

## **08. ARCHITECTURAL & CIVIL SPECIFICATIONS**

### **Particular specifications and Pricing Preambles for Architectural and Civil Works**

**Project: PROPOSED LABORATORY AND WASH FACILITIES IN  
ZANZIBAR, TANZANIA**

**Client: KOICA TANZANIA**

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## 1 PARTICULAR SPECIFICATIONS

### 1.1 GENERAL

### **1.1.1 Definition**

The particular specification in this lesson shall be read in conjunction with the British Standards (the standards produced by BSI Group). British Standard and the particular specification shall be treated as complimentary documents. In case of any ambiguity or discrepancy between the British Standard and this Particular Specification, the Particular Specification shall prevail.

In this specification the terms ‘approved’, ‘approval’ and ‘required’ mean ‘approved by the Employer representative’, ‘approval of the Employer representative’ and ‘required by the Employer representative’ respectively. The ‘Engineer’ means Employer’s Representative.

### **1.1.2 Quality of Materials & General Standard of Work**

All materials used in the work, shall be the best quality of their respective kinds as specified in this particular specification or in the British Standard, shall be obtained from services and suppliers approved by the Engineer and shall comply strictly with the tests prescribed herein or in the British Standard approved by the Engineer.

Where trade names, brands and/or catalogue numbers are referred to, sole preference for any manufacturer is not intended.

Contractor is obliged to prepare samples, make arrangement to carryout tests and produce test reports in connection with all tests required by this Specification or the relevant British Standards. The Employer as provided for in the Contract shall pay the cost of such tests to the contractor.

Test Certificates covering all materials, which are supplied for the works for which certificates are required, shall be submitted to the Engineer for approval. At all times when tests are in progress, the Contractor shall have at least one qualified and approved representative present. In the event that any tests fail and additional retesting is required, then the cost of this additional retesting shall be borne by the Contractor.

No materials shall be used in the Works unless the Engineer has first approved them.

### **1.1.3 Temporary Facilities**

A suitable area will be made available by the Engineer discussing with health facility authority for establishing temporary building and storage for the Contractor. The Contractor shall not occupy an area outside the limits set down by the Engineer.

The Contractor shall submit to the Engineer details, particulars, drawings, etc. of all temporary works necessary for the Works for latter's information. The Engineer reserves the right to call for technical justification of the Contractor's proposals and to order any necessary modifications. But the Contractor shall be solely responsible for the stability and safety of all temporary works and for the quality of the permanent works resulting from the Temporary works eventually adopted The Contractor shall provide all statutory and necessary amenities

and sanitary facilities for workmen and other persons lawfully upon the site and remove on completion of the Works.

#### **1.1.4 Temporary Services**

The Contractor shall provide and maintain temporary services necessary for the execution of the Works under the contract. The Contractor shall make applications and install such services in accordance with the regulations and requirements of the relevant authorities.

The Contractor shall be responsible for all costs and charges in connection with the installation, alteration, shifting, adapting use and maintenance of such services. On completion of the Works, the Contractor shall handover to local authority such service, which are no longer required by him and or the Employer and clear away all traces.

#### **1.1.5 Damage to adjacent structures**

If during the execution of the work damage is, or is likely to be, caused to existing structures or services of the health facility or adjacent structures of neighbour due to the Contractor's operation they shall be made good to the approval of the Engineer or the authorities concerned. All costs in connection therewith shall be borne by the Contractor.

#### **1.1.6 Hours of Work**

The hours of work shall be 8.00am to 5:00pm, Monday to Saturday inclusive. Should the Contractor wish to perform any work, including plant maintenance, outside these hours/days he shall first obtain the permission of the Engineer to do so.

The Engineer reserves the right to restrict the contractor to make necessary changes on working hours and work programme, on the interest of health workers, in order to minimize the disturbance to the health facility.

#### **1.1.7 Bills of Quantities**

### **Performance Guarantee and Advance Payment Guarantee / Security**

Performance and Advance Payment Guarantee shall be on demand, unconditional, from a bank acceptable to the Employer. Payment for this item will be made when the Security or Guarantee in the specified format has been provided and accepted by the Employer.

### **Insurance**

The Contractor shall submit with his tender a breakdown with the cost specified for each insurance policy that he wishes to get reimbursed under this item. Payments for each insurance will be certified in accordance with the agreed breakdown when the individual insurance policies together with proof of full payment of its premium has been submitted to

and approved by the Engineer. All insurance policies submitted shall be on demand and unconditional, from an insurance organisation acceptable to the Employer

### **Temporary Works**

Payment for temporary works will be in monthly instalments, pro-rata to the measured works completed. All materials supplied by the Contractor for temporary works shall remain in the property of the Contractor and their removal from site is deemed included in sums and rates.

### **Time -Related Charges**

Time - Related Charges shall not be subject to re-measurement. The Contractor shall distinguish between “Time - Related Charges” and “Fixed Charges”. Payment for establishment costs relevant to these items will be by lump sum which will be made only after completion and acceptance of all facilities. Payment for maintenance/time related costs will be in monthly instalments commencing from when the facilities are made available and accepted by the Employer’s Representative. Contractor shall furnish detailed invoices and receipts of bill payments from the relevant local authority for all subscription fees and actual consumption of said facilities, provided that such use has been clearly recorded individually for units to which the Engineer has sole access. Payments can be suspended, reduced or deleted from any Contract Payment if, in the opinion of the Engineer, the Contractor is not fulfilling his obligations.

### **Provisional Sums**

Provisional Sums may only be expended upon the instructions of the Engineer. The work will be valued in accordance with the General Condition of Contract. The Provisional Sums included in the Bill of Quantities may be used in whole or in part or not at all on the instruction of the Engineer. Percentage for adjustment of Provisional Sums as provided in the General Conditions of Contract shall not be applicable to any work carried out by other parties employed directly by the Employer. Payments for such parties shall be made directly by the Employer.

### **Day Works**

A Day-Works bill is included in the Bill of Quantities for use when a work is executed on a day-work basis in accordance with the General Conditions of Contract. Work shall not be executed as day-Works except by the written order of the Engineer. Please also refer to the Notes under the Day Works Bill.

#### **(i) Labour**

Payment in respect of labour used in the execution of the day-Works shall be at the hourly rate stated in the Day-work Bill. Separate payment shall be made in respect of the amount of wages of the Contractor’s Site Supervisory, Administrative Staff or other minor categories of labour not listed.

The inserted rates for labour shall cover all bonuses, statutory charges and all other charges and costs in respect of or incidental to the employment of the said labour, except only the cost of materials and Constructional Plant. The rate shall also include the costs in respect of portable tools such as picks, shovels, barrows, trowels, ladders, hand-saws, buckets, trestles, hammers, chisels and all items of a like nature, which for the purpose of work executed on a day-work basis shall not be considered as Constructional Plant.

**(ii) Materials and Goods**

Payment in respect of materials or goods used in the execution of work on a day-work basis shall be net cost of materials or goods plus the required percentage addition stated in the Appendix to tender.

The “net cost of materials” means the net cost of such materials or goods delivered by the supplier to store or stockpile on the Site.

The stated rate shall cover the costs of taking delivery and putting into the store or stockpile, usage of any minor tools/equipment not listed under plant and equipment, storage, overheads and all other charges and costs in respect of or incidental to the procurements and handling of such materials or goods.

The costs of taking the materials from the store or stock pile on site to the place where they are used shall be paid for at the appropriate day-work rates for labour and Constructional Plant.

**(iii) Constructional Plant**


The inserted rate for Constructional Plant shall be paid for the plant when actually employed directly in the execution of the work on a day-work basis, excluding any travelling time, associated movement on the site with a prime mover or idling hours. The rate shall include the following:

- The cost of Constructional Plant including maintenance and spares, fuel and fuel distribution, oil grease, and any other consumables.
- The cost of crews, operators/drivers and attendants.
- All overheads, profits and other costs associated with the plant being required to work on a day-work basis.

**1.2**

**HEALTH & SAFETY AT WORKSITE**





Construction / renovation with in a facility in operation needs more attention in terms of health & safety of occupants. Vulnerable populations, workers and visitors remains important on top of construction workers. The top priority is keeping people safe during construction. Interim safety measures are often needed when construction interrupts the flow of the facility.

The below specification guides employer and contractor for figuring out how to get the project done without making any detrimental impact on occupants in any facility.

### **1.2.1 Planning and communication**

Smart planning and extensive communication play critical roles in all aspects of construction projects. The contractor can devote one employee to facilitate communication among UNOPS field staffs and facility's workers. Facility's workers are aware of the project. UNOPS field staffs shall inform them the scope of works of the facility and the schedule of construction well in advance.

It is the responsibility of the contractor together with UNOPS field staffs to make the work programme more feasible taking the necessary input of facility's workers. Input of workers in terms of operation of facility and health & safety of facility's workers are most essential to set out the suitable timing of certain activities. Extensive communication among all the parties is needed not only at the beginning of the construction but also during the entire period of construction. No work in any trade shall be carried out in such a manner as to cause any nuisance to the facility, adjacent owners, tenants or the public.

### **1.2.2 Dust Control**

Construction zones are dusty in general, while the existing facilities must be kept very clean. The dust from construction can enter in to the facility in multiple ways – through the ventilation systems, through open doors and windows, or tracked in on boots of workers walking through facility area. It is recommended to follow below mentioned best practices on how to contain and control dust during the construction.

- Isolate work area from the facility in operation. Close doors, windows and vents, create temporary walls with plywood/plastic/sheetrock up to the height of ceiling, designate a main entryway to the work area and use poly sheeting to isolate the work area and minimize the migration of nuisance dust.
- Always cut wood, drywall. Plastic metal, and all other materials, that you may use in your renovation/construction works, outside and away from any close facility.
- When possible remove furniture, tool, equipment and other things out of the work place: if not possible cover the property with drop cloths or poly sheets.

- Use runners, fiber boards, rosin paper or other surface protection material to protect walls and floors from dust or damage.
- Try to control and collect dust at the point / source of generation with vacuum equipped tools
- Breaking, drilling and other source of vibration have potential to create and dislodge dust collected above suspended or false ceilings; vibration loosen corrosion within water pipes as well. Plan should require vacuuming of affected area, in case of renovation within the health facility.
- Workers' clothing including shoes should be free of loose soil, dust and mud while entering into health facility.
- Misting before or during cutting also helps control airborne dust.
- Use proper personal protective equipment; protect your mouth, eyes, nose, ears, hands and feet.
- Do not dry dust, this practice relocates as much dust as you collect. A more effective way to collect dust from floor & furniture and other wood surfaces is to use microfiber dust collectors and damp cotton rags.
- Use water sprinklers on the site roads to reduce dust
- Minimize drop heights for loading and unloading operations
- Limit soil stockpile heights and slopes, protect from wind, cover if necessary

### **1.2.3 Cart Away Construction / demolition Debris**

The debris should be cart away from the site as soon as possible. Pile of the waste will minimize the space of occupants in the site, will become source of dust and contaminate ground and ground water in the event of rain.

- Sweeping construction debris lifts dust into the air; vacuum this materials. Vacuums should use either a HEPA or fine particulate filter. If sweeping, use dust control sweeping compound.
- Barricade and cover debris at the site before cart away.
- The debris piles should not block the surface runoff and the existing drains should be free from construction debris.

### **1.2.4 Control Odors and “Off-Gassing”**

Order and off-gassing is a problem for the closest facilities workers. Measures are needed to control them.

- Ventilate the work space before, during and after paints or finishes have been applied, Anti-termites application, flooring finished, carpets installed, or any other activity likely to off-gas pollution.
- Consider using of non-solvent (water) based paints
- Implement suitable waste management system to avoid Odour from the organic waste, temporary toilets

- Locate all existing sewer lines before excavation in order to avoid damaging them and order.

### **1.2.5 Fumes control**

Inhalation of fumes containing gases is a health risk of occupants in the facility. It should be eliminated or maintained to minimum.

- Introduce regular maintenance and service to the plants & equipment. Remove plant with the excessive fumes from site.
- Plants & equipment to be placed in a way to avoid fumes getting into the any other facility.
- Locate park plant away from site boundary.
- No incineration of any waste materials allowed on site
- Use of electric plant
- Use plants and equipment with the catalytic converters
- Avoid or consider substitution for hot work activities with in the health facility.
- Turn the engines off when plant not in operation
- Use proper personal protective equipment; protect your mouth and nose.

### **1.2.6 Noise & Vibration Control**

Noise & vibration can be a problem for the workers around when construction take place within the premises of a facility. It is essential to pay more attention on reducing the noise since we have people working in the neighbour's facilities. Unfortunately there are no many ways to limit construction noise and vibration.

- Liaison with workers and a make plan for operating noisy construction equipment such as concrete mixers, grinder, vibrator etc..
- Appropriate selection of plant and equipment (consider plants with the acoustic enclosures)
- Introduce regular maintenance and service to the plants & equipment. Remove plant with the excessive fumes from site.
- Use smallest machine that will achieve the operation/job/task
- Locate park plant away from site boundary
- Turn off plant when not in use
- Use proper personal protective equipment; protect your ear.

### **1.2.7 Avoid Interruption of Utilities to the Facility.**

- Do not share existing utilities of health facility for construction of housekeeping purpose of the project.

- Do not choose an option of obtaining utilities if it effects the existing services to the health facility.
- Locate all existing drinking water pipes, sewer lines, underground electric/ communication cable before excavation in order to avoid damaging and subsequent interruption
- Minimize the duration of interruption of utilities when the new upgrades are integrated with existing system, discussing with health workers.

### **1.2.8 Privacy and Security**

Workers from other facilities have right of privacy from staffs, visitors and other on-site persons. Since the infrastructure works require workers to work among staffs they have to be aware of their appearance and behaviour on the job. If staff are present or the area appears to be “off limit” to the general public, workers should obtain permission from staffs before entering any room or area in which they need to work. The workers need to sign in and out of pre-designated areas if determined necessary. They should not go to unauthorized areas. Workers should wear high visible jacket to show them as workers under the project. No one allowed to consume any tobacco product, illegal drugs and any kind of alcoholic beverages with in the facility premises.

The contractor should not share security service with facility. Contractor shall take his responsibility for the security of works, materials, plants and equipment at work site. The contractor shall not undertake any activity that could take the safety and security of the facility into risk; it includes uncontrolled movement of workers in and out frequently, keep on changing the workers at site, many visitors of contractor to the workplace, leaving the gate open etc...

Contractor is not allowed to use either any property of facilities or workers attached to the the facility for the works under the contract.

### **1.2.9 Obstructions by Works**

- The space required for new construction, contractor’s temporary facility and stockpiles has to be designated with the concurrence of staff. The area shall be defined in a way making minimum disturbance to the flow of the facility.
- It is the responsibility of the contractor to put closed temporary fencing right around the construction site to prevent outsiders getting into the site.
- The Contractor shall, to the satisfaction of Engineer, erect and maintain all necessary warning signs, barricades and lights and take all necessary precaution for the safety of the public and protection of the works
- The fencing should not block the way of surface runoff during the rain.

- Any work (probable rehabilitation) area outside of fencing has to be isolated as project requires. Necessary arrangement shall be made to minimize the disturbance due to the isolation.
- Workers shall not keep their tools, equipment or materials outside of isolated area.
- Workers' clothing including shoes should be free of loose soil, dust and mud while entering into any facility.
- The drive way of the facility should not be damaged due to heavy vehicle movement. It has to be repaired immediately, if it is damaged.
- The drive way of the facility should not be made muddy due to heavy vehicle movement during the rainy season.

#### **1.2.10 Infection Control for Workers**

- Waste management system of the facility should not be disturbed due to the construction activity in order to avoid contamination / infection.
- The Contractor shall take all necessary precautions to ensure the safety of workmen employed on the works site and shall bear sole responsibility for giving effect to such precautions and for any damage or injury to workmen.
- The Contractor should ensure that all employees on site wear required Personal protective equipment (PPE) at all times.
- The Contractor shall take all precautions considered necessary by the Engineer, to prevent the entry of unauthorized persons into the construction areas.
- The Contractor shall provide, equip and maintain an adequate first aid treatment on site and shall have an experienced first aid man available at all times when work is in progress.

### **1.3 WORKS**

#### **1.3.1 Site Works**

All the dimensions given in the Drawings should be checked at the site by the Contractor prior to commencing all work. In the event of any discrepancies, the Contractor shall inform the Engineer and request instructions well in advance and prior to commencing work.

The area described or shown in the relevant site plan shall be cleared of all obstruction. Specified thickness of layer of the proposed area of the structure including 3m around it shall be removed and levelled. Usable materials from removal of trees and demolishing of building shall be handed over to the health facility. Remove all anthills etc. and fill the all the hollows with suitable earth approved by the Engineer, compact and level the site.

#### **1.3.2 Excavation and Backfilling of Structures**

This work shall consist of the necessary excavation for foundation of buildings and other structures.

The work shall include the necessary shoring, bracing, dewatering and pumping; removal of logs, stumps and other deleterious matter and obstructions for placing the foundation; trimming of excavation; backfilling, clearing the site of debris and the disposal of excess excavated material.

For purpose of re-use and disposal, excavated materials shall be grouped as suitable and unsuitable, as given below;

- Unsuitable materials shall include highly plastic clays, silts, peat and other organic soils and soils containing roots grass and other vegetable matter.
- Suitable materials shall include all natural soils other those defined as unsuitable materials above.

The contractor shall organize and carry out excavation work in a manner that the suitable materials are excavated separately for use in works without contamination by the unsuitable material. All suitable material that is excavated shall be used in the construction for backfilling.

The depth of excavation shall be as shown in the drawings. All necessary shoring, shuttering, planking for the safety of personnel and works shall be erected. Where water is met whining the excavation adequate measures such as bailing, should be taken to keep foundation trenches free from water.

The bottom of the foundation shall be to the lines and levels as given in the drawings. Where rock strata are encountered, soft and weathered material shall be removed as necessary and the surface trimmed and dressed. If the excavation has been carried out deeper than necessary, as given in the drawings, the extra depth shall be made good with any other approved material.


Backfilling around the structures shall be carried out using suitable material and compacted properly. Care shall be taken to see that no damage is done to the structure by these operations. All suitable material from the surplus of excavation shall as far as possible be used in the construction of the roadway. All excess soil and other material from the excavation, including logs, boulders, shall be removed from the site.

### **1.3.3 Disposal of Excess Material**

All excess material shall be disposed as directed by the Engineer. Unsuitable material that is excavated shall be removed from the site. All dumped excess material shall be spread in a manner not to interfere with the drainage pattern of the area and affect other local environment. Plantation and other necessary measures shall be taken after the proper disposal of excess materials at a specified disposal area to protect the environment.

### **1.3.4 Borrow Excavation**

This work shall consist of excavation of suitable materials from approved borrow areas, for land filling. The contractor should meet the legal requirement of government for operating a borrow pit and transport earth.



During borrow excavation the borrow areas shall be kept drained as far as possible and all necessary precautions shall be taken to prevent any erosion or interference with existing drainage facilities. Borrow operations should be carried out in a manner not to affect the stability or safety of any structure or cause any other damage to adjacent property.

### **1.3.5 Land Filling**

This work shall consist of filling of low-lying areas with approved material obtained either from borrow pits or other sources.

#### **Materials**

Land filling material shall be suitable material soil having a maximum dry density under standard conditions of compaction not less than 1500 kg/m<sup>3</sup>.

The top soil up to 150mm shall be removed from area required for land fill and shall be set put as required. The pegs or stakes showing the limits of embankment shall be fixed a suitable distance outside the actual limits of the fill.

Land fill material shall normally be placed in layers not exceeding 150 mm loose thickness, and compacted as directed. The moisture content of the material shall be checked at the time of compaction. If the material is too wet it shall be dried by aeration and if it is too dry the material shall be sufficiently wetted prior to compaction. Each successive layer shall be placed only after the degree of compaction of previous layer has been tested and found satisfactory.

#### **Forming Edges and Sodding**

Edges of the landfill shall be sloped 1:1.5 gradient and compacted. Compacted edges shall be filled with removed top soil to 100mm thick and cover with strip grass sodding tamped to the same level with the slope, pegged and watered as directed by the Engineer.


### **1.3.6 Masonry Works**

#### **Random Rubble Masonry**

This work shall consist of construction, in Random Rubble (RR) Masonry of walls, foundations, drains and other structures. Work shall be carried out to the lines and dimensions shown in the drawings.

Stones used in Random Rubble Masonry shall be obtained from approved quarries. They shall be hard, durable, fresh rock free from fractures and other imperfections, and shall be of maximum dimension not exceeding 450mm.





Cement mortar used shall normally consist of Ordinary Portland cement, sand and water in the proportions specified. Mortar shall be mixed thoroughly by hand until its colour and consistency are uniform. It shall be mixed in small quantities only as and when required and shall normally be used within 30 minutes of mixing. Mortar, which had been mixed for more than one hour and showing signs of hardening, shall be discarded.

All stones, chips and spalls used shall be of clean surfaces to facilitate adherence of mortar to them and shall be wetted before laying. Every stone shall be set flush in cement mortar of 1:6 or other approved mix proportions and there shall be no dry work or hollow spaces left. Smaller stones shall be used to roughly fit the spaces between the larger stones and chips/ and spalls shall be wedged in where necessary to prevent thick beds of mortar. The stones in each course shall overlay the joints in the preceding course as far as practicable. A sufficient number of through stones shall be used in building walls. At least one through stone shall be built into walls at intervals of 2 m horizontally and 600 mm vertically.

They shall run through the full thickness of the walls, which are up to 600 mm in thickness. In case of walls exceeding 600 mm in normal thickness, more than through stones shall be used to run through the full thickness of the wall. In such cases the overlap shall not be less than 150 mm.

Where the faces of walls are to be plastered, their joints shall be raked to depths of 12 to 20 mm to form a key and the pasting shall be done using cement mortar of specified proportions and to the specified thickness. The faces, which are not to be plastered, shall be provided with struck off joints unless otherwise specified. In the latter case selected stones shall be used with straight edges as far as practicable, to provide close fitting joints of uniform width not exceeding 20 mm. The bushing of the stones shall not project more than 25 mm from the plane of the joints.

Where pointing of joints is specified they shall be carried out as given in the drawings or as directed.

Vertical construction joints in walls shall be avoided and at horizontal or sloping construction joints the mortar in the last course at the joint shall be omitted, for at least half the nominal thickness, to be later placed with the succeeding course of masonry.

When placing rubble masonry on or against construction joints all laitance shall be removed from exposed hardened mortar surface; any further edges and hardened mortar shall be removed from exposed stone surfaces.

Where rubble masonry is placed against a fill or excavation, surface irregularities in such surface shall be filled with stone chips, spalls or other free draining materials. Drains and formed weep holes shall be constructed as shown in the drawings walls above ground level in earth retaining structures except in wall foundations.

All rubble masonry work shall be maintained in constantly wet condition for a period of at least 3 days commencing from the time of final setting of the cement.



### **Solid Cement Block Masonry**

Solid cement blocks shall be 150mm in breadth, and easy to handle and casted with Portland cement and pure sand. They shall be solid with out cavities, in proper shape and well cured. The strength shall be conformity to BS specification. All joints and course well flushed with built in English Bond with mortar as specified in drawings/BoQ and no joints wider than 9mm.

### **Brick Masonry**

Well burnt common clay bricks in the size of Engineering Bricks. They shall be regular in shape with good clean arises free from lumps, cavities or stones. When broken the bricks fractures shall give a close grain uniform texture and colour. The strength shall be conformity to BS specification. All joints and course well flushed with built in English Bond with mortar as specified in drawings/BoQ and no joints wider than 9mm.

#### **1.3.7 False Work and Form Work**

Temporary works should be designed by the contractor and the design and construction should comply with British Standards. Responsibility for the strength and safety of false work and formwork remains with the contractor.

Formwork shall include all temporary or permanent forms / moulds required for casting concrete in-situ and all the temporary construction required for support.

The form work shall be constructed with adequate struts, braces, ties and clamps so as to produce finished concrete work to the required shape and dimensions. The formwork shall be sufficiently rigid and tight to prevent loss of grout or mortar from the concrete and shall take due account of the method of placing and compacting.

The formwork shall withstand the worst combination of the following loads:

- (i) Total weight of formwork, reinforcement and concrete
- (ii) Construction loads including dynamic effects of placing, compacting and construction traffic
- (iii) Wind loads.

Formwork shall be so constructed as to be easily dismantled and removed in sections in the desired sequence from the cast concrete, without shock, disturbance or damage. Where necessary the formwork shall be so arranged that the soffit form properly supported on props only, can be retained in position for such period as may be required by the maturing conditions or specification.

Propping and centring shall be sufficiently rigid and stable. Suitable horizontal as well as diagonal braces shall be provided to resist the lateral forces due to dumping of concrete movement of construction equipment and action of the wind and to provide lateral stability.

### **Materials for Formwork**

The timber used for formwork shall be light weight and easily workable with nails without splitting. It shall be stiff and strong enough to avoid undue deflection when loaded; be stable and not liable to warp when exposed to sun and rain, or wetted during concreting. It shall not be so soft as to get damaged easily on the contact faces under normal condition of erecting forms, fixing steel and pouring concrete. The timber shall be free from loose knots, projecting nails, splits or other defects that may mar the surface of the concrete. It shall not be so dry as to absorb water from concrete and swell and bulge, nor so green or wet as to shrink after erection. Species of timber which are not appreciably affected by contact with water shall be used.

### **Removal of Formwork**

The formwork shall be so removed as not to cause any damaged to concrete due to shock or vibration.

Formwork shall normally be stripped in the following order;

- (i) Shutters to vertical faces, e.g. Side of columns, beams and walls
- (ii) Shutters forming soffits to roof and floor slabs, horizontal and inclined canopies, etc.
- (iii) Shutters forming soffits of beams and girders.

### **Time of Removal**

In no circumstances shall forms be struck until the concrete reaches a strength of at least twice the stress to which the concrete may be subjected at the time of strike. Where possible, the formwork shall be eased out carefully in order to prevent the load being transferred suddenly to the partly hardened concrete. The period that shall elapse after the concrete has been laid, before easing and removal of centering and shuttering is undertaken shall be as given in Table below;

Vertical formwork to columns, walls and large beams	03 days.
Soffit formwork to slabs	14 days
Props to slabs	14 days
Soffit formwork to beams	21 days
Props to beams	21 days

Care should be exercised to avoid damage to the concrete, especially to corners and sharp edges and features.

In the case of other construction as an indication, only the minimum period between the completion of concreting and the removal of frame work shall be taken as follows:-

Vertical Faces to Mass Concrete	-	24 hours
Vertical Faces to Reinforced Concrete	-	24 hours
Support to soffits of beams, slabs, etc.	-	14 days

### **1.3.8 Concrete for Structures**

This work shall consist of the production of cement concrete for use in the construction of culverts and other structures. The work shall also include proportioning and mixing of materials; transporting, placing and compacting, finishing and protecting and curing for specified periods.

#### **General**

Concrete shall be composed of Portland cement, sand, coarse aggregate and water. The contractor is encouraged to prepare concrete as per the approved mix design. If not they also can follow nominal mixes proportioned by volume.

Aggregate shall be free from iron pyrites, iron oxides, carbon, organic matter, lumps of clay or other deleterious substances, and shall be screened and / or washed if necessary.

All cement used shall be Portland cement.

Preferred gradings for coarse aggregate for concrete

Sieve size mm	Percentage Passing	
	Nominal size of graded aggregate mm	Nominal size of Single sized aggregate mm

	37.5 to 4.75	19.0 to 4.75	12.5 to 4.75	37.5	19.0	12.5
75.0	100	-	-	-		
63.0	-	-	-	100		
37.5	95-100	100	-	85-100	100	
19.0	35-70	95-100	100	0-25	85-100	100
12.5	-	-	90-100	-	-	85-100
9.5	10-40	30-60	50-85	0-5	0-25	0-50
4.75	0-5	0-10	0-10	-	0-5	0-10
2.36	-	-	-	-	-	-

Preferred gradings for fine aggregate for concrete  
 (Zone 1,2,3 of PS 882, 1201: Part 2, 1973)

Sieve size Mm m	Percentage Passing		
	Zone 1	Zone 2	Zone 3
9.5	100	100	100
4.75	90-100	90-100	90-100
2.36	60-95	75-100	85-100
1.18	30-70	55-90	75-100
	15-34	35-59	60-79
600	5-20	8-30	12-40
	0-10	0-10	0-10
300			
150			

## Water

Water used for concrete shall be free from objectionable quantities of suspended solids, organic matter, alkalis salts and other impurities. Water taken from excavations shall not be used.

## Proportioning of Concrete Materials and Strength

### Mix Proportions and Strengths

The mix proportions and compressive strengths are given below. The mix proportions are indicated by the volumetric ratios of cement; fine aggregate; coarse aggregate. The concrete to be used in any locations is specified on the Drawings by the mix proportions followed by the nominal maximum size of coarse aggregate in brackets.

Mix Proportions	Nominal Maximum Size of Coarse Aggregate (mm)	Nominal Grade	Minimum Cube Strength at 28 days N/mm <sup>2</sup>
1:4:8	37.5	10	08
1:3:6	37.5	15	13
1:2:4	37.5	-	15
1:2:4	20	20	18
1:1.5:3	20	25	23

An additional 10% of cement over and above the specified mix proportion shall be used when hand mixing is done. The water / cement ratio by weight shall not exceed 0.55.

### Workability of concrete

The workability or consistency of fresh concrete shall be such that the concrete is suitable for the conditions of handling and placing so that after compaction it surrounds and grips all reinforcements and completely fills the form work.

The degree of workability shall depend on the nature of work and the method of placement; whether with vibration or without vibration.

For purposes of these specifications the degree of workability shall be classified as low, medium and high and shall normally be assessed by means of the slump test.

Generally accepted values of slump, in relation to the degree of workability and the aggregate used, are given in table below.

Degree of Workability	Nominal max. size of aggregate (mm)	Slump (mm)
Low	12.5	0-12

	20	12-25
	37.5	25-50
Medium	12.5	12-25
	20	25-50
	37.5	50-100
High	12.5	25-75
	20	50-125
	37.5	100-150

### Testing of Concrete for Acceptance

Concrete shall be tested by determining the crushing strength of 150 mm cubes at 28 days. Where so required, an early assessment of the 28 days strength shall be made by carrying out tests at 7 days on the assumption that 65% of the 28 days strength is achieved in 7 days.

### Hand Mixing

Hand Mixing where permitted, shall be carried out on a smooth watertight platform large enough to allow efficient turning over of the constituents of concrete before and after adding the water. Mixing platform shall be so formed that no foreign material gets mixed up with the concrete and the mixing water does not flow out of the mixing area.

### Placing and compaction of concrete

Prior to placing of concrete all formwork and reinforcement therein shall be cleaned of all extraneous material and dust and made free of any standing water. It shall be ensured that all formwork is made leak proof and that there is no loss of mixing water or grout from the concrete.

All mixed concrete shall be placed and compacted in the formwork, using approved vibrators of the internal, external or screed types, or combinations thereof depending on the type of job. Where approved, steel rods may also be used for the purpose in addition to the vibrators. The adequacy of the compacting equipment or the suitability of the compacting method shall be determined depending on the requirements. Use of steel rods only for compaction shall be restricted to only in small jobs and in low strength concretes.

In all cases of continuous concreting, fresh concrete shall be placed before the already laid concrete is less than 30 minutes old and where this time gap is exceeded a construction joint shall normally be formed prior to continuing with the concreting. All concrete shall be placed and compacted in horizontal layers normally not exceeding 300 mm in depth except where internal vibrators are used when the depth may be increased up to a maximum of about 450mm.

No concrete shall be dropped from a height greater than about 1.5 meters. Where chutes are used for placing of concrete they shall be kept clean and used in a manner to prevent segregation. When concreting has to be resumed on a surface, which has hardened, it shall be

roughened, swept clean thoroughly wetted and covered with a thin layer of cement grout or cement mortar as approved. Semi-hardened surfaces shall be well brushed to remove all laitance, cleaned and covered with a thin layer of cement grout prior to overlaying with fresh concrete.

### **Curing of Concrete**

Freshly laid concrete shall be kept undisturbed and protected from the effects of sun and rain from drying out till it hardens. Once hardened, the concrete shall continuously be cured in a moist atmosphere for a minimum period of 7 days and for a further period if so specified.

The method of curing shall depend on the type of member to be cured. Slabs shall be covered with burlap or other similar water absorbing material which shall be kept moist throughout the curing period. Such slabs may be kept covered with wet sand or even kept ponded up with water. Sides of such slabs may have to be kept continuously sprinkled with water.

It is encouraged to make use of curing agents to contain moisture in case of vertical faces of concrete element.

#### **1.3.9 Steel Reinforcement for Concrete Structures**

Reinforcement bars should comply with specifications in BS 4449: 1988 and mesh reinforcement with BS 4483: 1985. Steel reinforcing bars considered in the design are high yield strength bars for diameters 10, 12, 16, 20, 25; the characteristic strength should be 460 N/mm<sup>2</sup>.

Detailing is prepared on the assumption of the use of 6m bar lengths.

6mm diameter bars shown in reinforcement details are mild steel. ( $f_y = 250$  N/mm<sup>2</sup>)

Mill certificates of composition and strengths of steel, and certificates of strength tests on samples of steel purchased for use on this project and tested in an independent approved local laboratory should be furnished.

### **Spacers for achieving Cover to Reinforcement**

Specified concrete cover to reinforcement bars should be provided using cover blocks. Stool should be used to support top horizontal reinforcement and to separate vertical reinforcement in walls.

#### **1.3.10 Wood Work**

##### **Carpentry & Joinery Work in Roofer and Doors**

The quality and Properties of Building timber shall confirm to British Standard.

Sizes of joinery timber indicated in drawings shall be finished sizes and those of structural timber are "ex"-sizes before planning. The allowable tolerances of joinery & structural timber shall confirm to the standard.

All timber shall be kiln seasoned to a moisture content of 12% and shall be free of all defects such as end splits, dead knots or decayed section, surface cracks, warping, Seasoning of timber shall confirm to BS. All imported timber shall be preservative treated by pressure impregnation method, and shall generally confirm to BS 5628 Part V for structural timber and BS 5589 for joinery timber. The Contractor shall furnish a certificate from the organization, which will be responsible for preservative treatment, giving particulars of the chemicals used, and method of impregnation, Penetration etc.

Woodwork shall be deemed to be fixed with non-corroding nails and screws unless otherwise described, all plugging pelleting, etc., is deemed to be included.

Screwed woodwork shall be so described and shall be deemed to be fixed with non-corroding screws.

Special millings shall be described according to convention except that grooves, rebates and the like shall include for splayed grooves, rebates and the like.

Items which are to be plugged shall include for building in or drilling or cutting for and providing hardwood fixing plugs or approved proprietary fixings at 450mm centres unless specified otherwise.

If imported timber is used a certificate from the exporter giving particulars of preservative treatment, seasoning etc, shall be furnished by the Contractor to the Engineer.

All timber surfaces in direct contact with masonry or concrete work shall be coated with an approved fungi resistant waterproof paint or primer.

The Contractor shall furnish samples of all types of timber used in construction and also finished sections showing grooves, rebates, and splays etc, indicated in drawings or as required by the Engineer.

### **Adhesives**

Adhesives used for joinery work shall conform to one of the following:

- B.S. 745 - animal glues for wood
- B.S. 1444 - cold setting casein glue for wood
- B.S. 1203 - synthetic resin adhesive (Phenolic and Amino plastic) for plywood
- B.S. 1204 - synthetic resin adhesive (Phenolic and Amino/plastic) for wood

For structural gluing one of the latter three glues shall be used as specified.



Regarding storage, mixing and use of adhesive, the instructions of the manufacturer shall be followed.

## Fasteners

Fastener	Specification
Wire Nails	<p>Wire nails (oval, chequered head, lost head, round or panel pins) shall conform to the following standards.</p> <p>Steel nails - CS 8</p> <p>Copper nails - BS 120% Part II</p> <p>Where not specified, the gauge of the nails shall be suited to the woods being used and their length shall give a sound and secure fixing. Nails or screws used with reactive timbers shall be of non-ferrous metal.</p> <p>Nails used in wood work likely to be subjected to moist conditions (as in the case of external work) shall have the specified protective coating.</p>
Wood Screws	These shall be made of steel wire or brass wire and shall conform to CS 6 or BS 1210. The finish shall be oxidised, anodised, galvanised as specified
Coach Screws	These shall conform to BS 1494 Part 2. The finish shall be as specified
Black Bolts, Screws and Nuts	These shall conform to CS 97 with the specified finish
Washers	These shall be made of steel or brass and shall conform to CS 238 or BS 4320.
Steel Gussets	These shall be manufactured to the profiles shown on the drawings and made from steel plates conforming to BS 4360. Thickness of plates and the finish shall be as specified.
Mild Steel Connectors	These shall conform to BS 1579.
Other Fixing Devices	Expanding bolts and nuts, joist hangers, framing anchors, tie down straps, anchor bolts etc. shall be as specified in respect of materials, size, gauges and the finish.
Plugs	These shall be of durable timber like teak of specified sizes.
Dowels	These shall be Mild Steel rods of 16mm diameter and of adequate length.

Holdfasts	These shall be of Mild Steel flats 25mm x 6mm x 250mm long, turned up and with 2 Nos. 3mm holes drilled one end, and finish tailed at the other end.
Plywood, Hard Board, Block Board, Chip Board, etc.	<p>Plywood, Hard Board, Block Board, Chip Board, etc. These shall conform to the relevant Sri Lanka or British standards as noted below.</p> <ol style="list-style-type: none"> <li>1. Plywood for general purpose - SLS 261</li> <li>2. Plywood for exterior use – BS 1455 bonding W.B.P. (Grade 1 - where varnished, Grade 2 - where painted, Grade 3 - where hidden.</li> <li>3. Block Board - BS 3444</li> <li>4. Wood chipboard - BS 5669</li> <li>5. Hard Board - BS 1142</li> </ol>

### 1.3.11 Aluminium Doors and Windows

Samples of all the Aluminium sections, Glass, Hinges, Barrel Bolts and Locks and other fittings should be forwarded for approval within one month after the Award of the Contract. The Contractor should fabricate one sample Window and one sample Door for Approval by the Employer's Representative, prior to the assembling of the others. Shop drawings should be forwarded to the Employer's Representative for approval before manufacturing

- All aluminium sections shall be extruded sections and shall comply with D I N 1748 Part 4 or B.S. 6063 and of temper T5 to B.S. 1474.
- Aluminium Windows, Doors and Screens shall comply with the requirements of B.S. 4873.
- All anodising shall comply with the requirements of B.S. 1615 or B.S. 3987.
- Aluminium Framed Doors, Windows, Sliding Windows, Louvred Windows Screens, and such shall be made of extruded Aluminium alloy section by reputed approved organization. Anodised/Powder coated to specified colour to a minimum thickness of 20-25/60-80 microns unless otherwise specified.
- Aluminium roller shutters and the like shall be made of extrude Aluminium alloy section by reputed approved organization. Anodised/Powder coated to specified colour to a thickness of 20-25/60-80 microns unless otherwise specified.
- Aluminium sliding windows shall be removable for cleaning and shall be fitted with a suitable locking device.
- Fly screens shall be made of suitable matching Aluminium frame and Aluminium mesh.
- Aluminium Units shall be designed to resist penetration of external moisture to the

inside of the building. Fixing of frames for all units to building shall be such as to ensure solid, void free, waterproof joints. The joints shall be caulked with a building mastic which does not sag or run, non-hardening, non-staining and can be painted.

- For all Aluminium Units the Contractor shall check site dimensions and make fabricated work correspond to the 'Approved' shop Drawings.
- Samples of Aluminium Units shall be provided by the Contractor for approval, by the Architect. All units shall be of similar quality to the approved samples.
- All Glass louvers to Aluminium louvered Units shall be provided with the units.
- All glazing to Aluminium units shall be provided with the units.
- All Aluminium louver blades to Aluminium louvered units shall be provided with the units.
- The Contractor shall ease and adjust all aluminium window and doors and leave in perfect working order on completion.

### **1.3.12 Floor Finishes - In-situ Terrazzo Flooring**

The work shall generally conform to IS:2114 – Code of practice for laying in-situ terrazzo floor finish.

#### **Materials**

Aggregate for terrazzo topping shall be marble chips from 1 mm to 25mm in size and marble powder used as infill shall pass through sieve 300.

#### **Pigments**

All pigments shall be permanent colour

#### **Dividing Strips**

Dividing strips may be of aluminium, glass or as specified. Aluminium strips is used shall have a protective coating of bitumen. The thickness of strip shall not be less than 1.5mm and width not less than 25mm

#### **Thickness**

The floor finish shall consist of 2 layers, and under layer 20-25mm thick and topping 6mm to 12mm thick depending on the size of the topping aggregate.

#### **Mix Proportions**

The under layer shall be in nominal mix 1:2:4 and aggregate size shall not be exceed 10mm. Topping ingredients shall comprise of cement, pigments (optional), marble powder, marble

aggregates and water. Cement and marble powder shall be in the ratio of 3:1 by weight. For marble aggregate size less than 7mm, the ratio of mixture of cement and marble binder to aggregate shall be 1:1.50. Pigments when used shall be in quantity specified by Table 1 of IS:2114.

### **Crack Prevention**

Each panel shall not be more than 2 m<sup>2</sup> in area and joints so located such that longer dimension of any panel does not exceed 2 m in length.

### **Preparatory Works**

Flooring shall be taken up after erection of heavy machinery, plastering and fixing of doors and windows. All levels and extent of the flooring shall be clearly marked before proceeding.

All materials shall be stored in a clean dry place. Mixing may be done either manually in a trough or in a special mechanical mixer. Cement and pigments shall be mixed first, then marble powder added. After further mixing aggregates shall be introduced. When all materials have been thoroughly mixed water shall be added in small quantities until the proper consistency is obtained. The mix shall be used within half an hour of its preparation.

### **Spreading under Layer**

The surface of the base concrete shall be prepared as for granolithic flooring. All dividing strips shall be laid out and anchorage between panels provided by 40mm cross nails where dividing strips are not used the screed strips shall be correctly fixed on base. The under layer shall be spread on a cement slurry over base and its top surface left slightly rough for proper bonding with the topping.

### **Laying Terrazzo Topping**

Terrazzo topping shall be laid according to best workmanship standards. Topping shall commence within 24 hours after laying of under laying while it is still in its plastic stage. A preparatory coat of cement slurry shall be brushed first. The mix shall be compacted thoroughly by tamping and then trowelled. Excess towelling shall be rammed highly to remove any depression. Finally the surface shall be trowelled with a slight pressure rather than pure float to ensure removal of air bubbles and give a more durable finish. Borders and decorative designs shall be laid out beforehand. In removing form work for decoration adequate care shall be taken to ensure minimum disturbances to the design and the surrounding topping. All defects arising from such disturbance be immediately rectified with a trowel.

### **Curing**

First air curing shall be carried out 12 to 18 hours. Then curing by ponding with water shall be for minimum of 4 days.



## Grinding

Manual grinding shall not be carried out within two days of laying. For machine grinding this period shall be 7 days. The grinding shall be carried successfully in 4 stages with a 5 days curing period in between. For the first stage 60 grit size carborundum stone shall be used. And for next successive stages grit size of 80, 120-150 and finally 320-400 shall be used. After final grinding, the surface shall be washed cleaned, rubbed with felt and moistened with oxalic powder. Finally just before occupation the floor shall be washed with dilute oxalic acid and made glossy by running a polishing machine fitted with felt bobs.

## Laying Terrazzo Skirting and Dodos

Under layer shall be of stiff cement mortar 1:3 combined under layer and terrazzo thickness shall not be less than 20mm and topping by itself not less than 6mm thick. Other details regarding laying, curing, grinding shall be as for in-situ terrazzo flooring described earlier.

### 1.3.13 Wall Finishes - Plastering

Plastering shall consist of Portland cement plaster applied to the limits and lines indicated on the drawings. The thickness indicated on the drawings / BOQ are the minimum thickness required and additional thickness will be required to provide for any unevenness in the masonry surface. In the event the average complete plaster thickness over an area in excess of 5 square meters will exceed 5 cm, a galvanised wire reinforcing square mesh of weight not less than 1.4 kg/sq. m shall be attached to the masonry and plastered into base coat.

Before plastering all grounds and corner bends shall be firmly secured in place. Concrete masonry and brick / block surfaces shall have sufficient roughness to provide proper bond and shall be dampened by brushing or spraying with clean water followed by a primary coat of Portland cement. Where the finished plastering is to be greater than 2 cm thick it shall be applied in two coats, a base course not less than 1.5 cm thick and a finish coat not to exceed 1.5 cm thick.

## External Plaster in Buildings

The external plaster shall be in 1:1:5 (cement: lime; sand,) finished smooth/rough to a thickness of 20mm as indicated in the drawings. Any variations to this would be as approved by the Employer's Representative and within the clauses listed above.

## Internal Plaster in Buildings

The internal plaster shall be in 1:1:5 (cement: lime; sand,) finished smooth to a thickness of 15mm as indicated in the drawings. Any variations to this would be as approved by the Employer's Representative and within the clauses listed above.

## Soffit Plaster

In the case of soffit plaster to underside of floor slab should be after completion of floor rendering and finishes to the suspended floor. The concrete surface should be wetted and allowed to dry before application. Even thickness and true surface is ensured by establishing gauges at 1.5 m intervals.

Cement mortar 1:3 or other specified proportion shall be used for concrete surfaces to thickness of 10 mm.

### 1.3.14 Ironmongery

All ironmongery shall be **polished brass heavy quality type**. Samples of ironmongery items required for the works shall be submitted as soon as practicable after commencement of the works, to the Engineer for approval.

All ironmongery shall be installed and fitted according to the printed instructions of the manufacturer.

Before the start of painting works all locks, handles etc, shall be carefully removed, numbered and stored, and replaced before handing-over.

Ironmongery, which cannot be removed, shall be covered with a linen tape for protection against damage and paint splashes. This tape shall be removed at handing over and the ironmongery cleaned.

## Hinges and Pivots

All hinges shall be "heavy-quality" polished brass fixed to sashes and frame with matching screws supplied by the manufacturer of hinges.

Number of hinges per door shall be as shown in details. The following may be taken as a guide. In case of discrepancies between the following guideline and the information furnished in drawings, instructions given by the Engineer shall prevail.

Doors lighter than 30kg to have a minimum of 2 Nr. butt hinges 102 long, unless fitted with a door closer, in which case 3 Nr. butt hinges shall be fitted.

Doors between 30 and 50kg to have minimum of 3 Nr. butt hinges 102 long. Doors heavier than 50 kg to have 4 Nr. butt hinges at least 102 long.

Top of upper most hinge approx. 125mm from top of door, underside of lowest hinge approx. 200mm from bottom of door, central hinge(s) on fire doors equally spaced between top and bottom hinges, on non fire doors the third hinge is to be placed immediately below the upper hinge, on non fire doors requiring a hinge, the fourth hinge shall be placed centrally between the lower and the third hinge.

Swing doors in disabled's toilets shall be provided with gravity hinges (two for each sash.)

Each timber window sash shall be provided with butt hinges, barrel bolt (150mm), casement stays, casement fasteners complete with all parts.

### **Glazing.**

All glass in building doors and windows shall be best quality clear glass free from bubbles, waves, scratches and cloudiness. Minimum thickness shall be 5mm. Pin head glass shall be fixed to quarters' doors and windows.

## **1.3.15 Painting and Decorating**

All dirt, dust, loose plaster, and other deleterious matter which would prevent good paint adhesion shall be removed. All holes, cracks, and depressions shall be filled with patching plaster, mixed and applied to properly key with and match existing plaster. Patches shall be sand papered when dry so that flush, smooth, and properly sealed surface is available before applying prime coat. After priming surfaces, suction spots shall be touched up again with additional prime coat material until entire surfaces evidence uniform coating. For enamel finishes on smooth plaster, all undercoats shall be sand papered by hand with No.00 sandpaper and dusted clean before applying succeeding coat.

Paints shall be proprietary brands approved by the Engineer and shall be the best of their respective kinds and shall comply with the relevant current British Codes and Standards and the Specification of work. If the Contractor intends to use a brand of paint other than those mentioned in the contract the prior approval for the same shall be obtained from the Engineer. Primers and finishing coats of paint shall be those manufactured by the same manufacturer and shall be delivered to site in sealed containers as issued by the manufacturer concerned. Brand name, make, date of manufacture and date of expiry shall be properly identified and labelled in containers. Mixing and application of paint to be strictly in accordance with the manufacturers printed instructions.

Only freestanding independent scaffolding system will be permitted. All metal fittings and fastenings in areas to be painted shall be removed before the preparatory processes are commenced. These shall be cleaned and re-fixed in position on completion of painting work. Cleaned dustsheets are to be used for the adequate protection of floors, fixtures and services, which are not to be painted.

Paints shall be stored to avoid exposure to extremes of temperature. Paints shall not be thinned without specific approval but when necessary thinning shall be carried out with the type of thinner and in the proportions recommended by the manufacturer of paints.

The whole of the painting work is to be carried out by skilled tradesmen in a manner



conforming to the best trade practice and to the sequence approved by the Engineer. A properly qualified Forman is to be constantly on the job whilst the work is proceeding.

A painting schedule shall be prepared by the contractor in consultation with the Engineer, prior to the execution of work to enable work to proceed, as programmed. The schedule will give the necessary information on color, type of under coats and finishing coats, surfaces to be coated, and method of application. No exterior painting shall be carried out in extremes of temperature, in a rain or when temperatures are falling rapidly. Painting shall not be started until the preparatory work has been completed to the satisfaction of the Engineer. No paint shall be applied to surfaces having excessive moisture contents. No subsequent coat shall be applied until the previous coat hardened.

Except when approval is obtained to use roller coater, all paint is to be applied by approved brush ware. Use of rollers will only be permitted after the approval of the Engineer has been obtained

## **2. PRICING PREAMBLES**

### **2.1 GENERAL**

The Contractor should allow against the items or in the prices for everything contained in these Bills of Quantities which has a monetary value.

Lump sums shall not be given where unit rates are applicable.

Payment against any item in the Bill of Quantities will be made only if such item has actually been carried out by the contractor. If the Contractor intends to execute any alternative method of construction, the Engineer's prior approval thereof shall be obtained prior to execution of such work in order to ensure payment against the relevant item.

Unit rates may be used reciprocally in the settlement of accounts unless conflict between them occurs. The Contractor is, therefore, to ensure that identical items occurring in separate bills are not priced at different rates unless this is his deliberate intention.

The Contractor shall check against the summaries that each copy of the Bills of Quantities is complete in the number of pages and in the reproduction of each page.

The Contractor's prices and extension shall be entered in waterproof ink.

Unit rates and extensions shall be given in Sri Lankan Rupees to a maximum of two significant places of decimals.

The various documents collectively referred to herein as the Bills of Quantities jointly constitute the Bill of Quantities referred to in the Conditions of Contract.



These Bills of Quantities have been measured generally in accordance with the principles laid down in the Method of Measurement of Building Works and rates shall include for everything required for complete sections of work in accordance with the specifications and drawings.

In the Bills of Quantities, if any materials/ fittings are described by using a trade name, it is only for the purpose of indicating the minimum level of quality and standard required. The Bidder may use any other material/ fittings, which are considered as equivalent in quality and standard to those specified therein subject to the approval of the “ Engineer”

Items in the preambles section of these Bills of Quantities are deemed to qualify and to form part of every description of measured work to which they refer including composite descriptions.

No amendment which has not been authorized in writing by the Engineer shall be made to these Bills of Quantities.

The Contractor shall not use these Bills of Quantities as a construction programme or for the purposes of ordering materials or arranging sub-contracts. The references for these activities shall be the drawings, specification and instructions issued by the Engineer.

These pricing preambles are a standard and comprehensive set and hence may exceed the requirements of this particular project.

#### Format for Descriptions

In addition to common abbreviations the following have been adopted:

m	–	metre	m <sup>2</sup>	-	square metre
m <sup>3</sup>	–	cubic metre	mm	-	milli meter
nr	–	number	t	-	tonne
kg	–	kilograms	h	-	hour
CP	–	Code of Practice	BS	-	British Standard
BOQ	-	Bills of Quantities			

Every description shall read as if the phrase “and the like” were incorporated into it.

Where specific classifications have been given but are deemed to include other categories of work only the classified item shall be given in descriptions.

“Prices also to include”; items under this heading fall into two categories :

- a) Those which are deemed to be included in descriptions and therefore, in prices.
- b) Those for which the Contractor shall allow in his prices.

“Approved”, “Directed”, “Selected” and similar expressions shall relate to the Engineer’s decision.

“Falls”, “Slopes”, “Weathered”: inclined from the horizontal in one plane.

“Cross Falls”, “Cross Slopes”, “Cross weathered” : inclination from the horizontal in more than one plane.

Prices also deemed to include

Rates shall be comprehensive and include for the following:

- a) All obligations imposed by the Contract.
- b) Complying in every respect with the requirements and the considerations of the specifications and drawings.
- c) All considerations arising from the definitions incorporated into each preamble section.
- d) Labor for transport of material, construction works, curing of constructed works and for fixing, all associated costs, cleaning after completion of works and providing security.
- e) Materials and goods and all associated costs.
- f) Fitting and / or fixing materials and goods in any position, hoisting to any height.
- g) Use of scaffolding, plant, equipment and tools.
- h) Allow for protection of finished surfaces/fittings etc. of all work sections.
- i) Use of water for construction works, curing of constructed works and for cleaning after completion of works.
- J) Use of electricity during construction works. Any additional labours usually associated with measured items.
- K) Testing of material, water supply and sewerage works.
- L) Providing safety measures.
- M) Testing of electrical installations and Mega testing by and independent authority acceptable to the consultant.

N) All overheads profits, local taxes, security and monitoring fees unless otherwise described separately.

O) Removal of all debris as directed by the Engineer

All measurements are net and the rates shall include for all laps (except for steel reinforcement where the quantity of laps is included in the BOQ quantity), waste, working space and trade or traditional allowances.

The pricing of materials shall take account of the following:

Pricing Preambles, Drawings and Specifications shall apply reciprocally between sections of the works unless otherwise described.

- a) Materials shall be of the best quality available unless otherwise described.
- b) All materials shall be transported, handled, stored and fixed in accordance with the printed instructions or recommendations of their manufacture or suppliers.
- c) Protection of completed work, all casings and temporary coverings and making good and clearing away upon completion.

Building paper, damp proof membrane, quilts and all non-rigid sheet materials shall include cutting or forming holes and notching and the extra labour of turning up at edges and the like. Duct shall include draw wires.

Holes, mortices, pockets, grooves, chases and the like and items described as “built in” and “cast in” shall include making in its fullest sense and through, around, into over and up to the items concerned.

Items described as “cut” shall include general making good similarly.

Where the word “allow” is used the cost of the items shall be the responsibility of the Contractor.

The Contractor shall obtain from all sub-contractors (weather nominated or otherwise) their requirements for all recesses, chases, holes and the like in order that they may be built in or formed as the work proceeds. No additional charges shall be allowed for cutting recesses, chases and holes and the like after the construction of the works.

In the event of their being any discrepancies between details on drawings, descriptions in specifications and descriptions in the Bills of Quantities then the rates and pricing shall be deemed to relate to the documents order of precedence set out in the Form of Agreement.

The amounts set against any Provisional Sums for supply of materials shall be the net CIF amount adjusted for all discounts and customs duty. The amounts set against any items of profit shall include for all costs in connection with letters of credit, bank charges, interest charges and insurance after the materials come under the control of the Contractor.

The Contractor should leave the whole of the works ready for immediate occupation to the satisfaction of the Engineer including the following:

- a) Cleaning and touching the buildings both inside and out, leaving all surfaces free of cracks, blemishes or splashes.
- b) Easing, oiling and adjusting and making good of finishes to all fittings, doors, windows, ironmongery and the like.
- c) Cleaning and polishing all marble glass, anodized aluminum and sanitary ware, including the removal of all protective coverings, paint splashes and the like. Replacements of all or any chipped, cracked or broken items.
- e) Removal of temporary sheds, worker toilets etc. rubbish, debris or excess spoil from the site area and raking over and cleaning all unused parts of the site area.

### **Prime Cost Sums in Unit Rates**

Certain rates within the Bills of Quantities will include Prime Cost Sums. The material specification and fixing details will be specified. The Contractor is to include against each heading the necessary uplifts and additions required to give his final rate. This rate will then be carried to the relative places within the Bills of Quantities.

These prime cost sums are subject to alteration and no additional claim will be allowed for the varying of these items.

## **2.2 WORKS**

### **2.2.1 Excavation and Earth Works**

#### **Definitions**

Rock is defined as any material met with which is of such size or position that, in the opinion of the Engineer it can only be removed by means of wedges, special plants or explosives..

#### **Method of Measurement**

The method of measurement and re-measurement will be entirely at the discretion of the Engineer but generally will be as follows:

- a) Where there is no reduced level excavation, other excavations will be measured from natural ground level.
- b) In instances where there is excavation to reduce levels other excavations will be measured from the reduced level.

Should the Contractor be able to use any excavated material arising from the works as general filling then it shall be measured as material back filled in making up levels with a deduction of items for filling and for material removed from site.

#### Prices also to include

Rates for excavation shall be deemed to include for the following.

- a) Excavating by whatever means are necessary including hand excavation in any kind of ground, except rock.
- b) The depth of excavation shall be as shown in the drawings. All necessary shoring, shuttering, planking for the safety of personnel and works shall be erected. Where water is met whining the excavation adequate measures such as bailing, pumping, and foundation trenches free from water should be taken.
- c) Over-break including filling with mass concrete to the levels required by the Engineer.
- d) The bottom of the foundation shall be to the lines and levels as given in the drawings. Where rock strata are encountered, soft and weathered material shall be removed as necessary and the surface trimmed and dressed.
- e) Ramming and compacting sides and bottoms of excavations.
- f) Additional excavation for working space arising out of any cause, as excavation measured net unless otherwise specified in item description.
- g) Compliance with relevant acts, by laws and regulations relating to excavations and earth work supports.
- h) Compliance with relevant acts, by laws and regulations relating to excavations and earth work supports.

#### Hard Rock

The tenderer at the time of preparing the tender shall ascertain the prevailing laws and regulation as to the legal requirements of blasting rock and shall allow in his prices accordingly.

### Hard rock requiring blasting

Rates for excavation in rock requiring blasting shall include for:-

- a) Obtaining all necessary permits and taking precautionary measures during blasting operation.
- b) Complying with all regulations and instructions issued by relevant government or local government authorities.
- c) Additional Insurance cover; if necessary.

Sledding and stock piling excavated rock etc. as directed by the Engineer. (Maximum distance of stock pile 100 meter from the point of excavation).

#### Note:-

For the purpose of measurements, percentage of voids in stock pile shall be taken as 20% the volume considered for payment shall be the gross volume of stock pile x 0.80

#### Earth work support

- a) Provisional quantities of earth work support (planking and strutting) are given in the BOQ.
- b) Payment for earth work supports will only be considered if physically carried out at the site.

The Contractor shall obtain the prior approval of the Engineer before carrying out any alternative method of earth work supports than specified in the Contract.

### Backfilling Around the Structures

Backfilling around the structures shall be carried out using suitable excavated material of trenches & pits for foundations

### Termite Protection/Applying Insecticides.

The quantity measured in the BOQ is the plinth area of the building in square metres. The bidder shall assess the actual quantity of area to be treated and shall allow in the unit rate accordingly.

Rate shall include for providing guarantee as per contract.

## **2.2.2 Concrete Works**

### Prices also to include

The Contractor should ascertain from the Engineer the total number of locations of items to be formed in and cast into in-situ and pre-cast concrete including those which are not specifically

shown on the drawings. No cutting away of concrete shall be carried out without the approval of the Engineer. All remedial works shall be carried out at the Contractor's expense.

**The rates for all In-situ concrete work shall include for the followings:**

- a) Concrete test cubes and testing costs.
- b) Mixing, hoisting (local) and placing and compacting on the surfaces of any material or on formwork.
- a) Forming any construction joints or the like.
- d) Vibrating, Curing and protecting concrete surfaces from harmful weather conditions.
- e) All necessary keys to concrete surfaces to receive in-situ finishes.
- f) All costs in connection with the construction of "kickers".

**The rates for plain concrete foundations and concrete blinding shall include for the following.**

- a) All necessary shuttering to edges or extra volume of concrete used in lieu of shuttering.
- b) Forming sloping upper surfaces where required.

The rates for reinforced concrete shall include for working concrete around reinforcement.

**The rates for bar reinforcement shall include for the following:**

- a) Positioning and protecting starter bars.
- b) Straightening (if required) cutting to length and bending reinforcement to required shapes.
- c) Waste and rolling margin of steel reinforcement.
- d) Cleaning and wire brushing.
- e) Supporting in position during concreting :  
Provision of supports (excluding links and stirrups) steel binding wire and approved/ appropriate cover blocks.
- f) Additional cutting and bonding in connection with holes, mortices, packets, grooves, chases and the like.

g) Preparation of detailed reinforcement drawings and bar bending schedules for all steel work to be submitted to the Engineer or his representative for approval before starting the work.

**The rates for reinforcement shall include for the following:**

- a) Straight raking curved and circular cutting and waste, bending to profiles, lap lengths / rectangular module or as noted.
- b) Supporting in position during concreting: provision of supports (excluding special chairs) steel binding wire and approved / proprietary distance pieces.
- c) Cutting, bending and notching around all obstructions.

**The rates for Form work as appropriate shall include for the following.**

- a) Small quantities.
- b) All cutting and waste including raking curved or circular cutting and cutting and notching around pipes, ducting and fittings.
- c) Setting up, strutting and supporting at any height above the structure subject to any limitations imposed by the Employer's representative including all props, stays struts, wedges and bolts etc.
- d) Carefully coating with shutter oil ensuring that no shutter oil is applied to surfaces of reinforcement.
- e) Easing, striking, removing and cleaning and preparing for re-use and removal when no longer required.
- f) Over laps and passing's at angles and labours at intersections.
- g) Shortening struts or shapes and re-strutting or re-shoring where required.
- h) Rubbing down, filling and making good the surface of concrete after removal of shuttering.
- h) Cutting or notching shutters or moulds to in-situ or pre cast concrete around projecting reinforcement.

**2.2.3 Masonry Works (Rubble, Block and Brick Works)**

Prices also to include



**The rates for masonry walls shall include for the following:**

- a) Material testing at a recognized laboratory, provision of certificates.
- b) Small quantities and any extra labour in forming curves and curbs.
- c) Straight, raking, curved and circular rough or fair cutting, plumbing at angles, cutting and bonding at angles, openings and intersections, building into and / or against adjacent work, wedging and pinning up to soffits.
- d) All necessary keys for in-situ finishes.
- e) Grouting up at back of walls built against other construction.
- f) All necessary cast in wall ties at any junctions between different types of constructions such as brickwork + block work, brick work + concrete work, block work + concrete work and the like.
- g) All necessary expansion, construction, contraction joints, slips, strip or the like curing and protecting from weather.

**2.2.4 Metal Works**Definitions

“Welding” is deemed to be in accordance with the specification and for the material to which it is to be used. Gusset plates, shoe plates, ends, caps, cleats, brackets, stiffeners, bolts, etc., have been included in the weights of the associated steel work in which they occur.

Prices to Include

- a) All shop fabrication work, marking, delivering, unloading, hoisting, and (local) erecting, fixing.
- b) Allowance for rolling margin.
- c) The weight of weld metal in welded constructions.
- d) Members of any length.
- e) Cutting to size and shape and joints in the running length.
- f) Notches, holes, slots, mitres, ends and for all drilling and splay cut ends.

g) Grinding to a smooth finish, unless otherwise required.

h) After fabrication wire brushed to clean the surface and spray painted with two coats of anticorrosive and two coats of enamel paint.

d) Rates for galvanising or similarly treated work are to include for the treatment of all ends to the approval of the Engineer.

### **2.2.5 Wood Works**

#### Method of Measurement

Sizes of sawn timber are basic.

Sizes of milled timbers are finished.

All timber sizes indicated in the descriptions shall be finished sizes after plane.

#### Prices also to include

The rates for woodwork shall include for the following:

- a) Working to size and shape including short lengths, mitres and ends.
- b) All joints in the running length including structural joints.
- c) Cutting and fitting to steelwork, trimming around openings, nothings, boring and sinking.
- d) Priming backs of woodwork in contact with structure with a mixture of linseed oil and red lead or as specified.
- e) Providing concrete spur blocks (50mm) high at floor or ground levels, packing's or the like for woodwork in contact with or fixed to the structure or the like.
- f) Applying two coats of an approved wood preservative before fixing.

The rates for framed woodwork shall include for proper framed joints, gluing joints, dowelling and/or screwing joints.

The rates for milled woodwork shall include for the following.

- a) Punching fixings below exposed surfaces and filling flush.
- b) Any necessary sanding to remove “rippling” caused by milling machines
- c) Special returned ends.

- d) Wreaths, ramps and the like.

The rates for woodwork described as “selected” shall include for the following

- a) Keeping clean and clear finishes
- b) Punching nails and pins below exposed surfaces and filling with an approved coloured filler to match the woodwork.
- c) Where described also as “screwed” the woodwork shall be fixed with brass screws recessed and pelleted to match the woodwork.

The rates for frames sills and linings shall include for bedding in cement lime mortar (1:1:6) and mastic pointing where required.

The rates for carpentry shall include for the following:

- a) All labour in framing together all work in accordance with the best practices, complete with all necessary nails, spikes, screws etc.
- b) Hoisting and fixing in position
- c) Drilling and making good

#### JOINERY

Note: All timber sizes indicated in the descriptions shall be finished sizes after planning.

Rates for Joinery Work shall include for:

- a) Framing together all work in accordance with the best practices
- b) Nails, screws, glue, plugs etc.
- c) Priming backs before fixing
- d) Roll plugs, brass screws etc.
- e) Drilling and making good

The rates for ironmongery shall include for the following:

- f) Mortices, sinkings and the like.
- g) Removing before and replacing after decoration.

- h) Testing, easing and adjusting including oiling and leaving in perfect working order.
- i) Adhering strictly to mastering and sub-mastering sections.
- j) Supplying and labelling at least two keys for each and every lock and handing to the employer's representative.
- k) Master key if required by the specification or drawings.

The rates for ironmongery described as “fixed to hardwood” shall include for fixing to plywood block-board and the like.

### **2.2.6 Roof Covering**

The rates for Roof covering and roof plumbing shall include for the following:

- a) Hoisting (local) and placing roofing materials in position.
- b) Laps, straight cutting and waste.
- c) Nails, screws, clips, rivets, straps and the like.
- d) Fixing nuts, limpets etc...
- e) Any Guarantee for finished work as per contract
- f) Apply paint to all exposed faces of roof plumbing as directed.

### **2.2.7 Floor/Wall/Ceiling Finishes**

#### Generally

- a) Thickness of plaster work, bedding, backing etc. given in the description of items are the optimum thickness required.
- b) Finished work must conform in all respect to the approved samples.
- c) Cutting, joining or providing pointed edges special tiles or the like to ceramic or clay tiles, marble work and the like shall be deemed to be included. Cement rendering, using cement slurry for pasting and use of grout to fill the joints or gaps.
- d) Brushing and cleaning off and damping down all backgrounds
- e) Square and rounded edges coving at wall, floor and ceiling junctions, quirks, wee-joints and making good to frames and the like.
- f) Dubbing out as necessary to take up tolerances in the structure and cambers in floors and the like

Rates for floor finishes shall include for:

- a) Straight raking curved and circular cuttings and all consequent wastage
- b) All setting out temporary rules, screeds, template and supports.
- c) Curing and cleaning off / down upon completion.
- d) Spacers, cover guards, etc. to tiling or the like.
- e) All labours and making good around pipes, ducting and fittings and the like.
- f) Joints between different surfaces.
- g) Finishing to slopes and cross falls.
- h) All normal cutting arises, rounded edges, bedding and pointing.
- i) Preparation of sample panels of different finishes for the approval of the engineer. Each panel shall not less than 0.5m<sup>2</sup> in area.

### **2.2.8 Painting**

Generally

All paint materials shall be best quality and shall be prepared products of manufacturers approved by the Engineer in writing.

All surfaces to be painted shall be prepared as directed and the prepared surfaces shall be approved by the Engineer before painting.

Unevenness and fillings in plastered surfaces shall be filled with gypsum and allowed to set and sand papered to give a smooth and even surface.

The rates for painting shall include for the following  
Rates for Painting shall include for:

- a) Preparation of surfaces, cleaning down
- b) Smoothing, knotting, stopping etc.
- c) Protecting floors, and fittings etc.
- d) Removing and replacing doors furniture and cleaning upon completion.
- e) Providing samples and specification of all paints to be used in the works.
- f) Providing painting to an approved colour scheme and design.
- g) Preparation sample panels of different finishes for the approval of the Engineer. Each panel shall not less than 0.5m<sup>2</sup> in area.

**Note:-**

Painting and similar work to timber surface, metal surfaces, PVC surfaces and any other surfaces requiring painting have been measured with the relevant items.