Inspection and test plan – Bored Piling

Project no. CC0374 **Project name** Pakenham Roads Upgrade **Date** **Approved by** Damian Hagebols

ITP no. 1630-P200-SYM-QAC-ITP-0026 **Revision date** 28/08/2023 **Plant and equipment used** Piling Rig, Excavator

Lot no. **Location (chainages, detailed description or marked up plan)**

Attach Dockets, Certificates and QA Documents to ITP

					Verification of acceptance by					Remarks/record (eg. Test frequency reports, certificates, checklist etc)
					Symal			Superintendent		
Item no.	Activity	Ref docs	Acceptance criteria	Freq	Key	Resp	Initial/ date	Key	Sign/ date	
1.0 Pre-start activities										
1.1	Preliminary Approval	VR606.03	**The Contractor shall submit for review by the Superintendent a quality procedure for the construction of the piles not less than 4 weeks prior to the commencement of the piling works. Piling works shall not take place until the quality procedure has been reviewed and approved by the Superintendent.**	Prior to start of works	H	SE		**H**		ACRS certificate from Manufacturers, Suppliers and Processors of Steel Quality Procedure Quality Procedure and checklist VicRoads pre-qualification certificate of pile testing consultant
1.2	Installation of Temporary Casing	VR606.03	Type and thickness of casing has been proof engineered by a Proof-Engineer who is prequalified in accordance with the VicRoads scheme for prequalification. **Yes** ☐ **N/A** ☐	Prior to start of works	I	SE				Proof engineering certificate (or written advice)

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1.3	Concrete Mix Design	VR610.07, VR610.13, VR610.18	Concrete mix design is a registered mix and approved by the Superintendent. Concrete placed under water is self-compacting concrete (SCC) & Concrete placed in the dry is either self-compacting concrete (SCC) or highly workable concrete in accordance with the requirements of clause 610.07, clause 610.13 and clause 610.18(c).	Prior to start of works	H	SE		**H**		
1.4	Reinforcement cages	IFC drawings	Reinforcement details to be as per IFC drawings and shop drawings.	Prior to start of works	R	SE				Steel Schedule
1.5	Site Toolbox Talks	VR610.18	The Contractor has submitted documented evidence of conducting tool box meetings of all concrete construction personnel on all aspects of the WMS, the ITPs, quality control checklist(s) and all specification requirements prior to the placement of concrete	Prior to start of works	H	SE		R		
2.0 Installation of Bored Cast-In-Place Piles										
2.1	Survey set out and drilling setup	IFC Drawings	Surveyor to set out centre of pile prior to excavation. Minimum of 2 survey offset marks to maintain the centre of the pile during excavation.	Prior to drilling Each pile	I	SE				
2.2	Adjacent Piles – Check Adjacent Pile Strength	VR606.04	No pile construction to commence within 2.5 m clear distance of a newly cast pile until the concrete in the pile has attained a strength of 15 MPa. Installation of piles resulting in significant vibration was not carried out within 2.5m to 9m until concrete strength has reached 15MPa. **Yes** ☐ **No** ☐ **N/A** ☐	Each Pile	W	SE				
2.3	Pile Excavation	VR606.03 VR606.05 IFC Drawings	Boring to correct size, position and level as shown on the drawings. Auger diameter to be no larger than 25mm of the specified pile diameter. If the final level of bored pile is above natural ground level, the pile must be formed to the correct level by using temporary liner.	Each pile	I	SE		**H**		

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2.4	Installation of Temporary Casing	VR606.03 VR606.06	Temporary pile casings have used unless the Contractor can demonstrate to the satisfaction of the Superintendent that an alternative construction method without casings will meet the required tolerances, cover, and durability. Type and thickness of casing has been proof engineered by a Proof-Engineer who is prequalified in accordance with the VicRoads scheme for prequalification. Unless otherwise approved by the Superintendent, temporary casings have been used to prevent the collapse of piles during excavation. Temporary casing toes have been driven into solid rock or suitable material as required to seal pile and prevent water and soil from entering from outside the casing. **Yes** ☐ **N/A** ☐		I	SE		**R**		
2.5	Inspection of Pile Excavation	VR606.05	Pile hole to be dewatered and cleaned as per the approved methodology prior to inspection by the Superintendent. The dewatered pile walls and base excavation should be inspected and confirmed satisfactory by the Superintendent. Any temporary casing installed was not removed, and reinforcement and concrete was not placed until such inspection above has taken place, and satisfaction of design assumptions by a geotechnical engineer has been received. Contractor to Ensure pile toe level has been measured and recorded. Inspection of hole to select either approved dry hole or approved underwater concrete mix. **Method of pile cleaning & inspection in the event the pile was unable to be dewatered has been reviewed by the Geotechnical Consultant and MRPV.**	Each Pile	H	SE		**H**		

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2.6	Pile Verticality	VR606.08	Once excavation operations are complete, visually inspect the excavation and confirm verticality using a plumb bob, spirit level against mast, piling rig data or other suitable method. Tolerances as follows: - Variation from the vertical or the specified batter/rake is not more than 1 in 100 - Where piling excavation has developed a curve or out of verticality, the offset from the theoretical straight pile line does not exceed 150 mm over a length of 15 metres or proportionally for greater or shorter lengths.	Each pile	I	SE				
2.7	Pile Excavation Cleaning	VR606.06, 610.18	Piles have been concreted within 24 hours of completion of Pile excavation. For delays greater than 24 hours, ream the walls and the base of the pile to remove not less than 25 mm thickness of material, or any other foundation material which has softened in that time. If water is present in the pile, water is to be cleaned out by means of NDD prior to pour. All foreign materials have been removed from the pile bore.	Each Pile	H	SE		**H**		
2.8	Spacers and Bar Feet	VR606.06	Spacers and supports for bored pile steel reinforcement to be placed at intervals of no more than 2 meters along the full length of the steel reinforcement cage. Ensure that spacers are also placed across the diameter of the cage such that even cover is achieved across the diameter of the pile. 75mm spacers must be used to achieve deign cover. **Yes** ☐ **No** ☐ **N/A** ☐	Each pile	H	SE				

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2.9	Installation of Reinforcement Cage	VR606.06, 611.09, 611.10	Ensure cage is vertical and sufficient cover to Reinforcement as per design drawings. Ensure that the orientation of the cage is as per the design. Steel reinforcement is not be fixed to temporary casing. Ensure that starter bar alignment is compatible with the reinforcement and hold down bolt details for the pile cap to avoid clashes with the pile cap reinforcement.	Each pile	R	SE				
2.10	On-Site Tack Welding (if required)	VR611.13(a, VR611.14(b)	Tack welding of steel reinforcement will be permitted for Grade 250N and Grade 500N carbon steel reinforcement bars provided welding is not within 50 mm of the tangent point of a bend in the steel. Welders have appropriate training in accordance to AS 1554.3. **Welding of splices in steel reinforcement, including to other steelwork and to continuity bar reinforcement, shall not commence until the welding procedure has been qualified and reviewed by the Superintendent**. **Yes** ☐ **No** ☐ **N/A** ☐	Each Pile	H	SE		**H**		
2.11	Concrete Delivery	VR610.13, 610.16	Concrete to achieve required uniformity and discharge time in accordance with 610.13. (60 minutes unless mix design is approved by Proof Engineer and Superintendent to be extended) Time between discharge ending and restarting is to be less than 45mins for a continuous pour. Concrete docket has been verified to confirm mix, slump and moisture content of aggregates is as per design. **Records of actual amounts of water added into the agitator drum at the slump stand is available for review by the Superintendent.**	Each pile	R	SE		**H**		Concrete dockets Pour record

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2.12	Concrete Placement	VR606.06, 610.17, 610.18	• Piles have been concreted within 24 hours of completion of the pile excavation. • Concrete has been placed through a tremie tube and was not dropped from a height greater than 2m through air. • Concrete was not mixed when the air temperature is out of the range of 5-35 degrees. • Discharge time to be 60 minutes unless an otherwise approved by the Superintendent. • If water is required to be added, it can be done so if no more than 60 minutes has elapsed. Concrete samples including slump test to be taken after adding water. • Any repairs have been carried out using a method and materials as approved by superintendent. • Concrete to be placed in dry bores is either (I) Self Compacting Concrete (SCC) with no vibration or (ii) Highly workable concrete which is to be vibrated by using immersion type, high frequency vibrators. • Where a temporary casing is used, the free surface of the concrete are at least 1.5m above the bottom of the casing. • Piles placed in the dry have been constructed to a minimum of 300 mm above pile cut-off level to allow breaking back of contaminated concrete at the top of the pile. Unless otherwise approved.	Each pile	R	SE				
2.13	Concrete Placement – Under Water	VR606.06	• Concreting using tremie methods is not commenced until the pile hole is filled with such head of water as to equalise the external water pressure from the surrounding ground. • 2m head of concrete has been maintained above the tremie tube while placing underwater to avoid contamination and mixing. • The rate of withdrawal of the tremie pipe or pump discharge hose versus the volume of concrete placed has been recorded by the Contractor and the records has been submitted to the Superintendent for review. **Yes** ☐ **N/A** ☐		W	SE		**R**		Tremie withdrawal record

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<tr><th colspan="3">Symal</th><th colspan="2">Superintendent</th></tr>
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<tr><td>2.14</td><td>Concrete Sampling</td><td>VR610.16, Table 610.131</td><td>Slump test in accordance with clause 610.16 (c).
The specified slump ranges are:<table><tr><th>Specified Slump, mm</th><th>Tolerance, mm</th></tr><tr><td><60</td><td>±10</td></tr><tr><td>≥60 ≤80</td><td>±15</td></tr><tr><td>>80 ≤110</td><td>±20</td></tr><tr><td>>110 ≤150</td><td>±30</td></tr><tr><td>>150</td><td>±40</td></tr></table>The consistency of the concrete to be measured by a slump test after the water has been added.
Tests are to be conducted for volumes cast in one operation as per:
0 to 10m3 – 1 test
10 to 25m3 – 2 tests
25 to 50m3 – 3 tests
50 to 100m3 – 4 tests
One extra test sample has been taken for each additional 50m3.
The compressive strength of the concrete has been tested with a minimum of 1 sample being tested at 7 days and 2 samples being tested at 28 days.
If SCC is used, it meets the requirements as stated per VR 610.16 (c) and (n).</td><td>Each pile</td><td>W</td><td>SE</td><td></td><td></td><td></td><td></td></tr>
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3.0 Pile Testing										
3.1	Integrity testing	VR606.07(a) VR606.07(b) AS2159 PS3050.07 (a) (iii)	Integrity Testing has been carried out in accordance with integrity test methods specified in A2159. Pile testing consultant is independent of the piling contractor and pre-qualified. Details of the pile testing consultant has been submitted for review by the Superintendent at least 2 weeks prior to testing. The measured cross-sectional area of each test pile is not to be less than 5% of the required area. Integrity testing was not carried out until the concrete has achieved a compressive strength of at least 25 MPa and not before 7 days after casting of the pile. The frequency of testing to be as per specification and the submission of raw integrity testing data to be available to the Superintendent within 48 hours. Testing has been carried out on the first 6 piles constructed, and subject to acceptable integrity test results being obtained, 1 in 3 remaining piles have been tested. If any pile fails to meet the acceptance criteria, all piles must be tested. Reduced frequency is to be approved from the Superintendent. Raw data of pile integrity testing has been provided to the Superintendent within 48 hours of request of the Superintendent.	Each Pile	H	SE		**H**		
3.2	Static Load Testing	VR606.07(b)	Static Load Testing – compression, static and lateral load test in accordance with AS 2159 and as specified in drawings and once concrete has achieved 28-day compressive strength. **Yes** ☐ **N/A** ☐	Each Pile	R	SE				
3.3	Details of the Dynamic Testing Pile Driving Analyser (PDA)	VR606.07(c)	The details of the proposed pile driving rig, hammer size and drop heights have been provided to the Superintendent for review prior to undertaking the testing. **Yes** ☐ **N/A** ☐	Each Pile	R	SE		**R**		

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3.4	Dynamic Testing	VR606.07c) VR606.07 (d)	• At least one (1) load test every 10 piles or, one load test per pile cap or bridge abutment which ever gives the greatest number of piles tested. • Dynamic testing has also been carried out on piles of which the pile toe levels vary by more than 2 metres from the test pile. The test procedure and test reports to conform with the requirements of AS 2159. **Yes** ☐ **N/A** ☐	1 in every 10 piles Piles with varying toe levels > 2 m	R	SE				
3.5	Reporting & Acceptance of Test Results	VR606.07 (d) & (e)	Two copies of the test report to be provided for the Superintendent. The test results to demonstrate acceptance criteria as shown on the Drawings with ultimate capacity equal to or greater than the pile test load. Where confirmation of pile capacity using dynamic pile testing is obtained by re strike, the report includes the results of the initial drive and all subsequent re-strike.	Each Pile	R	SE		**R**		Test Results/Reports
4.0 Pile Completion										
4.1	Tolerance for Pile heads	VR606.08	Pile heads have been cut back to design level no sooner than 24 hours after concrete has been placed. Pile head finishes within 75 mm of the specified plan position. Pile head reduced level finishes within 25mm of design.	Each pile	R	SE				Survey Report
5.0 Work Lot Close Out										
5.1	Test Reports	VicRoads Specifications	All Test reports received and reviewed. **Have all of the above been tested and proven to pass design requirements?**	Each lot	R	SE				Pile Test Report Compressive Strength Test Report

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5.2	Product Non-Conformance	CQMP	All Product Non-Conformance(s) recorded and closed (if applicable) **Have all of the above been tested and proven to pass design requirements?** **Yes** ☐ **No** ☐ **N/A** ☐	Each lot	R	SE				NCR No:_____ NCR reports
5.3	Quality Representative to check the above criteria and records to confirm	CQMP Lot Records	All above criteria met, and records identified attached. **Have all of the above been tested and proven to pass design requirements?** **Yes** ☐ **No** ☐ **N/A** ☐	Each lot	R	SE				Reports and other compliance records attached.

Works complete (signer SE) _____ **Date works complete** _____

Lot conforms (signer PE) _____ **Date lot closed** _____ **NCR/s no. raised** _____ **Date NCR closed for this lot** _____

Responsibility (Resp.) Key: **PM**-Project Manager, **PE**-Project Engineer, **SE**- Site Engineer, **CS**-Civil Superintendent, **SS**-Site Supervisor, **SV**-Surveyor, **CR**-Client Representative

Inspection Key : W – Witness, **H –** Hold Point, **S -** Surveillance