

ANNEXURE – F2

**SCOPE OF WORK AND TECHNICAL SPECIFICATIONS
AND CONDITIONS FOR INS DELHI**

SITE PREPARATION

1. Extent of Work

The work comprises all building work necessary for construction of the proposed building together with temporary building works and other ancillary works ordered by the Architect for the construction, completion and maintenance of the Project.

2. The Site

The exact location of the site may be obtained from Consultant. The site shall be investigated by tendering contractor who must judge themselves the conditions under which the work is to be carried out, access to the site, availability of material, water and labour, the nature of ground, the ground water table and the like.

3. Temporary Access Roads

The contractor shall provide any necessary temporary or light gauge tracks for access to work and maintain, alter and adopt as required and remove, on completion.

4. Facilities for Architect's site staff

Immediately upon taking over the site, the Contractor shall construct temporary site office accommodation and services for the use of the Architect's site staff. Such accommodation and services shall be maintained for the duration of contract and demolished and cleared away and the site made good upon completion.

5. Drawings and Specifications to be returned

Safeguard as necessary during the progress of the work, preserve and return drawings and specifications to the Consultant within one month from the date of the certified completion of work.

6. Excavation and Earth Work

6.1 **Setting Out** – The setting out of the entire building shall be properly set out by Contractor as shown on the drawings and inspected and approved by the Consultant and his representative prior to commencing excavation.

6.2 **Size and depth of excavations** – Excavation shall be cut to the size and taken down to the formation level as per the Consultant's instructions.

6.3 **Shoring and excavation** – The sides of excavation shall be supported as necessary to maintain a vertical face and/or prevent caving in of any nature, specially during subsequent operations. The Contractor shall be responsible for design, supply, fixing, safety, and removal of all planking, strutting and shoring required to the sides of excavation.

6.4 **Preparation and inspection of excavation** – All excavations shall be kept free of water arising from whatsoever source and shall be properly cleaned out from all loose and foreign matters, levelled and rammed. The contractor is to report to Consultant when excavations are ready for inspection.

7. **Filling**

All filling materials shall be approved by the Consultant before being placed in position. Approved earth and sand shall be used to make up levels as shown on the drawings. The material shall be placed in successive layers each having a finished thickness not exceeding 20 cm watered, well rammed with mechanical rammers prior to the placement of the successive layer.

8. **Disposal of surplus material**

All surplus excavated material not used in back filling or levelling shall be carted away from site.

9. **Measurements**

9.1 The measurement of work shall be the exact length and width of the lowest steps of the footings according to the drawing of the Architect and the depth shall be measured vertically. It shall be priced per unit of cubic meter.

9.2 Rate for excavation shall include labour for returning, watering and ramming spoil of excavation between sides of trenches and foundation masonry and plinth, spreading on site, if required, and carting away surplus earth.

9.3 No extra shall be allowed for planning and strutting or shorting of sides of excavations for walls and piers and for keeping the excavation free from water unless otherwise specified.

10. **Excavation in rock**

10.1 Cutting in rock shall be done either by blasting or chiselling as directed to the required width and depths. As far as possible, the beds shall be in level.

- 10.2 Rock excavation shall be measured by working out sections by reference to levels before and after excavation, measured from a permanent bench mark.
- 10.3 In case of small work of rock excavation the measurements of excavated rock shall be by stacks which shall be made with the spoils with leaving minimum voids and the rate shall be per unit of cubic meter.
- 10.4 A deduction of 20% shall be made in measurements for voids in well stacked depots.
- 10.5 The spoils of rock excavation will be the property of the employers.

GENERAL SPECIFICATIONS FOR RCC WORK

SPECIFICATION FOR REINFORCED CONCRETE WORK

1.0 General

- 1.1 All R.C.C. work shall be executed in strict accordance with the instructions, drawings and details of the Architect.
- 1.2 The rates for R.C.C. items shall include for all labour material (including form work), planks, tools and all the operations involved but shall exclude M.S. Reinforcement, which shall be measured and paid for separately.
- 1.3 The rate shall allow for chamfers, grooves, lines in R.C.C. members as well as necessary slope and drops, drip moulds, etc.
- 1.4 All M.S. reinforcement shall be measured on the quantity actually going into the job according to the drawing and detail. The rate allow for the wastage and binding wire which shall not be paid for separately. Overlaps will not be paid separately.
- 1.5 The work shall be in the conformity with the requirements of Indian Standard Code of Practice for Plain and Reinforced Concrete for General Building Construction IS:456 or latest relevant revision.

2.0 Portland Cement

- 2.1 Cement shall be ordinary setting cement of approved Indian Manufacturer and shall comply with Indian Standard Specification No. 269 for the time being in force for such cement. Compression tests on cements sand cubes shall be made as well as tensile tests.
- 2.2 All cement shall be fresh when delivered. Cement shall be delivered in sound and properly secured bags, barrels or other packages ready for immediate use and shall be used direct from bag or barrel.

2.3 Cement shall be stored in a perfectly water tight, well ventilated and otherwise suitable shed or godown, which will have a wooden floor. The wooden floor shall be raised not less than 150mm from the ground. If supplies of cement are arranged by owner it will be the responsibility of contractor to ensure adequate and proper storage. Damaged or partly set cement will not be permitted to be used, and shall be removed from the site. Consignment of cement shall be consumed in the order of their delivery. The contractor shall maintain sufficient stock of cement to ensure continuity the work and each consignment shall be stacked separately so as to permit easy access for inspection and identification.

3.0 **Aggregates**

3.1 **General:** Materials used as aggregate shall be obtained from a source known to produce aggregates satisfactory for concrete and shall be chemically inert, strong, hard, durable, of limited porosity and free from adhering, coatings, clay lumps, coal residues and organic or other impurities that may cause corrosion of reinforcement or may impair the strength or durability of the concrete. Aggregates shall be tested in accordance with the requirements of IS: 383 or IS: 515 and the results of such tests shall be as hereinafter specified, the percentage being by weight unless the context indicates otherwise.

3.2 **Fine Aggregates:**

3.2.1 Fine aggregates shall be natural sand or sand derived by crushing material like gravel or stone and shall be free from coagulated lumps. Sand derived from stone unsuitable for coarse aggregates shall not be used as fine aggregates. The caustic soda test for organic impurities shall show a colour not deeper than that of the standard solution. The amount of fine particles as ascertained by the Laboratory Sedimentation test shall not exceed 10% for crushed stone shall be made and after being allowed to set in for three hours the thickness of the layer of silt deposited on the coarser material shall not exceed 10%. The grading of a natural sand or crushed stone i.e. fine aggregate shall be such that not more than 5 (five) percent shall

exceed 5mm in size, not more than 10% shall pass I.S. Sieve No.150 not less than 45% or more than 85% shall pass I.S. Sieve No.1. 18mm and not less than 25% or more than 60% shall pass I.S. Sieve No.600 micron.

3.2.2 Only washed sand of quality and grading specified herein above shall be used. Admixture of sand obtained by crushing, natural stone may be permitted by the Consultant, provided the mixture satisfies the requirements for fine aggregates hereinafter specified. But not more than once part of the sand obtained by crushing natural stone may be added to two parts of washed sand.

3.3 **Coarse Aggregate:**

3.3.1 Coarse aggregates shall be crushed stone. The pieces shall be angular, rounded in shape and shall have granular or crystalline or smooth (but not glossy) non-powdery surfaces. Triable, flaky and laminated pieces and mice shall not be present.

3.3.2 The "aggregate crushing value" shall not exceed 45%. The amount of fine particles occurring in a free state or as a loose apparent shall not exceed 1%. When determined by the laboratory sedimentation test, after 24 hours immersion in water. A previously dried sample of the coarse aggregates shall not have gained in weight more than 5%.

3.3.3 The grading of coarse aggregate shall be such that no more than 5% shall be larger than 20mm and not more than 10% shall be smaller than 5mm and not less than 25% or more than 55% shall be smaller than 10mm.

3.3.4 Maximum size of coarse aggregate shall be 20mm unless otherwise noted.

3.3.5 The grading of coarse aggregates of nominal size of 40mm shall be such that not more than 5% shall be larger than 40mm and not more than 5% shall be smaller than 5mm and not less than 10% or more than 10mm.

3.3.6 Aggregate (fine and coarse) shall be thoroughly washed with clean water if so directed by the Consultant.

4.0 **Water**

4.1 Water shall be cleaned and fresh and free from organic or inorganic matter in solution or suspension. Filtered water shall be obtained from approved supply. Water from excavations shall not be used. Water used for washing aggregates, shuttering, curing concrete and for similar purpose shall be of the same quality as water used for mixing concrete.

5.0 **Steel Reinforcement**

5.1 Mild steel bars shall be plain, round, hot rolled steel bars complying with the Indian Standard specifications No.432. Specifications for Mild Steel and High Tensile Steel bars and hard drawn steel wire for concrete reinforcement.

5.2 Reinforcement shall be free pitting, loose rust, mill scale, paint, oil, grease, adhering earth, snow or ice or any other material that may impair the bond between the concrete and the reinforcement or disintegration of the concrete. Adhering cement wash shall be permitted.

5.3 Bars with knicks or sharp ends shall not be used.

5.4 Neither the size nor the length of a bar or wire shall be less than the size or length described in the bar schedule or elsewhere.

6.0 **High Tensile Strength**

6.1 High tensile steel may be deformed or ribbed bars conforming to IS: 1139 cold twisted steel conforming to IS: 1786 bars and hard drawn steel wire and fabrics conforming to Indian Standard Specification No. 1566.

7.0 **Proportions of Concrete**

7.1 For ordinary concrete the aggregates shall be measured by volume in any accurate gauge box or by other approved means.

The gauge box or other approved container shall be filled without compacting with the aggregate to a pre-determined uniform depth, accurate allowance being made for bulking due to the moisture in the fine aggregate. The cement shall be measured by weight. One or more complete bags containing 50 kgs. of cement shall be mixed in the following proportion:

(a) 1:2:4 concrete shall be mixed in the proportion of 50 kgs. of cement to 75 litres of sand (measured when dry) and 150 litres of coarse aggregate.

(b) 1:½:3 concrete shall be mixed in proportion of 50 kgs. of cement to 50 litres of sand (measured when dry) and 100 litres of coarse aggregate. These quantities shall be altered if instructed and any alteration between the proportion of 1 part of fine aggregate to 1½ parts of coarse aggregate and 1 part of fine aggregate to 2 parts of the coarse aggregate shall be made without any alteration in the price of the reinforced concrete work. Any other special mixes shall be as directed by the Consultant.

7.2 For controlled concrete, the mix will be specified by grade of concrete and the minimum compressive strength for works test of hereinafter specified. However, the maximum total quantity of aggregate by weight per 50 kg. of cement shall not exceed 450 kgs.

7.3 The contractor must submit, free of charge, a test report of sand and aggregate and grading of the same when required. If the grading is not proper, as per specifications, the mix is liable to change. The contractor must submit, while tendering his basic analysis for basis rates of concrete. This analysis will be taken as the basis for rates of any revised mixes.

7.4 Water:

7.4.1 Only water shall be added to the cement and aggregate during mixing to produce concrete having sufficient workability to enable it to be well consolidated, to be worked into the corners of the shuttering and around the reinforcement to give the

specified surface finish, and to have the specified strength. Water cement ratio shall be maintained as per IS:456 when a suitable amount of water has been determined, the resulting consistency shall be maintained throughout the corresponding parts of the work and tests shall be conducted to ensure the maintenance of this consistency according to the standard method of test for consistency of concrete (slump test) as below:

<u>7.4.2 Description of Work</u>	<u>Maximum Slump in mms</u>
Beams and slabs	100 to 150
Walls and stairs	125
Columns	100 to 125
Footings	80

7.5 Consistency

If the difficulty be experienced in placing concrete of the specified proportions and approved consistency between and below the reinforcement bars, in the bottom of beams and similar members, the bars shall be embedded in concrete of approved workability by increasing the amount of cement as approved by using aggregates of approved smaller maximum size than specified.

7.6 Mixing Concrete

7.6.1 The cement and aggregates shall be thoroughly mixed together in the proportions described in batch type mechanical mixer, unless otherwise approved. The water shall not be admitted to the drum of the mixer until all the cement and aggregate constituting the batch are in the drum. Mixing shall continue until the concrete is uniform in colour and for not less than two minutes after all the materials and water are in the drum. The entire contents of the drum shall be discharged before the materials for succeeding batch are fed into the drum. No partly set or retempered concrete shall be used.

7.6.2 Partly set or excessively wet concrete shall not be used on the work and shall be immediately removed therefrom.

7.6.3 Hand mixing shall be allowed for small quantities with prior permission and approval of the consultant. It shall be carried out on a water tight platform and care shall be taken to ensure that mixing is continued until the mass is uniform in colour and consistency. For hand mixing 10% extra cement shall be used than normally required. Hand mixing shall be confined to one bag batch system.

7.7 Strength of Concrete

7.7.1 The minimum quantity of cement for various proportions and their strength at 28 days for normal concrete shall be as follows:-

By vol. mix	Cement in kg/cub.mtr. of concrete	Preliminary test results for minimum crushing strength at 28days	Min. crushing strength at 28 days
1:4:8	180 kgs.	75 kgs/sq.cms.	78 kgs\sq.cms.
1:3:6	233 kgs.	100 kgs/sq.cms.	115 kgs/sq.cms.
1:2:4	323 kgs.	150 kgs/sq.cms.	225 kgs/sq.cms.
1.1½:3	412 kgs.	200 kgs/sq.cms.	265 kgs/sq.cms.
1:1:2	640 kgs.	250 kgs/sq.cms.	336 kgs/sq.cms.

7.7.2 For controlled concrete by strength, the minimum stresses shall not be less than as specified below:

Grade	Min. crushing at 7days	Strength in kg/sq.cms @ 28 days
M-100	70	100
M-150	100	150
M-200	135	200
M-250	170	250
M-300	200	300
M-350	235	350
M-400	270	400

7.8 Distribution of Concrete

Concrete shall be distributed from the mixer to the position of placing in the works by approved means which do not cause separation or segregation of aggregates or otherwise impair the quality of the concrete.

Mixing and distribution equipment shall be cleaned before commencing mixing and distribution of the concrete and such equipment shall be kept free from set concrete.

7.9 Placing of Concrete

7.9.1 Placing of concrete shall not commence before the shuttering and the reinforcement fixed position in the shuttering, has been inspected and approved by the consultant. The contractor shall maintain a record of such inspection and approvals and shall obtain all approvals to proceed with the placing of concrete in writing.

7.9.2 Before proceeding to place the concrete, the shuttering shall be realigned, if necessary, and water and rubbish therein shall be removed by approved means immediately prior to placing the concrete. The shuttering shall be wetted, except in frosty weather, and inspection opening shall be closed.

7.9.3 The interval between adding the water to the dry materials and completion of the placing of the concrete shall not exceed 20 minutes.

7.9.4 Except where otherwise approved, concrete shall be placed in the shuttering by shovels or approved implements and shall not be dropped from a height or handled in a manner which will cause separation. Accumulations of set concrete on the reinforcement shall be avoided. Concrete shall be placed directly in its permanent position and shall not be worked along the shuttering to that position.

7.9.5 Each layer of concrete while being place shall be consolidated either by ramming, tamping or by mechanical vibration as required to form a dense material with all surface free from honey combing and free from water accumulating on the surface

of newly placed concrete shall be removed by approved means. No further concrete shall be placed thereon until such water is removed.

7.9.6 No unset concrete shall be brought into contact with unset concrete containing cement of different type.

7.9.7 Unless otherwise approved, concrete shall be placed in a single operation to the full thickness of slabs, beams and similar members and shall be placed in horizontal layers not exceeding 1m deep in walls, columns and similar members. Concrete shall be placed continuously until completion of the work. Construction joints, as specified hereinafter, of a part up to approved extent. At the completion of a specified or approved part construction joint shall be made when the work is stopped.

7.9.8 All the concrete for the machinery or special foundations shall be cast in one operation and shall be machine vibrated.

7.10 Placing concrete in cold weather

No concrete shall be mixed or placed while the temperature is below 40 degree C on a rising thermometer or below 4 degree C on a falling thermometer. The contractor shall supply an accurate maximum and minimum thermometer and hang it in an approved position on the works.

Aggregates that have been exposed to frost shall not be used until completely thawed. Concrete shall be maintained by approved means at a temperature of not less than 4 degree C during placing, and for a period of three days thereafter. All concrete placed during cold weather or when a frost is predicated or is likely to occur or occurs contrary to expectation, shall be protected from freezing by approved means.

7.11 Placing of concrete in wet weather

Concrete shall not be mixed and/or placed in rainy weather or when there is likelihood of impending heavy showers. If it becomes necessary to place concrete during rainy weather the contractor shall provide adequate protection by means of

tarpaulin or similar other waterproof material or immediately cover fresh concrete to prevent rain falling over it. This protection shall be left on the concrete for a period of 24 hours after placing of concrete.

7.12 Consolidated by mechanical vibration

All concrete specified to be vibrated shall be consolidated by internal vibrators. The frequency of vibration shall not be less than 3000 complete cycles (or vibrations) per minute. The amount of water for mixing concrete shall be reduced for all concrete that is required to be compacted by vibration (about 20% less than the water used for concrete to be compacted by ramming and tamping). Water required for mixing concrete that is to be consolidated by mechanical vibration shall be determined by slump test. As a general rule vibration should be stopped when air rubbles cease or practically cease coming up the surface and the surface itself is continuous.

Vibrations shall be inserted and withdrawn at many points from 0.5m to 1m apart from short intervals (usually from 5 to 15 seconds is sufficient) in preference to insertion for longer periods at wider intervals. Systematic spacing of insertions of the concrete remains unvibrated.

7.13 Construction joints

7.13.1 Construction joints shall be provided in the position described on the drawings or elsewhere and where not so described on the drawings or else shall be in accordance with the following:

7.13.2 A joint shall be formed horizontally at the top of a foundation and 75mm below the lowest soffit of the beams meeting at the head of a column.

7.13.3 A joint shall be formed in the rib of a large tee beam and all beams 25mm below the soffit of the slab.

7.13.4 Concrete in a haunch or a splay on beam or a brace, and in the head of a column where one or more beams meet, shall be

placed without a joint at the same time as that in the beam or beams or brace.

7.13.5 Concrete in the splay at the junction of a wall and slab shall be placed throughout without a joint, but if the provisions of a joint is unavoidable, the joint shall be vertical and the middle of a span.

7.13.6 A joint in the slab shall be vertical and parallel to the principal reinforcement, where it is unavoidable, at the right angles to the principal reinforcement, the joint shall be vertical and at the middle of the span.

7.13.7 Before placing new concrete against that has already hardened the face of old concrete shall be cleaned and roughened and scum and loose aggregate removed from the form. Immediately before placing the new concrete the face shall be thoroughly wetted and coating of neat cement grout applied thereto. The new concrete shall be well rammed against the prepared face before the grout sets.

7.14 Structure joints

7.14.1 Expansion joints, hinges or other permanent structural joints shall be provided in the positions and of the form described in the drawings or elsewhere.

7.15 Protection and curing concrete

7.15.1 Newly placed concrete shall be protected by approved means from frost, rain, sun and drying winds. Exposed faces of concrete shall be kept moist by approved means for 21 days after placing, except of there is a likelihood of curing water of damp covering, freezing, when the period shall be instructed by the consultants.

7.15.2 Concrete placed below the ground shall be protected from failing earth during and after placing. Concrete placed in ground containing deleterious substances shall be kept free therefrom during placing and for a period of seven days or as otherwise instructed hereafter. The ground water around a structure below

the ground shall be kept to an approved level of pumping, or the works shall be taken to prevent floatation. Approved means shall be taken to protect immature concrete from damage by debris, excessive loading, vibration, and abrasion, deleterious ground water, mixing with earth or other materials, floatation and other influences that may impair the strength and durability of the concrete.

7.16 Removal of Shuttering

7.16.1 Shuttering shall be removed by a gradual easing without jarring. Before removal of the shuttering, the concrete shall be examined and removal shall proceed only in the presence of a competent supervisor and after the concrete has attained sufficient strength to support, its own weight and any imposition of a load exceeding the design load is anticipated, propos shall be provided in an approved manner, after removal of the shuttering and before the imposition of lead exceeding the design load. The contractor shall record on the drawings or elsewhere the date upon which the concrete is placed in each part of the work and the dates upon which the shuttering is removed therefrom. The assessment concrete and removing the shuttering and consequence arising therefrom shall be the contractor's entire responsibility. Permissible tolerance in the dimension of form work shall be as per IS:456.

7.16.2 The shuttering for a part of a structure suspended from concrete placed subsequently to that or in the shuttering concerned shall not be removed until the supporting concrete has matured and such shuttering shall be prominently remarked as a warning against premature removal

7.17 Finish

7.17.1 Honey comb surface shall be made good immediately upon removal of the shuttering and superficial water and air holes shall be filled in. Unless instructed placed against shuttering shall be rubbed down immediately upon removal of the shuttering to remove fins or other irregularities. The face of concrete for which shuttering is not provided other than slabs shall be smoothed with a wooden float to give a finish equal that

of the rubbed down face where shuttering is provided. The top face of slabs which is not intended to be covered with other materials shall be levelled and floated while unset to a smooth finish at the levels of falls shown on the drawings or elsewhere. The floating shall be done so as to bring an excess of mortar to be the surface of the concrete. Concrete shall be so finished that no plaster work should be necessary.

7.17.2 Surface which are to be finished with plaster shall have indentations formed on them by approved implements to the depths and patterns required so as to provide key for the plaster or finishes.

7.17.3 All exposed concrete work shall be rubbed down smooth and not plastered but finished smooth and given one coat of cement wash without any extra charge when directed.

7.17.4 All concrete slabs, where directed shall be finished smooth and levelled with neat cement grout immediately after concreting without any extra charge.

7.18 Fittings and accessories

7.18.1 Holes for bolts or for any other purpose shall be moulded during the work of concrete in the positions shown on the drawings. Openings already to receive pipes, wires and other fittings, shall be formed where shown or otherwise detailed.

7.18.2 Bolts, pipe holes, hangers and other connections and fittings shown on the drawings or as directed by the consultant shall as far as practicable, be built in as the work proceeds.

7.18.3 Pipes for the conveyance of steam, water and gas etc. shall be carried along with exterior of the concrete work, except where special ducts for laying these pipes have been provided or otherwise as shown in the drawings. Conduit pipes for carrying electric cables, if so required, shall be embedded in concrete work or as directed by the consultant.

7.19 Testing of concrete

7.19.1 The contractor must make his own arrangement for testing of the concrete blocks from time to time as required by the consultant and all the cost of testing and conveyance shall be borne by the contractor. At least three blocks of 150 x 150 x 1150 per 30 cm of R.C. work must be taken as directed and tested. The employer reserves right to test the blocks at the cost of contractor if the contractor fails to follow this clause.

7.19.2 The compressive strength shall be ascertained by crushing 150mm cubes of concrete. The cubes to be made on the works and tested in accordance with IS:516.

7.19.3 Three test specimens shall be made for each stage at which tests are required. It is usual to cast six specimens and test three specimens at 7 days age remaining three specimens at 28 days age, at every stage of construction or for every 30 cm concrete or as directed, tests shall be made. Testing of cubes shall be carried out at any approved laboratory and the results obtained shall be forwarded to the consultant.

7.20 Structure Tests

7.20.1 The consultant shall instruct the contractor to make a loading test on the works or any part thereof, if in the consultant's opinion, such a test is necessary.

7.20.2 The consultant shall instruct the contractor to make the test for the reason that the works cube tests show strength below the specified strength and/or because of one more circumstances attributed to alleged negligence on the part of the contractor and/or for the purpose of the testing the finished completed structure.

The contractor shall include and allow the cost of test or tests in his prices and shall carryout them without additional payment.

7.20.3 For the purpose of testing floors, roofs and similar structure and their supports, in addition to all dead load supported by the structures, the test load shall be equivalent to one and a quarter

times the live load (or super load) for which the works or part thereof to be tested has been designed, and all the test load shall not be applied within 28 days of the completion of placing of the concrete in the part of works to be tested, and the later shall be unsupported during the test by the shuttering or other non-permanent supports. The test shall be made as instructed.

7.20.4 For a test on a floor, roof or similar construction the result shall be deemed to be satisfactory if upon removal of the load the residual deflection does not exceed one quarter of the maximum deflection after maintaining the load in position. If the residual shall be repeated, and the result shall be deemed to be satisfactory if the residual deflection after removal of the load for the second time does not exceed one quarter of the maximum deflection occurring during the second test.

7.20.5 If the result of the tests is not satisfactory, the consultant shall instruct that the part of the works concerned shall be taken down or cut and the reconstructed to comply with this specification, or test other measures shall be taken to make the work secure. The contractor is liable to conduct the test at his own cost if directed and he shall also at his own cost take down or cut and reconstruct the defective work or shall execute remedial measures as instructed.

8.0 **Reinforcement**

8.1 Cutting and bending of reinforcement:

8.1.1 All reinforcement bars shall be made perfectly straight before bending. Bars shall be bent by suitable machine or manually round a pin having a diameter of not less than 4 times the diameter of the bar, producing a gradual and even motion. Bars shall be bent cold unless the consultant shall approve bars of over 25mm in the size being hot. Bars bent hot shall not be heated beyond cherry red colour and after bending shall be allowed to cool slowly without quenching. Bars dependent on cold working for their strength shall always be bent cold.

8.1.2 Bars incorrectly bent shall be used only if the means used for strengthening and re-bending shall be such as shall not injure

the material. No reinforcement shall be bent when imposition on the works, without approval whether or not it is partially embedded in hardened concrete.

8.1.3 Bending shall comply with the dimensions given in the bending schedule given by the consultant. Dimensions of bent bars and internal dimensions of binders and the like shall not be more than ½% shorter than the specified dimensions.

8.1.4 The internal radial of bends shall not be less than twice the size of the bars unless described to the contrary. The internal radial of the bends at corners of binders or the like shall be half the purpose of this requirement the size of a bar shall mean the diameter of a plain round bar or wire.

8.2 Fixing of Reinforcement

8.2.1 Reinforcement shall be accurately fixed and by approved means maintained in the position described on the drawings or elsewhere in accordance with IS: 2502. Bars intended to be in contact at passing points shall be securely wired together at all such positions with No.16 gauge annealed soft iron binding wire, binders and the like shall tightly embrace the bars with which they are intended to be in contact and shall be securely wired, or if approved, welded thereto.

8.2.2 Bars shall be accurately set and held in place by system of bar chairs, bolsters, wire items, etc. of not less than 16 B.W.G. Spacing and location shall be shown on drawings.

8.2.3 Immediately before placing the concrete, the reinforcements shall be examined for accuracy of placing and cleanliness and corrected, if necessary.

8.2.4 Reinforcement projecting from work being concrete of already concreted shall not be bent out of its correct position for any reason unless approved and shall be protected from deformation or other damage. No reinforcement shall be placed in the same forms within 10m of concrete being poured.

8.3 Cover

8.3.1 The cover of concrete to the reinforcement shall be as described on the drawings and shall be provided and maintained within a tolerance of 3mm under and over, by means of distance pieces of cement mortar or other approved material. Blocks of concrete on ground to hold the reinforcement, in proper level shall be of 225 kg. sqmm strength. The clear spacing between bars shall be not less than 1½ times the maximum size of the coarse aggregate not less than 25mm.

8.3.2 The vertical distance required between successive layers of bars or similar members shall be maintained by the provisions of mild steel space bars inserted at such intervals that the main bars do not perceptibly sag between space bars.

8.4 Lapping and Splicing

8.4.1 Bars shall be lapped as per I.S. Standards unless otherwise shown on the drawings. Splicing of bars shall be at selected positions to be determined by the consultant.

8.5 Welding Reinforcement

8.5.1 Welding may be permitted and shall be carried out as directed by the consultant, by competent and experienced welders, using electrodes and according to first class technique.

8.5.2 If butt jointing of reinforcement bars by electric arc welding be approved, the consultant's requirement of the regulations of the work as per IS: 456/1964 and IS 2751/1966 shall be complied with and all operations connected therewith shall be done only by man skilled thereat. These requirements shall not apply to the spot welding of binders or the like, to main bars, where approved of, to electrically welded fabric.

8.6 Exposed Reinforcement

8.6.1 Exposed reinforcement intended for bending with future extensions shall be protected from corrosion.

9.0 **Shuttering and form work**

9.1 **General**

9.1.1 The contractor shall be responsible for the sufficiency of the form work. If so instructed, calculations and designs for the shuttering shall be submitted for approval before construction. Form work may be on plywood, metal rough board or concrete.

9.2 **Fixing of Shuttering**

9.2.1 Shuttering for concrete shall be rigidly constructed of material and shall be true to the shape and dimensions described on the working drawings. Timber shall be well seasoned, free from loose knots and wrought on all faces. Faces in contact shall be free from adhering, grout, projecting, nails, splits or other defects. Joint shall be sufficiently tight to prevent leakage of cement grout and to avoid the formation of fins or other blemishes. Faulty joints shall be caulked. Where described on the working drawings or elsewhere, the position and direction of the joints shall be as so described. Opening for inspection of the inside of the shuttering and for the escape of water used for washing out shall be formed so that they can be conveniently closed before placing the concrete.

9.3 **Connections**

9.3.1 Connections shall be constructed to permit easy removal of the shuttering and shall be either nailed, screwed, bolted, clamped, wired or otherwise secured so as to be strong enough to restrain the correct shape during consolidation of the concrete. Bolt holes in concrete shall be made good after removal of the bolts. Wire ties passing through concrete shall be used only where approved and the ends of the wires shall be concealed and measured taken to prevent rust stains on the concrete.

9.4 **Sloping Work**

Shuttering shall be provided for the top faces of slopping work, and anchored to prevent floatation where the slope exceeds 1 in 1½.

9.5 Deflections

Shuttering shall be true to line and braced and structured to prevent deformation under the weight and pressure of the wet concrete, constructional loads, wind and other forces. The deflection shall not exceed 3mm. Bottom of beams boxes shall be erected with an upward camber of 6mm for each 3m of span.

9.6 Beams and Slabs

The shuttering of beams and slabs shall be erected so that the shuttering on the sides of the beam and of the soffits of slabs can be removed without disturbing the beam bottoms. Reproping of beams shall not be done except with the approval of the consultant. Props may be reinstated in anticipation of loads in excess of the design load. Vertical props shall be supported on wedges, or other measures shall be taken when commencing to remove the shuttering. Props for an upper storey shall be placed directly over those in the lower storey and sufficiently.

9.7 Columns

In the shuttering for a column, one side shall be left open and shall be built upon in sections as placing of the concrete proceeds.

9.8 Fixtures

Before placing the concrete, bolts and fixings shall be in position and cords and other devices used for forming openings holes, pockets, chases, recessed and other cavities shall be fixed to the shuttering. No holes shall be cut in any concrete unless approved.

9.9 Mould Oil

Any approved mould oil or other material shall be in position, and cords and other devices used for forming openings holes, pockets, chases, recesses and other cavities shall be fixed on

the shuttering. No holes shall be cut in any concrete unless approved.

9.10 Props

The props used for shuttering shall be of full length. Joined props shall not be allowed. They should be of sufficient size and suitably placed as per the instructions of the consultant.

Where shuttering at high altitude is to be done, the contractor shall provide special props and beams to the approval of the consultant.

9.11 Removal of Shuttering

The shuttering will be struck for different parts of the structure, after expiry of the following periods, unless stated otherwise:

Vertical sides of slabs, beams and columns	:	48 hours
Bottom of slabs upto 4M span	:	7 days
Bottom of slabs above 4M span, bottom of beams up to 5M span and arch rib bottom upto 5M	:	14 days
Bottom of beams over 5M span and arch rib bottom above 5M span	:	21 days

10.0 **Restricted Concrete Work**

10.1 General

10.1.1 All specifications hereinbefore given will be applicable to prestress concrete except in addition to as stated hereinafter.

10.2 Concrete

10.2.1 All concrete used for pre-stressed work shall be controlled concrete with a cube crushing strength of 350 kg/cm at 28 days of 150mm cubes.

10.2.2 The maximum size of coarse aggregate shall not exceed 20mm.

10.3.2 Moulds shall be sufficiently strong and rigid to withstand, without distortion, the effects of placing and compacting concrete.

10.3.3 Moulds shall be made sufficiently water tight to prevent loss of mortar or grout from the concrete.

10.4 Prestressing Steel

The prestressed steel shall be stored, handled, and used in accordance with the specification laid out in "INDIAN STANDARD CODE OF PRACTICE FOR PRESTRESSED CONCRETE" I.S. 1343.

10.5 Stressing

The beam shall be pre-tensioned by line method of construction.

The specified force shall be maintained by the use of approved fixing devices at the ends of the tensioned steel during concreting and curing, until the concrete has attained the strength specified. The tensioned steel shall be released gradually and uniformly.

10.6 Lifting, Stacking and Launching

The precast members shall be lifted by suitable tackle only at specified points.

11.0 Measurements

11.1 General

11.1.1 The item rates shall be cost of all materials (unless otherwise specified) including labour tools, plants and other accessories required to complete the job in workman like manner.

11.1.2 Mode of measurement of items of reinforced concrete work shall be as stated below and shall be the net cubic metre as specified in the schedule of quantities or the net area of specified

thickness of cast concrete. The thickness of plaster finishing shall not be taken into account in measuring the work even though the price may be of structural members in concrete, the measurement of encased concrete shall be net cubic meter as specified without any deduction of structural members.

11.1.3 No extras shall be paid for provision of pockets and holes up to 150mm x 150mm areas but concrete will be paid without deduction for such holes in pockets and holes larger than 150mm x 150mm actual areas of shuttering will be paid at rates in the schedule, but the volume of pockets will be deducted from the concrete, quantities.

11.1.4 If due to some fault or mistake of the contractor, the sizes cast are more than those shown on the drawing, the contractor shall be paid only as per the sizes shown on the drawings. In case the sizes are cast smaller than those shown on the drawings, the contractor shall rectify the same or if similar size is approved by the consultant, it may be allowed, but the actual size cast will be paid to the contractor.

11.1.5 No extra will be paid for placing cable and other pipes, anchor bars or bolts, anchor rails etc., which will be supplied by the employer.

11.2 Concrete

11.2.1 Footing and rafts shall be measured in cubic meter.

11.2.2 Columns shall be measured in cubic meter being the products of the area of cross section multiplied by the height, as measured in between the top of footings or slab to the underside of slab immediately above as per drawings. In case slabs of different thickness the underside of the thicker slab shall be guiding factor.

11.2.3 Rectangular beams and lintels shall be measured in cubic meter being the product of the cross sectional area and length between supporting columns or beams. Where such beams or lintels rest on masonry work, the length is equal to the clear distance between the faces of masonry plus the length of bearings as shown on the drawings.

11.2.4 T & L Beams (i.e. beams cast with floor or roof slabs) shall be measured in cubic meter. The length shall be the distance between the faces of supporting columns or the faces of the supporting beams or girders, the breadth shall be the breadth of the stem projecting below the slab and the depth shall be the portion projecting below the underside of the slab (thicker one in case of slabs of different thickness). It shall be the net cubic contents of the portion projecting below the underside of the thickest slab and between the faces of supporting beams or columns.

11.2.5 Slabs, cornices, projections, stairs, waist slab and the triangular concrete portion of steps shall be measured in cubic meter, or in sq. meter with specified width, in case of slabs of different thicknesses, thicker slab will be measured upto the face of the beam on the side of the thinner slab.

11.2.6 Chajjas shall be measured in square meter or cubic meter being the products of the projection beyond the face of supporting beams and the length and of average thickness as per drawing.

11.2.7 Pardi walls, partition walls, drop walls, railing walls, fins of specified thickness, coping, etc. shall be measured in square meter or cubic meter.

11.3 Shuttering and Form Work

11.3.1 Shuttering is to be measured as the area in square meter of the finished structure which is required to be supported during the deposition of concrete.

11.3.2 The shuttering required to form the construction joints, skew backs, stunt ends, steppings, the bonding, chases and the like, which may be necessary to uphold the concrete during the operations of deposition and setting shall not be measured and hence the cost of this is to be covered by the rate of concrete.

11.3.3 Where shuttering is included in the item rates of concrete, shuttering will not be measured separately.

11.4 Steel Reinforcement

- 11.4.1 The unit of weight shall be 1 M. Tonne or 1000 kg.
- 11.4.2 The reinforcing bars or rods are to be measured according to the weight as calculated from the drawings. The basis of calculated weights shall be as per I.S. Specifications. No allowance being made for waste or rolling margin.
- 11.4.3 The length of the bars shall be the total length to be cut as shown in the drawing or as specified by the consultants including hooks, bends, loops etc.
- 11.4.4 Binding wire required for tying reinforcement shall not be measured. The items rate shall include the same.
- 11.4.5 Pins and other types of special supports required for supporting reinforcement shall be measured.
- 11.4.6 The laps provided as per drawing and/or instructions shall be paid for where they are unavoidable. Alternatively, the bars may be welded if permitted by the consultant for which the cost of laps will be paid. The consultant's decision with regard to the necessary and/or regarding the position of laps or welds shall be final.
- 11.4.7 No allowance shall be made for wastage. The item rate shall include the same.
- 11.4.8 The concrete briquettes required for providing proper cover over to reinforcement shall not be measured. The item rates shall include the same.

GENERAL SPECIFICATIONS FOR BRICK WORK

BRICK MASONRY

1. General

- 1.1 All brick work shall be carried out as shown on the drawings with set backs, projections, cuttings, tooling, etc.
- 1.2 Whenever the proportion of cement mortar has not been specifically mentioned, cement mortar in the proportion of 1:6 (cement : sand) shall be used.
- 1.3 All external brick walls shall be built with cement mortar having proportion of 1:5 (cement : sand).
- 1.4 Flat brick arches shall be provided wherever required without any extra cost.
- 1.5 Brick work shall be kept wet while in progress till mortar has properly set. On holidays or work is stopped, top of all unfinished masonry shall be kept wet.
- 1.6 If the mortar becomes dry, whit or powdery, for want of curing, work shall be pulled down and rebuilt at the contractor's expenses.

2. Material -

2.1 Bricks -

The bricks shall generally comply with IS: 1077. The bricks shall be the best quality locally available, table moulded, well burnt, have plane rectangular faces with paralleled sides and sharp right angled edges, have a fine compact and uniform texture. The bricks shall be free from cracks, chips, flaws, stones or lumps of any kind and shall not show efflorescence either dry or subsequent to soaking in water.

The brick shall smite a clear ringing sound on being struck and shall not absorb water more than 20% by weight.

Common building bricks shall have a minimum compressive strength of 35 kg./sq.cm. unless otherwise stated in the schedule of quantities.

2.2 Cement -

Unless otherwise specified the cement to be used shall be ordinary Portland cement complying with the latest publication of IS: 269.

2.3 Lime -

Lime shall comply in every respect with the requirements of IS: 712.

Lime shall be made from approved lime stone or kankar and properly burnt. It shall be free from excess or unburnt kankar or lime stone ashes or any other extraneous materials.

Lime shall be stored in weather proof sheds.

Lime which has been damaged by rain, moisture or air slaking shall not be used and shall be removed from the site of work immediately.

Lime shall be slaked with fresh water and screened through appropriate screen and stored and used within 14 days provided it is protected from drying out.

Field tests according to ISL 1624 shall be carried out from time to time to determine the quality of lime.

2.4 Sand -

Sand shall conform to ISL 383 and IS: 515.

Sand shall pass through 1.5 sieve 4.75mm (3/16 B.S.) test sieve, leaving a residue not more than 5%. Sand shall be from natural source or crushed stone screenings, chemically inert, clean, sharp, hard, well graded and free from dust, clay, shala, large pebbles, salt, organic mater, mica or other deleterious matter. The sum of all deleterious material in sand shall not be more than 5% by weight.

Sand shall be washed, if directed, to reduce the percentage of deleterious substances to acceptable limits.

2.5 Water -

Water for mixing cement/lime mortar shall be clean and free from acids, vegetable matter, etc. Only water fit for drinking shall

be approved for use. In case of doubt, water shall be tested in approved lab at contractor's expense.

2.6 Mortar -

The mortar to be used for brick masonry shall be from cement/ lime as instructed by the Architects. The ingredients in the proportions specified shall be measured in gauge boxes and thoroughly mixed dry on a clean approved platform with water added afterwards until all parts are completely incorporated and brought to a proper consistency and used within an hour.

No partially or wholly set mortar will be allowed to be used or re-mixed.

When large quantities are required, the mortar shall be mixed by mechanical means.

3. Workmanship -

- 3.1 Bricks shall be thoroughly cleaned, well wetted and soaked in fresh water for at least 12 hours before using it.
- 3.2 English bond shall be used throughout in walling except brick on edge and half brick walls shall be built in structure bond. A good bond shall be maintained throughout the work, both laterally and transversely.
- 3.3 All brick work shall be set out and built to the dimensions shown horizontal and in plumb with the frogs facing upwards. Vertical joints shall not exceed 10mm thickness and shall be full of mortar.
- 3.4 No broken bricks shall be used except as closers.
- 3.5 After days work all joints shall be raked to 12mm before commencing further brick work.
- 3.6 The top of walling shall be wetted where let off, before commencing further brick work.
- 3.7 Whole of the masonry work shall be brought up at one uniform level, throughout the structure. Where breaks are unavoidable, joints shall be made in good long steps.

All junctions of walls and cross walls shall be carefully bonded into the main walls.

- 3.8 During rains, the work shall be carefully covered to prevent mortar being washed away. Should any mortar or cement washed away, the work shall be removed and rebuilt at the contractor's expenses.
- 3.9 Mortar to be used shall be as specified in respective items.
- 3.10 The wall shall be kept wet for three days after construction.
- 3.11 Wooden plates, door frames or window frames shall be bedded in brick work with fixing clamps or holdfasts embedded in courses of brick work.

4. **Mode of Measurement:**

- 4.1 Finishes to brick work such as plaster and cement pointing will be paid for separately under plaster.
- 4.2 75mm thick 1:2:4 PCC band shall be provided in half brick thick partition walls and in brick on edge walls at every 1.5M height or as directed PCC band shall not be measured and paid separately.
- 4.3 One brick or more thick walls shall be measured in cubic meter that is length and height multiplied by the thickness. Thickness shall be measured in multiples of half brick which shall be deemed to be inclusive of mortar joints. Half brick thick or brick-on-edge walls shall be measured in square meter.

GENERAL SPECIFICATIONS FOR WOOD WORK

WOOD WORK -

1. General -

- 1.1 The timber used for wood work shall be sound, well conditions, properly seasoned to suit the particular use and free from defects or combination of defects rendering it unsuitable for the purpose intended.
- 1.2 All timber used structurally shall comply with the relevant requirements of Indian Standards.
- 1.3 All timber is to be ordered and delivered immediately to the site for open stacking for as long as possible before use. All timber will be inspected by the supervising officer and if not approved by him shall be removed from the site immediately. Notwithstanding the supervising officer's approval, any timber incorporated in the works found to be in any way defective before the expiry of the Defects Liability Period, shall be removed and replaced at the sole expense of the contractor.
- 1.4 Timber shall be free from hole borer, beetles or other insects attack when brought to the site. The contractor shall be responsible till the end of maintenance period for executing any work necessary to eradicate insect attack at his own expenses including the replacement of timber attacked or suspected of being attacked, notwithstanding that the timber may have been inspected already and passed as fit for use.
- 1.5 The moisture content of the timber used for internal joinery is to be 10% and that used for external doors and frames is to be 16% when the joinery is delivered to the site, and these moisture contents are to be maintained until the building is finished. The consultant will require evidence of correct moisture content to be submitted to him before the joinery is fixed.

The moisture content of timber shall be determined according to method described in paragraph 4 of I.S. 287 for "Maximum Permissible Moisture Content of Timber used for Different Purposes in Different Climatic Zones".

2. **Material and Workmanship :**

2.1 Teak Wood -

This shall be Dandeli, Balarshah or Malabar Teak, or any other approved quality teak wood. It shall be of good quality and well seasoned. It shall have uniform colour, reasonably straight grains and shall be free from large, loose, dead knots, cracks, shakes, warps, twists, bends, borer holes, sap wood or defects of any kind.

No individual hard and sound knot shall be more than 1cm in diameter and aggregate area of all knots shall not exceed 0.5% of the area of the piece.

It shall be close grained and there shall not be less than 6 growth rings per 2.5cm width.

2.2 Flush Doors -

Flush doors shall be solid core unless otherwise specified, consisting of wood core or framing covered with 6mm plywood both sides and complying where applicable with the IS: 2202.

The solid core shall be wood laminates prepared from battens of well seasoned and treated good quality wood having straight grains. The battens shall be of uniform size of about 25mm width. These shall be properly glued and machine pressed together with grains of each piece reversed from that of adjoining one. The longitudinal joints of the battens shall be staggered and no piece shall be less than 50cms length.

Alternatively, the core shall be of solid teak particle board. Edges of the board shall be lipped internally with teak wood battens of 4cm (minimum) depth, glued and machine pressed alongwith the core. If specified the flush doors shall be veneered and polished as per the standard methods specified or to be provided with laminations as specified.

Thermosetting synthetic resin conforming to IS: 303 or moisture-proof plywood grade MP F.I. shall be used in manufacture.

All flush doors shall be edged all round with 25mm thick wood lipping, tongued and glued in.

Doors described as "external" shall be covered both sides with 6mm exterior quality plywood.

All flush doors shall be plain on both faces and be free from all waves, ripples or distortions of any kind.

Any door, which after the application of paint or polish, shows any defect of this nature shall be removed and replaced at the contractor's expense.

2.3 Plywood -

Plywood shall be obtained from an approved source to the correct thickness specified. The contractor will not be permitted to make up the required thickness by glueing together sheets of thinner plywood.

Plywood shall be manufactured from topical hardwoods of the first grade for "interior" quality.

Where veneered plywood is specified, samples must be submitted to the supervising officer for his prior approval.

2.4 Block Board -

Block board shall be of approved manufacture and comply with relevant I.S. and shall be "exterior quality".

2.5 Frames -

Frames to doors, windows and other joinery shall be provided and built in to the size shown on the drawings.

Frames of doors, windows, ventilators, etc. and shutter styles, rails, etc. shall be of best quality teak.

The scantlings shall be accurately planned smooth. Rebates, roundings and mouldings shall be made as shown on the drawings. Patching or plugging of any kind shall not be allowed.

Joints shall be single, neat and strong. Frame joints shall be glued together with synthetic resin. All mortice and tenon joints shall fit in fully and accurately without wedging or filling. The joints shall be pinned with hard wood or bamboo pins of 10mm to 12mm dia after the frames are put together and pressed in position by means of a press.

All portions of timber abutting against or embedded in masonry or concrete shall be treated against termites by giving a coat of approved wood preservative.

Frames shall be securely fixed on walls, columns, and beams by means of hold-fasts.

Holdfasts shall be secured to frame and laid in the course of brick masonry.

When door or windows to be fixed to RCC column, wall or beam, holdfasts shall be substituted by suitable arrangements such as coach screws, rawl bolts, etc.

If the width of the door or window exceeds 1 mtr holdfasts or coach screws or rawl bolts shall be provided at the top and bottom (if applicable). These shall be at minimum distance of 60 cms.

The frames shall be protected during progress of work by suitable means.

Frames and shutters shall not be erected before the approval of the Architect.

Frames shall be polished or painted as specified.

2.7 Architraves -

Architraves shall be as shown on the drawings and all properly mitred at inter-sections. Architraves shall not be installed until after the wall coverings have been formed or constructed, unless otherwise specified.

Where Architraves are required to be installed before the wall coverings have been formed or constructed because of their design and detail, they shall be protected against damage by suitable casings.

2.8 Framed and Panelled Doors -

These shall be from the timber approved by the supervising officer. The styles and rails of the frames shall be mortised and tenoned together, or joined by dowels where specified. The thickness of each tenon shall be approx. one third the thickness of the door, and the width of each tenon shall not exceed five times its own thickness. Haunching shall be sunk to a depth not

less than 10mm. Dowels shall be straight grained and keyed for glueing. The stiles and rails shall be grooved to a depth of 10mm to receive the panels.

Panels shall be of pattern and size as shown on the drawings.

Solid teak wood panels shall be in one piece wherever possible. Where two or more pieces are permitted they shall be of equal width, tongue and grooved.

Panels shall be framed into grooves made in styles and rails to the full depth of groove and faces shall be closely fitted to sides of groove.

Where panels specified are block board, or chip board, it shall also be fixed in similar manner as shown above. Partly paneled and partly glazed shutter shall be similar to paneled shuttered except glazed parts shall receive plain or ground glass as specified. Styles and rails shall be rebated 12mm to receive glass. Sash bars shall be moulded and rebated and mitred on sides to receive glass. The glass shall be fixed with wooden beads.

2.9 Skirting -

Skirting shall be from teak wood as specified and shall be as shown on the drawings.

Skirting shall not be installed until after the flooring is laid, unless otherwise specified.

Where skirting are required to be installed before the flooring is laid because of their design and detail, skirting beads shall be scribed on their lower edges to follow the contour of the flooring and shall be secured back to the wall by screws.

2.10 Scribing -

All skirtings, architraves, plates and other joinery works shall be accurately scribed to fit the contour of any irregular surface against which they may be required to form a close butt connection.

2.11 Iron Mongery -

The contractor shall provide and fix the iron monger required by the particular specification or shown on the drawings or as per

Architect's instruction. The use of nails for fixing iron monger will not be permitted. The contractor shall hand over all the work in a finished stated and to the satisfaction of the Architect.

All iron mongers shall be of first quality and shall be obtained from an approved manufacturer.

The contractor will be required to submit for approval samples of all items of iron monger he proposed to use.

3.1 Measurements -

3.01 Measurements for doors and windows will be out of main frame. Architraves, cover moulds, plaster beads, shall be measured separately in running meter. Door height for payment will be measured from finished floor to top of main frame. Teakwood hand rails will be measured in running meter measure and false ceiling in square meter of actual work done.

3.02 The rates quoted should include for all materials and labour and tools for execution of work at any level. Lift of materials will not forma criteria for any extra amount.

GENERAL SPECIFICATIONS FOR METAL WORK

METAL WORK -

1. Material -

1.1 Mild Steel

Mild steel shall comply with IS: 226 of 1955 and IS: 1977 of 1962.

This steel shall not have more than 0.06% of sulphur and 0.065% of phosphorous. The carbon content shall not exceed 0.30% and the steel shall be of weldable quality.

1.2 Aluminium -

Aluminium shall be of the approved alloy and shall comply with IS: 733.

The aluminium shall be anodized to minimum thickness of 25 microns.

2. Workmanship -

2.1 Smithing, Shearing and Cutting

All smithing, welding, cutting and bending shall be soundly and neatly executed, care being taken not to overheat. All frame cut edges and welds shall be neatly grounded off on completion.

2.2 Aluminium Doors and Windows -

2.2.1 General -

Minimum thickness of aluminium section shall be 2mm. All the frames shall be made to the exact size of the opening, without leaving any gap. Any small discrepancies shall be filled with gun applied mastic. The frames coming in contact with zinc chromate conforming to IS: 104 – 1950.

All anodized surfaces of aluminium shall be covered with a thick layer of clear transparent lacquer based on methacrylates or cellulose butyrate for protection against accidental damage or

from wet cement during the progress of work. This coating shall be removed on completion.

All aluminium work shall be washed with mild solution of non-alkali soap and water before handing over.

2.2.2 Aluminium Openable Door -

The outer frame shall be out of minimum 100 x 45mm. The fixed glazed fanlight if any shall also be made out of 100 x 45mm or as specified in the drawing. The glazing shall be fixed by means of PVC glazing gaskets with concealed screwless beveled glazing clips. Minimum glass thickness for doors shall be 5mm and optically true. The openable shutters shall be provided with dead lock, aluminium handles, floor springs, concealed tower bolt if two shutters.

Approved weather stripping shall be provided to stop completely air and water infiltration.

The openable shutter shall have bottom and top styles out of minimum 100mm x 45mm and vertical styles out of minimum 50mm x 45mm or as specified.

2.2.3 Aluminium Windows -

The outer frame shall be cut of minimum 65mm x 40mm sections or as specified.

The openable shutters shall be from Z sections out of minimum 40mm x 40mm or as specified.

The glazing shall be fixed by means of concealed screwless snap on clips with PVC gaskets.

Approved weather stripping shall be provided to stop completely air and water infiltration.

The openable shutter shall be provided with standard hardware like hinges or pivots, with pins, handles, locking arrangement, etc.

The louvered window (if provided) shall have approved hardware for adjustable louvre blades.

The glazing shall be minimum 5mm thick and optically true.

2.7 Shop Inspection -

The supervising officer shall be granted full facilities and any necessary assistance for inspection of materials and assembled parts in the contractor's (or his sub-contractor's) workshop. At least two weeks notice shall be given to the Engineer in writing prior to the despatch of finished components to the site to enable the Engineer to inspect and approve the materials and workmanship at the workshop.

Approval of work at the workshop does not relieve the contractor of his obligation to carry out the work complete at the site to the Consultants' satisfaction and in accordance with the contract.

3. Measurement -

- 3.1 Clear openings as given by the Architect's in the plan shall be considered (length and height) for payment of doors, windows.
- 3.2 Floor springs in aluminium doors, if required, shall be paid extra.

GENERAL SPECIFICATIONS FOR GLASS WORK

GLASS WORK -

1. **General** -

1.1 Glass generally shall comply with the requirement of relevant I.S. and be free from bubbles, specks, waves, flaws or any other defects.

2. **Material** -

2.1 **Clear Plate Glass**

The clear plate glass shall be minimum 5mm thick flat drawn sheet of selected glazing.

2.2 **Glass for Louvers** -

The glass for louvers blades shall be rough cast obscured rolled glass, 5mm thick with all exposed edges ground and polished.

2.3 **Putty**

The putty for glazing to timber frames and to metal frames to be of approved manufacture.

3. **Workmanship** -

3.1 All glass shall be accurately cut to fit easily into rebates with a tolerance of 2mm all round. It shall be back puttied, sprigged for timber rebates (pagged for metal rebates) and neatly front puttied. Care to be taken to ensure that the putty does not appear above the sight lines.

3.2 The contractor must allow in his rates for the protection of all work in this section and for replacing any cracked, scratched, broken or defective glass prior to handing over. He must also allow for cleaning all the windows inside and out and other glass on completion with an approved window cleaner and wash leather and for removal of all paint splashes.

4. **Measurements** -

4.1 The rates for glazing is included in the respective items of doors, windows, ventilators etc.

4.2 No separate payment shall be made for glazing unless otherwise specified.

**GENERAL SPECIFICATIONS FOR FLOORS,
WALL & CEILING FINISHES**

FLOOR, WALL AND CEILING FINISHES -

1. General -

- 1.1 Portland cement and sand shall be as described in 'Contractor' Technical Specifications.
- 1.2 Contractor shall submit samples of all kinds of tiles, stones, marble, etc. for approval before ordering the same or as an alternative all kinds of tiles, stones, marbles shall be used as per the samples shown to the contractor.
- 1.3 Where required the flooring shall be machine polished.
- 1.4 Surface to receive flooring tiles, etc. shall be cleaned thoroughly from all dust, dirt, mortar deposits, laitance water, etc. and washed clean with water.
- 1.5 Minimum 25mm thick line mortar (1:2) bedding floated with cement slurry or as specified in Schedule of Quantity shall be laid in such levels and thickness as required in the area of work. The thickness mentioned is only indicative and may vary in some particular areas. No extra will be paid on account of any variations in thickness or bedding mortar. The bedding mortar shall be compacted with wooden floats. For dado work the bedding material will be 15mm to 20mm thick (1:4) cement mortar.
- 1.6 The joints in tiles shall be neatly pointed with coloured cement to match with the tiles.
- 1.7 Kota stone or marble stone slabs to be obtained from approved quarries and to be free from all defects.
- 1.8 Coloured ceramic pattern glazed tiles, white glazed tiles shall be H&R Johnson first quality make in sizes specified in the Schedule of Quantities. The pattern and colour will be selected by the Architect before ordering these tiles. Chipped, cracked or worked tiles shall not be used in the work. The tiles shall be minimum 6mm thick and the best quality.
- 1.9 Marble mosaic tiles and specials (skirting) shall be of the best quality and of approved make. Tiles shall be minimum 20mm

thick having a base of 12mm thick in cement and sand mortar in proportion (1:3) with top layer of 8mm thick in neat coloured cement and marble chips facing. They will be compacted under minimum pressure of 300 lbs per sq.ft. All the edges shall be exactly to size free from chipping and the top surface and edges shall be smooth, but the base shall be rough. The marble chips shall be smaller and of approved colour in neutral shade. The tiles and specials shall be cured in water for at least one month before delivery.

2.0 **Indian Patent Stone Flooring -**

- 2.1 Indian patent stone flooring shall be 40mm thick to be laid in 2 layers, bottom later 30mm thick in one part of Portland cement, two parts of sand and four parts of crushed stone aggregates ½” down well graded machine mixed with not more than 25 litres of water for each bag of cement, 2½ parts of selected crushed stone chips, 1/8” down with just enough sand maximum 1 part to make workable mix, machine mixed with not more than 25 litres of water. Top layer to be laid before the bottom layer has hardened. Flooring shall be laid in square or bays as directed and each layer shall be well compacted by ramming with heavy teakwood floats. The top shall be brought to a smooth and even surface free and blemishes and finished smooth by steel trowelling. After the concrete surface has hardened sufficiently to prevent dislodgement of aggregates, the patent stone shall be polished with No.1 and 3 polishing stones. The flooring shall be kept wet for seven days for curing.

3.0 **Plain & Coloured Cement Tiles, Marble Mosaic & Terrazzo Tiles Flooring, Dado and Skirting -**

- 3.1 The tiles shall conform to IS: 1237.
- 3.2 The rates shall include provision of border tiles and tiles of different colours in pattern, if directed.
- 3.3 The sub-grade shall be thoroughly wetted after cleaning of all dirt, laitance and loose material.

A bed of lime/cement mortar shall be laid evenly to an average thickness of 25mm and the surface kept slightly rough to form a key for tiles.

Neat cement plaster of honey like consistency shall be spread over mortar bed (over such area that may accommodate about 20 tiles).

Tiles shall be soaked in water for 15 minutes and allowed to dry for the same duration.

Tiles shall then be fixed with a thin coat of cement paste on the back of each tiles and then each tile being gently tapped with a wooden mallet till it is properly bedded and in level with adjoining tiles.

Joints shall be fine and as imperceptible as possible.

After tiles have been laid in a room or a day's fixing work is complete, surplus cement grout that may have come out of the joints may be wiped off gently and joints cleaned.

A thin slurry of coloured cement matching to the colour of tiles shall be spread over it and rubbed so as to seal even a thinnest joint between the tiles and make it impervious.

The flooring shall be cured for seven days.

The tiles shall be polished and finished according to the instruction of Architect and in conformity of IS: 1443.

- 3.4 For dado and skirting – The tiles shall match with the flooring times and/or as per the Architect's instructions.
- 3.4.1 The tiles shall be fixed with neat cement grout on a backing coat consisting of 1:4 cement sand plaster of 15mm to 20mm thickness.
- 3.4.2 The top and bottom junctions of tiles shall be rounded off neatly as directed.
- 3.4.3 The joints shall be filled with matching shade coloured cement slurry.

3.4.4 The surface shall be kept wet for seven days and then polished with carborundum stone to obtain smooth surface and fine polish.

4. **Marble Mosaic – In Situ Terrazo Flooring -**

4.1 The surface of the base slant shall be struck off reasonably true at a level not less than 45mm below the required finished level. The work shall be of the larger size shall be spread over the topping during rolling until 85% of the finished surface shall be composed of marble chips. Immediately after rolling the surface shall be floated and trowelled once. No attempts shall be made to remove trowel marks.

4.10 After the terrazzo concrete has hardened enough to prevent dislodgement of aggregate particles, it shall be ground down with an approved type of grinding machine shed with free, rapid cutting carborundum stones to expose the coarse aggregates. All materials ground off shall be removed by squeezing and flushing with water.

4.11 Air hones, pits and other blemishes shall then be filled with a thin grout composed of neat cement. This grout shall be spread over the surface and worked into the pits. After all patch fillers have hardened for seven days, the floors surface shall receive a second and final grinding to remove the film of cement paste and to give the floor a polish. It shall then be thoroughly washed and all surface material removed.

4.12 All freshly placed concrete shall be protected from the elements and from the defacements due to building operations. The contractor shall provide and use, when necessary tarpaulins to cover completely or enclose all freshly finished concrete.

4.13 As soon as the concrete has hardened to prevent damage, it shall be covered by at least one inch of wet sand or other covering approved by the Architect and shall be kept continually wet by sprinkling with soap water for at least ten days.

4.14 After removing all loose material the finish shall be scrubbed with warm water and soap and mopped dry.

5. **Stone Flooring, Dado & Skirting -**

5.1 **General**

- 5.1.1 The stone shall be hand cut, machine polished or rough, free from cracks and flakes and uniform in colour. The edges shall be straight and square.
- 5.1.2 The stone slab be laid and finished as described under “cement tiles” or a bedding of lime/cement mortar 25mm (average) thickness. The finished stone surface thus laid shall then be polished as approved by the Architect.
- 5.1.3 For dados and skirtings the stone slabs shall be laid on a backing plaster of cement mortar 1:4 of 15mm to 20mm thickness and finished as described under “cement tiles”.

5.2 **Marble Flooring and Lining**

- 5.2.1 The marble shall be as approved by the Architect.

The exposed surface of marble shall be polished or otherwise as specified and shall be free from scratches and other defects.

The marble shall be machine cut, machine polished (if specified) free from cracks or flakes and uniform in colour. The edges shall be straight and square.

- 5.2.2 The marble shall be bedded in lime/cement sand mortar with cement floated. The joints shall be laid with fine invisible joint or otherwise as instructed.
- 5.2.3 The contractor shall take care to match the grains of the marble, if instructed.
- 5.2.4 Marble for treads and risers shall be in one piece upto 1.5 meter length. The thickness shall be as per the Architect's instructions.
- 5.2.5 Marble lining to walls, columns and the like shall be fixed with copper clamps and hooks. The clamp shall be 25 x 50 x 100mm girth, one end built into wall. Mortices shall be carefully cut and thoroughly grouted.

5.2.6 Whenever the marble is exposed to weather, the vertical faces must be well bonded to the base by applying glue and aggregate as per the Architect's instructions.

5.2.7 The exposed edges and mouldings shall be protected by means of timber nosing.

5.2.8 After laying, the work shall be polished as required and unevenness removed to the satisfaction of the Architect.

6. **Glazed Tiles Flooring & Dado -**

6.1 All glazed tiles to be used shall be from an approved manufacturer conforming to IS: 777. The colour, size etc. shall be as per the Architect's approval.

6.2 All the tiles shall be immersed in clear water for 6 hours before laying. The tiles shall be laid on cement grout, with a true vertical or horizontal face and continuous horizontal and vertical joints.

The surplus grout shall be removed after laying of tiles and joints shall be cleaned off the grey cement grout with a wire brush or trowel to a depth of 5mm.

Joints then shall be flush pointed with white cement with approved pigment.

The floor shall be cured for seven days. After curing the surface shall be washed with mild hydrochloric acid and clean water.

The finished flooring/dado shall not sound hollow when tapped with a wooden mallet.

7. **Measurements -**

The rates quoted should include for all materials and labour and for execution of work at any level. Lift of material will not form a criterion for any extra amount. It also includes providing and fixing scaffolding and removing the same after completion, machine polishing, hand polishing, curing and cleaning the entire work on completion.

8. **Neeru Finish Cement Plaster -**

- 8.01 Cement mortar shall consist of one part of cement to 4 parts of screened and washed sand.

The plaster on wall shall be in two coats, the first under coat of approx. 10mm to 12mm thick, dashed against wall and roughly levelled. To ensure proper line and level gauged patches shall be made at 1.5m to 2m apart in both directions.

The second or finishing coat shall be a thin coat of cream of lime putty evenly applied and trowelled smooth, to produce a perfectly smooth and even surface.

Plaster to concrete ceilings shall be as thin as possible but not less than 12mm. The under coat and finishing coat shall be as well.

8.02 **Sand faced Cement Plaster -**

The surface to be prepared as instructed before.

The under coat shall be in the proportion of 1:3 (cement:sand) with approved waterproofing compound added at the rate of 1.50 kg. per bag as specified by the manufacturer. This shall be applied uniformly all over the surface with dashing to a thickness of 12mm and finished true to level and line. Keys shall be formed to receive finishing coat. The surface shall be kept moist till the finishing coat is applied.

The finishing coat shall be applied after four days. The proportion of mortar shall be 1:3 cement, well graded and washed sand. This coat shall be applied in a uniform thickness of 6mm. The surface shall be dabbed to have uniform grained texture by using sponge pads.

The curing shall start after 24 hours and the surface shall be kept wet for seven days.

8.03 **Rough Cast Plaster -**

The under coat shall be prepared as per sand faced cement plaster.

Mortar for finishing coat shall be in the proportion of 1:1:1 cement specially graded sand: gravel of 3mm to 6mm size. This mortar shall be dashed to the first coat with large trowel to form a even and decorative coat. The thickness of this coat shall be about 12mm. The plaster shall be cured for seven days.

8.04 **Measurements** -

The rates quoted should include for all materials and labour and for execution of work at any level. Lift of materials will not form a criterion for any extra amount. It also include providing and fixing scaffolding and removing the same after completion of work, raking out joints, hacking and hatching the concrete surface and providing the key for holding down the plaster, watering, curing etc. complete. Nothing extra will be paid for work if arises, round angles, fair edges, narrow return works, V-joints, splays, drip mouldings, grooves 1" wide x ½" deep in plaster, making good around pipes, conduits, timbers, cill, brackets, railing etc. and making good after all specialists have done their work. Measurement will be of actual area of work done.

**GENERAL SPECIFICATIONS FOR
PAINTING & POLISHING**

PAINING & POLISHING -

1. General -

- 1.1 All paintings shall be carried out by a skilled painter with paints and shades as approved by the Architect.
- 1.2 Paints generally shall be ready mixed and supplied and delivered to site in sealed containers clearly labelled.
- 1.3 Paints are to be used strictly in accordance with the manufacturer's instructions and no contamination by mixing with other brands or materials will be permitted. Thinning is also permitted if it is in accordance with the manufacturer's printed instructions.
- 1.4 Wherever required scaffolding shall be double scaffolding so it is independent of structure or walls.
- 1.5 The surface to receive the paint shall be thoroughly cleaned from mortar droppings and foreign matter. All broken edges, cracks, loose plaster and wavy surfaces shall be brought up by patch plaster work or by plaster of Paris.
- 1.6 All metal fittings and fastenings are to be removed before preparatory processes, cleaned and refixed in position on completion. Wherever it is not possible the fittings shall be protected by covering it with polythene sheet or clothes, etc. at no extra cost.
- 1.7 All cracks, crevices and holes to be scrapped out, primed and made good with hard stoppings, faced up, rubbed down to an even surface. The hard stopping must be of approved make, or made up on the job site according to the approved practice.

All knots in wood work to be treated to prevent bleeding. Large or loose knots to be cut out and replaced with ground wood or cut back and the surface made good with stopper. Smaller knots to be treated with two thin coats of knotting. The knotting used shall be of approved make, free from resin.

- 1.8 This preparation and priming should be followed immediately by painting, with approved paint.

- 1.9 Painting shall be done to the entire satisfaction of the Architect. If Architect feels that surfaced is not achieved properly, additional coat/coats of paint shall be applied until the required surface is achieved at no extra cost.
- 1.10 All rubbish to be cleaned from time to time as it accumulates, and the premises left clean and fit. All locks to be eased and oiled. Hot and cold water tanks and flushing tanks of WC's cleaned out and all taps washed. All floors to be scrubbed on completion of the work.

2. **Materials and Application** -

2.1 **White Wash** :

White wash shall be prepared from lime slaked on site, mixed and stirred with sufficient water to make a thin cream. Approximately five litres of water to be added per one kg. of lime to make the required cream. This shall be allowed to stand for 24 hours and shall be screened through clean cloth. Four kgs. of gum dissolved in hot water shall be added to each cubic meter of the cream. Blue shall be added if required to give whiteness.

White wash shall be applied in specified coats by using brush or spray pump. Each coat shall be allowed to dry before the next coat is applied.

The finished dry surfaces shall not show any signs of cracking or peeling and shall not come off readily while rubbing with hand.

2.2 **Colour Wash** -

Same as white wash but mineral colours to be added, which are not affected by lime to white wash.

2.3 **Dry Distemper** -

A primer coat of white wash or otherwise shall be first applied to the surface prepared and then sand prepared to receive second coat. The second coat shall be of approved primer or sizing evenly on the surface.

Distemper prepared as per the manufacturer's specification shall be applied now in minimum of two coats. Distemper shall be applied with brush or roller.

The finished surface shall be even, uniform, free from chalking when rubbed and shall not show any brush marks.

2.4 **Oil Bound Distemper** -

The surface shall be prepared as specified before. A primer coat of either cement primer or approved distemper primer shall be applied. After the primer coat has dried, the surface shall be lightly sand papered and dusted to make it smooth to receive distemper.

Distemper shall be prepared as per the manufacturer's instructions and applied as specified in "Dry Distemper".

2.5 **Cement Paint** -

The surface shall be prepared as specified before and shall be thoroughly wetted with clean water before the paint is applied.

The paint shall be prepared as manufacturer's instructions and in such quantity which can be used in an hour.

The paint then shall be applied on clean wetted surface with a brush or spraying machine.

The paint shall be stirred during the process of application.

The direct heat of the sun should be avoided as far as possible.

The completed work shall be cured sufficiently.

Sufficient time gap shall be allowed in between subsequent coats.

2.6 **Oil, Enamel or Plastic Emulsion Paint** -

The surface shall be prepared as specified. A coat of approved primer shall be applied on the prepared surface.

After 24 hours a coat of paint shall be applied evenly and sand papered after drying. Then a filler putty coating shall be done for smooth and levelled finish of the surface.

Over this number of paint shall be applied as directed (minimum two coats shall be applied). Each coat shall be allowed to dry thoroughly and then lightly rubbed down with sand paper and cleaned of dust, before the next coat is applied.

The final coat if directed shall be rolled with an approved roller or stippled with a brush. On completion of the job the surface shall be uniform in finish without any hair marks from the brush or clogging of paint puddles in the corners of panels, angles of mouldings etc.

2.7 **Polishing and Varnishing** -

General -

Refer Item No.1.7 in conjunction with this. Holes and indentations on surface shall be filled with putty made of whiting and linseed oil.

Surface shall be given a coat of filler made of 2.25 kg. of whiting in 1.5 litres of methylated spirit. When it dries, surfaces shall be rubbed down perfectly smooth with sand paper again and wiped out.

2.7.1 **French Polishing** -

French spirit polish shall be of an approved make conforming to IS: 346. If it is to be prepared on site, the polish shall be made by dissolving 0.7 kg. of best Shellac in 4.5 litres of methylated spirit without heating. Pigment may be mixed to obtain required shade.

The pad, made out of clean fine cotton cloth and cotton wool, shall be used to apply polish. The pad shall be moistened with polish and rubbed hard on the surface applying the polish sparingly but uniformly and completely over the entire surface. Another coat shall be applied in the same way after the first coat has dried sufficiently.

The finishing coat shall be applied with new clean pad slightly dampened with methylated spirit and rubbed lightly and quickly with a circular motion, till the surface attains uniform texture and high gloss as per the satisfaction of the Architect.

2.7.2 **Wax Polishing** -

Wax polish shall be bought readymade from the market as approved by the Architect or otherwise it shall be prepared on the site as below.

This shall not prepared from a mixture of pure bees was, linseed oil, turpentine oil and varnish in the ratio of 2:1½:1:½ by weight. The bees wax and the boiled linseed oil shall be heated over a slow fire. When the wax is completely dissolved the mixture shall be cooled till it is just warm and turpentine oil and varnish added in the required proportion and well stirred.

The first coat shall be applied with the prepared mixture, evenly with a clean cloth pad in such a way that no blank patches are left. This coat shall be rubbed continuously for half an hour.

When the surface is dry a second coat shall be applied in the same manner but shall be rubbed continuously for an hour or until the surface is dry.

Final coat then shall be applied and rubbed for two hours or more until the surface has assumed a uniform gloss showing no sign of stickiness when touched. The rubbing shall be continuous with uniform pressure and frequent change in direction.

2.7.3 **Varnishing** -

After preparation of surfaces as described before, two coats of clean linseed oil with sufficient interval of time shall be applied evenly.

After this has dried two coats of varnish shall be applied keeping sufficient interval of time.

3. **Measurements** -

- 3.1 The work will have to be executed at any height above ground level. Lift of material will not form a criterion for extra amount.
- 3.2 Rates quoted shall include for all materials and labour, providing and fixing scaffolding and removing the scaffolding after completion of work. Nothing extra will be paid for work if arises, round angles, fair edges, narrow returns, splays, mouldings, grooves etc.
- 3.3 Where painting, polishing etc. is included in the items such as doors, windows, ventilators, gates and false ceiling etc., painting will not be measured separately.
- 3.4 While painting work is being carried out, flooring, dado, skirting and other finished works shall be fully protected from being smeared with paint. Any paint marks shall be cleaned instantly. The contractor shall cover for this in his rates and clean the areas after the painting is over.