| **INSPECTION AND TEST CHECKLIST FOR:**  **Driven Tubular Steel Piles (B54)** |
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| Activity No.# | Description | Requirements / Reference | | Acceptance Criteria | | | | | | | Comments / Attachments / Records | | | | Engineer Signoff | |
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| 1 | **Safety Review** | Project Safety Plan | | * All site personnel inducted (includes environment and cultural) * Required Safe Work Method Statements completed and signed * Subcontractor’s safety plan/procedure approved | | | | | | |  | | | |  | |
| 2 | **Environment** | Project Environment Plan  G36 CL 3.1  G38, G40 | | * Installation of soil erosion and sedimentation controls completed in accordance with ESC Plan and EMP, as well as Specification TfNSW G38 * All work undertaken under this Specification must be approved by the Environmental Site Representative (refer TfNSW G36) and comply with Abergeldie’s CEMS and CEMP | | | | | | |  | | | |  | |
| 3 | **Materials** | B54 Cl 2 | | Materials must be in accordance with the Drawings and this Specification. Where shown on the Drawings, supply and fix steel end plates or driving shoes to the pile toes prior to driving  The following steels may be used: AS 3678 (Grades 250 or 350), AS 1548 (Any grades) or AS 1594 (Grade HU 240)  Provide evidence that materials comply with the relevant Australian Standards and TfNSW specifications. Provide material test reports as per Annexure B54/C2 | | | | | | | * Material test reports | | | |  | |
| 4 | ***Construction of Temporary Works*** | *G1 Cl 26* | | *As per Item 5 above, design lifting points and the like and submit details for piles as a temporary works design in accordance with TfNSW G1 Clause 26*  ***HOLD POINT: Construction of temporary works***   * *At least 15 working days prior to construction of temporary works, submit the Design Report (including drawings and methodology, if applicable) for proposed temporary works, including design certification* | | | | | | |  | | | |  | |
| 5 | ***Use of Temporary Works*** | *G1 Cl 26* | | ***HOLD POINT: Use of temporary works***   * *At least 5 working days prior to use of temporary works submit the construction certification to the Client* | | | | | | |  | | | |  | |
| 6 | **Site Preparation** | B54 Cl 4 | | *Undertake temporary works to access the required “new borehole” at pier one and carry out the required geotechnical investigation as a priority (refer to TfNSW G1 Cl 9.2)*  *Prior to commencing pile hole excavation, drill an additional borehole and take 50mm diameter cores and other appropriate tests / investigations to confirm the geotechnical assumptions for piles at Pier 1. The Geotechnical Engineer must also be in attendance during any borehole / coring and other tests / investigations. The Geotechnical Engineer is to log these activities and make their interpretations available for the Principal’s review*  *Commence taking of the core samples and other appropriate tests/ investigations at a level that is at one metre above the level of the top of the rock socket shown on the Drawings, for that pile, to a depth that is at least 3 m or 3 pile diameters, whichever is the greater, below the pile Contract Level*  *Log the cores in accordance with AS 1726, place the cores in suitable core boxes and make them available for inspection by the Principal as required*  Carry out any excavation or backfilling in the vicinity of the piles in accordance withSpecification TfNSW B30.Stage the driving of the piling as per the requirements of B54 Cl4 .2  Clause 4.2 - Where the level of the bottom of the pile cap is more than two metres below the existing natural surface level, prior to the driving of the piles, carry out excavation for the pile cap to a level which is not more than two metres higher than the level of the bottom of the pile cap, to reduce any temporary contribution of the ground above the bottom level to the pile resistance measured during driving   * ***HOLD POINT: Commencement of construction of any piles for Pier 1.*** *At least 20 working days prior to commencing construction of any piles for Pier 1, submit the logged boreholes / cores and other appropriate tests / investigations, as well as the Geotechnical Engineer’s interpretations* | | | | | | |  | | | |  | |
| 7 | **Piling Plant and Piling Method** | B54 Cl 5  B54 Cl 5.3 | | Without limiting the requirements of TfNSW G22, prior to bringing any piling plant to site, provide drawings and calculations with certification from a suitable Chartered Professional Engineer of any working platforms or supports required to keep the piling rig stable and safe during piling operations. *This also applies to any barges used to keep the piling stable and safe during piling operations*  Drive piles using diesel, compressed air, drop or vibration hammers or a combination of these. Do not use clutch operated drop hammers  Maintain the equipment and its packing, replace packing regularly to maintain efficient cushioning  Pre-boring may be used to assist in achieving the Minimum Penetration Depth specified. Where pre-boring is used, submit details of the proposed pre-boring equipment and methods including pre-boring diameter *and certification by a suitably qualified engineer that the proposal will not be detrimental to the pile performance*. The depth of pre-boring must not exceed the Minimum Penetration Depth specified   * **HOLD POINT: Setting up of piling frame and driving of all piles, including Test Piles and Representative Piles**. Submit details of the proposed driving equipment and method, together with certification, including calculations by a Chartered Professional Engineer with membership of Engineers Australia practicing in the field of Civil or Structural Engineering or equivalent, and verifying that under the proposed site configuration and site conditions, the equipment nominated will be used within its safe working capacities. | | | | | | |  | | | |  | |
| 8 | **Test Pile Notification** | B54 Cl 7.1 | | Drive Test Piles at the locations nominated on the Drawings. Drive all Test Piles prior to driving the remaining piles.  **HOLD POINT: Driving of each Test Pile**. Submit notification of the time and location of the driving of each Test Pile at least one working day prior to commencing   * *NOTE: Test Piles will be completed as part of the Test Piling package of works for this project, hence this Hold Point is not required* | | | | | | |  | | | |  | |
| 9 | **Test Pile Results** | B54 Cl 7.2 | | Record the number of blows per metre for Test Piles over the whole driven length. For the last ten blows, record the final Set in mm and the average Temporary Compression per blow  *Unless shown otherwise on the Drawings, perform* Dynamic Testing over the whole driven length, and record data for analysis from the start to the end of driving on the steel tube alone. Verify the resistance of the Test Pile before or after filling the tube with concrete, as specified on the Drawings  Unless specified otherwise, carry out a restrike test in accordance with Clause 13.3 after a minimum period of 24 hours  On completion of driving the Test Piles, submit to the Principal the driving records and Dynamic Testing reports of the Test Piles. Allow three working days for the Principal to consider the submission and instruct the lengths of the remaining piles  **HOLD POINT: Making up the pile lengths, and driving of piles represented by the Test Piles. Driving of all piles, other than Test Piles**. Submit driving records and Dynamic Testing reports of all Test Piles, including restrike test results   * *NOTE: Test Piles will be completed as part of the Test Piling package of works for this project, hence this Hold Point is not required* | | | | | | |  | | | |  | |
| 10 | **Representative Piles** | B54 Cl 8 | | Drive Representative Piles at locations nominated on the Drawings  Record the number of blows per metre for Representative Piles over the whole driven length. For the last ten blows, record the final Set in mm and the average Temporary Compression per blow  Perform Dynamic Testing over the whole driven length and record data for analysis from the start to the end of driving on the steel tube alone. Verify the resistance of the Representative Pile before or after filling the tube with concrete, as specified on the Drawings  Unless specified otherwise, carry out a restrike test in accordance with Clause 13.3 after a minimum period of 24 hours  If there is any reason to believe the geotechnical conditions are not essentially uniform, the Principal may nominate additional piles to be Representative Piles   * **HOLD POINT: Driving of each Representative Pile**. Submit notification of the time and location of the driving of each Representative Pile at least one working day prior to commencing | | | | | | |  | | | |  | |
| 11 | **Driving Operations** | B54 Cl 9 | | *Scare fish prior to driving, including undertaking some initial “warning strikes”*  The Piling Supervisor must supervise and control the driving at all times  During all driving operations, the driving equipment, procedures and parameters must be in accordance with the procedures established during driving of the Test Pile / Representative Pile. Confirm during driving, using the records of the Test Pile / Representative Pile, that the pile is being driven in the same manner, using records of number of blows per metre, Penetration and Temporary Compressions  At all times during the driving operation, adjust the driving equipment such that the blow of the hammer is directed centrally and axially on the pile head  *Submit to the Principal each week a day-by-day program showing the scheduled work for pile hole excavation and / or reinforcement cage and concrete placement*  *During driving and excavation of each pile, the Geotechnical Engineer must also be in attendance. They are to verify that driving operations conform to the requirements of the Specification and that the requirements of each pile are satisfied (or better) as per the Drawings*  *Submit to the Principal for acceptance, details of relevant qualifications and experience of the Geotechnical Engineer*  *Tolerances on pile installation must conform to Section 7 of AS 2159, except that the inclination tolerance for vertical piles is 1%, measured on the internal side of the casings*  *Remove all excavated material from the site, unless specified otherwise. Collect and treat water, as well as any waste concrete, as per Specification G36*   * *Protect each pile hole to prevent personnel, site run-off and loose material from falling in during excavation. Make each pile hole safe with appropriate measures, including covering it with a secure lid whenever the pile is not under construction. Leave the finished top of the casing at least one meter above ground level to prevent personnel and loose material from falling into the pile hole.* | | | | | | | * *Details of relevant qualifications and experience of geotechnical engineer* | | | |  | |
| 12 | **Driving of Each Piles** | B54 Cl 9.3 | | * **WITNESS POINT: Driving of each pile**. Submit notification of the time and location of the driving of each pile at least one working day prior to commencing | | | | | | |  | | | |  | |
| 13 | **Driving of Any Further Piles** | B54 Cl 9.3 | | During pitching, lift and support piles at the positions shown on the Drawings  During the initial stages of driving, do not bend or spring piles into position. At all stages of driving, the pile frame must not exert any undue lateral force on the pile. At all times, do not restrain the pile against rotation about its longitudinal axis  If damage occurs to the head of the pile or the rest of the pile, consult B54 Cl 9.3 for next steps  Where the pile driving equipment is altered, test the equipment to determine the relationship between the operation of the equipment and the Net Driving Energy at the head of the pile   * **HOLD POINT: Driving of any further piles (For piles not founded in rock and if Minimum Penetration Depth is not achieved)**. Submit details of the amended driving method, together with certification that the amended driving method is likely to result in achieving the Minimum Penetration Depth before the required pile resistance is obtained | | | | | | |  | | | |  | |
| 14 | **Backfilling and Concreting** | B54 Cl 11 | | Prior to concreting a pile, bring the bottom of the hole to a clean and stable condition and maintain in that condition without contamination or softening until concrete is placed. If this cannot be achieved, place a concrete plug and allow the concrete to set before the reinforcement is placed in position  Supply and place reinforcement in accordance with Specification TfNSW B80. Thoroughly clean the pile shaft of all loose material, including any material adhering to the inside of the tube, before the reinforcement is placed  Supply and place concrete in accordance with Specification TfNSW B80. Use only high workability concrete or self-compacting concrete conforming to Annexure B80/G. Use a rigid tremie pipe and a hopper to place concrete in piles. Where a concrete pump is used, a flexible rubber hose may be used to transport the concrete between the discharge hopper of the pump and the hopper of the tremie. The tremie pipe must be watertight throughout  Insert the tremie pipe inside the pile hole until the bottom end of the tremie is at the base of the pile, before charging the tremie with concrete. In wet pile holes, do not commence concreting until the pile hole is filled with sufficient head of water as to equalise the external water pressure from the surrounding ground. *When placing concrete in water, a larger over-pour may be required.*  *Discharge any slurry used to prime the concrete pump and tremie pipe away from the pile hole*  Place concrete in such a manner and with such consistency that pockets of air, water, or ground materials are not entrapped in the concrete, and the space between the reinforcement and the side walls of the hole are completely filled with compacted concrete  Provide a continuous supply of concrete such that each pile hole is concreted in one uninterrupted operation  *Continue pouring concrete until the excessive water, mud or other non-conforming materials included in the concrete, are discharged from a point in the pile tube, and managed in accordance with environmental requirements*   * **HOLD POINT: Backfilling the pile shaft (if applicable) and cutting off of a pile after completion of driving (upon completion of driving of each pile)**. Submit driving records and survey report showing the alignment and plan position of the pile. Also include certification by the Piling Supervisor that the pile has been driven in accordance with this Specification | | | | | | |  | | | |  | |
| 15 | **Dynamic Testing** | B54 Cl 13 | | * Carry out Dynamic Testing in accordance with this Clause and AS 2159, using an approved organisation with approved equipment and dynamic testing system and analysis, as listed in the “Lists of TfNSW Approved Bridge Components and Systems” * Use the following testing procedure: Attach four bolt-on transducers to the pile at a min. of 1.5 times the maximum pile width below the head of the pile in accordance with the requirements of the system supplier. Following the connection of the transducers to the analyser, strike the pile with sufficient energy to verify the required pile resistance. *Allow for any required re-set of relaxed pile to complete the dynamic testing* * Avoid pile damage due to overstressing, and record the driving stresses, measured pile resistance, Nominal Driving Energy, measured Net Driving Energy and Set * When a restrike test is required, consider only the first 20 blows at the beginning of the driving to be part of the restrike test. Measure the driving parameters at the required Net Driving Energy on blow numbers 6 to 15 inclusive * Analyse the dynamic test results for each pile tested. Analyses must include full Dynamic Analysis using measured field parameters of the test data and resistance versus Set curves, when requested by the Principal, showing a minimum of six different resistances and the corresponding blowcounts   Provide the Principal with two copies of a report for each pile tested, including details such as complete PDA output (or approved equivalent) for all blows and CAPWAP analyses (or approved equivalent) for selected blows | | | | | | | * Dynamic test results | | | |  | |
| **REVIEW BY PROJECT ENGINEER** | | | | | | | | | | | | | | | | |
| Any non-conformances? | | | YES | | NO | | Nos: | | | Closed Out | | | YES | | | NO |
| Other QA details – NCRs, CARs, Identified Records etc | | |  | | | | | | | | | | | | | |
| All work has been satisfactorily completed | | | | | | YES | | | NO | | | | | | | |
| Name | | | | | | | | Signature | | | | Date | |  | | |