

WORKMANSHIP AND MATERIALS EXCAVATION AND EARTHWORK

ITEM

- A The measurements of all excavations and subsequent disposal are those before excavating and the contractor must allow for slips; slopes, increase in bulk and any additional excavation required for planking and strutting.**
- B The prices for excavations are to include for getting out and clearing away any tree roots and breaking up and filling in all old walls, cesspools, voids; etc., found during the process of excavation and removing all contaminated earth and filling with hard dry materials and well consolidated.
- C The prices for "getting out" excavated materials by any means necessary, depositing adjacent to the excavations or in temporary spoil heaps as is most convenient shall be obtained, to be included with the prices of excavation.
- D The contractor shall notify the Company's Representative when the excavations are ready to receive concrete and no concrete shall be laid until the Company's Representative has signified his approval that a proper foundation has been obtained. Any concrete or other workput in before the Company's Representative has approved the excavation shall be removed by contractor at his own expense.
- E Should the contractor excavate below the proper level in good ground he shall fill up the part so excavated with concrete 1:4:8 mix at his own expense.
- F Any loose, soft or bad ground met with shall be excavated to a solid foundation and filled in to the proper level with either concrete or hardcore alternatively bridged with reinforced concrete at the discretion of and as directed by the Company's Representative. Such work shall be treated as a variation and be measured and priced according to the prices in the bills of quantities and in accordance with the terms and condition of the contract.
- G Sand and earth filling where required shall be placed in layers as described and well tampered or rammed. No filling shall be done until the concrete foundations have been inspected and approved.
- H Generally clear the site of rubbish, grub up bushes, shrubs, vegetation, etc. clear and leave ready for excavation.
- I The contractor shall not remove any excavated material from the site unless directed in writing by the Company's Representative.

**WORKMANSHIP AND MATERIALS
CONCRETE WORK**

ITEM

- A The cement shall be Portland cement complying in all respects with B.S.S. 12. It shall be delivered in the original sealed sacks of the manufacturer and be stored 9 inches off the ground in a proper manner to avoid deterioration, and arranged in such a manner that consignments can be used in the order in which they are received. No cement which has deteriorated in any way shall be used, and must be removed immediately from the works by the contractor.

- B The sand or fine aggregate shall be clean river, or pit sand, washed if required, and shall be capable of passing through a mesh 3/16" square measured in the clear, and it shall be well graded within these limits.

- C The coarse aggregate shall be clean crushed stone and well graded of the sizes specified, and if not quite clean shall be washed. For "ordinary concrete" the nominal size of aggregate shall be 3/4" graded down to 3/16" and for "fine concrete" the nominal size shall be 1/2" graded down to 3/16". The grading between the stated limits shall be such as to produce a dense concrete of the specified proportions, and of a consistency that will work readily into positions without segregation and without the use of an excessive water content.

- D The mixing water shall be clean and free from alkali, acids, vegetable matter and other substances likely to affect adversely the concrete.

TABLE OF MIXES

nominal mix by volume	aggr.	cement per 94lb sack	sand cwt	coarse aggr. cwt	crushing strength lb/sq. in.
1:3:6	1/2" aggr.	4.9	17.8	29.6	2000
1:2:4	3/4" aggr.	7.1	17.5	28.1	3000
1:1 1/2:3	3/4" aggr.	8.9	15.7	26.2	3750

- E Test cubes shall be taken by the contractor and submitted for testing before the commencement of concreting work. Test will also be taken at intervals during the progress of the work. Slump tests shall be carried out to check the consistency of batches of concrete and to ensure that excessive water is not being used. The following is a statement of acceptable slumps of concrete.

WORKABILITY	SLUMP-inches	USES OF CONCRETE
Low	1 to 2	Mass concrete foundations, lightly reinforced sections
Medium	2 to 4	Normal reinf. concrete which can be hand compacted

**WORKMANSHIP AND MATERIALS
CONCRETE WORK**

ITEM

- A Materials shall be measured in suitable gauge boxes. The proportions referred to are for dry aggregate and due allowances shall be made for the moisture content, to the satisfaction of the Company's Representative. The amount of mixing water shall be only sufficient to give a good workable mix. The mixing unless otherwise approved, shall be carried out in an approved mechanical batch mixer. Mixing shall continue until therein a uniform distribution of materials and the mass is uniform in color and consistency.
- B All concrete shall be transported and placed as rapidly as possible after mixing and in all cases within 20 minutes and thoroughly compacted and left without voids. Concrete shall not be delivered or dropped from a height greater than six feet.
- C All construction joints in slabs and beams shall be formed by inserting temporary vertical stopping off boards against which concrete can be properly consolidated. The positions at which such joints may be made will be indicated by the Company's Representative. The face of the concrete forming the side of the joint shall be suitably hacked with (with flagging hammer) & cement grouted to form key for bonding to the subsequent concrete. All previous work to be connected to new concrete must be properly cleaned and roughened. In the case of vertical joints the face of the concreting is recommenced. In the case of horizontal joints a layer of 2 to 1 cement mortar 1/2" thick shall be deposited immediately before concreting is recommenced and the new concrete thoroughly hacked. The contractor shall include in his prices for forming all construction joints as described above.
- D All formwork is to be constructed in a solid and substantial manner and of sufficient strength to withstand the hacking of the concrete and to support the dead load without deflection and formed with close jointed and thickness timber to produce a true and even surface in the finished work. It shall be so constructed that it may be removed without shock or vibration to the concrete. All joints of the formwork; shall be sufficiently close to prevent loss of liquid from the concrete.
- E The surfaces of all formwork and the interior of all molds and boxes shall be hosed down with clean water immediately prior to casting. All formwork shall be thoroughly cleaned before re-use.

**WORKMANSHIP AND MATERIALS
CONCRETE WORK**

ITEM

A The dimension and locations of any openings, holes or other voids formed in the concrete and the design and disposition of lugs, clips, bolts and other fixings embedded in concrete are to be approved by the Company's Representative to ensure that the strength of the concrete is not impaired thereby.

B Prices for formwork are to include for splayed edges, notching, allowances for overlaps, and passing at angles, battens, strutting, bolting, wedging, casting, striking and removing.

C Formwork shall not be struck at less than the following periods of time after completion of casting, unless authorised by the Company's Representative.

Columns (influence) and sides of beams and walls	-	3 days
Soffits of slabs and beams	-	14 days
Soffit of cantilevers	-	28 days

The responsibility for the removal of the whole or part of the formwork shall rest entirely with the Contractor.

D All steel reinforcing rods and mesh reinforcing shall comply with B.S.S. 785 and 1221 A respectively. Reinforcement bars, which are to be used in main structural elements, are to be straight and free from winding. Bars, wire or any other reinforcement in all works must be free from surface defects such as pitting due to corrosion, loose rust, scale, paint, oil, acid or loam. Vigorous wiring brushing must be used to remove any impurities on the bars. Any material, which falls off into the shuttering, must be removed prior to casting.

E Bars must be accurately placed into the specified position and be maintained this way. When a delay occurs between the time of placing and the concrete works, the bars must be inspected by the Company's Representative before casting. Rods shall be secured of laps and intersections with 16G (1/16") malleable iron wire and lapped 40 diameters unless otherwise detailed in the drawing.

All bending bars shall be carried out in accordance with B.S.S. 1478. Mesh shall be laid with 6" laps unless otherwise stated. No welding or bars is permitted.

WORKMANSHIP AND MATERIALS CONCRETE WORK

ITEM

- A Protection of the reinforcement is important for the durability of any structure. This is ensured by providing adequate cover to the reinforcement. Cover blocks are normally used between the reinforcement and the shuttering to maintain and secure the required cover for the reinforcement. All distribution steel, ties, links or stumps shall be taut so that the main bars are properly braced and they shall be in actual contact with the bars around or to which they are fixed. Blocks made of concrete or mortar are preferable since these can be made on the site in conformation with the design. These blocks may be left permanently in position unlike timber or metal pieces, which must be removed prior to placement of concrete.

The use of aggregates or pieces of discarded materials are not recommended since a uniform cover cannot be guaranteed and there is the risk of the stone being displaced during concrete works.

- B Prices for reinforcement are to include for cutting, bending, tying with wire and fixing and securing in position.
- C The rates for precast concrete shall include all formwork and molds and fixing of reinforcement and stripping of formwork and demoulding and hoisting and fixing in position.
- D Lintels described as precast work may be cast in-situ if preferred, but no additional cost will be allowed if so executed.
- E Where concrete is described as trowelled smooth the contractor shall allow in his rate such labor and any additional materials necessary to produce a smooth surface resembling wood floated rendering.
- F The items referring to mortises for and grouping in ragbolts etc. do not include the supply of the bolts, which are measured separately.
- G Damp-proof course shall be 500 gauge polythene damp proof membrane laid and taped with minimum twelve inches side and end laps without being punctured either by rough projections in the base or by foot traffic.

**WORKMANSHIP AND MATERIALS
BLOCKWORK**

ITEM

- A The concrete blocks shall be of approved manufacture and shall be of the full nominal thickness of the wall. The blocks shall be 16" x 8" nominal or actual size in length and depth. The blocks shall be manufactured by machine and shall be cured for at least 21 days before use. The mix of the block making materials shall not be weaker than 1:6 cement/sand.
- B The volume of concrete in any block shall be not less than half the gross volume of the block and the total width of the cavities shall not be more than two-thirds of the overall thickness of the block at any point. The compressing strength must be not less than 350lbs. per square inch of the total cross sectional area including the cavity.
- C The contractor shall notify the Company's Representative in writing of the name of the manufacture of the block, which he proposes to use, and shall submit samples for approval.
- D The mortar for block work shall be composed of one part of cement to six parts of clean, sharp sand with an approved mortar plasticizer added strictly in accordance with the manufacturer's instruction. No mortar, which has commenced to set, shall be retempered nor shall any mortar be used later than thirty minutes after initial mixing.
- E All blocks shall be thoroughly wetted with water before placing. All joints be 3/8" thick and shall be struck flush and when necessary mortar added to ensure that all joints are wall filled. Chases, holes through walls, etc., left or cut for all pipes, cables, etc., shall be made good afterwards with cement mortar where block work is to be plastered joints shall be raked out.
- F All joints shall be well flushed up with mortars as the work proceeds. The work shall be carried out in a uniform manner, no one part being raised more than 8'-0" above another at one time. All grains shall be kept true and square and all perpendes kept vertically above one, all work shall be in "stretcher" bond.
- G The prices for block work shall include for all rough cutting and pinning up at tops of walls, cuttings at ends and round openings, cutting and bounding at intersections and building of beams and plates.

WORKMANSHIP AND MATERIALS

ROOFING

ITEM

- A The roof sheeting shall be 22 gauge galvanized polysterised coated trapezoidal - mild steel sheeting, fixed with 2" galvanized screws colored to match sheeting, with neoprene washers. The sheets shall be laid with a side lap of two corrugations and an end lap of not more than 12". The laying of sheet shall commence at the lower end of the roof slopes and the exposed bottom edges shall be carefully lined up so as to present a perfectly straight h on completion.
- B Flashing shall be 22-gauge galv-mild steel flat sheet carefully and accurately made and fitted with a minimum 9" end laps or as stated.
- C. The Contractor shall notify the Company's Representative in writing of the name of the supplier of the sheeting he intends to use and submit samples for approval.

WORKMANSHIP AND MATERIALS CARPENTRY AND JOINERY

ITEM

- A All greenheart shall be obtained from an approved sawmill and shall be properly seasoned. It shall be best quality and free from sap, shakes, large loose or dead knots and other defects.
- B Except where dimensions are indicated as "finished sizes or otherwise specified, nominal" dimensions are intended for dressed timber. An allowance of 1/8" from the nominal dimensions shall be permitted for each dressed surface unless otherwise specified. All timber faces that are to be exposed shall be dressed unless specified.
- C Posts, studs, beams, joints, rafters, purling, etc., shall be fixed in one piece between supports and securely fixed at both ends unless otherwise specified or approved. All joints in structural timbers shall be made over a point of support.
- D All joints to cabinetwork must be glued and shall be cross-tongued and all linings tongued at angles. All corners shall be slightly rounded.
- Prices for carpentry and joinery works shall include for all labors, cuttings, notching, halving to other timbers, mortising, tenoning and wedging, hardwood pins, gluing and making joints with lead where required and for all short lengths.
- E Prices for timber described as "screwed" shall include for screws but for timber described as "bolted" the bolts and holes are measured separately. Prices for timbers described as "plugged to block work and for timbers described as "plugged to concrete" for cutting or drilling and plugging of concrete or for casting in fixing blocks.
- F Doors shall be constructed in the joiner shops of the contractor or by a specialist joiner manufacturer and not upon the site. Timbers for use in doors shall be specially selected for straightness and free from faults, tenoned, glued and wedged or pinned together. The contractor shall notify the Company's Representative in writing of the name of the manufacture of the doors and shall submit brochures and samples for approval.
- G All boarding shall be kiln dried to 12 per cent moisture content.

WORKMANSHIP AND MATERIALS METAL WORK

ITEM

- A All metals shall be of the best available qualities and shall be within the thickness and weight tolerance set out in the relevant B.S.S. All steel shall be free from loose rust and scale.
- B Unless otherwise described, all bolts shall be provided with two washers, one under the head and one under the nut, except coach and rag bolts which shall have one washer under the nut. All nuts shall be tightened at fixing and re-tightened after completion of the work on or before covering up with other work.
- C The louvre frames shall be "crittal" or other equal and approved aluminum frame with single control.

**WORKMANSHIP AND MATERIALS
PLUMBING**

ITEM

- A The work includes all plumbing, fixtures, installations and piping for a complete plumbing system down to ground level. Drains are included in 'external works'
- B Gutters and down pipes shall be PVC. Gutters shall be lapped not less than 6" and fixed to fascia with PVC brackets at 2'-0" maximum intervals. Rainwater pipes shall have 6" slip joints and be fixed to walls with PVC brackets fixed at 3' - 0" maximum intervals.
- C PVC soil and ventilating pipes shall be jointed with PVC solvent cement and fixed to walls with steel brackets.
- D PVC tubes shall be jointed with PVC solvent cement and fixed to walls with stoat galvanised brackets.
- E The fittings for use with PVC tubes shall be PVC and jointed as described.
- F All valves, cocks, taps etc. shall be full way and comply with the provisions of B.S.S 1010.
- G All plumbing work shall be carried out by skilled workmen and by or under the supervision of a licensed Plumber.
- H The prices for all pipe fittings shall include for cutting pipes and joining materials and making joints.
- I The Contractor shall notify the Company's Representative in writing of the name of the manufacture and shall submit samples for approval.

**WORKMANSHIP AND MATERIALS
ELECTRICAL INSTALLATION**

ITEM

- A. Wire building in accordance with the British Institution of Electrical Engineer's Regulations, 16th Edition in Conformity with the Electrical Regulations of the Government of Guyana's Electrical Inspectorate as applies to Factories Residence and other buildings.
- B. Install and erect cables inclusive of fittings for lightings, power points and lighting points in accordance with the work detailed. Drawings & details to be done by the Contractor and submitted to the Chief Electrical Engineer of Company for approval.
- C. The wiring to be done in PVC insulated flat or circular copper cable on surface or circular single core in trunking or conduit or between walls or ceiling as specified. All non- armoured wiring done in ceiling must be protected from damages likely to be caused by termites or rats by a metallic sheath. Armored cable must be used when wiring through ducts.
- D. NEMA Switch Socket out-lets to be wired to an independent distribution breaker panel which will be supplied with (CLEAN POWER) for computer and instrument use. Cable to be used for this purpose to be 3x2.5 mm², PVC insulated, stranded, tinned jacket, colour coded.
- E. All metal trunking and conduit to electrically earthed.
- F. Electrical components used should conform to the following specifications:
 - 1. 5 Amps Switch Socket Outlet to BS5733 MEM moulded range 4001.
 - 2. 13 Amps Switch Socket Outlet to BS1363 MEM moulded single gang 3100, double gang range 3101.
 - 3. 15 Amps Switch Socket Outlet to BS5733 MEM moulded single gang range 4012.
 - 4. 20 Amps Switch Socket Outlet to BS3676 MEM moulded with Neon Indicator range 2202.
 - 5. 5 Amps Single Pole Switch to BS3676 MEM single range 2400, 23401, 2405. Double gang 2402, 2406. Three gang MEM range 2403, 2407.
 - 6. 15 Amps NEMA type outlet to be of the two pins polarised with Earth type complete with switch.
 - 7. Ceiling Rose 3.3.2 to BS67 MEM range 1302.
 - 8. Ceiling Batten holders to B#504 - T2 range 1031 (3T H/O skirt).
 - 9. Main Isolators to BS5419: 1977 category AC23 MEM range AX and ANX fuse carriers to be porcelain.
 - 10. Fuse Panels to BS5486 PT11: 1.979 MEM.

**WORKMANSHIP AND MATERIALS
ELECTRICAL INSTALLATION CONTINUED**

- 11. The Circuit Breaker Panel to be of either UK or US manufacture.

- G. All Electrical Materials to be used for the works to be approved by the Company's Representative. Electrical Certification to be obtained from Government Electrical Inspector.

WORKMANSHIP AND MATERIALS FINISHES

ITEM

- A The sand shall be finer grade of pit and normally used for plastering and shall be free from vegetable matter and other impurities.
- B The mix for rendering shall be one part cement, to six part of sand with an approved mortar

plasticizer added strictly in accordance with the manufacturer's instructions.

- C Where approved mechanical batch mixers are used to mix materials each batch shall be rotated in the drum for at least two minutes and then used immediately afterwards. When hand mixing is employed each batch shall be turned over while water is added through a rose until the color and consistency are completely uniform and such mixing shall be carried out on a clean boarded platform or on a smooth metal sheet and under no circumstances on the ground.
- D The rendering shall be 1/2" thick unless otherwise described, finished with a wood flat for external work and a steel float for internal work. The rendering shall be finished with surfaces perfectly flat and flush to stand be free from cracks, blisters and other defects and shall be left perfectly clean. The contractor shall complete each section of plastering in one operation.
- E Screeded beds shall be floated to levels and finished with a wood float. The mix for screeded beds shall be of cement and sand as described, mixed with a minimum of water so that no water appears on the surface when screeded or trowelled.
- F The faces of work to be rendered un- screeded shall be thoroughly wetted with clean water and the rendering or backing applied while the surface is still moist.
- G The prices for plaster work and other finishings shall include for all extra labor working behind pipes and other projections and for making good at skirting or other boundaries of the work and all extra labor to form internal angles and all necessary temporary rules or battens.
- H Before the tiles are laid, the surfaces of the base concrete or timber floor must be thoroughly cleaned and free from water.
- I All tiling will be done by skilled workmen under the supervision of a Professional Tiler. If Contractor cannot find one, the Company will recommend one. The Contractor shall notify the Company's Representative in writing of the name of the manufacture of tiles and submit samples for approval. The Company would like to look at samples of previous works done by the contractor.

**WORKMANSHIP AND MATERIALS
FINISHES CONTINUED.**

- (J) The Terrazzo tiles shall be Tricon K20 or other similar product. Samples and any information about Tricon K20 are available from:-
Trinidad Concrete Products Company Lt
Churchill Roosevelt Highway

Tunapuna
P.O. Box 144 Porrt of Spain
Trinidad, West Indies.
Tel: 868-663-1991

Fax: 0011-(868) 662-0361

Contact Person: Mr. Annand Ramroop, Marketing Representative.

Samples can also be examined at the office of the Engineering Manager, GUYSUCO.

Note: Non skid will have a grano finish (Brush finish).

- (k) Terrazzo tiles shall be thoroughly soaked in water and drained off, and bedded in cement and sand (1:3) with straight joints pointed in cement and sand (1:2).
- (l) Thermoplastic / vinyl sheetings shall be Marleyflor plus, Armstrong Medintech, or similar product. Such flooring shall be laid on a trowelled bed with an approved adhesive according to the manufacturer's instructions. When completed the flooring shall be treated with an approved liquid emulsion wax dressing and polished as instructed.
- (m) Sheeting shall be joined by fusion welding and, whenever terminated at walls shall carry a 6 inch high skirting.
- (n) Concrete paving stones shall be Bestcrete paving stones or other similar product. Samples and any information concerning Bestcrete paving stones are available from
Ansa Mc AL Trading Ltd
91 Middle street,
Georgetown,
Tel: 02-75286-91
Fax: 75299
Contact Person:- Mr. Gladstone Leitch.

WORKMANSHIP AND MATERIALS PAINTING AND DECORATING

ITEM

- A All brands of painting materials will be specified by the Company's Representative, but the contractor shall allow in his prices for using materials as stated in the attached price list.

B All surfaces shall, except where required by the manufacturer's instructions, be dry before decorative materials are applied and all coats must be dry before subsequent coats are applied. All coats, except cement paints, shall be rubbed down with glass-paper and brushed clean before application of subsequent coats. No external painting shall be carried out while rain is falling or in rainy weather. All decorative materials shall be used strictly in accordance with the manufacturer's instruction and no thinning or other dilution shall be carried out except in strict accordance with these instructions.

The Company's Representative shall select C All colours and tints and such selection shall be recorded on a specimen color board which shall be kept on the site and maintained until completion of the works. The prices for decorative works where adjoining surfaces are specified by the Company's Representative to be of differing colours or shades shall include for all necessary cutting in.

D All timber to be painted shall be primed before any metal fittings or fastenings are fixed in portion and after any cutting or notching for such fittings are made.

E All timber specified to be painted shall be clear and smooth and well rubbed and dusted down before commencement of any painting work. All knots shall be covered with a stable and impermeable shellac-knotting compound before the application of the priming coat. All timber to be painted shall be primed with one coat of wood primer brushed well into the timber. All nail holes and other defects shall then be filled with linseed oil putty or an approved patent filling material after priming and subsequently rubbed down to give an even surface. The work shall be dusted down before paint is applied.

F All rendered surfaces specified to be painted shall be brushed down and left even and clean before the application of any paint.

G All steel work not galvanised shall be wire brushed to remove any rust and unless otherwise specified, treated with two coats of zinc chromate primer followed by oil color is specified to be painted shall first be given a coat of riordant solution which shall then be cleaned off before application of the oil paints.

WORKMANSHIP AND MATERIALS GLAZING

ITEM

A. All glass shall be of the full weight and quality specified. Sheet glass shall be ordinary glazing quality and no glass having a noticeable distortion of sight shall be used. Float and plate glass shall be perfectly flat and true. Clear glass shall be of patterns selected by

Company's Representative.

- B. All glass shall be accurately and carefully fitted with a tolerance for movement all rounds.

WORKMANSHIP AND MATERIALS PILE DRIVING

ITEM

- A All surfaces of timber to be in contact with wet concrete shall receive two coats of hot coal tar.
- B The heads of all timber or concrete piles shall be protected with closely fitting mild steel or wrought iron rings, 3 inches wide by 3/4 inches thick. After piles have been driven to the required set and to the satisfaction of the Employer's Representative, the heads shall be cut off square at the level shown on the drawings or as directed by the Employer's Representative. When estimating the length of the timber piles to be brought to the site, the Contractor shall make allowances for the removal of damaged timber pile heads.
- C Timber or concrete piles shall be accurately pitched in the required positions and driven to the lines and levels shown on the drawings or as directed by the Employer's Representative. The weight of the drop hammer shall be equal to at least one half the weight of the pile to be driven and shall be guided by the leads to ensure that the piles are driven in the correct alignment and to the required batter where applicable. Any pile driven out of line, broken, split or otherwise damaged are to be withdrawn and replaced where necessary. Maximum permissible deviation shall be 3 inches for alignment and 2 per cent vertically.
- E Any pile which in the opinion of the Employer's Representative, has been driven more than 3 inches out of line or driven below elevation, or so damaged while being driven as to impair its structural value as a pile, shall be withdrawn and replaced by a new pile.
- F A detailed record of the driving of all piles shall be taken. This record shall include the date and time of driving, the weight and drop of the hammer, the blows per foot of penetration, butt diameter, tip diameter, etc.

GENERAL

Before any piling work is commenced the contractor shall, in amplification of information accompanying his tender, submit to the Engineer for approval full details of his proposed piling plant and detailed method statements for carrying out works. Such details shall include, where applicable, a full description of the piling frame, hammer, helmet and packing, method of handling, pitching and supporting the piles before and during driving, the proposed driving procedure to obtain the required penetration and/ or the proposed set for the working load on the pile, and the method calculation.

The Contractor shall not commence any piling until the Engineer has approved the plant and methods, which he proposed to use, but such approval shall not relieve the Contractor from any of his obligations and responsibilities under the contract. If for any reason the Contractor wishes to

make any change in the plant and methods of working which have been approved by the Engineer, he shall not make any such change without having first obtained the Engineer's approval thereof.

SETTING OUT

The Contractor shall establish and maintain permanent datum level points, base lines to the satisfaction of the Engineer, and shall set out with a suitable pin or marker the position of each pile. The setting out of each pile shall be agreed with the Engineer at least 24 hours prior to commencing work on a pile and adequate notice for checking shall be given by the Contractor.

Notwithstanding such checking agreement, the Contractor shall be responsible for the correct and proper setting out of the piles and for the correctness of the positions, levels dimensions and alignment of the piles.

DISTURBANCE AND DAMAGE

The Contractor shall carry out the piling work in such a manner and such times as to reduce noise and disturbance.

If during the execution of the Works, damage is likely to be caused to mains, services or adjacent structures, the Contractor shall submit to the Engineer his proposal for avoidance of such damage.

The Contractor shall ensure that damage does not occur to piling works and shall submit to the Engineer for approval his proposed sequence and timing for driving, having regard to the avoidance of damage to the adjacent piles.

LENGTHS OF PILES

The lengths of piles indicated on the Drawings or Bills may be adjusted by the Engineer based on information obtained during the pile installation, e.g. penetration per blow using specified hammer, etc.

The Contractor shall make allowance in his fabrication length for damage to pile heads that may occur during driving.

OBSTRUCTIONS

If during the execution of the works the Contractor should encounter obstructions in the ground whether or not they were foreseeable, he shall forthwith notify the Engineer detailing plans for overcoming the obstruction and proceed according to the Engineer's Instructions.

PROGRAMME AND PROGRESS REPORT

The contractor shall inform the engineer each day of the programme of piling for the following day and shall give adequate notice of his intention to work outside normal working hours and weekends, where approved.

The Contractor shall submit to the Engineer on the first day of each week or on such other date as the Engineer may decide, a progress report showing the rate of progress to that date and progress

during the previous week or period of all main items of piling works as required by the Engineer.

RECORDS

The Contractor shall keep complete records of all data required by the Engineer covering installation of each pile and shall submit two signed copies of these records to the Engineer not later than noon of the next working day after installation of the piles.

TOLERANCES

Pile shall be driven as accurately as possible to the vertical. The permitted deviation of the pile centre from the centre point shown on the drawings or setting out plan shall not exceed 75mm measured at the working level of the piling or as otherwise agreed by the Engineer.

DRIVING

Piles shall be accurately pitched and driven in the position and to the lines shown on the Drawings within the specified tolerances. The lengths of piles driven shall be shown on the Drawings or such other lengths as the Engineer may direct. Piles shall be driven in sequence approved by the Engineer. At the stages during driving, piles shall be adequately supported and restrained without damage to the piles or any coatings or preservative treatment, by means of ladders, trestles, temporary supports or other guide arrangements to maintain position and alignments and prevent buckling.

Where necessary, in the opinion of the Engineer, extension leaders shall be fitted. Handling, slinging and pitching of piles shall be by means or methods approved by the Engineer.

Pile shall be driven by means of plant and methods approved by the Engineer. Helmet or anvil blocks of the approved types shall be used for preventing damage to the heads and use of a follower or dolly shall not be permitted except with the agreement of the Engineer. Driving shall be carried out continuously until the specified depth and or penetration per blow is reached, except that the Engineer

may permit suspension of driving if he is satisfied that the suspension is beyond the control of the Contractor.

The Contractor shall report to the Engineer without delay any unforeseen change in driving characteristics that may be noted. Detailed records of the driving of all piles shall be kept by the Contractor in a form required by the Engineer to whom they shall be submitted the day following the pile driving. The Contractor shall give adequate notice of driving and provide facilities to the Engineer to enable him to check driving resistance. A set of pile data shall be taken only in the presence of the Engineer unless otherwise agreed.

The final set of each pile shall be recorded as the number of blows to produce a penetration of 25mm agreed by the Engineer who would need to be satisfied when a final set is measured as to the condition of the pile.

The Contractor shall ensure that piles are temporarily braced or stayed to the satisfaction of the Engineer immediately after driving to prevent loosening of the piles in the ground and ensure that no damage resulting from oscillation, vibration or movement of any free standing pile can occur.

ACCEPTANCE OF PILES

If a pile appears to be satisfactory, the Engineer shall agree to the cessation of driving but such agreement shall not constitute acceptance of the pile and he may order retrieving as result of information obtained from subsequent driving of piles.

A pile meeting the specification requirements and driven within the specified tolerances or as otherwise agreed by the Engineer, will be accepted only when defined row, of which the pile forms a part has been completed.

Where additional piles or extra works are necessary as a result of incorrectly placed or inaccurately driven piles or other defective work or damaged which in the opinion of the Engineer are attributed to the Contractor, such additional piles or extra works instructed by the Engineer shall be carried out at the Contractor's expense.

Piles driven or deflected outside the specified tolerances shall, if required by the Engineer, be withdrawn, re-pitched and re-driven by the Contractor at his expense. In carrying such work, any resulting holes due to withdrawal of the pile or from measures for moving the pile shall be packed with approved non-plastic material prior to replacing pile.

RE-DRIVING PILE

The Contractor shall, where instructed by the Engineer, take levels and measurements to determine any movement of the ground or pile. Piles which have risen as a result of driving adjacent piles shall be re-driven to the original depth or set, unless otherwise directed by the Engineer who may require the Contractor to carry out such approved corrective measures as are necessary in the opinion. During re-driving, checks where required, shall be carried out to an approved procedure.

TIMBER PILES

The species of wood for piles shall be Demerara Greenheart, "Ocotes Rodiali"

Plies shall be cut from live trees that are sound throughout their whole length, and be suitable for use as piles.

Piles shall have a gradual taper of not more than 1 in 120 with a minimum butt diameter of 406mm and a minimum tip diameter 300mm.

Trees for piles shall be peeled clean of all bark including the inner skin, soon after cutting so that the piles are clean and smooth. All knots or protrusions shall be trimmed or smoothly cut flush with the surface of the pile, to within a tolerance of 25mm.

Sound knots shall be no larger than one half the diameter of the pile located where the knot occurs. Cluster knots shall be treated as a single knot, and the entire not greater in size than that permitted for a single knot. The sum of knot diameters in any 150mm length of pile shall not exceed one third of the circumference at the point where they occur. Piles may have unsound extends not more than 40mm in depth, and that the adjacent areas of trunk are not affect.

Piles shall be free from short or reverse bends and from short crooks that deviate more than 75mm from straightness in any 1.5m lengths.

A check shall not extend any deeper than the pith and there shall not be more than one check extending to the pith. The length of any shake or any combination of shakes in the outer half of the radius of the butt of a pile when measured along the curve of an annular ring shall not exceed 1.2. The circumference at the butt shall not exceed the circumference at 900mm from the butt by more than 200mm.

All timber supplied for use as piles shall be greenheart thoroughly seasoned, straight grained and free from cracks, shakes, fungal or pest attack and from other defects, complying with grade stresses as specified by BS 5756 grading rules. Piles shall be one length unless otherwise approved by the Engineer.

The Contractor shall submit copies of consignment notes and certificates from suppliers, giving such information on deliveries of timber as the Engineer may require.

Tree trunks where approved for use as round piles shall have the bark removed but the sapwood left in place and shall be treated with a preservative as specified.

Where timber is damaged during handling and installation, all damaged areas shall be over coated with two coats of approved preservative, well brushed in. All pile heads, whether or not trimmed to level shall be given three heavy coats of approved preservative, sufficient time between coats being allowed to ensure maximum penetration into timber.

TOLERANCE OF TIMBER PILES

For a round pile, the following characteristics are required: maximum deviation from a straight line should not be greater than 100mm in any plane through the pile parallel to the vertical axis.

INSPECTION, HANDLING AND STORAGE OF TIMBER PILES

The Contractor shall notify the Engineer of the delivery of piles to the site or to the place where preservation treatment is to be carried out and shall provide all necessary labour and materials to enable Engineer to inspect and measure each piece at the time of delivery and immediately prior to driving.

Accepted timber piles shall be stacked and protected to the satisfaction of the Engineer. Care shall be taken during the handling to prevent the surface of treated piles from being broken and any cuts or breaks, which may result from the use of hooks or chains, shall be well brushed with two coats of preservative before driving.

HEAD OF TIMBER PILES

The pile head shall be flat and at right angle to the axis of the piles. Except where specified to the contrary, the head of each pile shall be trimmed to a round cross section and fitted with a tight steel ring. The ring not be less than 50mm by 20mm cross section and the ring joint shall be welded for its full section. The external diameter of the ring shall be that of the least transverse diameter of the firm head of the pile. The top of the ring shall be between 100mm and 20mm from the top of the pile.

If the ring is displaced during driving, it shall be refitted and if broken a new ring shall be fitted. If during driving the head becomes excessively broomed or other damaged, the damaged part shall be cut off, the head re-trimmed and the ring refitted.

After driving, the heads shall be cut off square at the designed cut off level of the piles. In estimating

the required lengths of timber piles, the Contractor shall make due allowance for the removal of the broomed or split section as well as for cutting off the heads of piles at the required levels.

SPLICING OF TIMBER PILES

Where the Engineer approves lengthening of timber piles, the position and details of splice shall be as shown on Drawings or as directed or agreed by the Engineer.

Where it is necessary to partly extend a partly driven pile, the upper part shall be securely supported during the splicing.

The Contractor shall observe splice joints continuously during driving to detect any departure in true alignment between the lengths of pile on each side of the joint or for any sign of distress or damage to the splice.

If any such departure in alignment, distress or damage is observed, the Contractor shall suspend driving and inform the Engineer.

