GPC-P-13-1. This shall be followed by two coats of white acrylic paint complying with Specification number GPC-C-29/1A.
**AMENDMENT CHECKLIST**

Specification No. 603 Title: **SAFETY & TRAFFIC BARRIER SYSTEMS**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Sign Off</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Project Manager has reviewed Specification and identified Additions and Amendments.</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Any unlisted materials/products proposed and approved by the Project Manager? If “Yes” provide details at 16.</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Clause deletes shows as “NOT USED”.</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Appropriate <strong>INSPECTION AND TESTING</strong> parameters included in Spec 201 (Text Methods, Minimum Testing Frequencies verified).</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td><strong>HANOVER</strong> and <strong>AS BUILT</strong> requirements addressed.</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Main Roads QS has approved changes to <strong>SMM</strong>.</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Project Manager certifies completed Specification reflects intent of the design.</td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Completed Specification – independent verification arranged by Project Manager.</td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Project Manager’s review completed.</td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td><strong>SPECIFICATION GUIDANCE NOTES</strong> deleted.</td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td><strong>TABLE OF CONTENTS</strong> updated.</td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>Supporting information prepared and submitted to Project Manager.</td>
<td></td>
</tr>
</tbody>
</table>

Further action necessary:

Signed: _____________________________ *(Project Manager)* Date: ____________

Note: All changes/amendments must be shown in Tracked Changes mode until approved.