TRANSPORT FOR NSW (TfNSW)

TfNSW SPECIFICATION D&C B59

BORED CAST-IN-PLACE REINFORCED CONCRETE PILES
(WITHOUT PERMANENT CASING)

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REVISION REGISTER

<table>
<thead>
<tr>
<th>Ed/Rev Number</th>
<th>Clause Number</th>
<th>Description of Revision</th>
<th>Authorised By</th>
<th>Date</th>
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<tbody>
<tr>
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<td>6.3.2</td>
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<td>DCS</td>
<td>22.06.20</td>
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<td></td>
<td>6.3.4</td>
<td>Lower level of excavation directed clarified as “new” level.</td>
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<td>Hold Point – reference to Clauses 6.3.2 and 7 added.</td>
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<td>Ed 2/Rev 2</td>
<td>Global</td>
<td>References to “Roads and Maritime Services” or “RMS” changed to “Transport for NSW” or “TfNSW” respectively.</td>
<td>DCS</td>
<td>22.06.20</td>
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<td>References to “RMS Representative” changed to “Principal”.</td>
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FOREWORD

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BASE SPECIFICATION

This document is based on Specification TfNSW B59 Edition 5 Revision 2.
TfNSW SPECIFICATION D&C B59

BORED CAST-IN-PLACE REINFORCED CONCRETE PILES
(WITHOUT PERMANENT CASING)

1 GENERAL

1.1 SCOPE

This specification sets out the requirements for the construction of reinforced concrete piles which are formed and cast in place without the use of permanent casing.

Materials and construction must conform to AS 5100.3 and this Specification.

This Specification does not cover concrete injected (CFA) piles (refer to Specification TfNSW D&C B63).

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 Schedules of HOLD POINTS, WITNESS POINTS and Identified Records

The schedules in Annexure B59/C list the HOLD POINTS and WITNESS POINTS that must be observed. Refer to Specification TfNSW D&C Q6 for the definitions of HOLD POINTS and WITNESS POINTS.

The records listed in Annexure B59/C are Identified Records for the purposes of TfNSW D&C Q6 Annexure Q/E.

1.2.3 Planning Documents

The PROJECT QUALITY PLAN must include each of the documents and requirements listed in Annexure B59/D and must be implemented.

1.2.4 Frequency of Testing

The Inspection and Test Plan must nominate the proposed frequency of testing to verify conformity of the item, which must not be less than the frequency specified in Annexure B59/L. Where a minimum frequency is not specified, nominate an appropriate frequency. Frequency of testing must conform to the requirements of Specification TfNSW D&C Q6.

You may propose to the Principal a reduced minimum frequency of testing. The proposal must be supported by a statistical analysis verifying consistent process capability and product characteristics. The Principal may vary or restore the specified minimum frequency of testing, either provisionally or permanently, at any time.
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 B59/M.

1.3 Definitions

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

The following definitions apply to this Specification:

**Design Toe Level:** Reduced level (RL) of the pile toe shown on the Design Documentation drawings.

**Dynamic Analysis:** A Wave Equation Analysis of a specific blow using force and velocity measured in Dynamic Testing together with measured pile/soil parameters, to replicate the measured traces of force and velocity and subsequently determine pile resistance, distribution of resistance and pile integrity (e.g. CAPWAP, TNOWAVE).

**Dynamic Data:** The force and velocity near the head of the pile and estimates of pile resistance, Net Driving Energy, pile integrity and stresses in the pile, determined immediately using electronic equipment (e.g. PDA) during pile driving.

**Dynamic Testing:** The measuring and recording of Dynamic Data for each blow of the hammer and subsequent Dynamic Analysis of specific blows. The term is the same as the High-Strain Dynamic Testing of AS 2159.

**Integrity Testing:** A non-destructive test carried out on a concrete pile after its installation/construction to verify or examine the quality of the concrete pile shaft in terms of its continuity, density, shape and length.

**Pile Design Load:** The design ultimate axial load shown on the Design Documentation drawings for the pile.

**Piling Supervisor:** Your employee responsible for supervision and control of the piling operations.

**Test Piles:** Piles nominated on the Design Documentation drawings for load testing to confirm pile design parameters.

**Wave Equation Analysis:** A predictive computer analysis of pile driving, which can use hammer, pile and soil characteristics measured during Dynamic Testing for the determination of resistance versus Set of a pile (bearing graph) or pile driveability (e.g. GRLWEAP).

2 MATERIALS

2.1 Temporary Casings

The type, thickness and fabrication of the temporary casings, where used, must be suitable for its intended purpose.
2.2 CONCRETE AND REINFORCEMENT

Unless specified otherwise in this Specification, concrete and reinforcement for the piles must comply with Specification TfNSW D&C B80.

3 PILING PLANT AND EQUIPMENT

The equipment for construction must be of proven capacity to excavate the pile shaft and the socket in the founding material to the specified depth and diameter to achieve the design pile resistance, including the capability to excavate an additional 20% of the nominated pile depth if required.

Without limiting the requirements of Specification TfNSW D&C G22, prior to bringing any piling equipment or plant to the Site, provide drawings and calculations certified by a Chartered Professional Engineer with membership of Engineers Australia practising in the field of geotechnical engineering (or equivalent) of any working platforms or supports required to keep the piling rig stable and safe during piling operations at the Site.

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 Civil Engineering and experienced in the geotechnical assessment of the stability and safety of working platforms or supports for piling rig during piling operations.

<table>
<thead>
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<th>HOLD POINT</th>
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<tbody>
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<td>Process Held:</td>
</tr>
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<td>Submission Details:</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Release of Hold Point:</td>
</tr>
</tbody>
</table>

4 SET OUT

Set out the site with adequate recovery pegs and survey markers so that the drilling and/or piling rig can be set up accurately on the location and alignment for each pile.

5 CORING

As required by site conditions, take 50 mm diameter cores prior to excavating the pile hole, to confirm the adequacy of the pile base and shaft.
Commence taking of the core samples at a level that is at one (1) metre above the level of the top of the rock socket shown on the Design Documentation drawings for the pile, to a depth that is at least 3 m or 3 pile diameters, whichever is the greater, below the pile Design Toe Level.

Log the cores in accordance with AS 1726, place the cores in suitable core boxes and make them available for inspection as required.

6 EXCAVATION AND CLEANING OF PILE HOLE

6.1 GENERAL

6.1.1 Weekly Program

Submit weekly a daily program showing your scheduled work for pile hole excavation and/or reinforcement cage and concrete placement.

6.1.2 Supervision

Your Piling Supervisor must supervise and control the piling operations at all times.

During excavation of each pile, a Geotechnical Engineer, engaged by you, must also be in attendance.

The Geotechnical Engineer must be a Chartered Professional Engineer with membership of Engineers Australia practising in the field of geotechnical engineering (or equivalent). 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 Civil Engineering and experienced in the geotechnical assessment of pile excavation.

Submit to the Project Verifier for acceptance details of relevant qualifications and experience of the Geotechnical Engineer.

6.1.3 Pile Installation Tolerances

Tolerances on pile installation must conform to Section 7 of AS 2159, except that the inclination tolerance for vertical piles is 1%. Demonstrate to the Project Verifier that the inclination tolerances have been achieved.

6.1.4 Environmental Requirements

Remove all excavated material from the Site, unless otherwise specified.

Collect and treat the water resulting from your piling operations in accordance with Specification TfNSW D&C G36.

6.1.5 Pile Hole Safety

Provide effective measures to protect each pile hole from site run-off and from loose material 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 metre above ground level to prevent personnel and loose material from falling into the pile hole.
6.2 **PILE HOLE EXCAVATION**

6.2.1 **Proposed Methods**

Provide in the PROJECT QUALITY PLAN the proposed methods for excavating and cleaning the pile holes, including methods of support of the sides of the excavated pile holes, and for verifying that the specified requirements have been met.

6.2.2 **Use of Temporary Casings**

Where necessary and appropriate, use a temporary casing to prevent the pile hole excavation from collapsing.

If a temporary casing is used, drive or sink the temporary casing through any inferior and/or hard materials, without damaging it, to bear on the founding layer.

The inside of the casing must be clean and free of any projections (such as weld backing bars) which could be an obstacle to the placing and positioning of the reinforcement cage for the piles, or which might prevent the proper completion of the pile.

6.2.3 **Temporary Casings Left In Place**

Temporary casings may be left in place provided that the minimum socket length shown on the Design Documentation drawings is not cased and the minimum cover to reinforcement specified on the Design Documentation drawings is maintained.

Where a casing is left in place, fill any gaps between the casing and the sides of excavations with sand, and compact the sand by flooding.

In the case of piles subject to high lateral loads (e.g. abutment piles and anchor pier piles), fill such gaps with a cementitious grout containing fine aggregates proportioned to produce a pourable liquid without segregation, with a compressive strength at 28 days not less than 10 MPa when sampled and tested to Test Method TfNSW T375.

Cement used for the grout must conform to Specification TfNSW D&C 3211.

6.2.4 **Use of Drilling Fluids**

As an alternative to temporary casings, you may use drilling fluids such as water, bentonite or polymer slurries to provide support to the sides of the excavated pile hole.

Maintain the drilling fluid properties during the times when the drilling fluid is in use.

6.2.5 **Bentonite Slurry**

Unless specified otherwise by the manufacturer, bentonite slurry properties must be in accordance with Table B59.1.
Table B59.1 - Bentonite Slurry Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>During Drilling</th>
<th>Prior to Concreting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bentonite-to-water mass ratio</td>
<td>≥ 4%</td>
<td>&lt; 4 %</td>
</tr>
<tr>
<td>Specific gravity</td>
<td></td>
<td>1.03 – 1.08</td>
</tr>
<tr>
<td>pH</td>
<td>8 – 11</td>
<td>8 – 11</td>
</tr>
<tr>
<td>Viscosity field check by Marsh funnel (seconds/0.95 L)</td>
<td>28 – 40</td>
<td>28 – 40</td>
</tr>
<tr>
<td>API sand content</td>
<td>0 – 10 %</td>
<td>0 – 2 % (1)</td>
</tr>
<tr>
<td>API fluid loss (ml/30 mins)</td>
<td>≤ 10 %</td>
<td>≤ 10 %</td>
</tr>
</tbody>
</table>

Note:

(1) Values of up to 5% may be accepted, subject to acceptance by the Designer.

Store the bentonite powder for approximately 24 hours after mixing with water to allow full hydration to occur prior to its use.

6.2.6 Polymer Based Drilling Fluids

Use polymer based drilling fluids in accordance with the manufacturer’s specifications.

6.2.7 Pile Hole Excavation

If a temporary casing is used, after installation of the temporary casing, excavate inside the casing past the toe of the casing and into the founding material to obtain the rock socket of the specified depth in rock of the class specified on the Design Documentation drawings.

If drilling fluids are used, maintain a hydraulic head in the excavated pile hole that is at least two metres higher than the ground water level, allowing for artesian head where it exists, at all times during extraction of drill. When withdrawing the drill, take care to prevent suction pressure forming below the drill leading to the excavated socket collapsing.

Do not leave slurry in a completed pile socket more than 2 hours without agitation to avoid formation of excessive filter cake on pile shaft walls.

Prior to placement of reinforcement and concrete, de-sand and re-circulate the bentonite drilling fluid to achieve the properties shown in Table B59.1.

6.2.8 Record Drilling Parameters

Record and measure the operating parameters of the drilling rig when excavating the first pile hole.

Excavate subsequent pile holes after the first pile with the same drilling rig operating parameters and work methods as that recorded during excavation of the first pile hole.
6.3 **FINAL PILE TOE LEVEL AND PILE HOLE CLEANING**

6.3.1 **Direction by Geotechnical Engineer**

The attending Geotechnical Engineer will direct the Piling Supervisor as to when ground or rock of the class specified on the Design Documentation drawings has been reached, the extent of further excavation required to form the socket in accordance with the Design Documentation drawings, and when the pile hole and socket are considered to be clean.

6.3.2 **Further Excavation**

After excavation of the pile hole in accordance with Clause 6.3.1, the Project Verifier will either accept the level reached as the final pile toe level or require that excavation be continued to a lower level.

Where excavation to a lower level is required, carry out further pile hole excavation to the new level required, including further driving or sinking of the temporary casing if practicable and if necessary without damaging the casing, and again clean the pile hole in accordance with Clause 6.3.3.

6.3.3 **Side Wall Roughening and Base Cleaning**

Roughen the side walls of the rock socket to remove debris and surface smear and expose intact rock.

After roughening the side walls, clean the base of the pile so that intact rock is exposed over the pile base.

6.3.4 **Acceptance of Pile Hole**

Upon completion of excavation of the pile hole, submit to the Project Verifier quality records, signed by the Piling Supervisor, demonstrating that the pile hole has been excavated to the position, size and level shown on the Design Documentation drawings or in accordance with the directions of the attending Geotechnical Engineer, and that the soil design parameters shown on the Design Documentation drawings has been achieved.

### HOLD POINT

<table>
<thead>
<tr>
<th>Process Held:</th>
<th>Completion of cleaning of pile hole.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submission Details:</td>
<td>Notification that the pile hole excavation is complete, and documentation verifying that the plan position, size and alignment of the casing and the pile hole will result in a pile that conforms to the specified tolerances and other requirements of the Design Documentation drawings and this Specification.</td>
</tr>
<tr>
<td>Release of Hold Point:</td>
<td>The Nominated Authority will consider the submitted documents, review the progress of the Works and will either accept the pile hole excavation, or require you to provide access for indirect examination of the pile hole (refer Clause 7), or require you to continue excavation (refer Clause 6.3.2), prior to authorising the release of the Hold Point.</td>
</tr>
</tbody>
</table>

Following release of the Hold Point by the Nominated Authority, keep the pile hole sides and base in a clean and stable condition without contamination or softening, until concrete is placed. Place the steel reinforcement and concrete as soon as practical following final socket cleaning, and within 24 hours of the excavation of the pile hole.
Where there is a delay of more than 6 hours between cleaning and concrete placement, undertake further cleaning prior to placement of reinforcement which is to be immediately followed by placement of concrete.

7 INDIRECT EXAMINATION OF PILE HOLE

To verify conformity with Clause 6.3, provide all equipment and personnel necessary for the Project Verifier or Geotechnical Engineer to indirectly examine the pile hole from top to bottom, including the socket base and sidewalls.

Provide the equipment for indirect examination of the pile hole, e.g. mirrors, probes, plumb weights, bright lights, CCTV cameras.

Verify conformity of the depth of each pile hole using a weighted tape at least at three locations. Carry out further indirect examination as required.

8 REINFORCEMENT

Fix and place the reinforcement for the piles in accordance with TfNSW D&C B80 and this Specification.

Use templates when fabricating the reinforcement cages to ensure that the required reinforcement distribution is maintained.

The spacers attached to the cage must be of an approved type and distribution capable of providing the specified concrete cover and maintaining the cage in the specified position, over the whole length of the pile, after placement and during concreting.

Where telescopic casing is used, the cage must be centralised and that the minimum concrete cover must be not less than the specified value.

Cages for raked piles must incorporate provision for inserting and removing the tremie pipe without the risk of it being snagged.

Clean the pile hole and reinforcement cage of all loose and adhering material before and after the reinforcement cage is placed.

HOLD POINT

Process Held: Placing steel reinforcement cage in pile hole.
Submission Details: Verification that the pile hole is clean, and that all loose materials have been cleaned from the reinforcement cage.
Release of Hold Point: The Nominated Authority will review the submitted documents and may carry out further surveillance and audit, prior to authorising the release of the Hold Point.
WITNESS POINT

Process to be Witnessed: Inspection of the reinforcement cage prior to placing into the pile hole.

Submission Details: Submit to the Nominated Authority a works program that allows at least 2 hours advance notice of the proposed placement of the reinforcement cage into the pile hole.

9 CONCRETE

9.1 GENERAL

At the time of concrete placement, the pile hole side walls and base must be clean and conform to the design parameters specified on the Design Documentation drawings.

Commence concreting the pile within 2 hours of the release of the Hold Point in Clause 8. At any time where the 2 hour requirement is not met, the authorised release of the Hold Point may become invalid in which case the same Hold Point will be re-imposed.

9.2 DEWATERING

Where dewatering of the pile hole is practical, place the concrete using a centrally placed rigid hopper and pipe to a depth that will ensure the concrete does not hit the reinforcing cage and segregate.

Where dewatering is not practical, place the concrete using tremie methods in a continuous process from the base to the top of the pile. Stir up any sediment in the pile hole into suspension immediately before placing the concrete.

9.3 CONCRETE SUPPLY

Unless specified otherwise in this Specification, deliver and place concrete for the piles in accordance with TfNSW D&C B80.

Provide a continuous supply of concrete so that each pile is concreted in one uninterrupted operation.

The tremie concrete mix must be self-compacting, with a nominated slump not less than 180 mm and not more than 220 mm, and in accordance with TfNSW D&C B80. The tolerance on these slumps is ± 40 mm.

Verify by calculations that the working time to completely fill the pile hole with concrete is within the mix reversion time. When calculating the mix reversion time, base it on concrete at the lower limit of the permitted slump range.

9.4 CONCRETE PLACING

Where a concrete pump is used, a flexible rubber hose may be used to transport the concrete between the pump and the hopper. The hose must be long enough with sufficient support to carry the concrete to the hopper when it is raised to the highest level at the end of concreting.
Do not discharge concrete directly from the concrete pump or its discharge hose into the pile hole; use the hopper and pipe for this purpose.

The hopper and pipe of the tremie must be clean and the joints watertight throughout. Seal the tremie pipe with a plate taped to its outlet, to prevent contamination of the first charge of concrete. Alternatively, use a suitable segregation barrier such as a vermiculite plug placed in the tremie or a greased rubber ball, immediately before concrete placement. Extend the tremie pipe to the base of the pile hole before the tremie is charged with concrete.

The concrete must be of a consistency and be placed such that pockets of air or water or ground materials are not entrapped in the concrete, and the space between the reinforcement and the sides of the pile hole are completely filled with concrete.

At the start of concreting, position the outlet of the tremie pipe at the base of the pile hole. Throughout the concreting, keep the outlet of the tremie pipe a minimum distance of two metres below the top surface of the concrete by lifting the tremie pipe as the concrete level rises until the concrete surface level is above the cut-off level.

Continue concreting until sound concrete appears a minimum of 400 mm above the required pile cut-off level, to avoid defective concrete at or below cut-off level.

9.5 CONCRETING RECORDS

During concreting, maintain a record of the depth of the tremie outlet, the level of the concrete in the pile hole, and the corresponding volume of concrete placed.

9.6 CASING EXTRACTION

Withdraw any temporary casing whilst the concrete is still fluid at close to the original slump.

Where a temporary casing is being extracted during concreting, maintain a sufficient head of concrete within it to counter external pressure from the surrounding ground material so that the concrete forming the minimum cover to the reinforcement is not contaminated in any way.

Maintain the direction of pull on the temporary casing along the axis of the pile. Withdraw the casing slowly during concreting at a rate and in a manner such that no significant disturbance is caused to the surrounding material and that the pile hole is completely filled up with concrete to the exclusion of any voids. Do not withdraw the last section of casing until the concreting operation is completed.

Vibrating casing extractors may be used subject to compliance with statutory regulations (e.g. noise and vibration control) and the deed regarding protection of persons and property.

10 CUT-OFF AND CLEAN-UP OF TOP OF PILE

Carefully remove any concrete and/or casing above the cut-off level without damaging the permanent work not earlier than 24 hours after completion of placement of concrete.

Cut back the concrete of the pile so that the top of the pile embedded in the substructure is undamaged, sound, free of laitance and any loose material and has a profile with surface roughness not less than 3 mm.

The reinforcement protruding from the pile must be kept clean and protected from rusting and damage.
11 PILE LOAD TESTING

11.1 GENERAL

Where specified on the Design Documentation drawings, carry out pile load testing to confirm pile design parameters. The required pile test load is specified on the Design Documentation drawings and is dependent on the extent of pile testing as specified on the Design Documentation drawings. Carry out the tests specified on the Design Documentation drawings on the nominated test piles.

Additional performance criteria for load testing, if required, must be as specified on the Design Documentation drawings.

Perform static or high-strain dynamic testing in accordance with AS 2159, and Clause 11.2 of this Specification where applicable.

Other types of pile load testing in accordance with AS 2159 may be used.

11.2 HIGH-STRAIN DYNAMIC TESTING

11.2.1 General

Where high-strain dynamic pile testing is to be carried out, extend the pile as required to allow the attachment of transducers or similar testing instruments.

Carry out high-strain dynamic testing in accordance with this Clause and AS 2159 using an approved organisation with approved equipment using an approved dynamic testing system, with subsequent wave equation analysis or signal matching carried out using an approved computer program, all as listed in the “Lists of TfNSW Approved Bridge Components and Systems” at: http://www.rms.nsw.gov.au/business-industry/partners-suppliers/documents/tenders-contracts/listofapprovedbridgecomponentssystems.pdf.

Testing must not result in the allowable concrete stresses being exceeded.

11.2.2 Testing Procedure

Use the following testing procedure:

(a) Attach four bolt-on transducers to the pile at a minimum of 1.5 times the maximum pile width below the head of the pile in accordance with the requirements of the system supplier.

(b) Following the connection of the transducers to the analyser, strike the pile with sufficient energy to verify the required resistance.

Record the blow counts, measured resistance and nominal and measured driving energy.

The relationship between the nominal driving energy and blow counts determined from a dynamic test is only valid for the specific combination of hammer, helmet, cushion, pile rake, pile size, pile material and founding material.

11.2.3 Dynamic Analysis

Analyse the dynamic test results for each pile tested. Analyses must include full Dynamic Analysis using measured field parameters of the test data (e.g. CAPWAP) and resistance versus blow count...
curves (e.g. GRLWEAP analysis), showing a minimum of six (6) different resistances and the corresponding blow counts.

11.2.4 **Report**

Provide to the Principal and Project Verifier two copies of a report for each pile tested including:

(a) Complete PDA (or approved equivalent) output for all blows, including driving stresses and net driving energy.

(b) CAPWAP (or approved equivalent) analyses for selected blows.

(c) GRLWEAP (or approved equivalent) output in the form of resistance versus blow count curves giving the true pile resistance for specific driving energies, using data measured during the high-strain dynamic testing.

(d) Certification that the pile has been dynamically tested in accordance with this Specification. If it is not possible for this certification to be provided due to nonconformities in the testing or the pile tested, provide instead an itemised nonconformity report together with the proposed disposition.

12 **PILE INTEGRITY TESTING**

Pile integrity testing must be capable to confirm that the pile is sound over its full length. Carry out integrity testing on all piles nominated on the Design Documentation drawings and assess pile integrity in accordance with AS 2159.
ANNEXURES B59/A TO B59/B – (NOT USED)

ANNEXURE B59/C – SCHEDULES OF HOLD POINTS, WITNESS POINTS AND IDENTIFIED RECORDS

Refer to Clause 1.2.2.

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</td>
<td>Hold</td>
<td>Certification that piling equipment and method under the proposed set up and site conditions will be used within its safe working capacities.</td>
</tr>
<tr>
<td>6.3.4</td>
<td>Hold</td>
<td>Acceptance of pile hole.</td>
</tr>
<tr>
<td>8</td>
<td>Hold</td>
<td>Placing of steel reinforcement cage in pile hole.</td>
</tr>
<tr>
<td>8</td>
<td>Witness</td>
<td>Inspection of reinforcement cage prior to and during placing into pile hole.</td>
</tr>
</tbody>
</table>

C2     SCHEDULE OF IDENTIFIED RECORDS

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

<table>
<thead>
<tr>
<th>Clause</th>
<th>Description of Identified Record</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.3.4</td>
<td>Piling records, signed by Piling Supervisor, verifying conformity of the pile hole upon completion of its excavation.</td>
</tr>
<tr>
<td>7</td>
<td>Results of pile hole examination.</td>
</tr>
<tr>
<td>9.5</td>
<td>Records of tremie outlet depth, concrete level in the pile hole and volume of concrete placed during concreting.</td>
</tr>
<tr>
<td>11.2.4</td>
<td>Pile load testing results.</td>
</tr>
<tr>
<td>12</td>
<td>Pile integrity testing results.</td>
</tr>
</tbody>
</table>
ANNEXURE B59/D – PLANNING DOCUMENTS

Refer to Clause 1.2.3.

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.

(a) Equipment and methods for installing temporary casing and excavating pile hole (refer to Clauses 3 and 6.2.1);
(b) Method for overcoming obstructions to driving of temporary casing, if applicable (refer to Clause 6.2.2);
(c) Type of drilling fluid and method of maintaining its properties, if applicable (refer to Clauses 6.2.4 to 6.2.6);
(d) Method of sealing and cleaning base and sides of pile hole (refer to Clause 6.3.3);
(e) Method of supporting reinforcement cage (refer to Clause 8);
(f) Details of mix design for tremie concrete (refer to Clause 9.3);
(g) Method of placing concrete including method of inserting and withdrawing tremie pipe (refer to Clause 9.4);
(h) Method of extracting temporary casing (refer to Clause 9.6).

ANNEXURES B59/E TO B59/K – (NOT USED)

ANNEXURE B59/L – FREQUENCY OF TESTING

Refer to Clause 1.2.4.

<table>
<thead>
<tr>
<th>Clause</th>
<th>Characteristic Analysed</th>
<th>Test Method</th>
<th>Minimum Frequency of Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2</td>
<td>Concrete for piles</td>
<td>As detailed in TfNSW D&amp;C B80</td>
<td>As detailed in TfNSW D&amp;C B80</td>
</tr>
<tr>
<td>11</td>
<td>Pile Load Testing</td>
<td>Clause 11</td>
<td>Nominated Piles as shown on the Design Documentation drawings</td>
</tr>
<tr>
<td>12</td>
<td>Integrity Testing</td>
<td>Clause 12</td>
<td>Nominated Piles as shown on the Design Documentation drawings</td>
</tr>
</tbody>
</table>
ANNEXURE B59/M – REFERENCED DOCUMENTS

Refer to Clause 1.2.5.

TfNSW Specifications

TfNSW D&C G22   Work Health and Safety (Construction Work)
TfNSW D&C G36   Environmental Protection
TfNSW D&C Q6    Quality Management System (Type 6)
TfNSW D&C B80   Concrete Work For Bridges
TfNSW D&C 3211  Cements, Binders and Fillers

TfNSW Test Methods

TfNSW T375      Sampling and Testing of Grout

Australian Standards

AS 1726         Geotechnical site investigations
AS 2159         Piling – Design and installation
AS 5100         Bridge design
AS 5100.3       Part 3: Foundations and soil-supporting structures