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**REVISION REGISTER**

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<th>Clause Number</th>
<th>Description of Revision</th>
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PRETENSIONED PRECAST CONCRETE MEMBERS

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IC-DC-B110
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FOREWORD

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BASE SPECIFICATION

This document is based on Specification RMS B110 Edition 4 Revision 0.
1 GENERAL

1.1 SCOPE

This Specification sets out the requirements for the supply of pretensioned precast reinforced concrete members.

For supply of precast reinforced concrete members which are not pretensioned, refer to Specification RMS D&C B115.

1.2 STRUCTURE OF THE SPECIFICATION

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

1.2.1 (Not used)

1.2.2 (Not Used)

1.2.3 Schedules of HOLD POINTS, WITNESS POINTS and Identified Records

The schedules in Annexure B110/C list the HOLD POINTS and WITNESS POINTS that must be observed. Refer to Specification RMS D&C Q6 for the definitions of HOLD POINTS and WITNESS POINTS.

The records listed in Annexure B110/C are Identified Records for the purposes of RMS D&C Q6 Annexure Q/E.

1.2.4 Planning Documents

The PROJECT QUALITY PLAN must include each of the documents and requirements listed in Annexure B110/D and must be implemented.

1.2.5 Referenced Documents

Standards, specifications and test methods are referred to in abbreviated form (e.g. AS 1234). For convenience, the full titles are given in Annexure B110/M.
1.3 DEFINITIONS

The terms “you” and “your” mean “the Contractor” and “the Contractor’s” respectively.

The following definitions apply to this Specification:

**Line of members**
A number of similar members with identical forces and tendon patterns in a long-line stressing bed manufactured at the same time and under the same conditions using the same stressing procedures and equipment.

**Measured elongation**
Actual tendon elongation measured at the required jacking force.

**Nominated draw-in**
Expected length of the draw-in of the tendon into the wedges (when the prestressing force is released from the jack) nominated by the Contractor.

**Required elongation**
Calculated tendon elongation corresponding to the required jacking force.

**Required gauge pressure**
Gauge pressure at the jack corresponding to the required jacking force.

**Required jacking force**
The force required at the jack, which includes allowances for losses due to friction, draw-in and any other causes, to achieve the specified tendon force.

**Sheathing**
Material placed over a length of tendon to prevent bond between the tendon and the surrounding concrete.

**Specified tendon force**
Force remaining in the tendon after release of the jack. This force is typically specified on the Design Documentation drawings.

**Structural Engineer**
A Professional Engineer who is a Chartered Member of Engineers Australia (or equivalent) practising in the field of structural engineering. An equivalent to membership of Engineers Australia would be an Engineer registered on the National Engineering Register (NER) in the general area of practice of Structural Engineering.

**Tendon**
A wire, strand or bar complying with AS/NZS 4672.1 or approved equivalent, or any discrete group of such wires, strands or bars.

1.4 WORK HEALTH AND SAFETY

Implement work health and safety measures, including preparation of Safe Work Method Statements, in accordance with Specification RMS D&C G22 when carrying out prestressing, lifting, handling and storage activities.

1.5 PERSONNEL

Nominate in the PROJECT QUALITY PLAN the names, qualifications and experience of all personnel carrying out stressing operations under the contract.

Personnel carrying out concreting work must comply with the training requirements under Specification RMS D&C B80.
2 MATERIALS

2.1 CONCRETE AND REINFORCEMENT

Concrete, reinforcement and embedments must conform to RMS D&C B80.

2.2 PRESTRESSING MATERIALS

2.2.1 General

Obtain prestressing materials only from manufacturers and suppliers which have in place quality management systems independently certified as fully complying with AS/NZS ISO 9001, by an organisation accredited by JAS-ANZ or an affiliated international certification organisation.

Provide evidence demonstrating that each supplier of prestressing materials has the specified quality management systems in place.

2.2.2 Tendons

Tendons must conform to AS/NZS 4672.1. If tendons conform to other standard, provide evidence that the other standard is equivalent to AS/NZS 4672.1.

Tendons must be certified by the Australian Certification Authority for Reinforcing and Structural Steels (ACRS) or equivalent for compliance with AS/NZS 4672 or approved equivalent.

Strands must be Class 2 relaxation (Relax 2) to AS/NZS 4672.1 unless otherwise specified.

2.2.3 Test Reports

Provide, with each coil or bar delivered, documentation listing the Lot numbers from which each coil or bar is taken and test certificates to RMS D&C Q6 showing conformity with AS/NZS 4672 or approved equivalent.

The test certificates must show the following results:

(a) breaking load;
(b) yield strength and elongation;
(c) load-elongation curve;
(d) cast analysis of the steel;
(e) cross-sectional area of tendon;
(f) 1000 hour isothermal relaxation test of the tendon supplied or of a tendon that is representative of the tendon Lot to be used. A tendon is considered representative if it is obtained from the same production run as the tendon that has been supplied.

Testing must conform to AS/NZS 4672.2 and RMS D&C Q6. However, with the exception of the relaxation test in item (f) above, test at least one sample from each coil of wire and strand delivered and three bars from each Lot and each delivery.
2.2.4 Handling and Treatment

Keep tendons free from loose or thick rust, oil, grease, tar, paint, mud or any other deleterious substance, but do not bring them to a smooth polished condition. A slight film of rust is not regarded as harmful, but the steel must not be visibly pitted by rust.

Do not use tendons that are damaged, kinked or bent.

Protect tendons from stray current arcing and splashes from the cutting operation of oxy-acetylene torches or arc-welding processes.

Do not weld tendons.

2.2.5 Storage

Store prestressing materials not currently in use in a weatherproof environment and support them above the ground in a manner that will prevent deterioration or damage.

3 MANUFACTURE

3.1 LENGTHS OF PILES

For prestressed concrete piles, manufacture test piles to the lengths shown on the Design Documentation drawings.

Manufacture all other prestressed concrete piles to the confirmed or altered pile lengths subsequent to the driving of test piles.

3.2 FORMWORK

Formwork must conform to the requirements of RMS D&C B80 applicable to precast concrete members, and to this Specification.

Assemble and check the formwork before each major production run and after any major modifications. Carry out a dimensional check of the formwork to verify that the member tolerances of Clause 4.2 will be achieved.

3.3 TENDON INSTALLATION

3.3.1 Positions and Tolerances

Install tendons at the positions shown on the Design Documentation drawings within a tolerance of ±5 mm. Maintain the specified cover within a tolerance of –0 and +10 mm. Provide suitable devices to maintain the correct positioning of the tendons during concrete placing.

3.3.2 Prevent Contact with Form Surfaces

When tendons are being installed, ensure that the tendons do not come into contact with the oiled surface of the forms or are otherwise soiled. Remove any material soiling the tendons.
3.3.3 Debonding of Tendons

Where debonding of tendons is shown on the Design Documentation drawings, use smooth PVC or polyethylene sheathing tubes with external diameter not exceeding the tendon diameter plus 3 mm. Do not use rigid electrical conduits as sheathing.

Extend the sheathing tubes beyond the end plate of the form by at least 25 mm. Alternatively, push the sheathing tubes hard up against endplates and seal appropriately to prevent cement slurry ingress into the sheathing tubes.

3.4 STRESSING BEDS

3.4.1 Structural Adequacy

The stressing bed must have the capacity to safely accommodate the forces that will occur during the manufacture of the pretensioned members or line of members.

The structural adequacy of stressing beds for the execution of the Works must be certified by a Structural Engineer (refer Clause 1.3 for definition of Structural Engineer). Provide the required certification to the Project Verifier prior to the commencement of any stressing.

3.4.2 Member Movement After Jack Release

Where jack release is employed at one end of the stressing bed only, make provision to enable the member to translate along the mould without damage to the member.

3.5 STRESSING EQUIPMENT

3.5.1 Calibration

Calibrate stressing equipment in accordance with AS 2193 and RMS D&C Q6, using a testing facility accredited by NATA for the calibration at the appropriate force/pressure range.

Maintain current calibration certificates in accordance with AS 2193 Grade B and RMS D&C Q6 for jacks, pressure gauges and other stressing equipment. Calibration certificates must not be more than six months old for bourdon tube pressure gauges, or more than one year old for digital pressure gauges.

Calibrate and use jacks and pressure gauges as a single unit.

3.5.2 Equipment Requirements

The maximum jacking force must correspond to a pressure between 50% and 90% of the hydraulic gauge capacity.

Hydraulic pressure gauges, if used, must conform to AS 1349 and have a diameter not less than 150 mm and be of a type that will allow visual reading to the nearest 0.5 MPa or 5 bar.

Fit a device to the gauge to protect it against a sudden loss of pressure. Provide for the attachment of a second gauge to the jack.
3.6 STRESSING CALCULATIONS

3.6.1 General

Determine, by calculations, the required jacking force and the corresponding gauge pressure and the required elongation.

All stressing calculations must be certified by a Structural Engineer.

Use for your calculations the specified tendon force, the NATA endorsed calibration report(s) for the jack/gauge combination(s), and the NATA endorsed test certificates supplied with each coil or bar that contain the load-elongation curve for the tendon.

Where a number of members or lines of members are the same, allow in your stressing calculations and record sheets for the use of different prestressing tendons and prestressing equipment.

3.6.2 Stressing Bed Compression

Nominate in your calculations the losses due to compression of the stressing bed. Validate the calculated losses by testing.

3.7 STRESSING OPERATIONS

3.7.1 General

Measure the tensioning forces applied to tendons by jacks by measuring the hydraulic pressure in the jacks using pressure gauges.

HOLD POINT

| Process Held: | Pretensioning of the first member of identical members or the first line of a number of identical lines of members. |
| Submission Details: | Stressing calculations, Structural Engineer’s certification and test certificates and notification of the time of commencement of stressing, at least two working days prior to the proposed pretensioning. |
| Release of Hold Point: | The Nominated Authority will consider the submitted documents prior to authorising the release of the Hold Point for the first member/line and may witness the stressing of any of the remaining members/lines as per schedule. |

Do not carry out stressing when the temperature of the surrounding air is lower than 0°C.

Apply the tensioning force specified on the Design Documentation drawings evenly to each tendon at a uniform rate.

The jacking force must not exceed 80% of the minimum breaking load of the tendons (75% of the minimum breaking load of the bars) at any time during the stressing operations.
3.7.2 Break in Stressing Operation

**WITNESS POINT** (Where there is a break in stressing operations)

**Process Witnessed:** Recom mencement of stressing after a break in stressing operations.

**Submission Details:** Notice to the Nominated Authority of any intended breaks in stressing operations (such as for re-configuration of stressing beds). Notification of intention to recommence stressing, at least one working day prior to the proposed recommencement.

3.7.3 Mono-strand Stressing

The gauge pressure reading at the required jacking force must be within ±2.5% of the required gauge pressure.

For each stressing jack/gauge combination and for each day of production, verify the jacking force of one of the first five tendons and one of the last five tendons in a group of tendons with the same required jacking force and tendon profile by measuring the tendon elongation and comparing it to the required elongation.

Deal with any non-correlation between jacking force and elongation detected in accordance with Clause 3.8.2.

3.7.4 Multi-strand Stressing

The gauge pressure reading at the required jacking force must be within ±3% of the required gauge pressure.

Apply a fixed initial tension, which is between 15% and 30% of the required jacking force, to each tendon using a mono-jack to lift the tendon off the stressing bed floor and to equalise the forces in all tendons. At the completion of the initial mono-strand stressing, check the first tendon for losses due to bed shortening during stressing. If losses have occurred, then re-stress all tendons to ensure equal forces in all tendons.

Record the initial tension applied to each tendon together with the corresponding elongation.

Establish a datum mark on each tendon for the purpose of measuring elongations. Measure the additional elongations of each tendon from the datum marks during subsequent tensioning.

After the initial tensioning, tension all tendons simultaneously using hydraulic jacks acting on a moveable stressing head.

Transfer the prestressing forces from the hydraulic jacks to the stressing bed end blocks immediately after the required tendon elongation and the required jacking force have been reached.

If the required elongation has been reached prior to the required force, record the actual jacking force associated with the required elongation.

If the difference between the actual and required forces (or between the actual and required elongations) is not more than 3% of the required force (or the required elongation), no further action is required. Otherwise, deal with the non-correlation in accordance with Clause 3.8.3.
The above also applies where the required jacking force has been reached prior to the required elongation.

### 3.8 NON-CORRELATION BETWEEN JACKING FORCE AND ELONGATION

#### 3.8.1 General

If the stressing calculations are shown to be incorrect or the stressing method needs to be changed or where non-correlation is found between the actual and required forces or elongations during stressing, the following Hold Point applies.

<table>
<thead>
<tr>
<th>HOLD POINT</th>
<th>(Applies only if revised calculations or stressing methods are required)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process Held:</td>
<td>Stressing of further members.</td>
</tr>
<tr>
<td>Submission Details:</td>
<td>Revised stressing calculations with Structural Engineer's certification or revised stressing method.</td>
</tr>
<tr>
<td>Release of Hold Point:</td>
<td>The Nominated Authority will consider the submitted documents prior to authorising the release of the Hold Point.</td>
</tr>
</tbody>
</table>

#### 3.8.2 Mono-strand Stressing

Where any non-correlation is detected, take action to maintain the specified tendon force in the member. This may require the re-stressing of the remaining tendons in the group.

#### 3.8.3 Multi-strand Stressing

Where non-correlation is found between the actual and required jacking forces (or actual and required elongations) as described in Clause 3.7.4, establish the reason for the non-correlation before proceeding with further stressing. Carry out a lift-off testing on two tendons in the member which are the furthest from the centreline. Re-stress if needed and confirm with further lift-off testing.

### 3.9 DRAW-IN

Periodically check that the draw-in achieved during the stressing operations corresponds to the nominated draw-in.

The tolerance on the draw-in is $±2 \text{ mm or } ±0.04 L_T \text{ mm}$, whichever is smaller, where “$L_T$” is the length of the stressed tendon in metres.

If the actual draw-in is outside of the above tolerances, report it as nonconformity.

### 3.10 RECORD SHEETS

#### 3.10.1 Mono-strand Stressing

For each member or each line of members, enter on a record sheet the gauge pressure reading and elongation for the two tendons specified in Clause 3.7.3, and the gauge pressure reading for the other tendons.
Include the Young’s modulus and cross-sectional area of each tendon as shown on the coil test results on the record sheet.

3.10.2 Multi-strand Stressing

For each member or each line of members, enter on a record sheet the measured elongation of each tendon and the measured jacking force.

Include the Young’s modulus and cross-sectional area of each tendon as shown on the coil test results on the record sheet.

3.11 CONCRETING

Place, finish and cure concrete for the members in accordance with RMS D&C B80.

3.12 TRANSFER OF PRESTRESS

3.12.1 Preliminary Measures

Do not transfer the prestressing force from the stressing bed to the member until the concrete has reached the minimum transfer strength specified on the Design Documentation drawings.

Prior to transfer, check all tendons. All tendons must be tight.

Ensure that the prestressing force is distributed evenly (as practical) across the member cross-section during the tendon release.

3.12.2 Release of Tendons

During release of the tendons, use methods that result in a relatively shock-free transfer of stress.

You may use gentle (slow) flame-release to provide a coordinated and synchronised release of tendons at each end of each member in a line.

Do not cut through the tendon with a disk grinder, or sever the tendons directly and quickly with an oxy-acetylene torch. Report any such occurrences as a nonconformity.

3.12.3 Slippage of Tendon

Visually inspect the slippage of each tendon into the concrete at transfer. Report any localised spalling around fully bonded tendons at transfer due to excessive slippage as a nonconformity.

3.12.4 Records

Enter all transfer information on the record sheet. Information must include, but not be limited to, concrete compressive strength, verification of the transfer method and order of release of tendons, hog at transfer, and any defects in the member.

3.13 CUTTING OFF AND PROTECTION OF TENDONS

3.13.1 Cutting Off

Do not flame cut tendons within 5 mm of the end of the member.
Cut off all tendons flush (not using flame cutting) with the end face of members without damaging the concrete.

### 3.13.2 Protection

After cutting off, apply a coating of epoxy or epoxy mortar over the ends of the exposed tendons. The coating must be between 3 mm and 10 mm thick with an expanse of at least 2.5 times the tendon diameter. Allow for the thickness of the coating when measuring the overall length of the member.

### 3.14 MARKING OF MEMBERS

Provide temporary identification of each member until permanent marking has been carried out.

Provide on each member permanent markings, in characters approximately 75 mm high, showing the date of casting and the member identification number. Place such markings at locations on the member which will not be visible in the completed structure.

### 4 CONFORMITY

#### 4.1 CONCRETE

##### 4.1.1 General

Concrete in the members must conform to RMS D&C B80.

Damage to the end faces and edges of the end faces of precast concrete members that do not cover more than 5% of the area of the end face and that do not penetrate beyond the reinforcement cover are not required to be reported as nonconformities.

Report larger areas of damage as nonconformities.

Repairs to damage in the concrete must conform to RMS D&C B80 unless specified otherwise above.

##### 4.1.2 Repairs Prior to Transfer

Except at the end faces of the member, if the concrete is damaged in one or more locations with a total affected area (at any cross section) equal to or greater than 5% of the cross sectional area, repair the damage prior to the transfer of the prestressing force to the member.

##### 4.1.3 Repairs to End Face

Make good damaged areas using appropriate cementitious materials, similar in composition to the concrete of the member, so that the different coefficients of thermal expansion of the original concrete and the repair do not lead to cracking and detachment of the repair material.

Where rapid repairs are required, a chloride-free set accelerator may be used to reduce setting time. Do not use calcium chloride in the repair.

Cure the repair in a manner that ensures cement hydration and concrete strength gain without excessive shrinkage.
4.2 MEMBER TOLERANCES

Unless shown otherwise on the Design Documentation drawings, dimensions of members as measured at the age of 28 days must conform to the tolerances given in Table B110.1.

Table B110.1 – Dimensional Tolerances at 28 Days After Casting

<table>
<thead>
<tr>
<th>Description</th>
<th>Piles</th>
<th>Planks</th>
<th>Girders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall dimensions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any linear side dimension in cross section:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 2 m</td>
<td>±4 mm</td>
<td>±4 mm</td>
<td>±4 mm</td>
</tr>
<tr>
<td>&gt; 2 m</td>
<td>N/A</td>
<td>N/A</td>
<td>±7 mm</td>
</tr>
<tr>
<td>Overall length, $L$ (2)</td>
<td>±20 mm</td>
<td></td>
<td>Greater of ±0.06% $L$ or ±10 mm</td>
</tr>
<tr>
<td>Squareness of corners</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any diagonal dimension (3, 4)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>≤ 2 m</td>
<td>±7 mm</td>
<td>±4 mm</td>
<td></td>
</tr>
<tr>
<td>&gt; 2 m, ≤ 4 m</td>
<td>±7 mm</td>
<td>±5 mm</td>
<td></td>
</tr>
<tr>
<td>&gt; 4 m</td>
<td>±7 mm</td>
<td>±7 mm</td>
<td></td>
</tr>
<tr>
<td>Twist</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Angular rotation</td>
<td></td>
<td></td>
<td>$\frac{1}{2}^\circ$ over length of member</td>
</tr>
<tr>
<td>Profile</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Bow in horizontal plane</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hog in vertical plane</td>
<td>N/A</td>
<td>±0.05% $L$</td>
<td>Greater of ±35% of design value or ±20 mm</td>
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<tr>
<td>Cored holes and openings</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td>N/A</td>
<td></td>
<td>±7 mm</td>
</tr>
<tr>
<td>Diameter or side dimensions</td>
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<td>±4 mm</td>
<td></td>
</tr>
</tbody>
</table>

Note:  
N/A: Not applicable

(1) Measurements for checking tolerances must be carried out at a time of day (e.g. early morning) when differential temperature effects will not be significant.
(2) Overall length includes epoxy protection of tendons at ends.
(3) Applies to any diagonal dimension, whether in cross section or plan.
(4) Tolerances shown for squareness of corners are the permitted deviations between the measured and design diagonal dimensions.

If the hog exceed the specified tolerances, or if the member sags, submit a nonconformity report.
4.3 PRODUCTION OF SUBSEQUENT MEMBERS

4.3.1 Certification of First Member Produced

Upon removal of the first member from each mould or line of members from a long-line mould, measure and record the dimensions of the member.

Submit to the Project Verifier a diagram showing the actual dimensions achieved for the first member compared to the specified dimensions and tolerances, prior to any further members being cast in the mould. The diagram must be accompanied with a certificate stating that:

“The member dimensions, as anticipated at the age of 28 days, will be as shown on the Design Documentation drawings and will be within the tolerances specified in Specification RMS D&C B110.”

4.3.2 Casting of Further Members

If any dimensions of the first member anticipated at the age of 28 days do not conform to the specified tolerances, deal with the nonconformity in accordance with RMS D&C Q6, and the following Hold Point applies.

<table>
<thead>
<tr>
<th>HOLD POINT</th>
<th>(Applies only if any dimensions of the first member do not conform)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process Held:</td>
<td>Casting of any further members in that mould.</td>
</tr>
<tr>
<td>Submission Details:</td>
<td>A certificate with supporting checklists verifying that the formwork will produce members conforming to the tolerances specified in Clause 4.2.</td>
</tr>
<tr>
<td>Release of Hold Point:</td>
<td>The Nominated Authority will consider the submitted details and may carry out further surveillance and audit, prior to authorising the release of the Hold Point.</td>
</tr>
</tbody>
</table>

For members other than the first member from each mould, maintain records to verify that the specified tolerances for overall length, overall height and overall width at each end face have not been exceeded.

5 HANDLING, STORAGE AND TRANSPORT OF MEMBERS

5.1 GENERAL

5.1.1 Temporary Supports

While on temporary supports, each member must carry only its own weight, or the weights of other members stacked on top of it (but only in accordance with Clause 5.3). No other load is permitted during handling, storage and transport.

Unless noted otherwise on the Design Documentation drawings, support girders and planks within 300 mm either side of the transverse centreline of the bearing locations. Support other members at the positions shown on the Design Documentation drawings.

Support the members over the full width of their bottom surface.
5.1.2 Ground Supports

Temporary supports on the ground must be of a size appropriate to the weight of the supported members and the bearing capacity of the ground, so that excessive settlement will not occur. Supports on the ground must not be less than 200 mm wide and 150 mm thick.

Level the ground and clear the space between member supports to prevent accidental support being provided other than at the temporary supports. The minimum clearance from the ground to the underside of supported members must be 100 mm.

5.2 LIFTING

Include in the PROJECT QUALITY PLAN, the following details of the method of lifting of members:
(a) Location of lifting points.
(b) Lifting devices and concrete inserts.
(c) A certificate from a Structural Engineer stating that the capacity of the lifting arrangement is adequate and that the compressive strength of the concrete is adequate to withstand any load effects resulting from the lifting of the member.

5.3 STACKING

Precast members may be stored stacked on top of one another.

Bearers between the layers must be placed in line vertically at the specified support points. Timber bearers must be made of sound timber and must be of a size appropriate to the weight of the supported members, but not be less than 100 mm wide and 75 mm height.

Piles may be stacked up to a maximum of six layers.

5.4 CERTIFICATION OF SUPPORT OR STACKING ARRANGEMENT

At all times, secure members in a stable condition to prevent them from toppling over.

Where members with overall height greater than 1200 mm or 1.5 times its bottom surface width are to be stored or if members are to be stacked at any location, the temporary support arrangement or stacking arrangement must be designed by a Structural Engineer.

Consider temperature, shrinkage, creep and any other load effects affecting the stability of stacked members.

Provide a certificate to the Project Verifier prior to storing or stacking the members and any rearrangement of stacked members, stating that the proposed storing or stacking arrangement will not overstress or damage any member, and that the stored or stacked members will be stable.

5.5 TRANSPORT

Transport members in a manner which does not damage the members.

Do not transport any member to the Site until it is at least seven days old and the concrete has reached the specified 28 day strength.
Prior to transport, submit to the Project Verifier a certificate from a Structural Engineer stating that the proposed methods of support and transport of the member will be stable and secure and will not induce excessive stresses into the member.

5.6 INCORPORATION IN THE WORKS

Prior to members being incorporated in the Works, submit to the Project Verifier a certificate for each member stating that it conforms to Specification RMS D&C B110 and that all nonconformities have been rectified.

The certificate must be accompanied by a checklist, and the records for each member verifying conformity.
ANNEXURES B110/A TO B110/B – (NOT USED)

ANNEXURE B110/C – SCHEDULES OF HOLD POINTS, WITNESS POINTS AND IDENTIFIED RECORDS

Refer to Clause 1.2.3.

C1 SCHEDULE OF HOLD POINTS AND WITNESS POINTS

<table>
<thead>
<tr>
<th>Clause</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.7.1</td>
<td>Hold</td>
<td>Pretensioning of first member of identical members or first line of a number of identical lines of members.</td>
</tr>
<tr>
<td>3.7.2</td>
<td>Witness</td>
<td>Recomencement of stressing after a break in stressing operations.</td>
</tr>
<tr>
<td>3.8.1</td>
<td>Hold</td>
<td>Further stressing (applies only if revised calculations or stressing methods are required).</td>
</tr>
<tr>
<td>4.3.2</td>
<td>Hold</td>
<td>Casting of any further members in that mould (applies only if dimensions of first member do not conform).</td>
</tr>
</tbody>
</table>

C2 SCHEDULE OF IDENTIFIED RECORDS

The records listed below are Identified Records for the purposes of RMS D&C Q6 Annexure Q/E.

<table>
<thead>
<tr>
<th>Clause</th>
<th>Description of Identified Record</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.4.1</td>
<td>Structural Engineer’s certification of stressing bed.</td>
</tr>
<tr>
<td>3.6</td>
<td>Stressing calculations with Structural Engineer’s certification.</td>
</tr>
<tr>
<td>3.8.1</td>
<td>Revised stressing calculations with Structural Engineer’s certification or revised stressing method.</td>
</tr>
<tr>
<td>4.3.1</td>
<td>Diagram showing actual dimensions of members compared with design dimensions.</td>
</tr>
<tr>
<td>5.2</td>
<td>Certification that lifting arrangement for members is adequate.</td>
</tr>
<tr>
<td>5.4, 5.5</td>
<td>Certification of support or stacking arrangement in storage and during transport.</td>
</tr>
<tr>
<td>5.6</td>
<td>Certificate of conformity for each member.</td>
</tr>
</tbody>
</table>
ANNEXURE B110/D – PLANNING DOCUMENTS

Refer to Clause 1.2.4.

The following documents are a summary of documents that must be included in the PROJECT QUALITY PLAN. Review the requirements of this Specification and other contract documents to determine any additional documentation requirements.

<table>
<thead>
<tr>
<th>Clause</th>
<th>Description of Document</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
<td>Names, qualifications and experience of personnel carrying out stressing and concreting operations.</td>
</tr>
<tr>
<td>3.7</td>
<td>Procedures for pretensioning operations.</td>
</tr>
<tr>
<td>3.2, 4.2</td>
<td>Method for verification of member dimensions.</td>
</tr>
<tr>
<td>3.12.2</td>
<td>Method for transfer of prestress.</td>
</tr>
<tr>
<td>3.12.2, 4.2</td>
<td>Method for measuring hogs.</td>
</tr>
<tr>
<td>4.1</td>
<td>Procedures and materials for localised repairs to member.</td>
</tr>
<tr>
<td>5.2</td>
<td>Method of lifting of members.</td>
</tr>
<tr>
<td>5.1, 5.3, 5.4</td>
<td>Certified design of temporary support and stacking arrangements of members.</td>
</tr>
</tbody>
</table>

ANNEXURES B110/E TO B110/L – (NOT USED)
ANNEXURE B110/M – REFERENCED DOCUMENTS

Refer to Clause 1.2.5.

RMS Specifications

RMS D&C B80   Concrete Work for Bridges
RMS D&C G22   Work Health and Safety (Construction Works)
RMS D&C Q6    Quality Management System (Type 6)

Australian Standards

AS 1349        Bourdon tube pressure and vacuum gauges
AS 2193        Calibration and classification of force-measuring systems
AS/NZS 4672    Steel prestressing materials
   AS/NZS 4672.1 General requirements
   AS/NZS 4672.2 Testing requirements
AS/NZS ISO 9001 Quality management systems – Requirements