Inspection and test plan – Driven Piling

Project no. CC0374 **Project name** Pakenham Roads Upgrade **Date** 31/08/2023 **Approved by** Damian Hagebols

ITP no. 1630-P200-SYM-QAC-ITP-0025 **Revision date** 31/08/2023 **Plant and equipment used** Piling rig with attachments (augers, hammers), EWP's, excavator, heavy vehicles

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	Driving System	VR 605.03	Details of the driving system have been provided to the Superintendent including the make, model and rated energy of the hammer, the mass of the helmet, and the proposed cap-block and cushion materials. The driving system ensures that the hammer has a height of fall less than 2m. The methodology used in determining the pile capacity below the ultimate retention height of the test pile has been provided to the Superintendent for review prior to commencement of pile driving. **These details, including calculations which demonstrate that the proposed driving system has sufficient energy to achieve the specified pile test load, have been submitted to the Superintendent for review not less than 14 days prior to the commencement of pile driving.** All pile corners are have 25x25mm chamfers except chamfers on the top longitudinal corners.	Prior to start of works	H	SE		**R**		
1.2	Concrete Pile approval	VR 605.08 AS 5100.3 (6.4.2.1)	The date of casting is clearly marked on each pile along with 500mm intervals starting from the pile toe clearly marked.	Prior to start of works	H	SE		**R**		

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		VR620.03 VR 605.09, Table 1 BTN 023	Precast square piles chamfers comply with requirements of clause 6.4.2.1 of AS 5100.3.Chamfers are only required on 2 out of the 4 corners. - The cross-sectional area is not less than 90,000 mm2 - The head of the reinforced concrete pile is reinforced with a minimum of 6 mm thick and 75 mm wide steel strap - Longitudinal reinforcement consists of not less than four bars and spaced uniformly around the perimeter of the pile are provided for the full length of the pile. The full length of longitudinal reinforcement is enclosed with stirrups or helical reinforcement of not less than 5 mm diameter, and the volume of the stirrups or the helical reinforcement is not less than 0.2% of the gross volume of the pile. - Mechanical joints (if applicable) are only used with the approval of the relevant authority, are not less than 3 m and not more than 20 m long. - Driving shoes are either iron casting or made up from welded steel plate with no less than 10 mm thickness. Welding is GP in accordance with AS 1554.1. for hard driving, the driving shoe may incorporate a rock point. Piles are free from damage, cracks or distortion. shall be inspected by the Contractor in conjunction with the Superintendent. Where required, a rectification proposal of any defects has been submitted and agreed by the Superintendent and rectification works have been completed to this proposal.							

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			All piles are confirmed to have the below minimum age before driving: • Steam cured = 7 days after the date of casting • Moist cured = 14 days after the date of casting Precast [piles must achieve the below strength prior to lifting them up at the precast yard i) 10 MPa for piles ≤ 5 tonnes ii) 20 MPa for piles > 5 tonnes Concrete strength & cover of piles are not less than the value given in Table 1 of Bridge Technical Note BTN 023 for the relevant exposure classification.								
1.3	Pile Steel	VR605.09 BTN 023 (clause 4.3)	Equivalent reinforcement is approved by MRPV (When anchor bars on mechanical joints interfere with longitudinal reinforcement). Pile driving rings or head bands are fabricated using full penetration butt welds and backing plates. Pile protection fittings are made 'integral with the pile' by using anchor bars welded to these fittings.	Prior to start of works	H	SE		**R**		
1.4	Prequalified testing consultant	VR 605.07(b)	The consultant undertaking high strain dynamic testing is independent of the piling contractor and advised to the Superintendent at least 2 weeks prior to testing. The Tester needs to be DTP prequalified.	Prior to start of works	H	SE		**R**		
1.5	Temporary Works of Piling Pad Design	General Specification 1170.04	The manufacture, fabrication, erection or construction of any part of the Works of Temporary Works must not commence until the relevant Construction Documents, including the IFC Documents, have been finalised in accordance with the requirements of General Specification 1190.03.	Prior to start of works	H	SE		**R**		
2.0 Installation of Driven Piles										
2.1	Survey set out and drilling setup	1630-P200-SYM-SBR-DRG-0102	The Surveyor has set out the centre of pile prior to installation. There is a minimum of 2 survey offset marks to maintain the centre of the pile.	Each pile	I	SE				

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2.2	Isolation Sleeves	AMS Activity 6.3	The pile location is bored to the correct depth and a steel sleeve is inserted into the hole to provide isolation for the pre-cast driven pile. The voids between the embankment fill material and the outside wall of the sleeves (if any) are grouted using sand grout.	Each Lot	R	SE				
2.3	Pile driving records	VR 605.06	The following records have been retained for each pile being driven: (a) manufacturing lot number and date of casting (b) location in pile group (c) length prior to driving (d) date of driving (e) toe level (f) traces of set measurements showing set and temporary compression (g) calculated ultimate pile capacity (h) measured stresses in the pile. All records shall be provided to the Superintendent within 72 hours of each pile having been driven into position.	Each Lot	R	SE		R		
2.4	Pile driving	AMS Activity 2.06	The starting position of the pile has been checked against offset marks. piling rig and pile segment shall be lined up parallel to each other prior to piling,	Each Lot	I	SE				
		VR 605.04	During driving, the tops of the piles are held and guided by a suitable helmet and protected by cushioning material to avoid damage to the pile. Each pile is driven in a continuous operation, if pile needs to be extended, splicing shall be done immediately once section has been completed so driving can re-comment as soon as splice is completed. Pile is driven to the design level Forced up piles are re-driven to the design level	Each Lot	I	SE		**I**		

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		AMS Activity 2.06	Once the pile has been driven to a level that will allow for a visual inspection, pile driving is to cease so that the piles can be inspected.	Each Lot	I	SE				
		VR 605.05	Pile stress during driving did not exceed the below: i) For concrete piles stress ≤ 0.8 fc for compression and 1.1√fc for tension ii) For steel piles stress ≤ 0.85Fy iii) For exposure classification B2 or C, concrete pile stress≤ 0.5√fc	Each Lot	R	SE				
2.5	Pile tolerances	VR 605.04	The Contractor shall ensure that piles achieve the specified accuracy of level and position. The following tolerances shall apply to piles after driving: (a) pile alignment •deviation from the vertical or the specified rake shall not exceed 20 mm per metre length of pile (b) pile straightness •deviation from vertical shall not exceed 5 mm per meter length of pile. (c) pile position for piles in pile caps and the underside of crossheads •pile head center, ± 50 mm of the specified position.	Each Lot	R	SE				
2.6	Extensions to piles	VR 605.10	Reinforced concrete piles are extended with either an additional length of precast reinforced concrete pile or with a cast in place reinforced concrete extension subject to the requirements of VR605.09.	Each Lot	R	SE				
3.0 Pile Testing										
3.1	Pile Testing	VR 605.03VR 605.07	Pile testing has been carried out in the presence of the Superintendent. The first pile driven in each group is tested (which determined the driving set each pile group) and the ultimate capacity determined in accordance with the formula in clause 605.05(a).	Each Lot	H	SE		H		

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		VR 605.04	Set measurements shall be taken to verify capacity of each pile driven, recorded as traces during driving to show the temporary compression of the pile and the permanent set. Traces must be taken relative to a stable hurdle supported securely by posts at least one pile diameter from each side of the pile.	Each Lot	H	SE				
		VR 605.07, 605.05(a)	The first pile in each group has been tested and the ultimate capacity determined in accordance with the formula in clause 605.05(a). The pile test has determined the driving set for each pile group by correlating the set with the driving system and the designer's requirements for the pile test loads shown on the drawings. All piles within that group have not been driven to a set exceeding the driving set as determined by the pile test for that group. Nominated testing coefficient will be reviewed by MRPV	Each Lot	H	SE		R		
		VR 605.05(b)	In addition to VR 605.05(a), pile capacity should be proven using dynamic analysis (PDA with CAPWAP) as per the drawings: • 2 piles at each abutment • 3 piles at the pier All high strain dynamic testing has been undertaken by a prequalified consultant and approved by the Superintendent. The pile test has determined the driving set for each pile group by correlating the driving system and design pile capacity. All piles within that group have been driven to a set not exceeding the driving set as determined by the PDA test. An additional pile test has been conducted where the driving conditions are no longer represented by the	Each Lot	H	SE				

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			initial pile test for that pile group. Additional pile tests are required where: • The design pile toe level of individual piles within a pile group is more than 2 metres, or • During pile driving pile toe levels vary by more than 2 metres from the test pile, or • Pile rake differs by more than 8 degrees from the test pile. • distance of any pile from the test pile did not exceed 20 metres.							
3.3	Restrike Test	VR 605.08	If the ultimate load capacity has not been achieved at the specified level or at refusal, restrike testing has not been conducted less than 24 hours after initial driving. If directed by the Superintendent, the pile shall be driven until the specified ultimate load capacity is achieved. Driving resistance must be equal to or greater than the pile test load shown on the drawings.	Each Lot	R	SE				
3.4	Defective Piles	VR 605.13	Where a pile exceeds the specified tolerances, is damaged or is otherwise defective, the strength, serviceability and durability of the pile shall be reappraised and where found to be unsatisfactory the pile shall be repaired, downgraded or replaced with one or more supplementary piles subject to the approval of the Superintendent.	Each Lot	R	SE				
3.5	Joint location	Drawing no. 1630-P200-SYM-SBR-DRG-0105	All mechanical joints are a minimum of 5m below natural surface level.	Each Lot	R	SE				
4.0 Work Lot Close Out										
4.1	Test Reports		All Test reports received and reviewed.	Each lot	R	SE				

4.2	Product Non-Conformance	CQMP	All Product Non-Conformance(s) recorded and closed (if applicable)	Each lot	R	SE				NCR No:_____ **Yes** □ **No** □ NCR reports
4.3	Quality Representative to check the above criteria and records to confirm	CQMP Lot Records	All above criteria met, and records identified attached.	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 **R -** Review