

SPECIFICATION FOR GENERAL PILING

1.0 GENERAL

This specification concerns permanent works and is to be read in conjunction with the conditions of contract, drawings, the General Specification, the particular Specification for Precast Pretensioned Spun Pile, Specification for Concrete and Reinforcing Steel for Piling Work, Specification for Pile Testing and Specification for Excavation.

Where works are ordered to be performed by the Contractor, but are not specified in this specification. The Contractor must carry them out with full diligence and expedience as are expected for works of this nature.

This specification shall be used for general piling works only. Clauses relevant to other pile types are for information only. The Contractor may use this specification as a reference to develop his piling specification for the alternative pile system he proposed.

2.0 SCOPE OF WORKS

The contract comprises the provision of labour, materials, tools, transportation, instrumentation and all things necessary to construct the permanent works in accordance with the contract drawings and to the quality standards set in the contract specifications, inclusive of material and performance tests where these are specified.

Pile Foundation

- (i) Supply and install pile foundation to carry the working loads as specified in the contract drawings.
- (ii) Strip pile to cut-off level and check pile eccentricity at cut-off level
- (iii) Construct pilecaps and ground beams to the underside of slabs in contact to the ground.
- (iv) Failure load test of preliminary test piles and working load test of works piles as specified.
- (v) Integrity tests and High Strain Dynamic Load Test on preliminary test piles and works piles.

2.1 Provisional Number Of Piles

The provisional number of piles are shown in the tender drawings. The actual number to be installed may vary for this contract. The Contractor shall allow in his tender for variation in the total number of piles to be installed up to 10% of the provisional number specified at tender stage.

2.2 Other

Provide temporary drains, sumps and all other measures necessary to keep the Site dry.

Any other incidental works, whether of a temporary or permanent nature, for the satisfactory completion of the contract.

3.0 CONTRACTOR TO ACQUAINT HIMSELF WITH THE SITE OF WORK

Prior to the submission of the tender the Contractor is deemed to have visited the Site to

acquaint himself with the existing site conditions, means of access, nature and proximity of adjacent properties and other matters liable to affect the overall contract price. The award of the contract shall be based on the understanding that the Contractor is completely familiar with the climatic and physical conditions prevailing on Site. No extra payment will be considered at a later date due to the Contractor's failure to allow for contingencies arising from the work and the nature of existing site conditions.

The Contractor shall ensure that his system and method of pile installation is suitable and safe for use at the proposed site of work, taking into account the nature and proximity of adjacent properties and their facilities. The Contractor shall indemnify the Employer against any expense, liability, loss, claim or proceedings which the Employer may incur or sustain by reason of damage to any property real or personal other than works, injury or accident to workmen or public caused by collapse, subsidence, vibration, weakening or removal of support or lowering of ground water, arising out of or in the course of or by reason of the execution of the works.

4.0 SUBSOIL DATA

A soil investigation factual report is available at the Engineer's office for the Contractors/tenderers information. The factual report is intended solely as a preliminary and approximate guide to the nature of ground stratification as it is known to the Engineer. Neither the completeness nor the accuracy of the information provided is guaranteed. No responsibility is assumed by the Employer or the Engineer for any opinion or conclusion given in the soil report.

The reports limit itself to and identify subsurface conditions only at selected points where soil samples were taken, when they were taken. The actual conditions in areas not sampled may differ from the reported findings.

The soil reports are based on conditions which existed at the time of subsurface exploration. Continuing adequacy of the report may be affected by time, construction operations at or adjacent to the Site and by natural events such as floods and groundwater fluctuations.

The Contractor shall study the given soil report in detail and shall be obliged to place his own interpretation on the information provided, and to make due allowance for the effects of site conditions on his construction operations. No claims shall be entertained or accepted on grounds that the information provided is incomplete or incorrect.

If the Contractor is of the opinion that additional geotechnical data is necessary for the successful installation of the foundation system, he shall include in the submission of the tender his proposed program of soil investigation, supported by full technical justification, for review and agreement by the Employer and the Engineer. The Contractor's proposal shall include among other things the time frame for the work, numbers and locations of boreholes, and numbers and types of tests.

If the Contractor's proposal is found to be in accordance with accepted principles of good foundation engineering and technically justifiable without duplicating the data contained in the soil investigation report, this work shall be included in the contract for execution within the contract period.

5.0 UNEXPECTED GROUND CONDITIONS

The Contractor shall report immediately to the Engineer any circumstances which, in the Contractor's opinion, indicate ground conditions that may differ from those expected by him from his interpretation of the soil investigation report. The Contractor's report shall be in the form of a written notice of Adverse Physical Conditions and Artificial Obstructions which shall be given to the Engineer at the earliest possible time after encountering such conditions and obstructions. The report shall be accompanied by all information available to the Contractor

which will materially assist the Engineer in verifying the conditions reported, and in determining the cause and reasonableness of any claim relating thereto in accordance with the conditions of contract.

It shall be the responsibility of the Contractor to maintain a daily record of his material, plant and labour expenditure from the time unexpected ground conditions were first encountered and investigative work undertaken to identify them, until such time when the problem is resolved to the Engineer's satisfaction and construction of the affected portion of the permanent works resumed. It is held that the Contractor shall bear the costs of wastages which shall be reported in the daily record. This record of expenditure shall be verified and endorsed each day by the Engineer's representative only in his capacity as a witness to the proceedings at the material time, and such endorsement shall not in any way be construed to represent the Engineer's agreement to the Contractor's claim.

In the opinion of the Engineer, if unexpected ground conditions require the permanent substructure works to be constructed to a modified design, the Engineer shall issue instruction for a variation to the permanent works in the contract.

Generally, it is foreseeable that the Engineer will require the Contractor to modify either his temporary works or his method and sequence of construction to suit unexpected ground conditions, regardless whether such ground conditions require a modification of the permanent works design, in order for the permanent works to be constructed safely and to the required specifications.

6.0 SYSTEMS AND NATURE OF NEIGHBOURING BUILDINGS

The Contractor shall pay very careful attention to construction constraints imposed by neighbouring buildings. The Contractor shall exercise extra care and implement adequate monitoring measures when carrying out his piling operations so as not to disturb or damage existing adjacent properties and building foundations. The Contractor shall include in the submission of the tender his proposal for monitoring adjacent properties for any detrimental effects arising out of his execution of the piling works, so that appropriate and timely preventive action can be taken to minimise damage. The Contractor's monitoring program, when deemed adequate by the Engineer, shall be included in the contract.

The Contractor shall include in the contract the cost for carrying out a condition survey of adjacent properties to establish the condition of the existing buildings and facilities prior to commencement of piling work. Condition surveys shall be conducted by a registered building surveyor. The results of the survey shall be lodged with the Architect for record.

The Contractor shall be responsible for and shall bear the cost of any claims for damage to adjacent buildings and facilities arising from his execution of the piling works.

7.0 SITE ACCESS

The Contractor shall be responsible for obtaining all necessary approvals from the authorities concerned for the use of the temporary access. He shall comply strictly and diligently with all conditions attached to these approvals. He shall maintain the access as well as the portion of public road and walkway connected with it in a clean and safe state at all times. He shall provide at all times adequate security arrangements in the vicinity of access points into the Site.

8.0 SYSTEM OF PILES FOUNDATION

Pile installation system shall be approved by local authority. The use of dolly in connection with driven pile systems is strictly prohibited under this contract. All materials shall be new and of the best quality. By "best" it shall be understood that no other superior class of

specified materials and workmanship is available in Malaysia when such are to be produced on the demand of the Engineer.

Materials, workmanship and conditions for the manufacture and installation of piled foundations shall be strictly in accordance with the relevant clauses of the contract specification and the latest British Standard Code of Practice for Foundations BS 8004:1986. In matters not specifically covered by this specification the Contractor shall comply with BS 8004. Where discrepancies arise between this specification and BS8004, the provisions of this specification shall take precedence. The Contractor shall allow in the unit rate for piles the cost of material quality tests on concrete and reinforcement, which shall be conducted by him in the manner and at such frequency as required under the General Concrete Specification.

Details of the pilecaps layout are given in the contract drawings. The Contractor shall be responsible for determining the lengths of piles supported by detailed calculations in accordance with the following:

- a. The results of the failure load tests, which shall form the basis for assessing the depth of penetration required to achieve the pile working capacity with a minimum factor of safety of 2.0 for compression piles.
- b. The bearing in underlying rock formation will only be allowed when proven by the Contractor to the satisfaction of the Engineer. Proof shall comprise drilling, sampling and testing of material obtained from the pile toe and 5 metres or 5 times the pile diameter, whichever the greater, below the pile toe.
- c. Piles shall not be installed unnecessarily beyond the depths required for them to develop the required load carrying capacity. No payment shall be made for extra installation length which the Contractor cannot technically justify.
- d. All other relevant requirements of the contract.

9.0 ALTERNATIVE DESIGN BY CONTRACTOR

The Contractor may propose a suitable alternative piling system subject to the condition that the assessment of adequacy of any system and its approval shall be at the discretion of the Engineer and the Local Authority. The Contractor shall not be entitled to extra cost or time in the contract should his proposed alternative system be disapproved.

Where a loading plan is made available to the Contractor, the column loads shown therein refer to unfactored total compression loads, lateral loads and bending moments to be transferred to supporting piles, excluding the self-weight of pilecap. The Contractor shall be required to fully account for the additional load contribution from pilecap in his design. Where indicated, net tension loads shall refer to loads transmitted to tension piles after making approximate reductions to account for the beneficial affect of self-weight of pilecaps, ground beams and slabs.

The Contractor is required to submit his proposed alternative design for the Engineer's review. The Contractor's submission shall be endorsed by his Professional Engineer and include the following information:

- a. Calculations demonstrating the single pile and group working capacities and pile lengths of the pile system proposed stating clearly the underlying assumptions adopted.
- b. Specifications for the proposed system, including type of piling equipment, maximum length of piles that can be satisfactorily installed and average output in linear metres of installed pile per piling frame per normal working day of 8 working hours per day.
- c. Pile layout and arrangements.
- d. Method of construction, including method of jointing.

- e. Design, drawing and quantities of pilecaps.
- f. Guarantee of pile capacity for all piles installed, regardless whether or not the capacity of a pile is proven by test.
- g. Any other information required by the Engineer in his review of the alternative system.

The system or systems put forward by the Contractor shall have good records of successful installation and performance in at least 5 local projects of comparable project size and ground conditions.

The Contractor's design calculation and specification shall comply fully with the relevant recommendations of the British Standard BS 8004, the requirements of the Engineer's specification and the conditions of contract, unless he has reason acceptable to the Engineer for departing therefrom. In matters not specifically covered by the British Standard BS 8004 and the Engineer's specification, the Contractor's proposal shall also be subject to the Engineer's approval. It shall be the Contractor's responsibility to clearly itemise any departure from British Standard BS 8004 and the piling specification provided.

Prior to the acceptance of the alternative pile design and the installation of any working piles, the Contractor shall be required to carry out failure load tests to confirm his design. Based on the results of the tests, the Contractor shall be required to modify his design of piles where necessary to the satisfaction of the Engineer at no extra cost.

10.0 PILES GROUP

Spacing of piles shall be not less than 2.5 times the diameter of the pile. The Contractor shall consider the effect of size of the group when determining the number of piles for the given column loads. He shall submit his calculation showing the group capacity of the pile group for the approval of the Engineer. If the group capacity is found to be less than the required capacity, the Contractor shall provide at his own cost additional piles as approved by the Engineer to compensate the deficiency.

11.0 UNDERGROUND SERVICES

Prior to commencement of work, the Contractor shall establish the locations and levels of all existing underground services within and surrounding the Site likely to be affected by his piling operations. Drawings of buried sewer lines, electricity and telephone cables, and water mains as they are known to the Engineer are available from the Consultants for the Contractor's review. These drawings are indicative only and are intended as an approximate guide for the Contractor's own verification on Site. The accuracy and completeness of the information shown in these drawings are neither guaranteed nor implied. It is deemed that the Contractor shall be responsible for taking all reasonable and necessary steps to confirm and supplement the information provided to make them complete and accurate. No subsequent claim from the Contractor on the basis of incomplete or inaccurate information shall be accepted.

The Contractor shall exercise reasonable skill and care during piling operations to minimize disturbance of existing underground services. The Contractor shall be responsible for and shall bear the cost of any claims for damages to underground services arising from his piling works.

12.0 EQUIPMENT AND LABOUR

The Contractor shall provide all frames, equipment, lifting devices and labour necessary for the installation of piles.

The Contractor shall satisfy the Engineer regarding the suitability, efficiency and operational capability of his piling equipment. The Contractor shall be required to provide adequate

numbers of operational piling frames to ensure that the works are completed within the time period stipulated in the approved construction programme. The Contractor is deemed to have made provision for the availability of standby plant at all times to allow for the contingency of equipment failure. Equipment found to have a consistent record of breakdowns shall be removed from the Site.

The Engineer shall order the removal or replacement of any equipment or staff whenever he is of the opinion that such equipment or staffs is not suitable for the works. The Contractor shall comply with the Engineer's instructions on these matters without extra cost or time to the contract.

13.0 PROGRAMME OF WORKS

The Contractor shall adhere to the time frame requirements set by his Construction Programme for timely completion of the project. Such requirements shall include, among other things, submission of all his construction schedules, method statements, construction records and any other relevant information necessary for monitoring, inspection and proper execution of the works.

14.0 METHOD STATEMENTS FOR CONSTRUCTION OPERATIONS

Upon award of contract, the Contractor shall submit to the Engineer a detailed method statement for the installation of piles. For the purpose of this clause, a method statement shall be a document containing:

- A detailed construction sequence.
- Shopdrawings showing, among other things, details of all special requirements for the construction activities such as hoisting of reinforcement cages, cast in fixings, etc.
- Design calculations of temporary works.
- Material, plant and labour requirements at each construction stage.
- Rate of production output based on resources allocated, such as the average output in linear meters of installed piles per piling frame per normal working day of 8 working hours per day.
- Other information relevant to the construction activities.

Engineer shall during the execution of the works require the Contractor to submit detailed method statements of other construction operations not mentioned in the Construction Programme but are subsequently required for the proper and safe construction of the works. If requested by the Engineer, the Contractor shall submit, within such times and in such detail as the Engineer may reasonably require, such information pertaining to the methods of construction (including temporary works and the use of construction plant) which the Contractor proposes to use, and such calculations of the stresses, strains and deflections that will arise in the permanent works or any part thereof during construction from the use of such methods, as will enable the Engineer to decide whether the permanent works can be executed safely and in accordance with the contract if the methods are adhered to, and without detriment to the permanent works when completed.

The Engineer shall inform the Contractor in writing within 14 days after receipt of the Contractor's method statement either:

- a) that the Contractor's proposed methods have the consent of the Engineer; or
- b) in what respects, in the opinion of the Engineer, the said methods fail to meet the requirements of the contract or will be detrimental to the permanent works.

In the latter event, the Contractor shall take such steps or make such changes in the said methods as may be necessary to meet the Engineer's requirements and to obtain his consent. While the Engineer will attempt to respond to such amendments or corrections speedily, the Contractor shall in no case assume that it can be undertaken in less than ten

(10) working days.

The Contractor shall not change the methods which have received the Engineer's consent without the further consent in writing of the Engineer, which shall not be unreasonably withheld. Works shall commence at such times when and not before the Engineer has given his consent to the method of construction.

The Contractor is deemed to have allowed for the method of construction in his contract price. The Contractor shall not be entitled for extra time and/or cost for his compliance with the Engineer's instructions on the adequacy and safety of his method statements.

Consent by the Engineer of the Contractor's proposed methods of construction in accordance with this clause, shall not in any way relieve the Contractor of any of his duties or responsibilities under the contract.

15.0 ENGINEER'S INSPECTION PROGRAM

The Contractor shall integrate the Engineer's inspection program into his proposed method of construction. The inspection program shall generally conform to the requirements of this specification and the conditions of contract.

In the course of the Engineer's review of the Contractor's method of construction and prior to commencement of work, the Contractor shall receive and incorporate into his method statement the Engineer's requirements on frequency, type, sequence and procedure of inspections and quality control checks at each stage of construction.

The Contractor shall adhere strictly to the Engineer's inspection requirements and shall not deviate from the approved inspection program without the prior consent of the Engineer. The Engineer may, at his own discretion, make periodic improvements of the inspection program.

15.1 Adequate Notice of Supervision

The Contractor shall inform the Engineer each day of his programme of piling planned for the following day. The Contractor shall give adequate notice of his intention to work outside normal hours and at weekends. For the purpose of this clause, advance notice given 1 working day ahead for weekday overtime and 2 working days ahead for weekends shall be considered adequate notice.

16.0 SETTING OUT

The Contractor shall provide all labour, pegs, rods, survey instruments, concrete posts etc needed for setting out the works. The Contractor is to ensure that boundary marks defining the limits of the Employer's property are in their correct positions and shall employ a licensed surveyor to check the accuracy of these positions. The Contractor shall be responsible for setting out the works from the drawings and boundary marks. The Contractor shall be responsible for safeguarding the position and level of all reference pegs, boundary and benchmarks used for setting out the works.

The Contractor shall obtain the Engineer's prior agreement on the locations and numbers of reference baselines and datum levels required for setting out of piles. The Contractor shall engage a licensed surveyor to set out on site the positions and levels of each pile.

The Contractor shall obtain the Engineer's prior agreement on the locations and numbers of boundary marks. The system of boundary marks shall be employed for cross-checking in conjunction with the method of setting out from reference baselines for each and every perimeter pile and pilecap to ensure these works are confined within the limits of the Employer's property. Boundary pegs shall be maintained in good condition at all times. While

such pegs may be removed temporarily at localised zones to facilitate construction, the Contractor shall re-install them at the earliest possible time. Boundary pegs shall not be removed without prior consultation with the Engineer.

Checking by the Engineer does not in any way absolve or reduce the Contractor's responsibility to ensure the accuracy of the setting out.

17.0 EMPHASIS ON DIMENSIONAL ACCURACY

The Contractor shall note that dimensional accuracy in construction is an important requirement of this contract. Since dimensional accuracy during construction and problems arising from the lack of it are entirely the Contractor's responsibility, due care shall be taken by the Contractor in his planning and execution of the Works.

18.0 PILE POSITION TOLERANCE

Ground level refers to the level at which the piling rig is stationed for installation of pile. The tolerance limits specified under this clause shall be taken to apply to pile eccentricities measured at pile head cut-off level. However, an additional tolerance of pile head cut-off below ground level may be allowed by taking into account the permissible deviation in pile verticality between ground and cut-off levels, subject to agreement by the Engineer.

Where piles are not arranged along a single line, the maximum permissible deviation of the centre of each finished pile in a group of 3 or more piles shall be 75 mm in any direction from the true position of the same pile, provided also that the centre of the finished pile group shall not deviate laterally from the true centre of the same group by more than 40 mm.

The maximum permissible deviation of the centre of each finished pile in 1- pile or 2-pile groups and single line pile groups of 3 or more piles shall not exceed 25 mm laterally from the true position of the same pile.

The verticality of each pile shall not deviate at any point below the ground by more than 1 in 75 from the true vertical position.

The Contractor shall employ a licensed surveyor who shall follow up directly from the stripping of pile to cut-off level to check the eccentricity of pile positions as compared with the positions indicated on the pile layout drawings. If any pile has been installed in a position or verticality not within the specified tolerance, all expenditure to remedy the work shall be borne by the Contractor. The Engineer's decision in this regard shall be final.

19.0 FORCIBLE CORRECTIONS

Forcible corrections to the as-installed positions of work piles shall not be permitted in this contract.

20.0 ADJACENT PILES

Piles shall be installed in such a manner as to ensure that no damage is sustained by previously installed piles in adjacent positions.

21.0 FAULTY PILES

Any piles cracked, deformed or twisted during installation or testing or otherwise damaged in any way, or not installed within the specified position or verticality tolerance, or failed the specified load tests shall be classified as faulty piles.

Faulty piles shall be rejected at the discretion of the Engineer and replaced or supplemented with substitute piles by the Contractor at his own expense. At the sole discretion of the Engineer, the pilecaps and any required compensating pile shall be constructed to a modified design proposed by the Contractor to account for the variation in pile position or alignment. The cost and time of replacement, including all direct and consequential costs in modifications required, shall be borne by the Contractor.

Generally, where substitute or compensating piles are installed within a particular pile group to make good a faulty pile, the Contractor shall be entitled to payment, where application in the contract, on the basis of a hypothetical working pile of the same size as the faulty pile and with a pay lengths equivalent to the average of the pay lengths of the adjacent working piles in the same pile group. Substitute or compensating piles shall not be paid. In the specific case of pile groups with single piles, and if such piles are judged faulty, the hypothetical pay length shall be based on the average of the pay lengths of surrounding piles of the same size as the faulty pile. Computations of hypothetical pay lengths shall be subject to the agreement of the Engineer, whose decision in this regard shall be final.

22.0 STRIPPING OR CUTTING OF PILES TO CUT-OFF LEVELS

Stripping of concrete spun piles to cut-off level specified in the drawings shall be carried out by the Contractor. Unless otherwise directed, cut-off level shall be 75 mm above the underside of pilecap and all cut-off piles shall be disposed as waste material.

Starter bars are sometimes provided as per Drawings for hollow section precast pretensioned spun piles. The contractor shall cut the pile head with mechanical cutter to form flush cut surface and construct the starter bars bonded to the annulus of the hollow section precast spun pile as per Drawings. In the Engineer's opinion, if the pile is defective, the Contractor shall carry out his own expenses on all necessary remedial work as required by the Engineer.

23.0 CLEANING UP

The Contractor shall propose to the Engineer the frequency of his periodic removal of debris from the Site in the course of the work. The Contractor shall adhere strictly to the agreed program of debris removal and the Engineer reserve the right to instruct the Contractor to increase his frequency of debris removal at no extra cost to the contract.

Upon completion of the work, all unnecessary plant, cut-off piles, rubbish and debris resulting from the piling operations shall be removed from the Site within a reasonable time agreed with the Engineer. Reasonable time is deemed to be the minimum time which the Contractor can justify to demobilize his plant and arrange the transportation of plant and waste materials off-site, provided always that ensuing construction operations are not hampered as a result of this arrangement.

24.0 PILE LENGTH

Where applicable in the contract, the Contractor shall be paid only for the length of installed pile measured from toe of the pile to the pile head cut-off level. The contractor shall make provision in his unit rate for condition of piling commencement level other than the cut-off level.

25.0 MARKING OF PILES

Piles shall be indelibly marked following installation to show their identification number, length and date of installation.

26.0 AS-BUILT DRAWINGS

After the completion of the piling, the Contractor shall submit an as-built drawing of the pile layout. This drawing shall be prepared by a licensed surveyor. It should include the following:

- a) Location marking of piles.
- b) Size and type of piles.
- c) Eccentricities of piles in both directions.
- d) Depth of penetration of each pile or reduced level of toe of each pile and cut-off level of each pile.

27.0 PILING RECORDS

Complete piling records shall be kept by the Contractor during pile installation. The Contractor shall submit in duplicate (hard & softcopy) the following information to the Engineer :

- a) Signed records of all piles as the work proceeds. Individual pile records shall be submitted not later than noon of the next working day after the pile was installed. The signed records shall form a record of the work. Any unexpected installation conditions shall be noted in the record.
- b) Upon completion, compile a record of the work as carried out and as-built drawings. The drawings shall be prepared and endorsed by a licensed surveyor.

The format of the record shall be approved by the Engineer and shall contain but not be limited to the following information where applicable:

- Pile Location Mark	(All Pile)
- Pile Type (Compression or Tension)	(All Pile)
- Pile Size	(All Pile)
- Date and Time of Installation	(All Pile)
- Date of Concreting	(Bored Pile)
- Concrete Mix	(Bored Pile)
- Method of Concreting	(Bored Pile)
- Standing Ground water Level	(Bored Pile)
- Pile Reference	(Driven Pile)
- Driving Record (penetration & blow count)	(Driven Pile)
- Set Value	(Driven Pile)
- Combination of Pile Lengths	(Driven Pile)
- Weather Condition	(All Pile)
- Ground Level Before Commencement of Pile Installation	(All Pile)
- Working Level of Ground for Pile Installation	(All Pile)
- Depth from Working Level to Pile Toe	(All Pile)
- Level of Pile Toe	(All Pile)
- Pile Cut-off Level	(All Pile)
- Depth from Cut-off Level to Pile Toe (Pay Length)	(All Pile)
- Length of Temporary Casing	(Bored Pile)
- Length of Permanent Casing	(Bored Pile)
- Details of Soil Strata Penetrated	(Bored Pile)
- Soil Samples taken and Insitu Tests carried out	(Bored Pile)
- Length and Details of Reinforcement	(Bored pile)
- Estimated Volume of Concrete required to form the pile shaft	(Bored Pile)
- Actual Volume of Concrete used in forming the pile shaft	(Bored Pile)
- Type and Model of Plant, Equipment	(All Pile)

All records shall bear the names of person who records and person who checks.

28.0 WASTAGES

It is held that the Contractor is responsible for and shall bear the cost of all wastages in material, labour and plant arising from his execution of the works.

29.0 PROGRAMME OF WORKS

Prior to the submission of the tender, the Contractor shall submit his preliminary programme and progress chart showing how he intends to organise and carry out the works and complete it within the stipulated period. The Contractor shall discuss his preliminary programme with the Engineer and based on the Engineer's comments, make the necessary amendments to the programme for submission with his tender. The agreed programme in this preliminary format is not intended for construction monitoring or for assessing the progress of works, but will form the basis for the Contractor to prepare his Construction programme after the award of contract.

The Contractor shall submit within 7 calendar days after the award of contract for the Engineer's agreement a detailed construction programme in the form of an Operational Network and Analysis. When agreed, the first submission of the Operational Network and Analysis printout prepared by the Contractor shall be considered the Construction Programme and used by the Contractor for his detailed control of the works and for monitoring construction progress.

In planning the operational network, the Contractor shall ensure that the total resources (material, plant and labour) required for the execution of the work according to his programme are at all times within his capability to provide. He shall ensure that the requirements of all other parties associated with him in the execution of the work as to the sequence and estimated times for their operations are fully taken into account.

The Operational Network and Analysis shall be updated every 14 calendar days during the execution of the contract. If the critical path has changed, or if it had been necessary, to alter the logic of the network or should the Engineer consider that the network or analysis is unsatisfactory and shall be mended, then a revised Operational Network and Analysis shall be prepared and submitted for the approval of the Engineer within 7 calendar days.

The Contractor shall report on the progress achieved and future planned progress at the end of every 14 calendar days. Five copies of the Report shall be provided.

If the Contractor fails to meet the starting and completion dates of any critical activity, he shall take such action as is necessary to improve progress and complete the works by the due dates. The Engineer may require him to submit, for approval, such revised network and analysis to demonstrate the manner in which improved progress and completion of the works by the due dates will be achieved without additional cost.

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