
SECTION 11 - BUILDING CONSTRUCTION

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S11.01 GENERAL

(1) Requirement

- (a) The Contractor shall perform the whole of the buildings construction work in accordance with this section.
- (b) All building constructions and finishing works shall be performed by skilled workmen or specialists approved by the Engineer. The Engineer may direct the Contractor to supply proof of competency of any workman employed.

(2) Scope of Works

- (a) The works include, under this section shall be executed at following locations:
 - (i) Power house
 - (ii) Component structure
 - (iii) Owner's residences and Engineer's residences
 - (iv) Housing in resettlement area
- (b) All materials shall be supplied, placed and attached to the structure by the Contractor. All timber metal or other accessories necessary for proper completion of the Works shall be as shown on the Drawings or as specified or directed and those costs of such material shall be included in the rates bid therefor in the Schedule.
- (c) If the Contractor considers that the working space of the control house is not enough for operation the Contractor shall design new lay-out and buildings submit to the Owner for approval. The additional payment shall be paid in the same unit rate as shown in the Schedule.

(3) Submittals

The Contractor shall submit, for approval, samples of all materials with specimens of workmanship, colour and finish for all items specified in this section at least thirty (30) days before the date of procuring such materials.

(4) Nominal Sizes

The Contractor shall allow for variations between nominal sizes and actual sizes where such variation is within the required tolerances or is a normal trade practice.

(5) Finishing Work

Finishing work shall not commence until each or all of the following conditions have been met to the satisfaction of the Engineer:

- (a) The area concerned and such adjacent areas which may affect the finishing work have been weatherproofed.
- (b) Unless otherwise directed, all construction, including installation of permanent plant, fittings and equipment has been completed.
- (c) Concrete or other materials have dried out sufficiently. The Engineer may apply a test for dryness, which he may consider applicable.
- (d) In all wall and ceiling finishings, the Contractor shall make necessary provision, to the satisfaction of the Engineer, for the installation of pipes, metal frames, electrical conduit, electrical wiring, lighting fittings, and other fixtures, and shall neatly finish the surfaces around them to conform to the surrounding wall or ceiling finishes.

(6) Tiles

All required floor and wall tiles and roofing sheets of a particular colour or type shall be procured by the Contractor from one source.

(7) Dissimilar Metals

The Contractor shall take all precautions to prevent contact between dissimilar metals in the finished structure and shall provide approved, permanent, separating material. The following precautions shall also apply:

- (a) All aluminium abutting steel or copper shall be protected by a 0.20 mm thickness of black polythene fixed with an approved adhesive. Alternatively, zinc chromate primer may be used, taking care not to mark exposed aluminium faces.
- (b) Where aluminium abuts onto concrete, the aluminium shall be protected by coating with bituminous paint; taking care not to mark exposed aluminium surfaces.

(8) Painting

Painting of the Works described in this section shall be carried out in accordance with Section 17.

(9) Manufacturer's Recommendations

Unless otherwise specified, approved or directed, all works specified in this section shall be performed in accordance with the written recommendations of the manufacturer from whom the Contractor purchases the specified materials.

Throughout this section the word 'recommended' shall mean 'recommended by the manufacturer of the material'.

(10) Thermal Expansion

Allowance shall be made for thermal expansion where necessary, to the satisfaction of the Engineer.

S11.02 CONCRETE AND REINFORCEMENT

- (1) All concrete referred to in this section shall comply with the requirements of Section 8. The minimum compressive strength of concrete shall be as indicated on the Drawings or as directed.
- (2) Reinforcing steel shall comply with the prescription of Clause S8.10.

S11.03 BRICK MASONRY

(1) General

This clause covers all works in connection with the construction of walls, partitions and screen block for ventilation as shown on the Drawings or as directed.

(2) Material

(a) Common Brick

Common brick shall be sound, durable, properly burned, free from defects that will affect service ability or strength, and shall be of the best local manufacture conforming to the requirement of TIS. 77-2517.

(b) Cement, Water and Fine Aggregate

Cement, water and fine aggregate for plaster, mortar and grout shall conform to Section 9 except that the grading of fine aggregate shall conform to the following limits:

Sieve Size	Percentage by Mass Passing Sieve
2.36 mm	100
1.18 mm	70-100
0.60 mm	40-80
0.30 mm	5-40
0.15 mm	0.10

(c) Mortar

Mortar shall consist of a homogeneous mixture of ingredients and shall be mixed in the following proportions:

Cement 1 part, hydrated lime 0.10 part and Fine Aggregate 5 parts of the mix volume.

All joints shall be struck flush.

(d) Admixture

Mortar shall be mixed with admixture, which is available in Thailand, to prevent crack and to obtain sufficient adhesive strength. The quantity of admixture shall be controlled so as not to considerably influence the strength and other properties of mortar and the quantity to be mixed shall be approved by the Engineer.

(3) Placing

(a) Common bricks shall be laid in horizontal courses true to line and plumb, and vertical joints shall be staggered with respect to those in the courses next above and below.

(b) All walls shall be raised up uniformly and as regularly as possible. No part is to be raised more than 100 cm above any other part at any time. The mortar in the horizontal and vertical joints shall range from 8 mm to 15 mm thick.

For bed joints a thick bed of mortar shall be spread and only slightly furrowed so that the joint will be completely filled with mortar. Spreading of the bed mortar shall extend only so far ahead that the mortar will be plastic when the blocks are laid. The ends of the blocks shall be buttered with an ample quantity of mortar and the brick pushed into place so that the vertical joint is completely filled with

mortar. In making closures ample mortar shall be spread in the closure space, the closure brick buttered on both end and end joints are completely filled with mortar.

- (c) Where an adjustment must be made after the mortar has lost its plasticity, the mortar shall be removed and fresh mortar shall be used to reset the Works.
- (d) The Contractor shall install at every third course of bricks, two 6 mm diameter bars embedded in mortar that will run horizontally for the whole length of the wall. Brick masonry shall be tied to adjoining columns with anchors sufficiently long to extend into the masonry not less than 20 cm and spaced at 35 cm interval or at every sixth course which is the lesser.
- (e) Screen Blocks for Ventilation

These blocks shall be placed on the wall of the generator house as indicated in the related Drawings. Opening of blocks shall be square and made of concrete of 39x19x7 cm.

- (f) Lintels

The Contractor shall construct and install concrete lintels for doors, windows and other openings left in the brick walls and partitions. The size of the lintels shall be of the thickness of the wall and in accordance with the span of the opening, as shown on the Drawings or directed. Each lintel shall be composed of two 9 mm diameter bars.

S11.04 FLOOR FINISHES

(1) General

- (a) The Contractor shall furnish and install the floor finishes, as specified in this clause, in areas as shown on the Drawings or as directed.
- (b) The Contractor shall be responsible for ensuring that the background or subbase to which the specified finish is to be applied, has properly cured, has the correct moisture content, is properly finished and is completely adequate to receive the specified finish. Any faulty work resulting from non-compliance with the above shall be replaced at the Contractor's expense and such replacement may be extended at the Engineer's discretion to include the whole of the rooms or area affected.

(2) Preparation of Surface

- (a) The surfaces of all concrete floors specified to receive a finish shall be constructed as shown on the Drawings.
- (b) The Contractor shall maintain the prepared surface in a satisfactory condition until the time of application of the specified finish, and shall ensure that:
 - (i) All materials likely to reduce adhesion of the finish, including curing compounds and surface retarders, shall be removed before application of the specified finish and the surface left dust free and clean. The surface shall be protected from contamination until the time of laying finish.
 - (ii) Surfaces that are to receive cement mortar shall be roughened and dampened before application of the mortar.
 - (iii) All traffic and loads shall be kept off completed work at least until bonding has set. If possible, areas shall be locked upon completion of finishing work.
 - (iv) The finished floors shall be protected by taping down building paper over finished surfaces, lifting and relaying as required for cleaning, sealing and polishing and removing immediately before handing over.

(3) Asbestos Vinyl Tile/Ceramic Tile Finish

- (a) The subbase of surfaces with asbestos vinyl tile and ceramic tile finishes shall be prepared in accordance with subclause (2) above.
- (b) Materials
 - (i) Asbestos vinyl tiles of size as shown on the Drawing
 - (ii) Glazed ceramic tiles of size as shown on the Drawing in accordance with TIS 38-2531
 - (iii) Cement mortar bedding shall be composed of 4 parts sand to 1 part cement with 25 percent approved bonding agent. Grout shall be composed of a mixture of 4 parts sand to 1 part white Portland cement.
- (c) Tiles shall be set out to the approval of the Engineer, and shall commence at expansion and control joints in the concrete slab. No tile shall bridge a concrete slab expansion joint.

- (d) Ceramic tiles shall be laid on the mortar bed and tamped into place. Closure tiles shall be neatly cut and set in. Joints shall be 2 mm wide and shall be slightly dished. After 24 hours, all joints shall be pointed up with cement grout and all surplus grout removed. No walking over the floor shall be allowed during the first 24 hours after laying.
- (e) Asbestos vinyl tile shall be laid on the floor, using adhesive of either emulsion or cut-back type. Adhesive for baseboards shall be a water resistant product recommended by the baseboard manufacturer.
- (f) Baseboards for vinyl tile/ceramic tile shall be rubber core type, 3 mm thick and 10 cm height. Molded external and internal corners and end pieces shall be used. Baseboard, exclusive for corners, shall be furnished in length not less than 1.20 m each using of corners shall not be less than 5 cm long.
- (g) Warranty

The Contractor shall obtain from the firms supplying the materials warranties against defective materials of the same type, quality and colour, equal to 2 percent of the quantity of each type laid. These materials shall be suitably packed and labelled for storage.

(4) Acid Resistant Flooring

Where specified, as shown on the Drawings or directed by the Engineer, acid resistant flooring shall epoxy resin as approved by the Engineer. Each coat of epoxy resin shall have a minimum dry film thickness of 0.40 mm, and shall be applied in accordance with the manufactures' instruction.

S11.05 WALL FINISHES

(1) General

- (a) The Contractor shall furnish and install the wall finishes, as specified in this clause, in areas as shown on the Drawings or as directed. The wall finishes in these Specifications shall be:
 - (i) Cement plaster finish
 - (ii) Ceramic wall tile
 - (iii) Glass block
 - (iv) Wire mesh

- (b) The Contractor shall be responsible for ensuring that the background or subbase to which the specified finish is to be applied has properly cured, has the correct moisture content, is properly finished and is completely adequate to receive the specified finish. Any faulty work resulting from non-compliance with the above shall be replaced at the Contractor's expense and such replacement may be extended at the Engineer's discretion to include the whole of the wall or area affected.

(2) Preparation of Surfaces

- (a) Surface which are to receive finishes shall be cleaned free from loose materials, fins, encrustations, oil, paints, dirt and any other material that might prevent satisfactory bond. Surfaces to receive mortar shall be kept thoroughly and continuously damp for at least 24 hours and then allowed to stand until the surface film of moisture has disappeared. All faces of concrete work shall be roughened need to the satisfaction of the Engineer prior to applying mortar.
- (b) All conduits, boxes, switches and services shall be fixed and properly cased. Where necessary, adequate keying shall be provided for render. Galvanized metal mesh shall be provided over pipes and fixed with galvanized fasteners.
- (c) Surfaces to receive adhesives or fixatives shall be thoroughly dry.
- (d) Surfaces shall be left dust free and clean and shall be protected from contamination until time of laying the finish.
- (e) Masking tape shall be provided where necessary to prevent staining of adjoining work such as aluminium windows and door frames.

(3) Plaster Finish

- (a) The Contractor shall apply one coat plaster wall finish where shown on the Drawings or directed by the Engineer.
- (b) One coat cement render 15 mm thick shall be applied to all internal and external walls required to be rendered. Grounds or screeds shall be placed at all points where required for rendering.
- (c) For external and internal plastering with smooth finish, the mix shall be 1 part of cement to 3 parts of sand by volume. Cement shall be as specified in Section 8. Sand grading shall be in accordance with Clause S8.03 (b).
- (d) All plaster shall be machine mixed for a period of not less than 2 minutes until it is uniform in colour and in composition. Remixing of plaster with addition of water will not be permitted. Plaster shall be used within 2 hours of mixing and all remainings after this period shall be discarded.

- (e) The plastering shall be applied with a wooden float, finished with a sponge, levelling up any unevenness on the surfaces and shall not exceed 15 mm in thickness. Each surface to be rendered shall be finished in one operation to avoid joining marks except that day to day breaks shall be made to coincide with architectural breaks in order to avoid joining marks. Particular attention shall be given to this matter by careful planning of the work site. Particular care shall be taken to ensure that the rendering is strong and sound at the corners.
- (f) The Contractor shall prepare samples of the rendering as directed by the Engineer until the quality, texture and finish required is obtained and approved by the Engineer, after which all rendering executed shall conform to the respective approved samples. The quality and mixing of the materials shall be constant throughout so that there is no variation in colour.
- (g) The finished render shall be cured by 4 applications of a water-spray at 12 hours intervals, the first application commencing 12 hours after completion of rendering. During and after the curing period, the render surfaces shall be protected against rapid drying.
- (h) The Contractor shall protect all rendered work from damage. Damaged, dummy or otherwise defective render shall be replaced at the Contractor's expense, and in such a manner that on completion of the Contract the render shall be sound and the general appearance of the work shall not be marred.

(4) Ceramic Wall Tiles

- (a) Ceramic wall tiles shall be glazed ceramic tile of size as shown on the Drawing conforming to TIS. 613-2529.
- (b) The Contractor shall submit, for approval, loose samples of each type of tile. Samples shall be sufficient in number to illustrate the extremes and average of the ranges of colour, size and texture.
- (c) The Contractor shall prepare sample panels, not less than 2 sq.m in area, of each type of finish specified. Examples of specified junction details and trim shall be included. Each panel shall be preserved until all works of its type is complete. Approved panels may form a part of the completed work.
- (d) Tiles shall be set out to use only whole tiles where practicable or to give equal margins of cut tiles larger than half a tile.
- (e) Cemented mortar shall be of 1 part of cement and 3 parts of fine sand. Grout shall be mixed in the proportions of 1 part white cement to 4 parts sand or proprietary grout, and colored to the approval of the Engineer.

- (f) Joints in all tiled wall panels shall be 2 mm wide in both directions. All joints and edges shall be grouted not less than 24 hours after tiles have been fixed. When it is necessary to cut tiles, cutting shall be done with a saw. Holes shall be drilled for cocks, spouts, etc., large enough for the body of the cock to be unscrewed if required, but smaller than the cover plate of the cock.
- (g) Cemented mortar shall be cleaned off tiles during laying. Grout shall not be cleaned off tile faces before 24 hours after last application.
- (h) Where structural joints occur in the base material, the joints shall be continued through the tiles in the form of control joints filled with an approved material. Joints shall be 5 mm minimum width and shall go right through tiles and bed. The joints shall be partly filled with polyurethane foam and sealed off flush with approved silicone rubber or polysulphide based sealant.
- (i) Warranty: The Contractor shall obtain from the firms supplying the materials warranties, against defective materials and workmanship of the finishes specified in this clause for a period of 2 years after the issuance of the certificate of final acceptance.
- (j) Spare Materials: The Contractor shall furnish additional spare materials of the same type, quality and colour equal to 2 percent of quantity of each type laid. These materials shall be suitably packed and labeled for storage.

S11.06 CEILING WORKS

The Contractor shall furnish and install the ceilings and frames as shown on the Drawings or as directed.

(1) Gypsum Board Ceiling

(a) Material

Gypsum board shall be of panel type with dimension 0.60 m x 0.60 m and 9 mm thick and square edge type or as directed by the Engineer. The gypsum board of waterproof type shall be used for the toilet room. Gypsum board shall be conformed to TIS 219-2524.

(b) Ceiling Frames

Frame shall be gavanized steel T-bar of natural white surface and of minimum thickness 0.25 mm.

The main frame shall be fastened to the roof frames by suspension tied rods hanging from the steel purlin every 2.00 m center to center.

The suspended frame will be required to support only the lighting fixture, the other mechanical equipment unit will have separate supporting.

The frames shall be installed true to level and plumb to make an even surface when laying the units.

(2) Installation

- (a) Installation shall not be started until all wet work, including concrete placing and plastering have been completed and dried out to a degree acceptable to Engineer.
- (b) Joints between two boards of tapered edge shall be filled jointing tape according to the instruction of the manufacturer to make a neat and smooth joint. On completion, all joints shall be sanded flush and smooth with fine paper before receiving the finish paint.
- (c) Where the ceiling panel meets wall, column or beam, wooden trims shall be installed at the edges. Wooden trims shall be made of dry and sound in quality of hardwood and painting according to Section 20 after finishing the installation.

On completion, the ceiling board shall be in true level and plumb to an even, smooth surface.

The gypsum board shall be painted with 2 coats of acrylic emulsion paint as specified in Section 17.

S11.07 STRUCTURAL STEELWORKS FOR ROOF TRUSS

(1) Requirement

The structural steelworks specified in this clause includes all rolled, cold formed and fabricated sections as shown on the Drawings or as directed in the following structures:

- (a) Power House

(2) Standards for Fabrication

Except as otherwise provided in these Specifications, the fabrication, and erection of structural steel shall be carried out in accordance with AISC, Specification for the Design Fabrication and Erection of Structural Steel for Buildings. All welding shall conform to the requirements of AWS D1.1. All welding rods shall be furnished by the Contractor and shall conform to AWS A5.17 and AWS A5.1. These operations shall be performed by approved experienced specialized personnel.

(3) Protective Coating

When fabrication has been approved all structural steelworks shall be cleaned and coated in accordance with Section 17.

- (a) The Contractor shall furnish all necessary equipment and shall erect the structural steel in accordance with these Specifications and the Drawings.
- (b) Not less than thirty (30) days before starting erection, the Contractor shall submit for approval drawings showing the method of erection proposed and the amount and type of equipment to be used. The Works shall not be commenced until such approval has been obtained.
- (c) Structural steel members to be stored shall be placed on blocks so that no part of the members will touch the ground or be over-stressed and shall be kept clean and properly protected.
- (d) Proper allowance shall be made to compensation for shrinkage of field welds so that the structure will not be unduly stressed or correct alignment affected.

S11.08 ASBESTOS CEMENT ROOFING TILES

(1) General

The Contractor shall furnish and install:

- (a) All roofing tiles, capping, flashing, ridge cover and other necessary accessories to perform the Works as shown on the Drawings or as directed.
- (b) The system shall be designed and fabricated by the Contractor to suit the building as shown on the Drawing and shall be installed under the supervision of the manufacturer and in accordance with his recommendation.

(2) Materials

Unless otherwise specified, materials including accessories and trim shall be as follows:

- (a) Roofing shall be asbestos cement roofing tile, Romantile of dimension 50x120 cm and white colour. The roofing tile shall conform to TIS 79-2529.

- (b) Fasteners shall be either 12 inches bolts or 16 inches bolts to fit the dimensions of purlins.
 - (c) Capping, flashings, ridge cover, corrugation closers and other accessories necessary for installation shall be as indicated on the Drawings or as recommended to match the roofing.
- (3) Installation and Fabrication
- (a) Flashing, capping, ridge cover, fasteners and other accessories shall be used in accordance with the manufacturer's recommendations.
 - (b) Roofing tile angle shall be cut before installation. Overlapping of end tiles shall be not less than 150 mm to protect from the wind and rain.
 - (c) After finishing the installation, roofing tiles shall be cleaned of dirt, mortar and other debris.

Steel roof members, such as truss, purlins and tie rods shall comply with Section 12. All steel surfaces shall be primed and painted before installation.

S11.09 STEEL ROLLING SHUTTER DOORS

- (1) The Contractor shall furnish and install galvanized steel rolling shutter doors where shown on the Drawings or directed by the Engineer.
- (2) The rolling shutter doors shall be double corrugated profile doors as approved by the Engineer.
- (3) The Contractor shall submit shop drawings of the typical shutter curtain and details of guides, brackets and operating mechanism to the Engineer for approval.
- (4) Rolling shutter doors shall have curtains constructed of interlocking roll-formed galvanized steel slats secured with malleable metal clips and wearing pads. The doors shall be fitted with wind lock lugs. Guides shall be steel sections of sufficient depth to retain the curtain with fittings as required. The brackets and drum shall be capable of supporting the full weight of the door without undue deflection and fixed so as to allow the smooth operation of the doors. Rolling shutter doors shall be installed in accordance with the manufacturer's written instructions to the approval of the Engineer.
- (5) Rolling shutter doors shall be fitted with wicket doors and shall be operated by means of an endless rust proofed chain to a cast reduction gear of ratios as recommended by the manufacturer to allow smooth efficient operation.

S11.10 DOORS AND WINDOWS

(1) General

- (a) The Contractor shall furnish and install aluminum and wooden doors and windows including all glazing, flashing, fixings, hardware and other accessories as specified in this clause, as shown on the Drawings or as directed. The furnishing and installation of frames with necessary incidentals are included.
- (b) The Contractor shall obtain from the manufacturer written warranties in favor of the Owner. The warranties shall state that the fabrication of all doors and windows complied with this Specification and any defects that may arise during a period of two (2) years after issuance of the certificate of Final Acceptance shall be made good at the expense of the manufacturer.
- (c) Not less than ninety (90) days before commencing fabrication the Contractor shall submit, for approval, shop drawings of doors and windows showing sections, dimensions, fixing, provision for doors and windows accessories and other information as may be required by the Engineer.
- (d) Before ordering the fabrication of the doors and windows, the Contractor shall check the actual dimensions and shape of existing concrete openings.

(2) Glazing

- (a) The Contractor shall furnish the materials, labour and all necessary incidentals and equipment for the installation of the glazing. All glass for glazed door and window shall be 5 mm thick clear float glass, Grade A quality and equal to TIS. 54-2516.
- (b) The method of glazing shall be such that building movements due to wind and thermal effects are not transferred to the glass. Before glazing, rebates and fixing surfaces shall be cleaned, any temporary protective film shall be removed and glass edges shall be checked to ensure that glass is undamaged.
- (c) After installation glass shall be marked with soap or marking compound, not with advertising stickers.
- (d) During the progress of the Works, the Contractor shall kept the glass clean by promptly removing foreign matter, particularly cement deposits. Immediately before handing over all glass shall be cleaned twice internally and externally, removing any remaining protective coatings, cleaning off any excess sealant or other mark and checking to ensure the correct smooth operation of all doors and hardware.

Any damaged or broken glass shall be replaced, and the whole of the works left in good condition.

- (e) Glass cleaning agent shall be clean water, with or without detergents, or approved glass cleaning agent. Agents such as paraffin, kerosene, acid or abrasive cleaners or cleaners, which contain felspar, shall not be used for glass cleaning.
- (f) All glass shall be supplied and installed by the specialist. All glass shall have clean cut edges without shells or damage and shall be secured in position with colour fast neoprene extruded snap in type glazing beads or colour to match the frame sections. The glazing beads shall be fixed internally and glazing shall be carried out complete with all necessary sealant as approved by the Engineer.

(3) Door and Window Accessories

- (a) Door and window accessories including latches, locks, handles, bolts, plates, closers and hooks shall be installed to doors and windows as required. Locks shall be equivalent to TIS 756-2535 and suitable for use of interchangeable stumbler cylinders.
- (b) All door accessories shall be fixed as recommended by the manufacture, and to the satisfaction of the Engineer.

(4) Aluminum Doors and Windows

- (a) Material for aluminum doors and windows shall conform to ASTM. B209 or the equivalent. They shall be true shapes and free from any defect.

The outside surface of the aluminum material shall be anodized brown finish with more than 6.2 mg/cm^2 of anodized coating.

Anodized aluminum shall be finished so that it is of uniform appearance and free from all marks and blemishes. Aluminum for frames shall be not less than 2 mm thick and shall be not less than 1.5 mm for blade of louvers.

All assemblies for these items shall be first class local products used as standard material for multi-storey building.

- (b) Fabrication shall be performed true to the shapes and dimensions as shown on the approved shop drawings, to make them weather-tight, well-fitting, sturdy in construction and easy in operation.
- (c) All works shall be installed plumb, level, square and in proper alignment. Possible wrappings shall be adjusted before glazing is

begun. Installation shall be executed by highly skilled workmen in accordance with the highest standards of quality for work of this type.

Aluminium to be placed in contact with concrete, mortar, plaster or similar metals shall be given a heavy coat of alkali-resistant bituminous paint applied to the contact surfaces.

The units shall be fastened firmly to the structure by galvanized bolts, screws and other approved means and all such fixing shall be concealed type.

After installation, all works shall be cleaned of protective materials and surface blemishes and left in a condition satisfactory to the Engineer.

(5) Wooden Doors and Windows

- (a) Materials for wooden door and window shall be Dang wood or Takean wood which shall be dry and sound in quality without any defects. Plywood for panel shall be made of Teak more than 6 mm thick, and shall be of the waterproof type. The thickness of the doors shall range from 40 mm to 45 mm.
- (b) Fabrication shall be performed true to the shapes and dimensions shown on the approved shop drawings to make them well-fitting, sturdy in construction and easy in operation.
- (c) Doors and windows shall be installed accurately and true to the dimensions. All the frames of doors fixed in walls shall be installed before the plastering of walls. All door frames shall be secured in position by mean of heavy and approved steel fittings.

The lower ends of the door frames shall be blocked in the floor to the extent of 5 cm when the sill is omitted.

The Contractor shall protect all doors and windows against dampness during delivery and after installation before it will be painted by approved method.

After installation, all woodworks shall be finished with lacquer coating and painting in accordance with the prescription of Section 17.

S11.11 WATER SUPPLY AND SANITARY SERVICES

(1) Water Supply

- (a) The Contractor shall install the water the water supply for all buildings as shown on the Drawings or as directed by the Engineer.

- (b) The Contractor shall include in his lump sum price for the water supply, the cost of water distribution as well as the connecting line for the incoming water line as shown on the Drawings.
- (c) Excavation and backfill of the trench as well as coating and wrapping with coal tar felts shall be included in the lump sum.

(2) Sanitary Services

The Contractor shall install the following for the toilet rooms of all buildings:

- (a) Septic tank
- (b) One shower cold water
- (c) One washes basin (lavatory) / mirror
- (d) W.C. service
- (e) Drain and vent pipe
- (f) Toilet paper holder
- (g) Sanitaryware as directed on the Drawings.

The sanitary installation described above will be drained through 100 mm Ø PVC pipe Class 8.5 to a septic tank. The septic tank and seepage tank shall be as shown on the Drawings.

S11.12 NAMEBOARD, FLAG POLE, GUARD SHED, FENCING ENTRANCE GATE AND ELEVATED TANK WITH ELECTRICAL PUMP

- (1) Concrete for all foundations, curb and concrete post shall comply with concrete described in Section 9 and shall be concrete 175 ksc compressive strength (Class "B").
- (2) Reinforcement for all foundations, post, and board shall be as shown on the Drawings and comply with the requirement of Section 8.
- (3) Logo and lettering of the panel board shall comply with notes and as shown on the Drawings.
- (4) Shrub for decoration in front of the nameplate shall be as species approved by the Engineer.
- (5) Flag pole and its foundation shall comply with notes and as shown on the Drawings.
- (6) Type of fence shall comply with notes and as shown on the Drawing.
- (7) Entrance gate shall comply with the notes and as shown on the Drawing.
- (8) Elevated tank with capacity in accordance with notes and as shown on the Drawings.

- (9) Electrical pump shall be provided to submersible pump water from the natural stream and store in the elevated tank. The pump capacity and head shall be as specified on the Drawings unless otherwise shall have a minimum capacity of 25 litres/ minute and minimum total dynamic head of 10 m. The pumping system shall consist of automatic water level control (float switches at the elevated tank and pump control panel, etc.) and any piece of equipment required for satisfactory pump operation.

S11.13 LIGHTNING PROTECTION SYSTEM

The lightning protection system shall be installed in the building or elsewhere as shown on the Drawings or as directed. The Contractor shall prepare the Shop Drawings and submit to the Engineer for approval before commencement of the work.

S11.14 MEASUREMENT AND PAYMENT

- (1) Concrete and Reinforcement for the Power House, Housing, Office and Component structure.

Payment will be made per cubic meter at the rate bid therefor in the Schedule as stipulated in Section 9.

- (2) Brick Walls

- (a) Measurement for payment for the brick wall will be of the area obtained from the Drawings and/or the instruction given by the Engineer. Openings less than 0.25 m in cross section will not be deducted.

- (b) Payment will be made at the rate per square meter bid therefor in the Schedule, which shall include full compensation for furnishing all labour, materials, tools, construction equipment and incidentals for mortar, scaffolding and any other cost necessary for doing the work as specified.

- (3) Cement Plastering Brick Walls

- (a) Measurement for payment for cement plastering brick will be of the area obtained from the Drawings or/and the instructions given by the Engineer. Openings less than 0.25 sq.m in cross section will not be deducted.

- (b) Payment will be made at the rate per square meter bid therefor in the Schedule, which shall include full compensation for furnishing all labour, materials, tools, construction equipment and incidentals for mortar, scaffolding and any other cost necessary for doing the work as specified.

(4) Doors and Windows

Payment for furnishing and installing doors and windows as specified will be made at the rate bid therefor in the Schedule per each unit. The payment will include the cost of supply and installation of the doors and windows, cost of all labour and materials required to perform the work, accessories, glazing, lacquer coating, painting and all other incidental works. The following pay items are provided in the Schedule:

- (a) Aluminium opening door
- (b) Wooden opening door w/fanlight
- (c) Aluminium sliding window
- (d) Aluminium fixed glass window
- (e) Double opening window
- (f) Adjustable glass louver window
- (g) Fixed glass louver window

(5) Steel Rolling Shutter Doors

Payment for furnishing and installing roller shutter doors will be made as the lump sum bid therefor in the Schedule. This lump sum shall include the cost of all labour and materials required to perform the work, including the testing and commissioning.

(6) Partition Plywood Wall with Hardwood Frame

Payment for furnishing and installing partition plywood wall will be made as the lump sum bid therefor in the Schedule. This lump sum shall include the cost of all labour, material, protective coating and incidental required to perform the Works.

(7) Floor Finishes

- (a) Measurement, for payment, for furnishing and installing floor tiles and base boards will be of the exposed surface of tiled area and of the length of base board.
- (b) Payment
 - (i) Payment for furnishing and installing asbestos vinyl and ceramic floor tiles will be made at the rate per square meter bid therefor in the Schedule.
 - (ii) Payment for furnishing and installation of terrazzo block and ceramic floor tiles will be made at the rate per square meter bid therefor in the Schedule.
 - (iii) Payment for furnishing and installing PVC strip will be made at the rate per linear meter bid therefor in the Schedule.

(iv) Payment for furnishing and installing oil and resistant flooring will be made at the rate per square meter bid therefore in the Schedule.

(v) These rates shall include the cost of all labour and materials required to perform the work specified.

(8) Wall Finish

(a) Measurement, for payment, for furnishing and installing or applying the following wall finishes will be made of the exposed surface areas of ceramic wall tile, glass block wall and wire mesh.

(b) Payment for furnishing and applying cement plaster and furnishing and installing ceramic wall tiles glass block wall and wire mesh will be made at the rate per square meter bid therefor in the Schedule. These rates shall include the cost of all labour and materials required to perform the Works specified.

(9) Ceiling Works

(a) Measurement, for payment, for furnishing and installing of ceiling will be of the area of ceiling installed.

(b) Payment for furnishing and installing gypsum board ceiling will be made at the rate per square meter bid therefor in the Schedule.

These rates shall include the cost of the suspended T-bar frames, the gypsum boards, wooden trims and all labour and materials to perform the Works specified.

(c) Payment for painting of gypsum board ceiling will be made separately as stipulated in Section 17.

(10) Asbestos Cement Roofing Tiles

(a) Measurement, for payment, for furnishing and installing the roofing will be of the net area, i.e., included of the roof installed.

(b) Payment for furnishing and installing of the roofing sheet including accessories, flashings, and insulation will be made at the rate per square meter bid therefor in the Schedule.

(c) Measurement for payment of steel roof frames will be made separately as stipulated in the Section 12.

(11) Nameboard and Entrance Gate

Payment for nameboard and entrance gate will be made at lump sum bid therefor in the Schedule. The lump sum shall include supply and construct of all concretes, logo, shrub, letting and all the works required to complete the nameplate and entrance gate.

(12) Flag Pole and its Foundation

Payment for the flag pole and its foundation will be made as the rate bid therefor in the Schedule.

(13) Guard Shed

Payment for guard shed will be made as lump sum bid therefore in the Schedule.

(14) Water Supply and Sanitary Services

Payment for the water supply and sanitary service will be made at the lump sum price, which includes the work described in Clause S11.11.

(15) Elevated Tank with Electrical Pump

(a) Measurement and payment for construction, furnishing and installing of concrete works, pipe and valve, storage tank with electrical pump and control will be made of completed as shown in the Drawings or as directed.

(b) Payment for water elevated tank with electrical water pump will be made at the lump sum bid therefor in the Schedule.

The term of payment for elevated tank with electrical water pump mentioned above will be scheduled as the followings:

- | | |
|---|-----|
| - Completion of foundation and concrete works | 30% |
| - Completion of furnishing and installing elevated tank | 30% |
| - Completion of furnishing and installing electrical pump and control | 25% |
| - Completion of furnishing and installing pipes and valves, railing stall pipes and remaining works | 15% |

(16) Fence

Measurement and payment for the fence will be made in unit rates bid therefor in the Schedule (type of fence refer to Clause S11.12 (6)).

(17) Lightning Protection System

- (a) Measurement for payment for supplying and installing the approved lightning protection system will be the lump sum bid therefor in the Schedule.
- (b) Payment for supplying and installing lightning protection system will be made at the lump sum price as specified in the Schedule. This lump sum shall include the cost of all labors, materials, equipments and others related with the Works.

(18) Paving Block and Concrete Curb

Measurement for payment of paving block and concrete curb including sand layer 0.10 m under the block will be made at the rate per square meter as shown on the Drawings.

(19) Roof Drain

Measurement and payment for roof drain will be made in unit rates bid therefor in the Schedule (type of PVC pipe refer to Clause S11.11).