Technical Specification

Transport and Main Roads Specifications MRTS74 Supply and Erection of Prestressed Concrete Deck Units, Kerb Units and Winged Planks

November 2023

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1 Introduction

This Technical Specification applies to the supply, transport and erection of precast prestressed concrete deck units, kerb units, transverse stressing units and winged planks for bridge superstructures.

Refer to MRTS75 for *Supply and Erection of Prestressed Concrete Girders*.

This Technical Specification shall be read in conjunction with MRTS01 *Introduction to Technical Specifications*, MRTS50 *Specific Quality System Requirements* and other Technical Specifications as appropriate.

This Technical Specification forms part of the Transport and Main Roads Specifications Manual.

1.1 Registered Products

The requirements for the supply, transport and erection of prestressed concrete elements include the use of registered products. For information regarding these products refer to the Transport and Main Roads website, https://www.tmr.qld.gov.au/business-industry/business-with-us/approved-products-and-suppliers/bridges-and-other-structures-approved-products-and-suppliers

2 Definition of terms

The terms used in this Technical Specification shall be as defined in Clause 2 of MRTS01 *Introduction to Technical Specifications*.

In addition, terms listed in Table 2 are applicable to this Technical Specification.

Table 2 – Definition of terms

Term	Definition
Prestressed concrete deck units	Precast rectangular beams made from prestressed concrete.
Prestressed concrete kerb units	Precast rectangular beams made from prestressed concrete. Bridge kerb is an integral part of the manufacture of the beams.
Prestressed concrete winged planks	Precast beams with a similar cross section to a closed top Super Tee Girder with a maximum depth of 765 mm.
Prestressed concrete members	Generic term for Prestressed concrete deck units, Prestressed concrete kerb units and Prestressed concrete winged planks.
Surface tolerant epoxy coating	A two component epoxy coating for providing corrosion protection and abrasion-resistance to steel.
Transverse stressing units	Consist of a stressing bar complete with necessary nuts, washers, anchor plates and couplers where shown on the project drawings.
Wet-to-dry epoxy	A two component epoxy adhesive for bonding fresh wet cementitious concrete or mortar to existing substrates.

3 Referenced documents

Table 3 lists documents referenced in this Technical Specification.

Table 3 – Referenced documents

Reference	Title
AS 1012.8.1	*Methods of testing concrete- Method for making and curing concrete - Compression and indirect tensile test specimens*
AS 1012.8.2	*Methods of testing concrete- Method for making and curing concrete - Flexure test specimens*
AS 1012.9	*Methods of testing concrete- Compressive strength tests - Concrete, mortar, and grout specimens*
AS 1627.2	*Metal finishing – Preparation and pretreatment of surfaces – Power tool cleaning*
AS 2193	*Calibration and classification of force measuring systems*
AS 3972	*General purpose and blended cements*
AS/NZS 1214	*Hot-dip galvanized coatings on threaded fasteners (ISO metric coarse thread series) (ISO 10684:2004, MOD)*
AS/NZS 4680	*Hot-dip galvanized (zinc) coatings on fabricated ferrous articles*
ASTM C939 / C939M-16a	*Standard Test Method for Flow of Grout for Preplaced Aggregate Concrete (Flow Cone Method)*
ASTM C940	*Standard Test Method for Expansion and Bleeding of Freshly Mixed Grouts for Preplaced Aggregate Concrete in the Laboratory*
ISO 8504-3	*Preparation of steel substrates before application of paints and related products. Surface preparation methods. Part 3: Hand- and power-tool cleaning.*
MRTS01	*Introduction to Technical Specifications*
MRTS50	*Specific Quality System Requirements*
MRTS71	*Reinforcing Steel*
MRTS73	*Manufacture of Prestressed Concrete Members and Stressing Units*
MRTS78	*Fabrication of Structural Steelwork*
MRTS81	*Bridge Bearings*
Queensland Legislation	*Transport Operations (Road Use Management) Act 1995* and Regulations
SD2045	*Bridge Kerbs - Standard Details of Cast Insitu Kerbs for Transversely Stressed PSC Deck Units*
SD2046	*Precast Units - Precast Units - Precast Kerbs for Outer Deck units for Transversely Stressed Bridges with Regular Performance Traffic Barriers*
SD2050	*Precast Units - 10m PSC Deck Unit (Drawing 1 of 6 to Drawing 6 of 6)*
SD2051	*Precast Units - 11m PSC Deck Unit (Drawing 1 of 6 to Drawing 6 of 6)*
SD2052	*Precast Units - 12m PSC Deck Unit (Drawing 1 of 6 to Drawing 6 of 6)*
SD2053	*Precast Units - 13m PSC Deck Unit (Drawing 1 of 6 to Drawing 6 of 6)*
SD2055	*Precast Units - 15m PSC Deck Unit (Drawing 1 of 6 to Drawing 6 of 6)*

Reference	Title
SD2059	*Precast Units - 19m PSC Deck Unit (Drawing 1 of 6 to Drawing 6 of 6)*
SD2065	*Precast Units - 25m PSC Deck Unit (Drawing 1 of 6 to Drawing 6 of 6)*

4 Quality system requirements

4.1 Hold Points, Witness Points and Milestones

General requirements for Hold Points, Witness Points and Milestones are specified in Clause 5.2 of MRTS01 *Introduction to Technical Specifications*.

The Hold Points, Witness Points and Milestones applicable to this Technical Specification are summarised in Table 4.1.

Table 4.1 – Hold Points, Witness Points and Milestones

Clause	Hold Point	Witness Point	Milestone
5.2.1.1 (referenced from 5.2.1.2)	1. Approval of procedure for handling, transport and storage of prestressed concrete deck and kerb units		Submit handling, transport and storage procedure (14 days)
7.1 (referenced from 8.2 and 8.7)	2. Approval of procedure for erection of deck and kerb units	1. Erection of deck and kerb units	Submit erection procedure (21 days)
8.2	3. Acceptance of completed joints between prestressed concrete units		
8.4	4. Transverse stressing		
8.7		2. Grouting of transverse stressing holes	

4.2 Construction procedures

The Contractor shall prepare documented procedures for all construction processes in accordance with the quality system requirements of the Contract.

Construction procedures for those activities listed in Table 4.2 shall be submitted to the Administrator in accordance with the quality system requirements of the Contract.

Table 4.2 – Construction procedures

Clause	Procedure
5.2.1.1	Handling, transport and storage of prestressed concrete units
7.1	Erection of prestressed concrete deck units, kerb units and winged planks

4.3 Conformance requirements

The conformance requirements which apply to lots of works covered by this Technical Specification are summarised in Table 4.3.

Table 4.3 – Conformance requirements

Clause	Conformance requirement
7.3.8	Tolerance for erection of kerb units
8.5	Transverse stressing

4.4 Testing frequency

The minimum testing frequency for work covered by this Technical Specification is each span.

5 Prestressed concrete deck units, kerb units, transverse stressing units and winged planks

5.1 Manufacture of deck units, kerb units, transverse stressing units and winged planks

Deck units, kerb units and winged planks (refer as prestressed concrete members in this specification) shall be of the lengths and dimensions shown in the Drawings and shall be manufactured in accordance with the requirements of MRTS73 *Manufacture of Prestressed Concrete Members and Stressing Units*.

5.2 Handling, transport and storage

5.2.1 Deck units, kerb units and winged planks

5.2.1.1 General

Prestressed concrete members shall at all times during handling, transport and storage, be kept in such a position that the lifting anchors are uppermost.

The method of handling and storage shall be such as to avoid the danger of fracture by impact, undue bending, twisting or whipping. Prestressed concrete members shall be moved only while fully suspended. In no case shall they be moved by dragging across the terrain.

The Contractor shall submit its procedure for the handling, transport and storage of deck and kerb units not less than 14 days prior to commencement of any such activities. **Milestone**

Handling, transport and / or storage of prestressed concrete members shall not proceed until the procedure has been approved by the Administrator. **Hold Point 1**

The Contractor shall be responsible for the stability of the prestressed concrete members at all times including during storage and transport.

5.2.1.2 Lifting

Deck units, kerb units and winged planks are provided with lifting hoops / anchors in the top face of each unit. Units shall be lifted only by these lifting hoops / anchors and no other means of lifting shall be used at any stage during handling unless details have been submitted and released in accordance with Clause 5.2.1.1 **[Refer Hold Point 1]**.

Cranes shall work within their rated capacity. The Contractor shall provide the following details of the proposed crane for handling and / or erection of units in the procedure for handling and transport of deck and kerb units **[Refer Hold Point 1]**:

1. crane manufacturer’s load chart, and
2. details of counterweight, jib length and rigging.

5.2.1.3 Transport

5.2.1.3.1 General

The Contractor shall assess the route from the place of manufacture of prestressed concrete members to the Site and provide the detail in handling, transport and storage procedure addressed in Clause 5.2.1.1. The procedure shall also include full details of the transport arrangements, including means of limiting torsional forces on the prestressed concrete members during transport to prevent torsional cracking. The Contractor shall also supply details of anticipated arrival time of the prestressed concrete members on the Site and the planned rate of delivery.

Prestressed concrete members shall be transported only after all inspections required by the Administrator have been satisfactorily completed.

5.2.1.3.2 Certification of equipment

Prime movers shall have a current Certificate of Inspection issued by the Department of Transport and Main Roads or are currently registered in the National Heavy Vehicle Accreditation Scheme maintained by the National Heavy Vehicle Regulator.

5.2.1.3.3 Mass of loads

All road transport shall comply with the vehicle limits prescribed by the *Transport Operations (Road Use Management) Act 1995* and Regulations.

5.2.1.3.4 Escorts and pilots

All road transport shall comply with the relevant clauses of the Traffic Regulations pertaining to provision of pilot vehicles and / or police escorts.

5.2.1.3.5 Support of members during transport and storage

Prestressed concrete members shall be supported in such a manner that no damage shall be incurred by the units. Prestressed concrete members shall be supported on two level timber bearers placed not more than 1 m from the ends of the members. Members shall not rest on any support between the specified support points.

Where prestressed concrete members are transported in more than one layer, the timber supports for each layer carried on top of another layer shall be placed directly above the previous supports.

In addition, timber packing pieces shall be placed between the sides of adjacent deck and kerb units for their full depth to prevent contact between the units during transport. The packing pieces shall be secured in such a manner that they shall not drop out during transport. Units shall be kept firmly secured by independent chains at each end of the units. Suitable packing placed between the units and chains to prevent damage of the concrete.

5.2.1.4 Support of prestressed concrete members during unloading and storage

Prestressed concrete members shall be supported in such a manner that no damage shall be incurred to the units. Units shall be supported on two level bearers, placed between 200 mm and 500 mm from each end. Where units are stacked in more than one layer, the supports for each layer shall be placed directly above the lower supports. Units shall not be stacked more than three layer high unless approved otherwise by the Administrator.

During storage, prestressed concrete units shall not rest on any support between the specified support points.

The storage area shall be cleared of rocks, tree stumps etc., and brought to an even grade to ensure that the units are supported as described in this clause. This requirement also applies to where units will be placed on the ground temporarily, for example, when unloading from rail or road transport.

The size of the supports shall be adequate to provide sufficient bearing capacity and clearance to the lower units for all ground conditions likely to occur during storage. End supports shall be levelled at all times to ensure that units do not develop a twist during storage.

5.2.2 Transverse stressing units

Transverse stressing units shall be lifted, handled, transported and stored in such a manner that no damage is incurred to the transverse stressing units. Threads on the ends of transverse stressing units shall be covered and protected during transport, handling and storage.

Transverse stressing units shall be stored at a place where they shall not be subject to damage by the following:

1. welding
2. weld splatters
3. accidental heating by adjacent oxy welding / cutting operations, and/or
4. passage of stray electric currents.

Stressing bars shall not be nicked during storage.

Transverse stressing units shall be stored well clear of the ground on timber supports and shall be protected from mud splatters and the corrosive effects of water, rain, dust and chemicals.

6 Materials

6.1 Registered proprietary products

Work Operations that require the use of registered products are listed in Table 6.1.

Table 6.1 – Items requiring use of registered products

Clause	Category of Work
6.4 and 7.3.3	Application of epoxy paste for seating of deck units, kerb units and winged planks on bearings
10.3 and 10.4	Surface tolerant epoxy coating of area over cut lifting hoop / anchors
11.1	Surface tolerant epoxy coating of exposed transverse stressing anchorages
11.2	Application of wet-to-dry epoxy to transverse stressing anchorage recesses

For information regarding registration of products for the above items refer to the Approved Products and Registered Suppliers page on the departmental website.

Clauses 3, 4 and 5 of Annexure MRTS74.1 lists the registered proprietary products to be used for the project. Alternative products, including full technical details of the alternative formulation, shall be submitted to the Administrator for approval.

6.2 Cement mortar

Mortar and grout shall be either constituted and mixed on-site or supplied as a proprietary bagged product as per the relevant specification clause and shall achieve a minimum 32 MPa at 28 days.

6.2.1 Cement

Cement shall be Type GP or Type HE complying with the requirements of MRTS70 *Concrete*.

6.2.2 Sand

Natural sand shall be in accordance with MRTS70 *Concrete*.

6.2.3 Water

Water shall be in accordance with MRTS70 *Concrete*.

6.2.4 Mortar proportions

Mortar shall consist of a mixture of one part of Type GP cement to two or three parts of sand uniformly mixed (1:2 or 1:3).

The water / cement ratio shall be the minimum required to allow placement, pouring or pumping as specified for the particular application.

6.2.5 Admixtures

Admixtures to increase the workability may be used in mortar. Admixtures shall be in accordance with MRTS70 *Concrete*.

6.3 Proprietary grouting products

6.3.1 Grout for transverse stressing holes

Registered proprietary products specifically designed for grouting of post-tensioning ducts could be used for grouting of transverse stressing holes.

Proprietary post-tensioning grout products shall have high bleed resistance, low shrinkage and high fluidity. Grout shall comply with the performance requirements specified in Table 6.3.1 below when tested.

Clause 1 of Annexure MRTS74.1 lists the proprietary products to be used for the project. Alternative products compliant with Table 6.3.1, including full technical details of the alternative formulation, shall be submitted to the Administrator for approval.

Table 6.3.1 – Performance requirements for proprietary post-tensioning grout

Property	Test Method	Criteria	Comments
Bleeding	ASTM C940	Final Bleeding < 0.5%	Measured when two successive readings show no further expansion or bleeding
Early expansion	ASTM C940	< 2% at 3 hours	Temperature tolerances are at 20ºC ± 5ºC
Fluidity	ASTM C939 / C939M-16a	Immediately after mixing: Efflux time < 20 s. 45 minutes after mixing: Change in efflux time < ± 3 s	Contractor's target efflux time for the Site conditions shall not vary from nominated value by more than ± 2 s
Minimum compressive strength	AS1012.9 AS1012.8.1 AS1012.8.2	32 MPa at 7 days	No comment

6.3.2 Grout for Holding Down bolt holes

Proprietary cementitious grout products shall be used to fill up the holding- down (HD) bolt holes. Proprietary cementitious grout shall have a fluid consistency with minimum compressive strength of 32 MPa at seven days.

Clause 2 of Annexure MRTS74.1 lists the proprietary products to be used for the project.

6.4 Epoxy paste

Epoxy paste shall be a registered proprietary product.

Epoxy paste shall consist of a proprietary two-part epoxy product capable of gap filling between the bearing and the soffit of the precast unit. Epoxy paste shall have a minimum compressive strength of 50 MPa.

Clause 3 of Annexure MRTS74.1 lists the registered products to be used for the project. Alternative products, including full technical details of the alternative formulation, shall be submitted to Administrator for approval.

6.5 Bearings

Elastomeric bearings shall comply with the requirements of MRTS81 *Bridge Bearings*.

6.6 Holding-down bolts

Holding-down bolts, nuts and washers for deck and kerb units shall be fabricated in accordance with the details shown in the Drawings and in accordance with the requirements of MRTS278 *Supply of Structural Fasteners*. Holding-down bolts, nuts and washers shall be hot-dipped galvanised after fabrication in accordance with AS/NZS 1214.

7 Erection of deck units, kerb units and winged planks

7.1 General

Deck units, kerb units and winged planks shall not be placed on reinforced concrete headstocks until seven days has elapsed from placement of the concrete in the headstocks and bearing pedestals, and has attained a compressive strength of 70% of the specified 28 day characteristic strength.

Before releasing the load from the lifting gear, the units shall be supported such that they cannot be overturned or slide. Methods to prevent overturning or sliding shall include, but not limited to, installation of the holding-down bolts, washers and nuts or independent bracing. Consideration shall also be given to overturning moments from formwork and other items attached to the units.

The Contractor shall submit its procedure for the erection of units not less than 21 days prior to commencement of erection. **Milestone**

Erection of units shall not proceed until the procedure has been approved by the Administrator. **Hold Point 2**

Erection of units shall be a Witness Point. **Witness Point 1**

The Administrator shall have the right at all times to cease any handling deemed damaging to the units.

7.2 Installation of bearings

For deck unit and winged plank bridges with bearings, bearings shall be installed in recesses in the headstock or on the concrete pedestals as shown on the drawings. Recesses shall be clean and dry. Bearings shall be placed within ± 3 mm of the correct plan position.

7.3 Installation of deck units, kerb units and winged planks

7.3.1 Removal of advertising labels

Any advertising labels on the deck and kerb units shall be removed before assembly to permit adhesion of mortar to units.

7.3.2 Seating deck units, kerb units and winged planks on mortar bed

Where the Drawings show that the deck units, kerb units or winged planks is to be bedded on cement mortar, a cement mortar seating strip shall be placed on the headstocks. The mortar shall consist of a mixture of one part of Type GP cement to three parts of sand uniformly mixed (1:3). The quantity of mortar placed shall be sufficient to provide, after erection, the widths and thicknesses shown in the Drawings and to provide an even seating for the end of the unit.

Immediately following the placement of the cement mortar seating strip and before the mortar sets, the unit shall be seated on the headstocks at the position shown in the Drawings. Any excess mortar shall be struck off.

Where one end of the unit is placed on elastomeric bearings, that end shall be seated as per Clause 7.3.3 first before placing the opposite end onto the mortar seating.

7.3.3 Seating deck units, kerb units and winged planks on single layer or laminated elastomeric bearings

Deck units, kerb units and winged planks shall be pre-positioned on non-compressible temporary packers on top of the headstock to ensure that the soffit of the units will clear the top of the bearings by 1 mm at the closest point. The gap between top of the headstock and deck unit/ winged plank soffit shown on the project drawing shall be achieved at completion of placement of the deck unit or winged plank.

The bridge designer will need to provide calculated minimum gap between the top of the headstock and the soffit of the deck unit / winged plank at the completion of landing the deck unit on the bearings that corresponds to a final minimum gap of 15 mm at the completion of construction of the bridge including superimposed dead loads.

Once the above clearances have been established, the unit shall be removed and the top surface of the bearing shall be coated with an epoxy paste. Epoxy paste material shall be a registered product in accordance with Clause 6.4. Clause 3 of Annexure MRTS74.1 lists the registered products to be used for the project.

The unit shall then be lowered into position and supported on temporary packers maintaining a minimum epoxy paste thickness of 1 mm but not greater than 15 mm. The periphery of the bearing shall be checked to ensure that the entire interface between the prestressed concrete unit and bearing is filled with epoxy paste. Any excess epoxy paste squeezed out shall be removed before it has set.

If the epoxy paste sets before completion of this operation, the unit shall be lifted and all contact surfaces cleaned before repeating the process.

After the epoxy paste has fully cured over a period of not less than 48 hours and has achieved a minimum compressive strength of 40 MPa, the temporary packers shall be removed without dislodging the prestressed concrete units.

7.3.4 End alignment of deck and kerb units

Deck and kerb units with cast-in sockets for expansion joints shall be carefully placed such that the sockets form a straight line which shall allow placement of the deck joint.

7.3.5 Spacing between deck and kerb units

The actual gap between units may vary slightly, plus or minus, from the nominal gap shown in the Drawings, to accommodate the manufacturer’s tolerances. For transversely stressed deck units, a minimum gap of 10 mm shall be maintained by wedging, where necessary.

7.3.6 Holding-down bolts

Holes for holding-down bolt holes shall be carefully aligned during erection of deck units, kerb units and winged planks. Each holding-down bolt shall be inserted into a formed hole as erection proceeds to reduce the possibility of difficulty later in the construction sequence.

7.3.7 Holes for transverse stressing bars

Where the deck and kerb units are to be transversely stressed after erection, transverse stressing holes shall be carefully aligned during placing of the units. The alignment of these holes shall be checked by inserting trial mandrels into the holes as erection proceeds.

7.3.8 Tolerance for erection of kerb units

350 mm wide kerb units shall be placed or aligned by the Contractor by wedging or pulling to attain the following tolerances: **Nonconformance**

a) lateral bow of unit — 1 in 1000 of nominal length

b) alignment of height of top faces of adjacent units — maximum step 5 mm, and

c) alignment of inside faces of adjacent units — maximum step 10 mm.

Tolerances ‘b)’ and ‘c)’ shall also apply where kerb units meet cast-in-place wingwalls at abutments.

8 Transverse stressing and grouting

8.1 General

Where transverse stressing of the deck and kerb units is required, the provisions of Clauses 8 and 11 shall apply.

No construction plant or vehicles shall be placed on the erected units before the completion of transverse stressing and until the grout in the transverse stressing holes has attained a minimum age of two days.

8.2 Installation of mortar joint between deck and kerb units before transverse stressing

All aspects of the installation mortar joints between deck and kerb units shall be included in the Contractor’s procedure for erection of units. **[Refer Hold Point 2]**

Mortar material shall be in accordance with Clause 6.2.4.

Placement of mortar to the joints between the units shall be completed at least 48 hours prior to transverse stressing of units.

Before placing mortar to the joints between the units, the Contractor shall carry out the following:

a) The longitudinal joints between the units shall be sealed with leak-proof formwork or seal to form a dense waterproof joint as per the PSC deck unit standard drawings listed in Table 3.

   Where a compressible seal is used to seal the longitudinal joints and where such seal is pre-attached to one of the units prior to erection, it shall be thoroughly glued or firmly attached. This requirement is to prevent dislodgement or rolling-up the gap / joint when units are lowered into place.

   The compressible seal at the base of the longitudinal joints shall be placed just above the chamfers of the units. Before any mortar is placed, the position of the seal shall be checked and, where necessary, it shall be adjusted using a flat spade-like tool to the required depth. The tool shall have a stop attached to prevent pushing the seal further than required.

b) Compressible packing shall be used to form voids surrounding each of the formed holes for stressing bars and extend to the unit surface. Compressible packing shall be selected such that it can be easily removed after the mortar/grout has hardened.

c) The Contractor shall ensure compressible packing / seal will not dislocate due to self-weight and hydrostatic pressure exerted from the mortar.

d) Joints shall be cleaned and free of debris prior to placing mortar.

Mortar shall be of a consistency that allows the mortar to be puddled into the joint without being free flowing.

During mortar placement, care shall be taken to ensure that mortar is not forced into the formed holes and that the voids surrounding these holes are maintained.

Mortar shall be placed into the joints in the following stages:

1. Up to the first height / thickness shown in the Drawings. Check and repair leakage if any.
2. The remainder of the joint after the mortar in the first height / thickness has achieved initial set.

   Placement of mortar in layers may be required to avoid dislocating compressible packing / seal due to self-weight and hydrostatic pressure exert from the mortar. Previous poured layer shall have achieved initial set prior to pouring of mortar for the next layer.

The completed joints shall be fully filled with sound mortar. Any porous, honeycombed or defective areas shall be cleaned out and repaired to the satisfaction of the Administrator before transverse stressing is carried out. **Hold Point 3**

Due to manufacturing tolerances and lateral / transverse bow of units and construction tolerances, grout may be used instead of mortar to fill the joints that are less than or equal 15 mm wide between the units. Grout material shall be in accordance with Clause 6.2.5. The grout shall have a minimum water / cement ratio for a flowable consistency and to allow for pouring or pumping. Placement of grout to the joints between the units shall be completed at least 48 hours prior to transverse stressing of units.

The Contractor shall ensure compressible packing / seal will not dislocate due to higher hydrostatic pressure exerts from the use of grout. Placement of grout in thinner layers may be required to avoid dislocating compressible packing / seal.

Where the bridge is constructed over an electrified railway or tramway, the compressible packing/seal between the deck and kerb units shall be removed after the mortar of the joints has cured.

8.3 Transverse stressing units

8.3.1 Cleaning and straightening of stressing bars

Before inserting transverse stressing bars into the deck and kerb units, any grease or protective coating film shall be removed with a product that does not leave any residue.

Transverse stressing bars which require straightening shall be used only with the approval of the Administrator. Under no circumstances shall heat be used to straighten a bar.

Straightening shall be carried out cold and ensuring that no nicking or notching of the bar takes place in the process.

8.3.2 Care of transverse stressing bars and nuts

Bars have to be supplied with a rolled thread and no further threading by lathe or die is permitted. Minor damage to bar threads may be repaired by careful filing with a saw file or a thread file. More extensive damage can be repaired by using dies supplied by the stressing bar manufacturer.

Nuts shall be checked for free running on the threads before commencing stressing.

No welding shall be permitted on stressing bars, nuts, washers, bearing plates or couplers.

8.3.3 Installation of stressing bars

Transverse stressing bars shall be carefully installed through the formed holes in the deck and kerb units. Care shall be taken not to damage the threads on the end of the bars. Nuts, washers and bearing plates shall be assembled as shown in the Drawings. Where stressing bars require extending, couplers shall be screwed onto the bar threads for the entire length of the socket in the coupler and tightened firmly.

The actual diameter of any unthreaded portion of the transverse stressing bars shall be measured prior to their insertion in the units to determine their actual cross-sectional area.

8.4 Transverse stressing

Each span shall be transversely stressed by applying a transverse stressing force to each of the transverse stressing bars. The transverse prestressing force shall be applied in the presence of the Administrator. **Hold Point 4**

8.5 Measurement of transverse stressing force

Each transverse stressing bar shall be tensioned to a force at lock-off of 350 kN in the bar unless shown otherwise in the Drawings.

The magnitude of the transverse stressing force shall be measured by means of a pressure gauge (or gauges) and by the elongation of the transverse stressing bar caused by the stressing force.

The anticipated extension, in millimetres, shall be calculated by using the following formula:

$$\text{Extension} = \frac{PL}{AE}$$

where:

P = total stressing force in kN

A = nominal area of the transverse stressing bar, in mm², based on the actual diameter

L = length, in mm, of the transverse stressing bar between the far anchorage and the point of attachment to the jack, and

E = the modulus of elasticity of the transverse stressing bar which shall be taken from the test certificate.

The actual extension shall be measured by using a Vernier scale fixed to the jack. Should there be more than 10% variation between the calculated and measured extension, transverse stressing shall be discontinued until the reason for such difference has been ascertained. **Nonconformance**

Care shall be taken to ensure that the ram of the jack does not reach the limit of its travel during the stressing operation.

8.6 Calibration of gauges

All equipment used for verification of pre-tensioning and testing shall be calibrated in accordance with AS 2193 and shall meet the readability, repeatability and mean error requirements of Class B for the range of forces used in the pre-tensioning or testing. The maximum period between calibrations shall be as given in Clause 3.8 of AS 2193 or one year, whichever is the lesser.

8.7 Grouting of transverse stressing holes

The formed holes for transverse stressing shall be grouted after completing the stressing operation. Grout shall be poured down into at least one of the gaps between the prestressed concrete units above the transverse stressing bars until the following occurs:

1. the grout is forced up in all remaining gaps, and
2. the grout emerges from the drilled hole in the stressing bar bearing plates on the outside of the outer / kerb units.

Grouting shall commence at the lowest end of the bars on super elevated bridges, thus forcing the grout to flow up to the highest end and expelling the air from the formed holes. The grout shall not segregate prior to setting and shall be used within 30 minutes of mixing. The Contractor may employ alternative means of placing the grout, for example, by pumping. Proposals for such alternative methods shall be submitted to the Administrator for approval.

Grout material shall be a proprietary product in accordance with Clause 6.3.1. Clause 1 of Annexure MRTS74.1 lists the proprietary products to be used for the project.

Grouting of transverse stressing holes using high early strength and rapid setting grouting product may be adopted for bridge widening projects subject to the Administrator's approval. In bridge widening projects, the existing traffic condition / requirements may not allow for long bridge closure. In such proposal, the Contractor shall prepare a procedure / work method for grouting in relation to the properties of the proprietary high early strength and rapid setting grout product. The procedure / work method shall be included in the Contractor's procedure for erection of deck and kerb units, refer to Clause 7.1.

Grouting using high early strength and rapid setting proprietary grout product shall not proceed until the procedure / work method statement and product have been approved by the Administrator. **[Refer to Hold Point 2]**.

Grouting of transverse stressing holes shall be a Witness Point. **Witness Point 2**

9 Grouting of holding-down bolts

9.1 Fixed end with (mortar bearing) seating

Each holding-down bolt shall be raised to about 150 mm above its final position in the formed hole.

Cement grout having a fluid consistency shall be poured around the bolt. The bolt shall be then pushed firmly to its final position.

Proprietary cementitious grout product in accordance with Clause 6.3.2 shall be used to fill up HD bolt holes. Clause 2 of Annexure MRTS74.1 lists the proprietary products to be used for the project.

For fixed ends without provision for jacking, the formed holes in the headstocks, deck units, kerb units and winged planks shall be completely filled. Any excess grout shall be struck off level with the top of the deck units.

For fixed ends with provision for jacking, the formed holes in the headstocks, deck units, kerb units and winged planks shall be filled to the specified depth shown in the Drawing.

9.2 Expansion end with (elastomeric bearing) seating

The procedure for grouting and fixing holding-down bolts shall be as per Clause 9.1 except that when the bolt is pushed into its final position, the grout shall be levelled with the top of the headstock. Any surplus grout remaining near the bearings shall be removed.

9.3 Tightening of nuts on holding-down bolts at expansion end

Nuts on holding-down bolts shall be screwed down finger tight only. Where the nut is tight on the threads, the nut shall be screwed down using a short spanner to just nip the washer. The recess on the top of the prestressed concrete unit shall be covered with a galvanised cover plate.

10 Activities to complete erection of prestressed concrete deck units, kerb units and winged planks

10.1 Unused formed holes in deck units, kerb units and winged planks

Any unused formed holes in deck units, kerb units and winged planks shall be filled with a cementitious mortar or concrete with a design strength of not less than 40 MPa.

10.2 Mortar joints at ends of deck and kerb units

For transversely stressed deck units supported on mortar pads, the gap between the end of deck units / kerb units and the ballast wall at fixed joints shall be filled with dry cement mortar packed tightly into the gap.

10.3 Cutting of lifting hoop anchors from deck units, kerb units and winged planks

The lifting hoop anchors shall be cut off flush with the top surface of the deck units, kerb units or winged planks. If gas cutting is used, the operation shall be performed quickly to ensure minimal heat transfer into the unit from the lifting hoop anchors.

For bridges with no cast in-situ deck, three coats of surface tolerant epoxy coating shall be applied over the area specified in the Drawing at each cut to prevent corrosion. The minimum total film thickness of the three coats shall be 0.3 mm dry or 0.6 mm wet.

Surface tolerant epoxy coating shall be a registered product in accordance with Clause 6.1. Clause 4 of Annexure MRTS74.1 lists the registered products to be used for the project.

After cutting and coating of the kerb unit hoop anchors, the recesses shall be filled with grout or mortar. Grout/mortar material shall be in accordance with Clause 6.2.4 or 6.3.2.

10.4 Filling of foot anchor recesses

After the foot anchors are no longer required, the foot anchor recesses on bridge with no cast insitu deck and kerb units shall be filled with grout. Grout material shall be in accordance with Clause 6.3.2

For bridges with no cast in-situ deck, three coats of surface tolerant epoxy coating shall be applied over the filled area specified in the Drawing to prevent corrosion. The minimum total film thickness of the three coats shall be 0.3 mm dry to 0.6 mm wet.

Surface tolerant epoxy coating shall be a registered product in accordance with Clause 6.1. Clause 4 of Annexure MRTS74.1 lists the registered products to be used for the project.

11 Anchorage protection of transverse stressing units

11.1 Epoxy coating

All exposed anchorages shall be degreased, rinsed with potable water and hand or power tool cleaned. Galvanised surfaces shall be prepared in accordance with AS 1627.2 and ISO 8504-3 St2 surface preparation. Two coats of a grey coloured, high build surface tolerant epoxy coating shall be applied. The surface tolerant epoxy coating shall be a registered product in accordance with Clause 6.1. Each coating shall have a minimum dry film thickness of 125 microns.

Clause 4 of Annexure MRTS74.1 lists the registered products to be used for the project.

Flame cleaning shall not be permitted.

11.2 Filling anchorage recesses

Where the Drawings require anchorage recesses to be filled, any projecting bar shall be cut off using a metal cutting disc to provide the cover shown in the Drawings.

Immediately before the recess is filled, the surface of the recess shall be painted with wet-to-dry epoxy. A cement mortar shall be prepared to a firm consistency and placed into the recess. The mortar surface shall be finished flush with the unit surface with a steel trowel.

The wet-to-dry epoxy shall be a registered product in accordance with Clause 6.1. Clause 5 of Annexure MRTS74.1 lists the registered products to be used for the project.

12 Miscellaneous requirements

12.1 Scuppers

Scuppers shall be kept clear of foreign material during construction.

12.2 Provision for future widening

Where provision is required for future widening, special instructions for stressing, grouting, and so on shall be as detailed in the Drawings.

12.3 Provision for attachment of services

Special fitments may have been cast into the deck and/or kerb units for supporting services such as pipelines and cables.

Such fitments shall not be used for construction purposes without the Administrator’s approval and shall be restored to a satisfactory condition if damaged in any way during construction.

12.4 Cast-in sockets for expansion joints

Where cast-in sockets for expansion joints have been provided in deck and kerb units, the sockets shall be kept covered by plastic caps to prevent ingress of mortar, water or foreign matter.

12.5 Kerb and parapet formwork support fitments

Where kerbs and/or parapets are to be cast insitu, special fitments may have been cast into the prestressed concrete units to provide support points for formwork.

Unless the construction of the kerbs and/or parapets is to proceed immediately, fitments shall be cleaned and protected against accidental damage and from the elements.

Where cast-in anchors at the side of deck unit are used for fixing formwork during bridge construction, anchors shall be cleaned, grease applied and bolt screwed in after the construction

12.6 Kerb and parapet steel reinforcing starter bars

Steel reinforcement may protrude from the outer deck units and winged planks for constructing the cast insitu kerbs and/or parapets.

Unless the construction of the kerbs and/or parapets is to proceed immediately, steel reinforcing shall be cleaned and protected against accidental damage and from the elements.

13 Supplementary requirements

The requirements of MRTS74 *Supply and Erection of Prestressed Concrete Deck Units, Kerb Units and Winged Planks* are varied by the supplementary requirements given in Clause 6 of Annexure MRTS74.1.