

# QBC-ITP | CONCRETE POUR - INSPECTION & TEST PLAN

ITP CODE	CP
REVISION	00

<b>Project</b>	J235 Mary and William Streets Blackstone Traffic Signalisation	<b>Date Developed</b>	27/03/2024	<b>Developed By</b>	Shaheen Ahmed	<b>Reviewed By</b>	Reece Doyle
<b>Process</b>	CP – Concrete Pour	<b>Contract No.</b>	22284	<b>Client</b>	Ipswich City Council	<b>Approved By</b>	Cameron Lochran

Ref No.	Inspection / Test / Approval Point	Inspection / Test Method / Standard / Specification	Stage or Frequency of Sampling	Acceptance Criteria	Method	Level of Inspection	Verification By	Record
1	Define Lot	MRTS50 CL7.1, 7.2	For each lot	Lot boundaries are defined to allow positive identification of work within the project. <b>Max lot: Each pour</b>	QBC QA Records	Review	CQR	Verification Checklist Sheet CP
2	Underlying Lots conform (if applicable)	Lot Register Relevant Lots	Prior to commencement of works	Works cannot commence until underlying lots are conforming	QBC QA Records	Inspection	CQR	Verification Checklist Sheet CP
3	Submit Proposed Concrete Mix	MRTS70 CL 9.2 MILESTONE	Submit proposed concrete mix 4 Weeks prior to commencing concreting operations.	The Contractor shall nominate the special class concrete mix to be used in the Works not less than four weeks prior to the commencement of concreting operations. <b>Milestone</b>	QBC QA Records	<b>Milestone</b>	CQR	Verification Checklist Sheet CP Milestone Acknowledged
4	Trial Mix	MRTS70 Clause 15.1.1	Trial Mix to be completed 4 weeks prior to commencing concrete operations.  3 Days' notice to be provided for trial mixes	When requested by the Administrator, and where extensive performance data is not available, mix design acceptance will be on the basis of trial mixes. Concrete intended for long distance or extended placement time use (see Clause 10.4.1) shall be trialled.  'Extensive performance data' refers to test results for the proposed or similar mixes over a recent timeframe of at least one month. Individual test reports are not expected.  Trial mixes shall be made using the plant and degree of quality control proposed for the Works. The minimum volume of the trial mix shall be 25% of the rated capacity of the mixer. Each trial mix shall be a witness point with a notice period of three days. <b>Witness Point 1</b>	QBC QA Records	<b>Witness Point</b>	CQR	Verification Checklist Sheet BsCP Hold Point Release
5	Mix and Concrete Plant Approval Prior to First Concrete Pour.	MRTS70 CL15.1 <b>HOLD POINT 1</b>	Prior to first concrete pour.	No concrete shall be placed in the Works until approval of the mix design has been obtained from the Administrator. <b>Hold Point 1</b>	QBC QA Records	<b>Hold Point</b>	CQR Administrator	Verification Checklist Sheet CP Hold Point Release
6	Concreting Procedures	MRTS70 CL 10.4.1 MILESTONE MRTS70 CL 13.1 MILESTONE MRTS70 CL15.3 MILESTONE MRTS70 CL15.11.1 – MILESTONE MRTS70 CL15.12 MRTS70 CL15.6 MRTS70 CL 15.6 <b>HOLD POINT 4</b>	Submission of Procedures (Different lead times for each procedure/design)	Concrete operations shall not commence until all relevant procedures, listed in Table 5.2 have been approved by the Administrator. MRTS70 CL 15.6 <b>Hold Point 4</b>  <b>Long distance travel and extended placement times (If Applicable)</b> Where travel or placement times are, by necessity, longer than those listed in Table 10.4 a procedure for long-distance travel or extended placement times shall be submitted to the Administrator for approval 6 weeks before concreting begins. MRTS70 CL10.4.1 – <b>Milestone</b>  <b>Hot Weather Concreting</b> The Contractor shall submit its procedure for hot weather concreting at least two weeks prior to the first concrete pour. MRTS.70 CL 13.1 - <b>Milestone</b>  <b>Falsework Design</b> The Contractor shall supply the Administrator with detailed drawings of such falsework at least four weeks prior to the commencement of erection. MRTS.70 CL 15.3 <b>Milestone</b>  <b>Curing Procedure</b> The Contractor shall submit its procedure for curing, including methods and materials, to the Administrator for approval at least 2 weeks prior to the first concrete pour. MRTS70 CL 15.11.1 – <b>Milestone</b>  <b>Surface Dressing and Repair Procedure</b> Prior to commencing concreting operations, the Contractor shall establish procedures and standards for surface dressing and repair of concrete. The standards and procedures established shall be subject to the approval of the Administrator MRTS70 CL15.12 & 17.17.  <b>Concrete Supply and Supervision Procedure</b> Prior to commencing concreting operations, the Contractor shall submit a procedure detailing material source, haulage time and minimum number of trucks, and batch plant supervision.	Receipt of Notice to Contractor confirming approval of concreting procedures.  QBC QA Records	<b>Hold Point</b> <b>Milestones</b>	CQR Administrator	Verification Checklist Sheet CP Hold Point Release Milestone Acknowledged

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7	Acceptance of Reinforcing Steel Supplier.	MRTS71 CL 6.1	Submission of proposed supplier of steel reinforcing (3 days).	<p>Steel reinforcing shall be manufactured, processed, and supplied only by a registered steel reinforcing supplier.</p> <p>At least 3 days before steel reinforcing is supplied, the Contractor shall submit to the Administrator the identity and address of the proposed supplier and evidence of conformance with this Clause – MRTS71- <b>Milestone</b></p> <p>Steel reinforcing shall not be delivered to the Site until written acceptance of the proposed supplier has been obtained from the Administrator - MRTS71-<b>Hold Point 1</b></p>	<p>Receipt of Notice to Contractor confirming approval of Reinforcing Steel Supplier.</p> <p>QBC QA Records</p>	Hold Point	CQR Administrator	<p>Notice to Contractor</p> <p>Verification Checklist Sheet CP</p> <p>Hold Point Release</p>
8	Steel Reinforcing Compliance.	<p>MRTS71 CL6.2.2</p> <p>MRTS71 CL11.3 <b>HOLD POINT 4</b> (if required)</p> <p>MRTS71 CL13 <b>HOLD POINT 5</b> (if required)</p>	<p>Manufacturer's test certificates provided to the Administrator prior to use, if required.</p> <p>Submit alternative products prior to use.</p>	<p>If requested, the Contractor shall supply to the Administrator certified copies of the manufacturer's test certificates identifiable with the reinforcement supplied or provide documentary evidence that all products meet the requirements of AS/NZS 4671 and that the supplier has a system in place to prevent non-conforming material from being supplied MRTS71 CL6.2.2</p> <p>Mechanical reinforcing bar splices permitted for use are to be listed in Clause 1 of Annexure MRTS71.1.</p> <p>Alternative registered mechanical reinforcing bar splices shall not be used without prior approval of the administrator. MRTS71 CL11.3 – <b>Hold Point 4</b></p> <p>Substitution of different sizes, grades, or ductility class of steel reinforcement to that shown on the drawings shall not be made unless approved in writing by the Designer and the Administrator. The application shall be forwarded at least 3 weeks prior to the date on which the steel reinforcement is required to be placed – MRTS71 CL13 – <b>Milestone</b></p> <p>Substitution shall be permitted only if the structure is not adversely affected by the change. Substitution shall not proceed until the Administrator has approved the change – MRTS71 CL13 – <b>Hold Point 5</b></p>	<p>QBC QA Records</p> <p>Inspection by Administrator</p>	<b>Hold Point</b>	CQR Administrator	<p>Hold Point Release</p> <p>Verification Checklist Sheet CP</p>
9	Approval of Welding Process and Consumables / Verifying Welded Splices.	<p>MRTS71 CL11.1</p> <p>MRTS71 CL14.2 – <b>HOLD POINT 6</b> (if required)</p> <p>MRTS71 CL14.2.1</p> <p>MRTS71 CL14.5 – <b>HOLD POINT 7</b> (if required)</p>	<p>Only proceed on Administrators approval of the process and consumables and verification of splice welds.</p>	<p>Splicing of steel reinforcing bar by welding shall be permitted only where shown in the drawings or where approved by the Administrator. MRTS71 CL11.1</p> <p>No welding shall be carried out until a Welding Procedure Specification (WPS) Sheet, in accordance with Section 4 of AS/NZS 1554.3, has been completed and a copy submitted to the Administrator. Welding shall not be carried out until the appropriate Welding Procedure Specification Sheet has been approved by the Administrator – MRTS71 CL14.2 – <b>Hold Point 6</b></p> <p>The process and consumable shall be approved by the Administrator and shall comply with the following:</p> <ul style="list-style-type: none"> <li>Where reinforcement is to be welded, the welding shall be conducted in accordance with the provisions of AS/NZS 1554.3</li> <li>Welding consumables shall be compatible with the parent metal and shall be classified and identified in accordance with the provisions of the appropriate Australian Standards. When welding consumables are specified on the Certified Engineering Drawings, the welding consumables on the Drawings take precedent. MRTS71 CL14.2.1</li> <li>Placement of the reinforcement within the concrete formwork shall not proceed until the Administrator has verified all splice welds - MRTS71 CL14.5 – <b>Hold Point 7</b></li> </ul>	QBC QA Records	<b>Hold Point</b>	CQR Administrator	<p>Verification Checklist Sheet CP</p> <p>Hold Point Release</p>
10	Formwork	<p>MRTS70 CL15.4.1</p> <p><b>HOLD POINT 3</b></p>	Prior to Concrete Pour	All formworks shall be subject to inspection and approval by the Administrator. <b>Hold Point 3</b>	QBC QA Records	<b>Hold Point</b>	CQR Administrator	<p>Verification Checklist Sheet CP</p> <p>Hold Point Release</p>
11	Testing arranged with NATA Approved Laboratory	MRTS70 CL12.2	NATA Certification	All specimens shall be manufactured and tested by a NATA-accredited laboratory	QBC QA Records	Inspection	CQR	<p>Verification Checklist Sheet CP</p> <p>NATA Certified Report</p>

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12	Survey set-out	MRTS01 CL8 <b>HOLD POINT 1</b>	Each location.	<p>The Contractor shall set out an installation as shown on the Drawings in sufficient detail to identify the location, length, and levels of the proposed installation.</p> <p>Once the initial set out is complete the Administrator will determine the design appropriateness of the set out with regard to the actual site conditions <b>HOLD POINT 1</b>. The Administrator may direct amendments to the set-out details. Payment for such amendments will be made at appropriate rates in the Schedule of Rates or, where such rates are not deemed by the Administrator to be appropriate, as determined by the Administrator.</p> <p>Installations to be set out in accordance with the above requirements include:</p> <ul style="list-style-type: none"> <li>a) drainage pipes, culverts, and structures</li> <li>b) landscaping, and</li> <li>c) Traffic control and lighting ducts, pits, poles, and equipment.</li> </ul>	QBC QA Records Visual check	<b>HOLD POINT</b>	Surveyor Administrator CQR	Verification Checklist Sheet CP Hold Point Release
13	Level Control in place	Project Drawings	Each location.	Confirm that level control is established prior to commencement of work.	Visual check	Inspection	Surveyor	Verification Checklist Sheet CP
14	Cutting and Bending of Steel Reinforcement	MRTS71 CL8.1 MRTS71 CL 8.2 – <b>HOLD POINT 2</b> (if required)	Each bar requiring hot bending	<p>Steel reinforcing bar shall be cold bent by the application of a consistent force around a circular pin. MRTS71 CL8.1</p> <p>Where specifically authorised by the Administrator – MRTS71- <b>HOLD POINT 2</b>, steel reinforcing bars may be bent hot on the site provided that:</p> <ul style="list-style-type: none"> <li>• The steel is heated uniformly through and beyond the portion to be bent (5 bar diameters is suitable for a 90° bend).</li> <li>• The temperature does not exceed 450°C.</li> <li>• Suitable temperature indicating crayons or equivalent are used to determine the temperature.</li> <li>• The bar is not cooled by quenching, compressed air blast or any other accelerated method.</li> </ul> <p>If the temperature of the bar exceeds 450°C, the bar shall be rejected – MRTS71 CL8.2 <b>Nonconformance</b></p> <p>Class L reinforcement or mesh shall not be heated or hot bent.</p>	QBC QA Records Administrator Surveillance On-Site	<b>HOLD POINT</b>	CQR Administrator	Verification Checklist Sheet CP Hold Point Release
15	Tolerance on position of steel reinforcement	MRTS71 CL12	Each Pour	<p>The Deviation from the specified position of steel reinforcement shall not exceed the following stated tolerances. A positive value indicates the amount of cover increases, and a negative value indicates the amount the cover decreases.</p> <p>a) For positions controlled by cover:</p> <ul style="list-style-type: none"> <li>• In girders, beams, slabs, and deck and kerb unit -5mm, +10mm</li> <li>• In slabs, columns, and walls -5mm, +10mm</li> <li>• In slabs-on-ground including footing of walls and culverts -10mm, +20mm</li> <li>• In footings cast in the ground where the depth of the footing is 500mm or more -10mm, +40mm</li> </ul> <p>b) For positions not controlled by cover:</p> <ul style="list-style-type: none"> <li>• The location of steel reinforcement on a profile ±10mm</li> <li>• The position of the ends of steel reinforcement along the line of the bar ±50mm</li> <li>• The spacing of bars in walls and slabs, and of fitments, the greater of 10% of the specified spacing, and 15mm</li> </ul>	Inspection by Administrator	Inspection	CQR Administrator	Verification Checklist Sheet CP
16	Approval of Reinforcement Placement	MRTS71 CL 10 – <b>HOLD POINT 3</b>	As per MRTS71 CL 10	<p>Steel reinforcement shall be placed in position as shown in the Drawings. Where the bars are to be tied together, the reinforcement shall be tied by wiring at each intersection, using annealed wire not less than 1.25 mm in diameter. Where the bar spacing is 300 mm or less, alternate intersections only need to be tied. Fixing by locational tack welding is to be in accordance with Clause 14.4. Plastic ties or clips are not permitted.</p> <p>Clearance from forms shall be maintained by use of registered bar chairs (refer to MRTS70). The shape of the chair shall be such that the minimum obstruction is offered to the formation of the homogenous concrete both within and around the chair. Some bar chairs are suitable for soffit use only and these shall not be used against side forms.</p>	QBC QA Records Administrator Surveillance On-Site	<b>HOLD POINT</b>	CQR Administrator	Verification Checklist Sheet CP Hold Point Release

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				<p>Steel spacers can be used for internal spacing of individual reinforcing mats where the spacer does not intrude on the cover zone in any way.</p> <p>The system of fixing shall be such as to form a rigid cage which maintains dimensional tolerances under all applied loads applied before and during the placement of concrete. All steel reinforcement in position shall be inspected and approved before placement of concrete commences – MRTS71- <b>Hold Point 3</b></p>												
17	Approval to Place Concrete	MRTS.70 CL 15.6.1 <b>HOLD POINT 5</b> WITNESS POINT 2 MRTS70 CL13.1 MRTS70 CL10.4	Contractor shall give at least 24 hours’ notice to the Administrator of the time that placing shall start	<p>No concrete shall be placed in the Works until: <b>Hold Point 5</b></p> <p>a) the formwork and reinforcement have been inspected</p> <p>b) all foreign material has been completely removed from the forms</p> <p>c) the mixing, batching, and compaction equipment have been approved by the Administrator.</p> <p>The Administrator may exclude (a) and (b) above from the Hold Point, reverting it to a Witness Point.</p> <p>The placing operation shall be conducted in the presence of the Administrator. <b>Witness Point 2</b></p> <p>MRTS70 CL15.6.1</p> <p>No concrete shall be placed in the Works if:</p> <ul style="list-style-type: none"><li>• Temperature of the concrete is less than 10°C or exceeds 35°C.</li><li>• 3 days prior to the proposed pour; ambient air temperature is likely to be greater than 45°C during placement or within 2 hours subsequent to placement.</li><li>• the temperature of the formwork or reinforcement exceeds 55 °C</li></ul> <p>If the ambient air temperature measured at the point of placement is likely to exceed 35 °C, noting an absolute maximum of 45 °C, during placing and finishing operations, the Contractor shall take practical precautions, approved by the Administrator, to ensure that the temperature of the concrete does not exceed the permitted maximum. These precautions shall be submitted as a procedure for hot weather concreting at least two weeks prior to the first concrete pour. MRTS70 CL13.1</p> <p>Where concrete work is constructed on ground surfaces or on a foundation bedding, a polythene sheet separator of thickness not less than 100 µm shall be employed between the ground/bedding and the concrete. The separator shall extend not less than 300 mm beyond the concrete work. Care shall be taken to avoid puncturing or tearing the separator. Should puncturing or tearing occur, the damage shall be repaired prior to concreting. Joints in the separator shall be made by overlapping the sheets a minimum of 300 mm or by overlapping and taping. MRTS70 CL15.6.1</p> <p>If placing operations necessitate a drop of more than 2 m, the concrete shall be placed using a flexible tube reaching to the base of the formwork or another method approved by the Administrator MRTS70 CL15.6.1</p> <p>Compaction of concrete shall commence immediately after deposition. Compaction shall be achieved by use of high frequency internal vibrators supplemented as required by external form vibrators. Where intense compaction is specified the use of external form vibrators is mandatory. The amount and type of vibration used shall be approved by the Administrator. MRTS70 CL15.6.2</p> <p>Concrete shall be placed and compacted within the times in Table 10.4 from the discharging of the batch plant. MRTS70 CL10.4</p> <p><i>Table 10.4 – Placement and Transport Time Limits</i></p> <table><tr><th>Temperature of Concrete</th><th>Time Limit</th></tr><tr><td>&lt; 32 °C</td><td>60 minutes</td></tr><tr><td>32 – 35 °C</td><td>45 minutes</td></tr><tr><td>&gt; 35 °C</td><td>Reject load</td></tr></table> <p>These times may be extended at the Administrator’s discretion where set-retarding admixtures are used and a trial mix has been conducted (refer to Clause 10.4.1).</p>	Temperature of Concrete	Time Limit	< 32 °C	60 minutes	32 – 35 °C	45 minutes	> 35 °C	Reject load	QBC QA Records  Administrator Surveillance On-Site	<b>Hold Point</b>	CQR  Administrator	Verification Checklist Sheet CP  Hold Point Release  Concrete pour sheet
Temperature of Concrete	Time Limit															
< 32 °C	60 minutes															
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18	Approval for Unspecified Construction Joints	MRTS70 CL15.13 – <b>HOLD POINT 7</b>	As per construction joint not specified in the drawings	Construction joints shown in the Drawings are mandatory. The use of construction joints elsewhere in the concrete work shall require the prior approval of the Designer – MRTS70 CL15.13– <b>Hold Point 7</b>	QBC QA Records	<b>Hold Point</b>	CQR Administrator	Verification Checklist Sheet CP Hold Point Release																						
19	Concrete Testing/Sampling	MRTS70 CL 12.1 MRTS70 CL11.1 MRTS70 CL15.2 MRTS70 15.2.1	Samples taken from truck prior to pouring	<p>All concrete used in the Works shall be subject to sampling and testing in accordance with the provisions of AS 1012, except as detailed in this Technical Specification. MRTS70 CL12.1</p> <p>A concrete delivery docket to be supplied with each batch delivered.</p> <p>Before any concrete is placed in the Works it shall be visually checked and shall be rejected if it is defective in any of the following ways listed in MRTS70 CL11.1</p> <p>Sampling and testing shall be conducted by a NATA-accredited laboratory and reported as a NATA-endorsed test report – MRTS70 CL11</p> <p>The consistency of each batch of concrete shall be checked by means of the slump or spread test. Sampling and testing shall be carried out in accordance with AS 1012.1 and 1012.3.1 or AS 1012.3.5. MRTS70 CL11</p> <p>The plastic material properties shall lie within the range established using the approved nominated value and the tolerances specified in Table 11(a) and Table 11(b). MRTS70 CL11</p> <p><i>Table 11(a) – Tolerances for consistency test (slump)</i></p> <table><tr><th>Nominated Slump (mm)</th><th>Tolerance (mm)</th></tr><tr><td>&lt; 60</td><td>± 10</td></tr><tr><td>≥ 60, ≤ 80</td><td>± 15</td></tr><tr><td>&gt; 80, ≤ 110</td><td>± 20</td></tr><tr><td>&gt; 110, ≤ 150</td><td>± 30</td></tr><tr><td>&gt; 150, ≤ 180</td><td>± 40</td></tr></table> <p>Samples for compression strength testing, shall be taken from separate batches of concrete during the placing operation. Two cylinders (minimum) shall be cast from each sample. Samples shall be taken in accordance with AS 1012.1 with records kept as per Clause 9 of that Standard. MRTS70 CL15.2.1</p> <p>The normal rate of sampling per lot is defined in Table 15.2.2. For the purposes of determining rate of sampling, a lot shall not extend longer than 24 hours. Sampled batches shall be evenly distributed through the lot. MRTS70 Cl15.2.1</p> <p><i>Table 15.2.2 – Sampling frequencies per lot for 28 day strength tests</i></p> <table><tr><th>Total Number of Batches in Lot (n)</th><th>Number of Samples</th></tr><tr><td>1 – 3</td><td>Every Batch</td></tr><tr><td>4 – 10</td><td>4</td></tr><tr><td>11 – 23</td><td>5</td></tr><tr><td>&gt; 23</td><td>%</td></tr></table>	Nominated Slump (mm)	Tolerance (mm)	< 60	± 10	≥ 60, ≤ 80	± 15	> 80, ≤ 110	± 20	> 110, ≤ 150	± 30	> 150, ≤ 180	± 40	Total Number of Batches in Lot (n)	Number of Samples	1 – 3	Every Batch	4 – 10	4	11 – 23	5	> 23	%	QBC QA Records	Test	CQR	Verification Checklist Sheet CP
Nominated Slump (mm)	Tolerance (mm)																													
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4 – 10	4																													
11 – 23	5																													
> 23	%																													
20	Removal of Formwork and Early Loading	MRTS70 CL 15.8 – <b>HOLD POINT 6</b> MRTS70 CL15.8 – <b>WITNESS PONT 4</b> MRTS70 CL15.9	As per lot	<p>Forms, falsework, and centring shall remain in position until the times stated below have elapsed after completion of concreting. MRTS70 CL15.8 <b>Hold Point 6</b></p> <ul style="list-style-type: none"><li>For soffits, until seven days</li><li>For side forms, in accordance with Table 15.8.</li></ul> <p><i>Table 15.8 – Retention of side forms</i></p> <table><tr><th>Exposure Classification</th><th>Minimum Form Retention (hours)</th></tr><tr><td>A</td><td>48</td></tr><tr><td>B1, B2</td><td>72</td></tr><tr><td>C1, C2</td><td>120</td></tr></table>	Exposure Classification	Minimum Form Retention (hours)	A	48	B1, B2	72	C1, C2	120	QBC QA Records  Administrator Surveillance On-Site	<b>Hold Point</b> <b>Witness Point</b>	CQR Administrator	Verification Checklist Sheet CP  Hold Point Release														
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				<p>Forms shall be removed with care, without hammering and wedging, and in a manner which shall not injure the concrete or disturb the remaining supports. Centres shall be lowered gradually and uniformly in such a manner as to avoid injurious stress in any part of the structure. MRTS70 CL15.8</p> <p><b>Witness Point 4</b></p> <p>Concrete shall not be loaded until seven days has elapsed from placement of all elements within the load path, including foundations.</p> <p>Loads which may cause damage to the work shall not be placed on or against any part of the structure.</p> <p>Loads placed on or against any concrete shall be subject to approval by the Administrator and shall satisfy any requirement specified elsewhere in the Contract.</p>										
21	Concrete Curing and Surface Dressing	MRTS70 CL 15.12 MRTS70 CL15.12.2 <b>WITNESS POINT 5</b> MRTS70 CL15.11.1	As per lot	<p>Following the removal of formwork, the operations listed in MRTS70 CL15.12 shall be carried out to the standard approved by the Administrator.</p> <p>Repairs shall be a Witness Point. MRTS70 CL12.2 <b>Witness Point 5</b></p> <p>Curing compounds shall be registered products and comply with the requirements of AS 3799. MRTS70 CL7.6</p> <p>Curing shall continue for a minimum period of seven days. If forms are removed in less than seven days, curing of the formed surface shall commence within one hour of stripping, unless otherwise specified in Clause 15.12. MRTS70 CL15.11.1</p>	QBC QA Records	<b>Witness Point</b>	CQR Administrator	Verification Checklist Sheet CP  Administrator confirming works witnessed						
22	Monitoring of Concrete Strength	MRTS70 CL 12.4 – Monitoring of Target Strength MRTS70 CL 12.5 – Acceptance or Rejection of Hardened Concrete on the Basis of Strength	As per samples taken load	<p>The compressive strength of the concrete shall be monitored, and trends observed. Where a significant amount of concrete is to be placed in a four-week period, monitoring shall include early age testing (typically seven days) and a comparison of cylinder strengths with previously measured strength gain results.</p> <p>For each insitu concrete mix, where 10 or more samples have been tested, the Contractor shall provide a monthly report covering the concrete supplied in that month confirming the concrete lies within the limits of Table 12.4.</p> <p><i>Table 12.4 – Long-term monitoring of concrete (insitu only)</i></p> <table><tr><th>Measure</th><th>Limit</th></tr><tr><td>Standard deviation</td><td>≤ 1.29 x nominated standard deviation</td></tr><tr><td>Average 28 day strength</td><td>≥ 0.5 (f<sub>c</sub> + f<sub>t</sub>)</td></tr></table> <p>Where the concrete performance lies outside these limits, the Contractor shall provide the raw data and a trend graph showing seven day (if available) and 28 day strengths. If the Administrator determines that control of concrete performance is not being maintained, approval of the mix design shall be withdrawn.</p> <p>Subject to the concrete meeting all requirements set out in this specification, it shall be accepted or rejected on a statistical basis using the results of 28 day tests as set out below.</p> <p>Concrete in a lot shall be deemed rejected if any of the following apply:</p> <ul style="list-style-type: none"><li>Any sample strength is less than 0.9 times the specified characteristic strength, f’c</li><li>The average strength of three consecutive samples is less than the specified characteristic strength.</li><li>The average 28 day strength of three consecutive samples from the lot is greater than 1.4 times f’c, without prior Administrator and Designer approval.</li></ul>	Measure	Limit	Standard deviation	≤ 1.29 x nominated standard deviation	Average 28 day strength	≥ 0.5 (f <sub>c</sub> + f <sub>t</sub> )	QBC QA Records  By Concrete Testers Records	Record	CQR	7 / 28 Days Strength Certificate  Verification Checklist Sheet CP
Measure	Limit													
Standard deviation	≤ 1.29 x nominated standard deviation													
Average 28 day strength	≥ 0.5 (f <sub>c</sub> + f <sub>t</sub> )													

Ref No.	Inspection / Test / Approval Point	Inspection / Test Method / Standard / Specification	Stage or Frequency of Sampling	Acceptance Criteria	Method	Level of Inspection	Verification By	Record																													
23	Works Within Tolerance	MRTS70 CL 15.7.3 MRTS70 CL 15.7.4	Checked on each lot	<p>Where tolerances for individual components and associated dimensions are not specified in the Drawings, deviations from established lines, grades and dimensions in the completed work shall not exceed the values given in tables 15.7.2 &amp; 15.7.3:</p> <p><i>Table 15.7.2 – Dimensional tolerances</i></p> <table><tr><th>Description</th><th>Tolerance (mm)</th></tr><tr><td>Cross sectional dimension of members and thickness of slabs</td><td>+ 10, - 3</td></tr><tr><td>Length of members, length and width of slabs:<ul style="list-style-type: none"><li>• dimension up to 18 m</li><li>• dimension 18 m or over</li></ul></td><td>± 6 1 in 3000</td></tr><tr><td>Clear cover to reinforcement</td><td>+ 10, - 5</td></tr><tr><td>Fitments for prefabricated elements, girder anchorages (including dimension between anchorages on adjacent piers), cored holes, handrail anchorages and other embedded items</td><td>1 in 1000 ± 5 max</td></tr></table> <p><i>Table 15.7.3 – Positional tolerances</i></p> <table><tr><th>Description</th><th>Tolerance (mm)</th></tr><tr><td>Level of footings</td><td>± 20</td></tr><tr><td>Level other than footings</td><td>± 5</td></tr><tr><td>Horizontal location, where tolerance on fit is not applicable</td><td>± 25</td></tr></table> <p>Relative tolerances refer to departures from linearity or planarity in any part of the structure. Tolerances are measured as the departure of any point in a line or surface from the remainder of that line or surface. MRTS70 CL15.7.4</p> <p>Departure may be sudden (e.g. misfit at joint in formwork) or gradual (e.g. a wobble in the surface). Tolerance on gradual departure is the value calculated by multiplying the overall length of the line or surface under consideration by the factor given in Table 15.7.4. MRTS70 CL15.7.4</p> <p><i>Table 15.7.4 – Relative tolerances</i></p> <table><tr><th rowspan="2">Description</th><th colspan="2">Tolerance</th></tr><tr><th>Factor</th><th>Maximum (mm)</th></tr><tr><td>Exposed edge: Gradual departure</td><td>0.001</td><td>-</td></tr><tr><td>Exposed surface:<ul style="list-style-type: none"><li>• Gradual departure</li><li>• Sudden departure</li></ul></td><td>0.004 -</td><td>10 3</td></tr></table>	Description	Tolerance (mm)	Cross sectional dimension of members and thickness of slabs	+ 10, - 3	Length of members, length and width of slabs: <ul style="list-style-type: none"><li>• dimension up to 18 m</li><li>• dimension 18 m or over</li></ul>	± 6 1 in 3000	Clear cover to reinforcement	+ 10, - 5	Fitments for prefabricated elements, girder anchorages (including dimension between anchorages on adjacent piers), cored holes, handrail anchorages and other embedded items	1 in 1000 ± 5 max	Description	Tolerance (mm)	Level of footings	± 20	Level other than footings	± 5	Horizontal location, where tolerance on fit is not applicable	± 25	Description	Tolerance		Factor	Maximum (mm)	Exposed edge: Gradual departure	0.001	-	Exposed surface: <ul style="list-style-type: none"><li>• Gradual departure</li><li>• Sudden departure</li></ul>	0.004 -	10 3	QBC QA records	Survey Record	CQR	Survey Compliance Report  Verification Checklist Sheet CP
Description	Tolerance (mm)																																				
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24	Site Cleaned Up		At completion of works	Site is clean and free of potential hazards. Finished works are as per drawings/specifications.	Visual Check	Inspection	CQR	Verification Checklist Sheet CP																													
25	Lot Closed	MRTS50 CL10.1, 11	For this lot	<p>Lot records conform to relevant specifications. Any NCRs have been actioned and closed.</p> <p><b>Final Conformance Requirements:</b></p> <ul style="list-style-type: none"><li>• Verification Checklist Sheet CP</li><li>• Concrete docket</li><li>• Test report - compressive strength</li><li>• Hold points released.</li><li>• QBC Concrete pour sheet</li><li>• Survey conformance – as required.</li><li>• Update concrete register</li></ul>	Review	Review	CQR	Verification Checklist Sheet CP																													