NOTICE
This document is a Roads and Maritime Services QA Specification. It has been developed for use with roadworks and bridgeworks contracts let by Roads and Maritime Services or by local councils in NSW. It is not suitable for any other purpose and must not be used for any other purpose or in any other context.

Copyright in this document belongs to Roads and Maritime Services.

<table>
<thead>
<tr>
<th>Ed/Rev Number</th>
<th>Clause Number</th>
<th>Description of Revision</th>
<th>Authorised By</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ed 1/Rev 0</td>
<td></td>
<td>First Issued</td>
<td>HL for GM,CMS</td>
<td>06.02.92</td>
</tr>
<tr>
<td>Ed 2/Rev 0</td>
<td></td>
<td>Clause numbers and lists have been restructured to suit the new format. Converted to MSWord 6.0c. References to RTA Specifications changed.</td>
<td>GM, RNIC (W Ho)</td>
<td>20.05.97</td>
</tr>
<tr>
<td></td>
<td>6.1</td>
<td>Reference Point identified as a survey control mark.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.2</td>
<td>Subclause rewritten.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>7.1</td>
<td>Last paragraph deleted</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>8.5</td>
<td>Clause rephrased.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ed 2/Rev 1</td>
<td>5.5.2</td>
<td>Suggested bearing cross section changed</td>
<td>GM, RNIC</td>
<td>03.05.99</td>
</tr>
<tr>
<td>Ed 2/Rev 2</td>
<td>Annexure B152/2</td>
<td>New annexure, Schedule of Identified Records</td>
<td>GM, RNIC (J Woodward)</td>
<td>14.04.00</td>
</tr>
</tbody>
</table>
9.2 Special Launching Provisions .................................................................13
9.3 Safety Precautions During Launching .........................................................13

10 INSTALLATION OF PERMANENT BEARINGS .............................................14

ANNEXURE B152/A – PROJECT SPECIFIC REQUIREMENTS ........................................15
   A1 Design Assumptions and Requirements .........................................................15

ANNEXURE B152/B – (NOT USED) ........................................................................18

ANNEXURE B152/C – SCHEDULES OF HOLD POINTS AND IDENTIFIED RECORDS ..........18
   C1 Schedule of Hold Points .............................................................................18
   C2 Schedule of Identified Records .....................................................................18

ANNEXURES B152/D TO B152/L – (NOT USED) ..................................................19

ANNEXURE B152/M – REFERENCED DOCUMENTS .............................................19

LAST PAGE OF THIS DOCUMENT IS ................................................................19
FOREWORD

RMS COPYRIGHT AND USE OF THIS DOCUMENT

Copyright in this document belongs to Roads and Maritime Services.

When this document forms part of a contract

This document should be read with all the documents forming the Contract.

When this document does not form part of a contract

This copy is not a controlled document. Observe the Notice that appears on the first page of the copy controlled by RMS. A full copy of the latest version of the document is available on the RMS Internet website: http://www.rms.nsw.gov.au/business-industry/partners-suppliers/specifications/index.html

REVISIONS TO PREVIOUS VERSION

This document has been revised from Specification RMS B152 Edition 2 Revision 2.

All revisions to the previous version (other than minor editorial and project specific changes) are indicated by a vertical line in the margin as shown here, except when it is a new edition and the text has been extensively rewritten.

PROJECT SPECIFIC CHANGES

Any project specific changes are indicated in the following manner:

(a) Text which is additional to the base document and which is included in the Specification is shown in bold italics e.g. Additional Text.

(b) Text which has been deleted from the base document and which is not included in the Specification is shown struck out e.g. Deleted Text.
RMS QA SPECIFICATION B152
INCREMENTALLY LAUNCHED
PRESTRESSED CONCRETE GIRDERS

1 GENERAL

1.1 SCOPE AND APPLICATION

This Specification applies to the construction of prestressed concrete superstructures by incremental launching, including the design and fabrication of the launching nose, the design and construction of the casting bed, the provision of the launching equipment, temporary bearings and lateral guides, launching operations, temporary supports and installation of the permanent bearings.

The requirements of Specifications RMS B80 and RMS B113 apply to the concreting and prestressing operations respectively, subject to any other overriding requirements of this Specification.

1.2 STRUCTURE OF THE SPECIFICATION

This Specification includes a series of annexures that detail additional requirements.

1.2.1 Details of Work

Details of work are shown in Annexure B152/A.

1.2.2 Not Used

1.2.3 Schedules of HOLD POINTS and Identified Records

The schedules in Annexure B152/C list the HOLD POINTS that must be observed. Refer to Specification RMS Q for the definition of HOLD POINTS.

The records listed in Annexure B152/C are Identified Records for the purposes of RMS Q Annexure Q/E.

1.2.4 Referenced Documents

Unless specified otherwise, the applicable issue of a referenced document other than an RMS Specification is the issue current at the date one week before the closing date for tenders, or where no issue is current at that date, the most recent issue.

Standards, specifications and test methods are referred to in abbreviated form (e.g. AS 1234). For convenience, the full titles are given in Annexure B152/M.

1.2.5 Definitions

The terms “you” and “your” mean “the Contractor” and “the Contractor’s” respectively.
2 INFORMATION TO BE SUPPLIED BY THE CONTRACTOR

Submit, as part of the PROJECT QUALITY PLAN, details of the launching method and segment manufacturing method.

Include the following details:

(a) Details of the launching jacks and control equipment, including the name of the manufacturer and model number (if any) of the jacks, the dimensions of the jacks, the maximum stroke in the horizontal and vertical directions, the capacity of the jacks in the horizontal and vertical directions, the provisions for attachment of supplementary launching devices, hydraulic pumps, hydraulic gauges, control devices, power supply, automatic shut-off devices, manual shut-off devices and the experience of the manufacturer in the supply of launching jacks and equipment.

(b) Details of the guides and braking saddles, including bearing plates.

(c) Details of the launching bearings, elastomeric bearing pads and sliding pads.

(d) Details of changes to the design of the substructure and/or superstructure to accommodate the launching equipment and launching nose.

(e) Procedures for the design and construction of the casting bed, inspection and maintenance of the casting bed, launching nose and launching equipment.

(f) Procedures for establishing, verifying and maintaining survey control, and for certification of the accuracy of control marks.

(g) Procedures for launching, including the launching of the first and last segments, launching intermediate segments, provisions to prevent runaway when launching downhill, and emergency procedures.

(h) Procedures for installing permanent bearings and longitudinal anchors.

(i) Procedures for removing the launching nose and making good the girder.

3 LAUNCHING EQUIPMENT

The launching equipment consists of the jacks (including pumps and control and monitoring devices) for applying the vertical and horizontal launching forces at the launching abutment, together with all associated braking saddle bearing plates, anchorages and guides.

The launching equipment must conform to the Drawings and the design assumptions in Annexure B152/A.

Design and manufacture the launching equipment to operate in accordance with the launching method specified in Clause 9.
4 LAUNCHING NOSE

4.1 GENERAL

Attach a launching nose to the first girder segment during launching of the girder. The design, fabrication, erection and use of the launching nose is your responsibility.

Submit to the Principal, at least 10 working days prior to the commencement of fabrication of the launching nose, a copy of the design together with certification by an Engineer who is a Member of Engineers Australia with experience in this field, stating that the design of the launching nose conforms to the Drawings and this Specification.

Submit to the Principal, at least 5 working days prior to the commencement of launching operations, certification that the fabrication of the launching nose conforms to the submitted design and this Specification.

4.2 DESIGN REQUIREMENTS

The launching nose must conform to the design assumptions in Annexure B152/A, and must be designed in accordance with AS 4100.

The launching nose must be fabricated with steel.

Design dead load effects during launching are given in Annexure B152/A. Design wind loadings during launching must be in accordance with AS/NZS 1170.2.

The launching nose must be straight in plan and must be attached to the first girder segment at the angle shown on the Drawings. Construct the launching nose with either no vertical curvature, or else to a profile which approximates more closely the theoretical curvature of the horizontal sliding surfaces.

Provide a lateral sliding surface on the launching nose which aligns with and has the same dimensions and curvature as the lateral sliding surface of the bridge girder.

The contact areas between the launching nose and the first girder segment must be of the size and at the position shown on the Drawings.

4.3 LAUNCHING NOSE JACKS

Provide jacks at the leading tip of the launching nose, to enable the tip of the nose, when it reaches a support, to be raised up to the level of the launching bearings.

The jack extension and vertical load requirements are shown on the Drawings. In addition, the jacks must be capable of resisting a simultaneous horizontal load of 5% of the design vertical load.

The bearing surface on the underside of the jacks must be parallel to the bottom flange of the launching nose.
4.4 **DESIGN GUIDELINES**

Design guidelines are given below to assist your preparation of the design of the launching nose. These guidelines are not comprehensive and give information only about some of the less well known aspects of the design.

In the design of the launching nose, pay particular attention to the high compressive forces which occur in the top chord of the nose at certain stages of the launch. This will require substantial bracing to the top flanges of the beams.

The bottom flanges are subject to high local loading from the launching bearings. It is usually impractical to fabricate the bottom flange stiff enough and accurately enough to carry these loads uniformly, so it is current practice to have a thick but unstiffened bottom flange which can rotate. Because of this, the flange will be subject to local bending.

In addition, due to the overall rotation of the launching nose, the bearing load will not be carried on the full length of the sliding bearing and it must be assumed that the total bearing load is carried on a length of 0.3L for the first 10 m of nose, 0.5L for the next 10 m and 0.7L for the remainder, where L is the actual length of the particular sliding bearing.

4.5 **FABRICATION OF STEELWORK**

Fabricate all steelwork for the launching nose in accordance with AS 4100.

Welding must conform to AS/NZS 1554.1.

High-strength bolting must conform to AS 4100.

The dimensional tolerances for steelwork in the launching nose are as follows:

(a) **Overall Length:**
   (i) Up to and including 25 m ± 5 mm  
   (ii) Additional allowance to be made to the above for each additional 10 m or part thereof ± 2 mm

(b) **Distance between Girder Webs:** ± 5 mm

(c) **Deviation from Specified Camber:**
   (i) At any point on bottom flange ± 5 mm  
   (ii) Relative variation between launching nose webs taken transverse to centreline 2 mm

(d) **Sweep (Variation from Straightness):**
   The sweep of any member of the launching nose must not exceed L/1000 or 3 mm, whichever is greater, where L is the length of the member under consideration.

(e) **Tilt of Bottom Flanges:**
   Determine the tilt of the bottom flanges by measuring the offsets of the edges of the flanges from their theoretical positions.
(i) Where the bottom flange is not rigidly restrained by web stiffeners and the web is free to flex, the offset must not exceed 1/200 of the total width of flange, or 3 mm, whichever is greater.

(ii) Where the bottom flange is rigidly restrained by web stiffeners, the total tilt offset must not exceed 0.5 mm.

(f) **Flatness of Bottom Flanges:**

The deviation from flatness of the bottom flanges across the width of the flange must not exceed 1 mm.

The deviation from flatness of the bottom flanges measured longitudinally over a gauge length of 2 m must not exceed 3 mm.

(g) **Lateral Sliding Surface:**

The tolerances on the lateral sliding surface of the launching nose must be as specified in Clause 7.4.

### 4.6 PROTECTIVE TREATMENT OF STEELWORK

Provide a suitable protective treatment to all steelwork to prevent rust staining of the permanent concrete work.

### 4.7 INSTALLATION OF LAUNCHING NOSE

Prior to the casting of the first girder segment, position the launching nose on the braking saddle and the launching bearings as shown on the Drawings.

Restrain the launching nose against movement during casting of the first girder segment.

### 4.8 ATTACHMENT TO THE FIRST GIRDER SEGMENT

Attach the launching nose to the first girder segment by means of prestressing bars or tendons as shown on the Drawings. Coat these bars or tendons with an anti-corrosive grease and install them in the ducts, but they must not be grouted.

On completion of launching, remove these bars or tendons and fill the ducts with grout.

Stress and de-tension the bars or tendons in such an order that the girder is not overstressed.

Check the load in the prestressing bars or tendons six weeks after initial stressing and re-stress if required.

Coat all parts of the launching nose in contact with the first girder segment with a bond breaker to aid subsequent removal.
5 LAUNCHING BEARINGS

5.1 GENERAL

The locations of all launching bearings, and the construction details of the pier and abutment launching bearings, are shown on the Drawings. Design all other launching bearings to suit your construction method. Such launching bearings must be of similar construction to the launching bearings shown on the Drawings. The design loadings for all launching bearings are shown on the Drawings.

The launching bearings must comprise high strength concrete contained within a steel frame, topped with a machined steel plate and surfaced with a thin, polished sheet of stainless steel.

In addition, if shown on the Drawings, provide a grid of 100 mm x 100 mm x 25 mm thick elastomeric bearing pads below the machined steel plate. These bearings must conform to Clause 5.5.

When the girder passes over the bearing, insert special elastomeric bearing sliding pads with PTFE bonded to the lower surface between the girder soffit and the top surface of the launching bearing. As the girder moves forward, insert additional sliding bearing pads at the back of the bearing, as they are progressively extruded from the front.

Provide side guides as shown on the Drawings to provide lateral restraint to the girder during launching. The operation of the side guide is similar to that of the horizontal launching bearings.

5.2 FABRICATION OF LAUNCHING BEARINGS

Machine the top plate of the bearing to give a surface roughness not greater than grade number N11 to AS 2536.

After fabrication of the bearings, but before filling with concrete and fixing the stainless steel sheet, treat the steelwork to prevent rust staining of the permanent concrete. All associated bolts, nuts and washers must be galvanized.

Concrete used to fill the bearings must have a minimum 28 day compressive strength of 40 MPa.

The stainless steel sheet used for surfacing the sliding surfaces of the bearing must be Grade 316, 2B finish to AS 1449. Subsequently, polish the top surface to a mirror finish with a surface roughness not greater than grade number N5 to AS 2536. Install the stainless steel sheet on the bearing so that it is under tension.

Protect the stainless steel against damage or deterioration at all times and clean it immediately and carefully before it is used for the first time.

5.3 INSTALLATION OF LAUNCHING BEARINGS

Install launching bearings, including those on temporary supports and side guides, at the positions indicated on the Drawings, to the following tolerances:

(a) Position:

(i) Measured in a direction parallel to the bridge centreline ± 3 mm
(ii) Measured in a direction normal to the bridge centreline ± 1.5 mm
(b) **Level:**

(i) **Launching bearings within the casting bed:**

- Levels relative to the Reference Point $\pm 2$ mm
- Levels relative to the soffit sliding surface adjacent to the launching bearing $\pm 0.5$ mm

(ii) **Launching bearings between the casting bed and the launching abutment and braking saddle plates:**

- Levels relative to the Reference Point $\pm 2$ mm
- Levels relative to adjacent launching bearings or braking saddle plate $\pm 0.5$ mm
- Levels relative to launching bearings or braking saddle plate located at the same cross section $\pm 0.5$ mm

(iii) **All other launching bearings:**

- Levels relative to launching bearings on adjacent piers or abutments $\pm 1.5$ mm
- Levels relative to launching bearings located on the same pier or abutment $\pm 0.5$ mm

(c) **Deviation from Specified Plane:**

The deviation from the specified plane both longitudinally and transversely must not exceed 1 mm in 1000 mm.

During the construction cycle, check the levels of the launching bearings and the alignment of the side guides and submit a certificate of conformity to the Principal before launching each of the first three segments and thereafter before launching every third segment.

The certificate must show the specified position, actual position and deviation for each launching or side guide, related to your adopted system of control.

5.4 **ELASTOMERIC SLIDING PADS**

Elastomeric sliding pads used on the horizontal sliding surface of the launching bearing must be of the plan dimensions shown in Annexure B152/A and be 13 mm thick. The pads used on the vertical sliding surface of the side guide must be 400 mm x 120 mm x 13 mm thick.

The sliding pads must comprise alternate layers of elastomer and steel plate and a layer of PTFE as follows:

- 2 mm elastomer
- 2 mm steel plate
- 4 mm elastomer
- 2 mm steel plate
- 2 mm elastomer
- 1 mm PTFE (unfilled)
Manufacture the sliding pads to AS 5100.4 insofar as materials, construction and tolerances are concerned. The elastomer must have a durometer hardness of 55 ± 5. Colour or treat it to avoid marking the bridge soffit. Side cover thickness to the steel plates must be at least 2 mm ± 0.5 mm.

Bond the PTFE sheet properly to the rubber to ensure that it does not detach under the high shear forces associated with launching.

Supply a certificate of conformity from a testing laboratory with the appropriate NATA registration verifying that the sliding pads conform to this Specification. Submit this certificate to the Principal at least 5 working days before the sliding pads are used in the Works.

Before inserting, clean and lubricate the PTFE surface with an approved silicone grease. Insert the pads with the leading edge of the new pad touching the trailing edge of the previous one so that the girder is continuously supported on the launching bearing. Insert the pads under the girder so that they are at the positions shown on the Drawings, to a tolerance of ± 5 mm. Insert the pads under the launching nose symmetrically under the beam webs, to a tolerance of ± 5 mm.

5.5 ELASTOMERIC BEARING PADS

5.5.1 General

The 100 mm x 100 mm x 25 mm elastomeric bearing pads shown on the Drawings must conform to Specification RMS B281, except that testing will not be required for Stiffness in Shear or Applied Rotation. The Stiffness in Compression test result under a rated load of 107 kN must be 2.50 mm with a tolerance on this deflection of ± 15%.

5.5.2 Prototype Bearing Pads

Submit to the Principal details of your proposed bearing pads at least 5 working days before commencement of manufacture.

A suggested prototype bearing pad cross section is:

- 2 mm elastomer
- 3 mm steel plate
- 6 mm elastomer
- 3 mm steel plate
- 6 mm elastomer
- 3 mm steel plate
- 2 mm elastomer

Manufacture five prototype bearing pads and test them for Stiffness in Compression in accordance with Table B152.1.

Prior to the manufacture of the bearing pads, submit to the Principal a certificate of conformity from a testing laboratory with the appropriate NATA registration, verifying that the prototype bearing pads conform to this Specification.
5.5.3 Testing of Bearings

During the manufacture of the bearing pads, randomly select one representative bearing pad in 20 bearing pads and test for Stiffness in Compression in accordance with Table B152.1.

Establish a system for identifying each of the bearing pads with the test results.

Submit to the Principal at least 5 working days before the bearing pads are used in the Works a certificate of conformity from a testing laboratory with the appropriate NATA registration, verifying that the bearing pads conform to this Specification. The certificate must contain the test results and must identify the bearing pads to which it applies.

<table>
<thead>
<tr>
<th>Property</th>
<th>Requirement</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prototype Bearing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stiffness in Compression:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>at 107 kN</td>
<td>2.5 mm ± 15%</td>
<td>AS 5100.4 Appendix D Paragraph D3</td>
</tr>
<tr>
<td>at 700 kN</td>
<td>no visual defects</td>
<td></td>
</tr>
<tr>
<td>Bearing Pads</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stiffness in Compression:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>at 107 kN</td>
<td>2.5 mm ± 15%</td>
<td>AS 5100.4 Appendix D Paragraph D3</td>
</tr>
</tbody>
</table>

Note:
(1) Loading must be continued to 118 kN.

6 SURVEY CONTROL SYSTEM

6.1 PROCEDURE

Establish a system of survey control to enable control of the vertical and horizontal alignment of the bearings and superstructure to the tolerances required for launching and installation of the permanent bearings.

As part of the system of control, establish a Reference Point in the vicinity of the casting bed as a survey control mark in accordance with Specification RMS G71 and agreed with the Principal, prior to the commencement of construction of the bridge girder. The Reference Point must be stable to within ± 0.5 mm, in both level and position, during construction of the bridge superstructure.

Submit, as part of the PROJECT QUALITY PLAN, the procedures for the establishment, maintenance and periodic correction where required of the survey control marks and system. Include in the procedures the method by which the survey control is to be transferred to the various parts of the structure, to ensure that all tolerances are met.

6.2 CERTIFICATION OF REFERENCE POINT

The Hold Point specified in RMS G71 Clause 5.5.1 must apply to the Reference Point prior to the construction of the casting bed.
7 DESIGN OF CASTING BED

7.1 GENERAL

The design of the casting bed, including forms, supports, footings, adjustment systems and access, must conform to AS/NZS ISO 9001 Clause 7.3.

The casting bed and forms must be of sufficient length to allow for minor adjustments to be made to the cast length of segments to account for actual creep and shrinkage and the change of segment length due to vertical curvature.

Design and maintain the formwork to give a Class 2 finish in accordance with RMS B80, except that the finish for the sliding surface must meet the tolerances in Clause 7.4 of this Specification.

7.2 LOCATION AND LAYOUT

Locate the casting bed at the position shown on the Drawings.

The layout must conform to the details shown on the Drawings listed in Annexure B152/A.

7.3 METHOD OF SUPPORT FOR FORMWORK

Support the forms for the soffit, outsides of webs and undersides of cantilevers, via transverse members, which are in turn supported on two longitudinal beams which run the full length of the casting bed. Strip these forms from the completed concrete by vertically lowering the longitudinal beams. Provide fine adjustment of the levels of the longitudinal beams in their raised positions.

The forms for the inner faces of box girder webs may be supported from the outer web forms.

Support the forms for the underside of the slabs forming the top of the closed box girder cell in such a way that the weight of the fresh concrete and associated dead and live loads will be taken to the foundations without overloading the bottom slab, i.e. generally supports are to be located where cross girders or longitudinal beams of sufficient stiffness are provided.

7.4 TOLERANCES OF SLIDING SURFACES

The sliding surfaces are indicated on the Drawings. Construct them to the following tolerances.

7.4.1 Soffit Sliding Surfaces:

(a) Vertical tolerance (relative to Reference Point)

All points on each soffit sliding surface must be within 2 mm of the specified level.

(b) Vertical tolerance (relative to other soffit sliding surface)

At any transverse section taken normal to the girder centreline, the difference in level between corresponding points on the two soffit sliding surfaces must be within 1 mm of the difference in the specified levels.
Incrementally Launched Prestressed Concrete Girders

(c) **Slope tolerance (deviation from specified slope)**

The maximum deviation from the specified slope on either soffit sliding surface must not exceed 1 in 1000, either longitudinally or transversely.

7.4.2 **Lateral Sliding Surfaces:**

(a) **Horizontal tolerance (relative to girder centreline)**

All points on the lateral sliding surface must be within 1.5 mm of the correct positions relative to the girder centreline.

(b) **Slope tolerance (deviation from specified slope)**

The maximum deviation from the specified slope on the lateral sliding surface must not exceed 1 in 1000, measured longitudinally or vertically.

7.5 **SUPPORT OF SEGMENTS DURING LAUNCHING**

Position launching bearings as shown on the Drawings.

Design the soffit form to permit lowering of the form to transfer the load to the launching bearings. Vertical movement of the segment at the bearing position is not permitted during the removal of the soffit forms.

8 **MANUFACTURE OF SEGMENTS**

8.1 **GENERAL**

Cast all segments of the superstructure in the casting bed shown on the Drawings.

Following launching of a segment, clean and apply a form release agent to all forms prior to commencing work on the subsequent segment.

Protect forms from damage when dragging reinforcement into position.

8.2 **SEGMENT LENGTHS AND OVERALL BRIDGE LENGTH**

The cast length of each segment must allow for shortening due to elastic deflection, creep and shrinkage. Before casting every fourth segment, measure the length of the final segment or segments containing top attachment plates for permanent bearings and compare with the theoretical values. Adjust the subsequent segments to correct the length of the girder.

8.3 **TOLERANCES IN INSTALLATION FITTINGS**

Install all inserts, attachments and fittings including longitudinal and transverse prestressing ducts and anchor plates with sufficient accuracy to enable the correct attachment of mating parts. Conform to Specification RMS B113 and Clause 8.4.
8.4 INSTALLATION TOLERANCES OF TOP ATTACHMENT PLATES FOR PERMANENT BEARINGS

If the Drawings show that top attachment plates for permanent bearings are to be placed within the soffit of the girder during construction, install these plates at the locations shown to the following tolerances:

(a) Position:
   (i) Measured in a direction parallel to the bridge centreline ± 10 mm
   (ii) Measured in a direction transverse to the bridge centreline ± 3 mm

(b) Level:
   The level of the bottom of the attachment plate must match the level of the girder soffit.

8.5 REMOVAL OF FORMWORK

Notwithstanding the requirements of Specification RMS B80, do not remove the girder segment forms before the following times:

(a) Inner Web Forms:
   A minimum of 12 hours after the completion of the concrete pour.

(b) Top Slab Forms:
   Before the concrete has reached the transfer strength specified on the Drawings.

(c) Soffit, Outer Web and Cantilever Forms:
   Before stressing the launching prestressing tendons.

9 LAUNCHING OF GIRDER

9.1 LAUNCHING METHOD

Launch the girder incrementally after each segment has been stressed.

Apply the launching force to the girder at the locations specified in Annexure B152/A.

Operate the launching equipment as follows:

9.1.1 Segments Other than First and Last Segments

(a) Transfer the girder reaction at the launching abutment from the braking saddles to vertical jacks, which are free to slide in the direction of launching.

(b) Move the vertical jacks horizontally by means of hydraulic jacks, thus moving the girder longitudinally.

(c) Retract the vertical jacks, thus transferring the reaction back to the braking saddles.
(d) Retract the horizontal jacks to reposition the vertical jacks back to their initial positions.

Unless approved otherwise by the Principal, the lifting jacks at the launching abutment must not lift the girder more than 3 mm clear of the braking saddle.

### 9.1.2 First and Last Segments

Physically connect the lifting jacks and the girder to apply the horizontal force and to restrain the girder in the longitudinal direction. Otherwise operate the equipment similarly to the launching of the other segments.

### 9.1.3 Launching on a Vertical Curve or Downgrade

Physically connect the girder to the launching equipment at any stage of the launching at which the minimum bearing frictional resistance is not greater than 1.2 times the minimum friction resistance available from the braking saddle.

### 9.2 Special Launching Provisions

During the launching of the first segment, the segment may tend to rotate in plan because of insufficient sideways reaction at the launching abutment side guide bearing. Take appropriate measures to prevent such movement.

During the launching of the first girder segment, ensure that the launching nose does not lift off the launching abutment braking saddle or launching jack when the segment is no longer supported by the launching bearing within the casting bed.

Where the braking saddle is located behind the lifting jacks, attach a temporary end frame to the end of the final segment to enable the superstructure to be supported on the braking saddle during the final stages of launching of the girder. Design and construct the end frame. Alternative methods of final launching may be used if approved by the Principal or if shown on the Drawings.

During certain stages of the launching of the first and last girder segments, the vertical reaction on the launching system may be insufficient to generate enough frictional force to move the girder longitudinally. Under these circumstances, physically connect the launching jack to a part of the girder, launching nose or end frame, as appropriate, to transmit the launching force to the girder.

Also, when launching downhill, during certain stages of the launching of the last segment, the vertical reaction on the braking saddle may be insufficient to generate enough frictional force to brake and hold the superstructure. Under these circumstances, physically connect the last segment to a temporary pier or other suitable anchor.

### 9.3 Safety Precautions During Launching

One person must be in overall control of the launching operation and must be in two-way communication with the persons in charge at each launching bearing location. Provide safe access around the launching bearings to enable the placing and removal of the elastomeric bearing pads to the horizontal and vertical sliding surfaces. Provide at least one person at each launching bearing throughout the launching operation to attend to the bearing pads.

At each launching bearing location, provide an on/off switch to stop the launching instantly if necessary. Such switches must require physical resetting to the “on” position in order to prevent accidental restarting.
The allowable horizontal deflection of each pier during the girder launching operation is shown on the Drawings. Continually monitor the horizontal jacking force and the horizontal deflections of the piers during the launching operation. Cease launching immediately if the horizontal jacking force increases suddenly or if the horizontal deflection of any pier exceeds the allowable value. For piers where the allowable deflection is less than 10 mm, the horizontal deflection of that pier does not need to be monitored.

10 INSTALLATION OF PERMANENT BEARINGS

Jacking for installation of the permanent bearings must only take place at one support (pier or abutment) at a time. At each support, simultaneously jack both girder webs using a common pressure line and with equal forces using the same arrangement of jacks under each web.

The locations of lifting jacks assumed in the design are shown on the Drawings. The assumed jacks are flat jacks applying a bearing pressure to the concrete of 14 MPa. The bearing pressure exerted by the lifting jacks on the concrete must not exceed 20 MPa. The lifting jacks must be capable of accommodating longitudinal temperature movements of the bridge, by using PTFE/stainless steel or similar sliding interfaces above or below the jacks.

To minimise movement of the bridge during installation and possible damage to the mortar packing, dry pack the permanent bearings only when no large temperature changes are anticipated in the next 24 hours. In addition, immediately after dry packing or grouting, lower the lifting jacks slightly (approximately 1 mm) to apply a small load to the mortar packing. Completely lower and remove the lifting jacks only after the mortar has attained a compressive strength of at least 30 MPa.

Include details of the removal of launching bearings and the installation of permanent bearings in the PROJECT QUALITY PLAN.
A1 DESIGN ASSUMPTIONS AND REQUIREMENTS

A1.1 Incremental Launching Procedure

Construct segments in a casting bed situated behind Abutment ..., stressed together and progressively launched towards Abutment .... When the bridge is in its final position, apply additional prestress and position the permanent bearings.

Attach a steel launching nose to the forward end of the girders during launching to limit the stresses in the girders. Launch the girders by using a system of hydraulic jacks at Abutment .... During launching, slide the girders on temporary bearings in the casting bed, at intermediate supports between the casting bed and Abutment .... and at all piers and Abutment ....

A1.2 Launching Equipment.

The bridge has been dimensioned for launching equipment manufactured by Eberspacher GmbH, D-73219 Kircheim/Teck, Germany. Eberspacher Model AH 123 launching jacks have been assumed in detailing Abutment ....

Unless approved otherwise by the Principal, the lifting jacks at Abutment .... must not lift the girder more than 3 mm clear of the braking saddle.

A1.3 Casting Area

The Contractor's casting area is shown on Sketch No .... of the Drawings. The casting area forms part of the Contractor's Working Area.

A1.4 Casting Bed Layout

The location of the casting bed is shown on Sketch No .... of the Drawings. The layout of the casting bed is shown on Sketch No .... of the Drawings.

A1.5 Launching Nose

A1.5.1 Design Assumptions

The following design assumptions have been made in the design of the box girder for the bridge:

(a) The length of the launching nose is .... m from the centreline of bearing at the front to the rear of the launching nose.

(b) The mass and mass distribution of the launching nose lies below the maximum values shown on Sketch No ....

(c) The moment of inertia of the launching nose at any point lies between the maximum and minimum values shown on Sketch No ....

(d) The connection between the launching nose and the girder has been designed for the loads shown on Sketch No ....
(e) The launching nose must be designed to take the shear forces and bending moments shown on Sketch No. ....

A1.5.2 Design Requirements

The launching nose must consist of a pair of parallel steel girders, braced together and straight in plan. At the point of connection to Segment 1, locate the centrelines of the steel girders .... m either side of the centreline of the box girder.

Connect the launching nose and the girder using the prestressing bars shown on the Drawings. Design the connection such that there is no tension across the joint at any time. Design any proposed launching nose and connection so that no tension occurs across the joint between the nose and the girder.

Match the locations of holes for stressing the launching nose to Segment 1 with the prestressing bars shown on Sheet No. .... of the Drawings.

Design the launching nose to slide across the launching bearings with the aid of the same elastomeric bearing pads used to launch the concrete box girder.

Provide a side guide at the lower edge of the nose to engage the lateral guides of the launching bearings.

A1.6 Launching Force

Except as detailed below, apply the launching force through friction between the girder and jacks located beneath the webs of the girder.

Launching of Segments Nos 1 and 2 will require the installation of pull rods connecting the launching nose to the jacks.

Launching of Segment No 3 will require the installation of end frames and pull rods connecting the girder to the jacks.

A1.7 Construction Sequence

The general construction sequence for the girder is shown on Sheet No. .... of the Drawings.

On completion of launching, lock off the pull rods and carry out the web (continuity) prestressing in the order specified on the Drawings, and then construct the diaphragms followed by installation of the permanent bearings.

During the removal of the temporary bearings and the installation of the permanent bearings, lift the girder by an equal amount under each web at all times and do not raise by more than 5 mm at one pier or abutment relative to the adjacent piers.

The total force required to lift the girder to permit the replacement of the launching bearings by the permanent bearings is .... kN at the abutments and .... kN at the piers.

Complete the parapets, railings, footway, abutments, expansion joints and minor items after the permanent bearings are installed.

The launching nose may be removed as soon as launching is complete.
A1.8 Elastomeric Sliding Pads

The elastomeric sliding pads for the horizontal sliding surface of the launching bearings must be .... mm x .... mm in plan dimension.
ANEXURE B152/B – (NOT USED)

ANEXURE B152/C – SCHEDULES OF HOLD POINTS AND IDENTIFIED RECORDS

Refer to Clause 1.2.3.

C1 SCHEDULE OF HOLD POINTS

<table>
<thead>
<tr>
<th>Clause</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.2 &amp; RMS G71</td>
<td>Establishment of the Reference Point</td>
</tr>
</tbody>
</table>

C2 SCHEDULE OF IDENTIFIED RECORDS

The records listed below are Identified Records for the purposes of RMS Q Annexure Q/E.

<table>
<thead>
<tr>
<th>Clause</th>
<th>Description of Identified Record</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.5.2</td>
<td>Details of proposed bearings</td>
</tr>
<tr>
<td>5.5.2</td>
<td>Certificate of conformity of prototype bearing pad</td>
</tr>
<tr>
<td>5.5.3</td>
<td>Certificate of conformity of representative bearing pad</td>
</tr>
</tbody>
</table>
ANNEXURES B152/D TO B152/L – (NOT USED)

ANNEXURE B152/M – REFERENCED DOCUMENTS

Refer to Clause 1.2.4.

**RMS Specifications**

- RMS Q  Quality Management System
- RMS B80  Concrete Work for Bridges
- RMS B113  Post Tensioning of Concrete
- RMS B281  Laminated Elastomeric Bearings

**Australian Standards**

- AS/NZS 1170  Structural design actions
- AS/NZS 1170.2  Wind loads
- AS 1449  Wrought alloy steels - Stainless and heat-resisting steel plate, sheet and strip
- AS/NZS 1554  Structural steel welding
- AS/NZS 1554.1  Welding of steel structures
- AS 2536  Surface texture
- AS 4100  Steel structures
- AS 5100  Bridge design
- AS 5100.4  Bearings and deck joints
- AS/NZS ISO 9001  Quality management systems - Requirements