TERNA PUBLIC CHARITABLE TRUST

NERUL, NAVI MUMBAI.

TENDER DOCUMENTS

FOR

STRUCTURAL REPAIR & RENOVATION WORK OF TERNA SCHOOL

PLOT NO.23, SECTOR-01, KOPARKHAIRANE, NAVI MUMBAI

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VOLUME-II

1.TECHNICAL SPECIFICATIONS

FROM

TERNA PUBLIC` CHARITABLE TRUST,

ROOM NO. 203, 2ND FLOOR,

TERNA ENGINEERING COLLEGE BUILDING,

PLOT NO.12, SECTOR -22, NERUL, NAVI MUMBAI 400 706.

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STRUCTURAL REPAIR & RENOVATATION WORK

OF

TERNA SCHOOL

PLOT NO.- 23, SECTOR-01, KOPARKHAIRANE NAVI MUMBAI**.**

I N D E X

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TERNA SCHOOL

PLOT NO.- 23, SECTOR-01, KOPARKHAIRANE NAVI MUMBAI

I N D E X

SECTION –I

PREAMBLE TO SPECIFICATIONS

1.1 GENERAL

All works shall be measured net as completed or as fixed in place with no allowance (unless specified for) for cuttings, wastage, joints, risks etc. No allowance shall be made for large or small quantities, narrow widths, easy access or difficult positions or other exceptional circumstances. Any work executed over and above the dimensions given in drawings or sketches provided by the Engineer in charge or written instructions by the Engineer in charge shall be ignored, and no payment shall be made for such extra work. In other words, payment shall be made for authorised Permanent Works only. Unless otherwise specified measurements shall be taken as per the provisions of I.S. code 1200.

1.2 LEAST COUNT FOR CALCULATING QUANTITIES.

The least count for the purpose of calculating quantities shall be as under. Linear dimensions shall be measured correct to the 0.01 m. Area shall be worked out correct to the 0.01 Sq.M., volume (Cubic contents) shall be worked out correct to the 0.01 cubic metre and weight shall be worked out correct to 0.001 Tonne or 1 Kg. as applicable, and thickness to 1.0 mm unless otherwise specified.

1.3 TRANSPORT :

All rates are inclusive of transportation cost.

1.4 FULL PROVISIONS :

The rates inserted by Contractor/tenderer against various items/amount of work detailed in various parts of schedule shall be deemed to include every allowance necessary, without extra measurement or charge for meeting the requirement of various components/parts of the contract documents viz. Particular Specifications. Standard Specifications of P.W.D. of Maharashtra, item wise specifications, Additional Special Conditions and Mandatory Instructions, Preambles and Notes to Schedule Items, description of Schedule items, which shall all be read together, and any or all of the following unless specifically provided for to the contrary.

a) Compliance with all the conditions of contract including General Conditions of Contract., Schedule of Quantities, Particular Specifications, drawings including notes thereon, Specifications in Standard Specifications and other Specification in this Contract of P.W.D. Maharashtra State, Relevant Indian Standard Specifications, and other Specification in this Contract. All India Standard Schedule of Rates 1986 "Standard Specifications" of Govt. of India as and where applicable.

b) All labour, materials, tools and plant, equipment and transport (which may be) required in preparation for and in the full and entire execution and completion of the Works, including waste in materials, carriage and cartage, carrying in, all leads and lifts. Hoisting, seating, fitting and fixing in position.

c) Local Conditions : Nature of works, local facilities for supply of labour and materials, accessibilities to site, and all other matters affecting the execution and completion of the works.

d) Duties etc. : Payment of any Octroi, Terminal Tax, Turnover Tax, Toll Tax, Contract Sales Tax, Ground Rent, Environmental Cass or any other duties and levies on materials obtained for the Works and any duties in respect of patent rights including Works contract sales tax etc.

e) Supervision : Competent supervision of the Works.

f) Labour : Reasonable terms and conditions of employment liabilities to pay compensation, pay wages in accordance with payment of wages Act wages as per statutory enactments, temporary accommodation, sanitation etc. compliance with Contract Labour Act.

g) Water and Power : Provision of all water and power required including temporary plumbing and electrical connections. **No water will be supplied. Electricity supply charges will be deducted from final bill.**

h) Temporary work-shops, stores, office, labour camps foundation for crane etc. : Provision of such structures as required for efficient execution of the work, removing and cleaning up site on completion of work.

i) Precautions against risk : Precautions to prevent loss or damage from all or any risks, insurance of sheds or any temporary accommodation provided by Client, watching and lighting and provisions pertaining to these in General Conditions of Contract.

j) Notices, Fees etc. : Compliance with statutory provisions of regulations and/or bye-laws of any local authority and/or any public service company or authority affected by the Works.

k) Setting out the Works including all apparatus required.

l) Site Drainage : Removal at no extra cost of all water that may accumulate due to springs, sub-soil water, rains, flood/tides and any other causes on the site during the progress of the Works or in trenches and excavations.

m) Execution of work in a workman like manner including providing facilities for inspection etc.

n) Rectification of bad work : Rectification or removal and reconstruction of any work which (as decided by the engineer) has been executed with unsound or imperfect material or unskilled or unsatisfactory workmanship or a quality inferior to that contracted for, whether during construction or prior to the expiry of the maintenance period.

o) Responsibility for damages and loss of all construction materials etc. at the site until handed over to Client

p) Removal of Rubbish : Removal of rubbish and debris and cleaning of any dirt before handing over to Client

q) Cleaning site and Works : Removal by the contractor, off the site any temporary structure any tools, plant and materials and sweeping, washing, cleaning joinery, removal of splashes of paint and lime wash and leaving the whole structure neat and tidy.

r) Completion : Completion of the Works to the satisfaction of the Engineer on or before the stipulated date of completion.

s) Difficult Positions : Accessibility or otherwise to site, easy or difficult positions in work. Co-ordination with CLIENT/ PWD/Any other statutory body for obtaining permission for diversion of traffic or any other facilities during execution of this project.

t) Errors : Rectification of all errors to the satisfaction of Engineer (e.g. when excavation is carried out deeper than ordered or required level shall be made up with concrete as specified for the foundation at no extra cost.

u) Maker's instructions : Compliance with maker's instructions in the case of proprietary articles.

v) Curved work etc. : Work of any quantity, size or shape, whether level, inclined, curved, battered etc.

w) Waste : All wastes, laps, seams, joints (rough or fair cutting) cutting, straight/raking, circular and making good.

x) Artificial Lights : To include for all lighting, kerosene or electric power as the case may be, when need arises for use of lighting out Works.

y) Tests : Carrying out all tests at field laboratory and or any other laboratory approved by Engineer as per relevant Indian Standards in required frequencies.

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Signature of Tenderer

Date :

SECTION –II

GENERAL SPECIFICATIONS

1.0 These specifications shall be read in conjunction with the Particular Specifications for various items of work. The Contractor shall carefully acquaint himself with the general specifications, coordinate the same with any other specifications forming a part of the Contract Document and determine his contractual obligations for the execution of various items of work in accordance with good engineering practices.

2.0 REFERENCE TO THE STANDARD CODES OF PRACTICE :

2.1 All standards, tentative specifications, specifications, code of practice referred to shall be the latest editions including all applicable official amendments and revisions. The contractor shall make available at site all relevant Indian Standard Codes of Practice as applicable.

2.2 In case of discrepancy between standards, codes of practice, tentative specifications, specifications referred to, these specification, shall govern.

3.0 CONTRACTOR TO PROVIDE :

The Contractor shall provide and maintain at site throughout the period of Works the following at his own cost and without extra charge, the cost being held to be included in the Contract Rates.

3.1 All labour, materials, plant, equipment and temporary Works required to complete and maintain the works to the satisfaction of the Engineer.

3.2 Lighting for night work, and also whenever and wherever required by the Engineer.

3.3 Temporary fences, guards, lights and protective work necessary for protection of workmen, supervisors, engineers or any other persons permitted access to the site.

3.4 All equipment, instruments and labour required by the Engineer for measurement of the works.

3.5 The contractor shall provide all necessary equipments to test the approved materials which are to be incorporated into the works. All the pegs for setting out the works and fixing the levels required for the execution thereof shall be as desired by Engineer-in-charge, be built in masonry at such places and in such a manner as the Engineer-in-charge may direct. The contractor shall carefully protect and preserve all bench marks and other marks used in setting out the works.**Amount required for testing of materials & concrete cubes shall be born by conractors.**

3.5 A Contractor shall provide site office for the Engineer's use of area admeasuring about 75 sqm.

Broad details about construction of office and other facilities to be provided shall be as follow :

1. Over all size of the office shall be 10.0 x 6.0 m with one separate cabin for the Engineer and site meeting and one room of 3.0 m x 2.5 m for computer.
2. 150 mm thick solid block masonry externally with internal neeru plasterand external sand face plaster/ temporary G.I sheet cabin.
3. A.C. sheet roofing at 12 feet height.
4. Coba flooring, plinth height of 450 mm.

Following furniture shall be provided by the contractor.

a) 2 tables of size 5' 00" x 2' 6"
b) 05 Chairs.
c) Full size store well steel cupboard and a filing cabinet.
d) One stool.
e) 2 Ceiling fans and one pedestal fan.
f) 4 tube lights.
g) 15 amp. Power point for A.C. and 15 amp. Power point for computer.
h) Display board of approximate 4 sqm. Area with 0.9 m height.
i) All necessary electrical and plumbing arrangements.

Contractor shall arrange to maintain this office by daily sweeping the floor and keeping the premises clean.

Cost of all this shall be deemed to have been included in the tender as incidentals and no separate payment shall be made for providing these facilities.

On completion period of the contract, contractor may dismantle and take away the furniture provided by him.

3.6 SWING TYPE WEIGH BATCHESS :

Contractor shall also provide platform swing type weigh batches of approved make (as per I.S. 2722 portable swing type).

3.7 Any layout of equipment not specifically mentioned above which can reasonably be held necessary for the completion and maintenance of the Works to the satisfaction of the Engineer.

4.0 DIMENSIONS :

4.1 Written dimensions on drawings shall supersede measurement by scale and drawings to a large scale shall take precedence over those to a smaller scale. Special dimensions or directions in the specifications shall supersede all others. All dimensions shall be checked on site prior to execution.

4.2 The dimensions where stated do not allow for waste, laps, joints, etc. but the Contractor shall provide at his own cost sufficient labour and materials to cover such waste, laps, joints, etc. and the rate quoted is inclusive of such provision and no separate payment will be made for the same.

4.3 The levels, measurements and other information concerning the existing site as shown on the drawings are believed to be correct, but the Contractor should verify them for himself and also examine the nature of the ground as no claim or allowance whatsoever will be entertained on account of any errors or omissions in the levels or the description of the ground levels or strata turning out different from what was expected or shown on the drawings.

5.0 SETTING OUT OF WORKS :

The Contractor shall set out the Works indicated in the Conditions of Contract.

The Contractor shall provide suitable stones/concrete tops with flat tops and build the same in concrete for temporary bench marks. All the pegs for setting out of the Works and fixing the levels required for the execution thereof shall, if desired by the Engineer, be built in masonry at such places and in such a manner as the Engineer may direct. The Contractor shall carefully protect and preserve all bench marks and other marks used in setting out the Works.

6.0 MATERIALS :

6.1 QUALITY :

All materials used in the Works shall be of the best quality of their respective kinds as specified herein, obtained from sources and suppliers approved by the Engineer and shall comply strictly with the tests prescribed hereafter, or where tests are not laid own in the specifications, with the requirements of the latest issues of the relevant Indian Standards.

6.2 SAMPLING AND TESTING :

All materials used in the Works shall be subjected to inspection and tests in addition to test certificates. Samples of all materials proposed to be employed in permanent Works shall be submitted to the Engineer for approval before they are brought to the site.

Samples provided to the Engineer for their retention are to be labelled in boxes suitable for storage. Materials or workmanship not corresponding in character and quality with approved samples will be rejected by the Engineer.

Samples required for approval and testing must be supplied sufficiently in advance to allow for testing and approval, due allowance being made for the fact that if the first samples are rejected further samples may be required. Delay to the Works arising from the late submission of samples will not be acceptable as a reason for delay in completion of the Works.

Materials shall be tested before leaving the manufacturer's premises, quarry or source, wherever possible. Materials shall also be tested on the site and they may be rejected if not found suitable or in accordance with the specifications, notwithstanding the results of the tests at the manufacturer's Works or elsewhere or test certificates or any approval given earlier.

The contractor will bear all expenses for sampling and testing, whether at the manufacturer's premises at source, at site or at any testing laboratory or institution as directed by the Engineer. No extra payment shall be made on this account.

6.3 DISPATCH OF MATERIALS :

Materials shall not be dispatched from the manufacturer's Works to the site without written authority from the Engineer. Wherever insisted on by the Engineer.

6.4 TEST CERTIFICATES :

All manufacturer's certificates of test, proof sheets, etc. showing that the materials have been tested in accordance with the requirement of this specifications and of the appropriate Indian Standard are to be supplied free of charge on request to the Engineer.

6.5 REJECTION :

Any materials that have not been found to conform to the specifications will be rejected forthwith and shall be removed from the site by the Contractor at his own cost.

6.6 The Engineer shall have power to cause the Contractors to purchase and use such materials from any particular source, as may in his opinion be necessary for the proper execution of the work.

7.0 STORING OF MATERIALS AT SITE :

All materials used in the Works shall be stored on racks, supports, in bins, under cover etc. as appropriate to prevent deterioration or damage from any cause whatsoever to the entire satisfaction of the Engineer. The storage of materials shall be in accordance with IS 4082 "Recommendation on stacking and storage of construction materials on site" and as per IS 7969 "Safety code for handling and storage of building materials".

The materials shall be stored in a proper manner at places at site approved by the Engineer. Should the place where material is stored by the Contractor be required by the Employer for any other purpose, the Contractor shall forthwith remove the material from that place at his own cost and clear the place for the use of the Employer.

8.0 WATER :

8.1 Water for Construction :

Clean fresh water only shall be used for the Works. The water shall be free from any deleterious matter in solution or in suspension . The quality of water shall conform to IS 465.

8.2 Storage :

The Contractor shall make his own arrangements for storing water, if necessary, in drums or tanks or cisterns, to the approval of the Engineer. Care shall be exercised to see that water is not contaminated in any way.

9.0 WORKMANSHIP :

9.1 All Works shall be true to level, plumb and square and the corners, edges and corners in all cases shall be unbroken and neat.

9.2 Any work not to the satisfaction of the Engineer or his representative will be rejected and the same shall be rectified, or removed and replaced with work of the required workmanship at no extra cost.

10.0 **LOADING TESTS :**

10.1 The Engineer shall during the progress of the Works or during the period of maintenance, instruct the Contractor that a loading test or any other non-destructive test such as ultrasonic test or smidth Hammer Test be made on the Works or any part thereof if, in his opinion such a test or tests be deemed necessary for one or more of the reasons herein below specified.

10.1.1 The site made concrete test cubes failing to attain the specified strength.

10.1.2 The shuttering for concrete works being prematurely removed.

10.1.3 Overloading during construction of the works or part thereof;

10.1.4 Concrete improperly cured;

10.1.5 If any portion of the work is carried out without prior approval in writing of the Engineer or his representative to proceed with such work;

10.1.6 If concrete is honeycombed or damaged or in the opinion of the Engineer particularly weak in important or critical areas of the structure where weakened concrete will affect the ability of the structure to carry design loads;

10.1.7 Any other circumstances attributed to alleged negligence on the part of the Contractor which, in the opinion of the Engineer, results in the Works or any part thereof being of less than the expected strength;

10.1.8 Any reason other than the foregoing.

10.2 The tests shall be made at the Contractor's own cost whether the results of such tests be satisfactory or otherwise.

10.3 All the loading tests and other tests like **N.D. Test will be carried out strictly in accordance with the instructions of the Engineer / consultant.** Load testing will generally follow the procedure set out in Indian Standard Codes of Practice, but the Engineer is not bound to follow the Indian Standard Codes of Practice and in his absolute discretion may issue instructions differing from the procedure set out in the Indian Standard Codes of Practice.

Minimum 10 ND tests of core cut, 30 tests of pulse velocity, 30 tests of rebound hammer for column, beam & fins to be carried out as per requirement after R.C.C work repair.

Above tests shall be made at the Contractor's own cost whether the results of such tests are satisfactory or otherwise.

10.4 If in the opinion of the Engineer the result of the loading tests and other tests like N.D. Tests is not satisfactory, the Engineer shall instruct that such parts of the Works as he specifies shall be taken down or cut out and reconstructed to comply with the specifications, or other remedial measures shall be taken to make Works secure to the satisfaction of the Engineer. The Contractor shall take down, or cut out and reconstruct the defective work or shall take the remedial measures instructed at his own cost.

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Signature of Tenderer

SECTION –III

GENERAL / SPECIAL CONDITIONS OF CONTRACT

1. **CONTRACTOR TO VISIT THE SITE.**

Each bidder must visit the site of works before submitting the tender so as to ascertain the physical site conditions and quality of materials (salvage) to be taken away.

2. **EXECUTION OF DEMOLITION / DISMANTLING WORK**

The demolition / dismantling of the ground and one upper storeyed building should be carried out mostly as per the scope of work. However the items mentioned in the list are quite approximate and only for the guidance of bidder. The bidder should himself conduct proper survey of the items to be demolished and dismantled and should give his offer for Salvage value to be payable to the Municipal Corporation of Greater Mumbai after accounting for the cost of labour for demolition / dismantling, stacking carting away and leaving the site clean.

3. He should quote his offer of salvage value payable to the Municipal Corporation of Greater Mumbai considering.

   i. All temporary canvas, lights tarpaulins, barricades tools and plants, equipments, scaffolding etc.

   ii. All such temporary fences, partitions guards, approach paths as may be necessary for execution of the contract works and for safe guarding the public.

4. The contractor shall indemnify the owner against any liability, loss, claim or proceedings whatsoever arising under any statute or at common law in respect of personal injury to or the death of any person whomsoever arising out of or in the course of or caused by the carrying out of the works unless due to any act or neglect of the owner or of any person for whom the owner is responsible.

5. **INSURANCE AGAINST INJURY TO PERSONS AND PROPERTY.**

Without prejudice to his liability to indemnify the owner under clause 15 of these conditions, the contractor shall maintain such insurance in the joint names of the owner and contractor in respect of injury or damage to property real or personal arising out of or in the course of or by reason of carrying out the work and caused by any negligence, omission or default of the contractor, his servants or agents or as the case may be of such sub contractor, his servants or agents.

GENERAL SAFETY PROVISIONS

1. Suitable scaffolds shall be provided for workman for all work that cannot safely be done from the ground, or from solid construction except such short period work as can be done safely from ladders. When a ladder is used an extra mazdoor shall be engaged for holding the ladder and if the ladder is used for carrying materials as well, suitable footholds and handholds shall be provided on the ladder and the ladder shall be given an inclination not steeper than 1/4 (1 horizontal and 4 vertical).

2. Scaffolding or staging more than 3.25 meters above the ground or floor, swaying or suspended from an overhead support or erected with stationary support shall have a guards properly attached, bolted, braced and otherwise secured at least 1 meter high above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends thereof with only such openings as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building or structure.

3. Working platform, gangways and stairway shall be so constructed that they do no sag unduly or unequally and if height of a platform or gangway or stairway is more than 3.25 meters above ground level or floor level, it shall be closely boarded have adequate width and be suitably fenced as described in 2 above.

4. Every opening in floor of a building or in a working platform shall be provided with suitable means to prevent fall of persons or materials by providing suitable fencing or railing with a minimum height of 1 meter.

5. Adequate precautions shall be taken to prevent danger from electrical equipment. No materials on any of the sites shall be so stacked or placed as to cause danger or inconvenience to any person or the public. The Contractor shall provide all necessary fencing to protect public from accidents.

6. All scaffolds, ladders and other safety devices mentioned or described herein shall be maintained in a safe condition and no scaffold, ladder or equipment shall be altered or removed while it is in use. Adequate washing facilities shall be provided at near places of work. All workers working on scaffolds above first floor height shall wear helmets and safety belts.

7. To ensure effective enforcement of the rules and regulations relating to safety precautions, arrangements made by the Contractor shall be open to inspection by the Engineer or his representatives and the Inspecting Officers.

8. All necessary personal safety equipment as considered adequate the Engineer or his Representative shall be available for use of persons employed on the site and maintained in a condition shall take adequate steps to ensure proper use of equipment by those concerned.

    a) Those engaged in handling any materials, which is injurious to eyes, shall be provided with protective goggles.

    b) Those engaged in welding works shall be provided with welder’s protective eye-shields.

    c) Safety helmets & safety belts for every worker / Identification batches.

d) When workers are employed in sewers and manholes or large tanks, which are in use, the contractor shall ensure that manhole covers are opened and manholes are ventilated at least for an hour before workers are allowed to get into them. Manholes so opened shall be cordoned off with suitable railing and provided with warning signals or boards to prevent accident to public.

9. When work is done near any place where there is risk of drowning, all necessary equipment shall be provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provision make for prompt and treatment of all injuries likely to be sustained during the course of the work.

10. Use of hoisting machines and tackle including their attachments, anchorage and supports shall conform to the following :

a. These shall be good mechanical construction, sound material and adequate strength, and free from patent defects and shall be kept in good working order.

Every rope used in hoisting or lowering materials or as a means of suspension shall be of durable quality and adequate strength, and free from patent defects.

b. Every crane driver or hoisting appliance operator shall be properly qualified and no person under the age of 21 years shall be in charge of any hoisting machine including any scaffold or give signals to operator.

c. In case of every hoisting machine and of every chain ring hook, shackle, swivel and pulley block used in hoisting or lowering or as means of suspension, safe working load shall be ascertained by adequate means. Every hoisting machine and all gear referred to above shall be plainly marked with safe working load. In case of a hoisting machine having a variable safe working load, each safe working load and the conditions under which it is applicable shall be clearly indicated. No part of any machine or of any gear referred to above in this paragraph shall be loaded beyond safe working load except for the purpose of testing.

d. In case of a departmental machine, safe working load shall be notified by the Engineer. As regards contractor's Equipment the Contractor shall notify safe working load of each machine to the Engineer whenever he brings it to site of work and get it verified by the Engineer.

e. Electrically operated equipment can be allowed to be used as per availability of power at site of work.

SECTION –IV

INSTRUCTIONS TO CONTRACTORS

1. The sizes of various structural members can be seen and ascertained by physical verification and inspection at site of work by bidder himself and rates quoted accordingly. No knowledge or half-knowledge will not be accepted as a reason for any variation in quoted rates.

2. Blasting, controlled or otherwise, is not permitted.

3. Any equipment, causing vibrations and thereby possible damage to the structures/ area around the point of demolition should not be used, if no presplitting technique is adopted.

4. Mechanically/pneumatically operated heavy-duty concrete/reinforcement cutting saws are ideal for this kind of work.

5. A series of holes of approx.50mm dia. be drilled around the periphery of slabs to be demolished for ease of operations.

6. Large chunks of concrete weighing more than 0.1MT should be handled by material handling equipment only and should not be dropped from heights more than 1.0 m to avoid damage due to impact. A cushion of sand bags shall be provided over ground slab to minimise impact.

7. If, by mistake/oversight/negligence, the Contractor and/or his labourers break any structure, which is not supposed to be broken/demolished, the same should be made good by Contractor at his own cost to the satisfaction of Employer/Engineer.

8. A detailed methodology the bidder proposes to adopt with sequence of operations, method of demolition/dismantling, lowering, handling etc., with the machinery proposed to be used for the same should be submitted by the Contractor for study and approval by the Engineer. The bidders may have to modify the methodology, if required, to meet the suggestions made by the Engineer.

9. The bidder has also to submit a list of safety gears he proposes to give to each of his workers. The safety gears at the minimum should consist goggles, safety helmets, safety shoes, safety belts, etc.

10. Electrically operated equipments can be allowed to be used as sufficient as per power available at site of work.

11. Demolition work should be carried out during day time between 9.00 A M to 6.00 P M only. Demolition works if to be carried out beyond 6.00 P M. should be only with prior permission of the Engineer-in-charge.

    However, works such as collecting and stacking of debris etc. for disposal can be done during night time under proper supervision and guidance.

12. Carting away of debris/steel etc, should be restricted during day time or as authorised by the Engineer.

13. The bidder should give a list of similar jobs executed by him since last three years with all the relevant data.

TECHNICAL SPECIFICATIONS

SECTION - A

EARTHWORK & METAL PACKING

A.1 Excavation for all Works and of materials required for filling shall be to the exact width, length and depth shown on the drawings or as directed in writing by the Engineer. If excavation is carried out to greater width, length, depth than required, the Contractor shall make good, at his own cost, the extra depth by sound masonry or concrete filling, and extra length or width filled in by well consolidated earth or if the Engineer thinks it necessary for the stability of the work, by masonry or concrete as he may direct.

A.2 Excavated material required for filling shall be stacked or dumped where indicated by the Engineer. Excavated material not required for filling and any surplus material shall be removed and spread on the site where and as directed by the Engineer or carted away from the site as directed by the Engineer. Dumping of this surplus material shall be in an orderly manner and according to the levels/grades as indicated by the Engineer. The maximum radius for dumping of this surplus material on site from excavations will be as noted in the bill of quantities. The cost of such removal and spreading shall be borne by the Contractor and held to be included in the Contract Rates.

A.3 The Contractor shall, at the Contract Rates make provision for all shoring, pumping, dredging, bailing out or draining water whether subsoil or rain or other water and the excavation shall be kept free of water while the masonry work or concrete work is in progress and until the Engineer considers the work well set (Refer IS:3764 Safety for Excavation Work). The sides of trenches shall be kept vertical and the bottom horizontal and shall be run level throughout or properly stepped as directed by the Engineer.

The Contractor shall effect and maintain during progress of Works temporary fences around dangerous excavations.

A.4 Excavation in ordinary soil means excavation in marine clay saturated or unsaturated with water or ordinary hard soil including stiff heavy clay, hard shale, or compact soil or any material which can be removed by the ordinary application of spades, picks and pick axes. This shall also include removal of isolated boulders each having a volume not more than 0.05 cu.m.

A.5 Excavation in soft rock includes limestone, sandstone, laterite, etc. or other rock which can be quarried or split with crowbars or wedges. This shall also include excavation of tarred pavements, masonry work and rock boulders each having a volume of not less than 0.05 cu.m and not more than 0.25 cu.m.

A.6 Excavation in hard rock includes any rock found in ledges or masses in its original form or sheet rock or cement concrete, excavation of which in the opinion of the Engineer requires the use of compressed air equipment, sledge hammer and blasting.

A.7 In case of any difficulty concerning the interpretation of Clauses A.4, A.5 and A.6 above, the Engineer shall decide whether the excavation in a particular material

is in ordinary soil, soft rock or hard rock and his decision in this matter shall be final and binding on the Contractor and without appeal.

A.8 The foundation trenches shall be inspected and passed by the Engineer before such approval concrete or masonry work is commenced and the Contractor shall hold an order in writing to this effect, otherwise the Contractor shall be liable to have this work removed for inspection.

A.9 The earth/murrum for backfilling in foundation shall be got approved by the Engineer. In the foundation the backfilling shall be done in layers not more than 300 mm thick and shall be thoroughly watered and consolidated by approved method. The rate for backfilling in foundation is deemed to have been included in the excavation rate.

A.10 Murum Filling

A.10.1 The backfilling in plinth and other places which are required for levelling shall be done in layers not more than 300 mm thick. The filling shall be watered and thoroughly consolidated by vibratory roller of approved capacity in case of platforms and by mechanical compactors in case of all buildings. The process shall be repeated till the required level is achieved. After the backfilling is completed the surface shall be uniformly dressed and levelled. Murum of approved quality brought by the contractor from outside source having liquid limit not more than 40 and platicity index not more than 20 and minimum dry density not less than 1700 Kg. per m3 shall be used for filling and spread in layers not more than 300mm, to the required line and grade, watered and compacted with 8-10 tonnes power road roller so as to attain at least 95% of modified proctor dry density.

A.10.2 The work to be executed shall conform to clause Nos. 101 to 114,301 to 309 and section 900 of the specification for road & bridge work of the ministry of surface transport (road wing), Second revision 1988.

A.11 Metal Packing: Unless otherwise specified, stone for metal packing shall consist of crushed or broken stone. It shall be hard, durable and free from disintegrated particles, excessive dust and other objectionable matter.
Grading of coarse aggregates shall conform to one of the gradings given in the following tables:

Grading No	**Size range**	**Sieve desig-nation (IS.460) in mm**	**% by weight Passing the sieve**	**Remark**
1.	90mm to 40mm	100mm 80mm 63mm 40mm 20mm	100 65-85 25-60 0-15 0-5	Suitable for 100mm consolidated thickness

Grading No	Size range	Sieve desig-nation (IS.460) in mm	% by weight Passing the sieve	Remark
2.	63mm to 40mm	80mm 63mm 50mm 40mm 20mm	100 90-100 35-70 0-15 0-5	Suitable for 75mm consoli-dated thickness
3.	50mm to 20mm	63mm 50mm 40mm 20mm 10mm	100 95-100 35-70 0-10 0-5	Suitable for 65mm consoli-dated thickness

Screening to fill the voids shall consist of the same material as coarse aggregates and shall conform to the grading given below:

Classification	Size of	Sieve desig-nation	% by weight passing
A.	12.5mm 150 micron	12.5mm 10.0mm 4.75mm	100 90-100 10-30 0-8
B.	10.0mm 4.75mm 150 micron	10.00mm 85-100 10-30	100

The metal packing shall be done in layers not more than 100 mm compacted thickness. For 150 mm compacted thickness, it shall be done in two layers each of 75 mm compacted thickness.

After laying, each layer shall be compacted thoroughly by mechanical Compactor in case of buildings & by vibrating roller in case of roads, as specified or by other equivalent method approved by the Engineer. Slight sprinkling of water shall be done at the time of rolling.

After rolling has been completed, screening shall be applied uniformly and gradually to fill the interstices and the surface shall be dry rolled. In no case shall screenings be dumped in a heap on the rolled surfaces. Rolling shall be accompanied with brooming.

After application of screening and rolling, the surface shall be copiously sprinkled with water and rolled. If necessary additional screening shall be applied to fill the voids if any. Rolling shall be continued until the coarse aggregates are well bonded. Care shall be taken that the base of subgrade does not get damaged due to addition of excessive quantities of water during the construction.

A.12 Measurements :

a) Measurements of excavation shall be solid measurements of the material prior to its removal. Measurement shall be of exact length and width as indicated in the drawings and depth measured vertically, according to the drawings or Engineer's written instructions. Measurement shall be as per drawing and dimensions of bed concrete net without any allowance for increase in bulk. Extra excavation for working space and on account of slips or falls shall not be measured and that rate will include cost of inserting planking, strutting etc. and filling with selected soil after removal of planking.

Rates of excavation shall include the following provision

a) Excavating either straight or curved or plain.

b) Bailing out by pumping or other measures all water which may accumulate in excavations or sites or in trenches or in pits from rains, springs, under ground water, tidal water, broken water mains, drains, well or any other sources.

c) Setting out Works and all profiles, cross heads, boning rods, staves as well as all tools and plants.

d) All materials and labour required for fencing in protecting against risk of accident to open excavation etc. and for providing gangways with handrail across open trenches etc. where necessary, during the progress of Works.

e) Watching and lighting where necessary and as directed by the Engineer.

f) Forming "Tell Tales" or "Dead Men" in borrow pits and forming steps in deep excavation for facility of recording measurement.

g) Planking and strutting of adequate strength to be designed by Contractor and as directed by Engineer.

h) Excavation for insertion of planking and strutting and filling with soil after removal of planking and strutting.

i) Removal of slips or falls in excavation.

j) Carting away spoil or falls in excavation separating useful soil fit for reuse in filling.

k) Cleaning of irregular pockets and dewatering excavation.

l) Carting of all excavated stuff and disposing off within a lead of 0.5 Km. as directed by Engineer.

Measurements for excavation of soft rock and hard rock (Clauses A5 & A6) when section or trench measurement are absolutely not possible, stack measurement with 40 percent void deduction shall be given provided reasonable care has been taken to

avoid deliberate hollows in the stack. The stacks of soft & hard rocks will be laid separately on an area as directed by Engineer-in-charge.

The measurement for murum filling shall be based on actual difference of levels before filling and after filling, levelling and compacting.

The rate for metal packing shall be based on final compacted thickness and shall include all labour, materials and the cost of rolling with road roller, or other equivalent method to obtain full compaction, application of screening, watering etc. complete. It shall be measured in cubic metres.

_____

Signature of Tenderer
Date :

SECTION - B

CONCRETE: PLAIN & REINFORCED

B.1 Cement

The Cement used shall be of the following grade with the prior approval of the Engineer shall be taken for any of the above brands. Proposed to be used in the work.

a.	Ordinary Portland Cement (Gr 53) (Only Birla Super, L&T, Gujarat Ambuja, ACC of approved source or any other approved brand will be allowed to be used in the work)	IS:12269 --- Only for RCC work
b.	----- do ---- (Gr 43)	IS:12239 --- For works other than RCC works.
c.	Sulphate Resisting Cement	IS:12330/1988

Use : Cement shall be used in the order in which it is received. Cement in bags in storage for more than 3 months shall be retested before use.

Testing: Not withstanding test certificate given by manufacturer a sample shall be tested from every batch of cement delivered on site or once for every 10000 bags whichever is more frequent. Tests shall be carried out for fineness, initial and final setting time, and compressive strength (IS:4031) and the results approved by the Engineer before use of the cement in permanent Works. Samples shall be taken immediately on receipt of cement at site. The methods and procedure of sampling shall be in accordance with IS:3535. The Engineer may specify other forms of sampling and tests including chemical analysis, (IS:4032) if in his opinion the cement is of doubtful quality; the costs of such additional tests shall be borne by the Contractor.

B.2 Fine Aggregates (Sand)

1. It shall be river or pit sand conforming to IS:383, obtained from sources approved by the Engineer. These sands, if found too coarse, shall be suitably blended with finer sand obtained from approved source to obtain the desire grading. The provision of two types of sand and their stacking separately and their mixing in the specified proportions shall be at the Contractor's cost.

   The sand shall not contain silt more than a total of 2% by weight or 7%by volume and shale, clay, silt and other structurally weak particles. A totalling to not more than 5% by weight. Chloride content in washed sand shall not be greater than 0.04% by weight and salty water in sad shall be thoroughly removed by washing sand in potable water

2. The grading of the sand shall conform to IS:383.

The sand shall be screened on a 4.75 mm size screen to eliminate over-size particles.

The sand shall be washed in screw type mechanical washers in potable water to remove excess silt, clay and chlorides. The screening and washing of sand shall be completed at least one day before using it in concrete.

The washed sand shall be stored on a sloping concrete platform and in such a manner as to avoid contamination.

3. The aggregate shall be subjected to tests in accordance with IS 2386 as may be ordered by the Engineer. The cost of such tests shall be borne by the contractor.

B.3 Coarse Aggregates

1. Coarse aggregates for the Works shall be crushed stone conforming to IS:383, obtained from sources such as Turbhe, Panvel etc., approved by the Engineer. Only Quarries having jaw crushers with choke feeding arrangement producing aggregates of nearly cubical shape shall be approved.

Aggregates shall be properly screened and if necessary washed clean before use.

2. Coarse aggregates containing flat or flaky pieces or mica shall be rejected.

3. Coarse aggregates shall be supplied in the following sizes

Nominal size	Maximum size	Minimum size
10mm	12mm	5mm
20mm	25mm	10mm
40mm	40mm	20mm
80mm	80mm	40mm

4. The grading of coarse aggregate shall be such that not more than 5% shall be larger than the maximum size and not more than 10% shall be smaller than the smallest size. Between these sizes the coarse aggregate shall be well graded.

5. The aggregates shall be subjected to tests in accordance with IS 2386 as may be ordered by the Engineer.

6. Aggregates shall be stored in such a way as to prevent segregation of sizes and avoid contamination with fines.

B.4 Mixers and Vibrators

1. For all concreting work the Contractor shall provide weigh batching plant of suitable capacity which shall be got approved before bringing it to the site. The plant used shall conform to IS:2722.

2. The Contractor shall provide concrete mixers (IS:1791 - Batch type concrete mixers, IS:2439 - Roller Pan Mixer).

3. The Contractor shall provide at site Concrete Vibrators Immersion Type, IS:2505 - Screed Board Concrete Vibrators, IS:2506 supplied by recognised manufacturers.

   The Contractor shall make available at site needle vibrators of sizes 25 mm, 40 mm, and 60 mm for use in various appropriate locations of the structure.

B.5 Grade of Concrete

The concrete is designated as follows :

- Concrete M - 25/20
- The letter M refers to the mix

The number 25 represents the characteristic compressive strength of 15cm cubes at 28 days in MPa (Mega Pascals : 1MPa : 10 kg/cm2 approximately). M25 concrete thus has a characteristic strength of 250 kg/cm2.

The number /20 represents the maximum nominal size of aggregate in the mix, in this case 20mm.

B.6 Minimum Cement Content

For all structural concrete work the minimum cement content shall not be less than 360 kg/m3 of concrete from durability considerations.

B.7 Trial mixes : (for strength)

1. The Contractor is entirely responsible for the design of the concrete mixes. The design is however to be approved by the Engineer. At least 8 weeks before commencing any concreting in the Works, the Contractor shall make trial mixes using samples of coarse aggregates, sand, water super plasticizer and cement , typical of those to be used in the works, and which have been tested in an approved laboratory. a clean dry mixer shall be used and the first batch discarded.

2. The cement content for different grades of concrete and the required average strengths at 28 days for which the mixes shall be designed are specified below :

TABLE - 1

Grades of Concrete	Character-istic strength (f'ck)	Target mean (f'cm) (Mpa)	Strength f'cm Mpa (Fcm)	Min Cement Content Kg/m3	*Water Cement Ratio (Max)	Maximum Slump at placing point (mm)	Cement Grade
M20/10	20	21	29	360	0.45	130	53
M20/20	20	21	29	360	0.45	130	53
M25/20	25	26	33	360	0.42	120	53
M30/20	30	29	39	400	0.40	120	53
M35/20	35	36	44	450	0.40	100	53
M40/20	40	36	49	450	0.40	120	53

* Note : 1) Proper workability will be achieved, without changing the water cement ratio by using adequate quantity of approved admixtures like superplasticizers at no extra cost to the corporation.

The mixes are designed to yield mean strengths (f'cm) greater than the corresponding specified characteristic strengths (f'ck) as indicated in above Table. The difference between f'cm and f'ck is called the `Current Margin'. The value of the current margin has been set at 9 MPa for all grades of concrete. The concrete mixes shall be designed on the basis of required strength, desired workability, the maximum size of aggregate and also the various grades of cements as specified in IS : 10262-1982, Clause. Grade of cement shall be 53 as described in table 1 above.

3.1.1. Accordingly the required cement content shall be ascertained. The Contractor has option to use either approved Super plasticizers or increased cement content to achieve the required strengths at his own cost and workability without affecting water cement ratio.

3. For each grade a total of 12 cubes shall be made. Of these 12 cubes made, not more than 3 may be made on any day and further, of the 3 cubes made in one day not more than 2 cubes may be made from any single batch. 6 of these cubes, each representing a different batch of concrete shall be tested at the age of 7 days and the remaining 6 cubes shall be tested at the age of 28 days. The making of the cubes, their curing, storing, transporting and testing shall be in accordance with Indian Standards IS:516. The test shall be carried out in a laboratory approved by the Engineer.

4. If the average strength of the concrete cubes falls below the required target mean strength (f'cm) fresh preliminary mixes for that grade shall be made as before, until the trial mixes yield cubes of compressive strength at 28 days greater than the required average target mean strength (f'cm) at that age.

5. Whenever there is a significant change in the quality of any of the ingredients for concrete, the Engineer may at his discretion order the carrying out of fresh trial mixes. All costs for trial mixes and tests shall be to the Contractor's account and held to be included in the Contract Rates.

6. Before commencing the Works the Contractors shall submit to the Engineer for approval full details of all preliminary trial mixes and tests.

7. The Contractor shall carry out trial casting of a mock-up of at least one metre length of RCC member to establish the correctness of grading aggregates, suitability of formwork, of admixtures proposed, suitability of mould oil proposed to be used on formwork to prevent surface blemishes etc.,. All costs of such trial casting shall be included in the Contract Rates.

8. When the proportions of a concrete mix have been approved by the Engineer, the Contractor shall not vary the quality or source of the materials or the mix without the written approval of the Engineer.

B.8 Concrete Cube Tests :

The quality of hardened concrete will be verified by the following procedure :

1. The Engineer shall select random batches of concrete for examination without warning the Contractor and sampling will generally be done at the point of discharge from the mixer.

2. From the batches thus selected 3 concrete cubes shall be made in accordance with Indian Standards. However not more than 2 cubes may be made from any single batch. Of these 6 cubes thus made 3 cubes (each cube representing concrete of different batches) shall be tested at 7 days and the remaining 3 cubes shall be tested at 28 days.

3. All cubes shall be made, cured, stored, transported and tested in accordance with Indian Standards. The tests shall be carried out in a laboratory approved by the Engineer.

4. At least 3 cubes shall be made on each day's concreting until 12 cubes have been made for each grade of concrete. This is in the initial period.

5. After the initial period, subject to the acceptance of the Engineer, the frequency at which the cubes shall be made may be reduced as follows :

(1 set = 3 cubes, each pair of cubes representing concrete from a different batch.)

At least 1 set for each day's concreting consisting of :

a) 1 set for every 10 m3 or part thereof of concrete for critical structural elements like columns, arch etc. plus :

b) 1 set for every 40 m3 or part thereof for all other elements.

If concrete is batched at more than one point simultaneously the above frequency of making cubes shall be followed at each point of batching.

3 of the cubes of each set shall be tested at 7 days and the remaining 3 cubes shall be tested at 28 days from the day of casting the cubes.

B.9 Acceptability criteria

1. The strength requirement of any particular grade of concrete will be considered satisfactory if the 28 days' compressive strengths of individual sets (each set consists of 3 cubes) and of individual cubes satisfy the following requirements :

i For the first five sets

a) The average strength determined from any group of 3, three consecutive test cubes exceeds the specified characteristic strength (f'ck) by not less than 0.8 times the current margin.

b) Only one individual cube test result in any set may fall below the specified characteristic strength (f'ck) provided that this value is not less than 95% of the specified characteristic strength (f'ck).

ii Thereafter : Provided that the average strength of any fifteen consecutive cubes exceeds the specified characteristic cube strength by at least 0.9 times the current margin all the subsequent test results may be considered acceptable if :

a) The average strength as determined from any group of three consecutive test cubes exceeds the specified characteristic strength (f'ck) by not less than 0.6 times the current margin.

b) Only one individual cube test result in any set may fall below the specified characteristic strength provided that this value is not less than 90% of the specified characteristic strength.

2. Whenever a mix is redesigned due to a change in the quality of aggregates or cement or for any other reason, it shall be considered a new mix and initially subject to the acceptability criteria in B.9 above.

3. If the concrete produced at site does not satisfy the above strength requirements, the Engineer will reserve the right to require the Contractor to improve the methods of batching, the quality of the ingredients and redesign the mix with increased cement content if necessary. The Contractor shall not be entitled to claim any extra cost for the extra cement used for the modifications stipulated by the Engineer for fulfilling the strength requirements specified. The cost of carrying out concrete cube tests shall be covered in the rates for concrete items quoted by Contractor.

4. The above specification is based on an assumed standard deviation of 5.5 Mpa, and a probability of concrete strength falling below the desired minimum strength of lin 20. In case quality control is very good at site and the cube test results consistently show a standard deviation better than the standard deviation assumed here the Engineer may at his discretion reduce the required target strength f'cm for any particular grade of concrete and in consequence the current margin.

B.10 It is the complete responsibility of the Contractor to design the concrete mixes by approved standard methods and to produce the required concrete conforming to the specifications and the strength requirements approved by the Engineer. It is expected that the Contractor will have competent staff to carry out this work.

B.11 Failure to meet Specified Requirements:

1. If from the cube test results it appears that some portion of the Works has not attained the required strength, the Engineer may order that that portion of the structure be subjected to further testing of any kind whatsoever as desired by the Engineer, including, if so desired by him, full load testing of the suspected as well as adjacent portions of the structure as specified in the Conditions of Contract. Such testing shall be at the Contractor's cost. The Engineer may also reject the work and order its demolition and reconstruction at the Contractor's cost.

2. If the strength of concrete in any portion of the structure is lower than the required strength, but is considered nevertheless adequate by the Engineer so that demolition is not necessary, the Contractor shall be paid a lower rate for such lower strength concrete as determined by the Engineer.

B.12 As frequently as the Engineer may require, testing shall be carried out in the field for :

1) Moisture content and absorption and density of sand and aggregates
2) Silt content of sand
3) Grading of sand and aggregates
4) Slump test of concrete
5) Concrete cube test
6) Permeability test for concrete as per DN 1048 (Part-I). Allowable permeability on untreated concrete surface 25mm
7) Density and P H value of Plasticiser

The Contractor shall provide and maintain on site at all times, until the Works are completed, equipment and staff required for carrying out these tests. The Contractor shall grant the Engineer or his representative full access to his laboratory at all times and shall produce on demand complete records of all tests carried out on site.

Before concreting commences on any section of the Works the Contractor shall obtain approval of the Engineer or his representative as regards the formworks and reinforcement's conforming with the drawings. He shall also indicate to the Engineer in writing and obtain his approval for positions of construction joints.

B.13 Admixtures : Use of Melamine or Napthalene based approved admixtures (Super plasticiser) is a must. They shall be such that the strength requirements are not affected by their use. The Admixtures will not be paid for separately. The admixtures shall also have the property of set retarding. Before approval of super plasticizer the contractor will submit test reports as specified in ASTMC-486 from an approved laboratory as approved by Engineer in charge. Subsequent batches will be tested for IR analysis, UV analysis and solid content or any other tests as directed by Engineer-in-charge.

B.14 Weigh Batching

All structural concrete shall be weigh batched. All concrete ingredients shall be batched by weight using a weigh batcher of an approved make (IS:2722 Portable swing weigh batchers for concrete). Batching shall be to an accuracy of not less than 1/2 kg and the batcher shall be tested for accuracy of calibration before commencement of the Works and at least once a week thereafter or more frequently if so required by the Engineer.

Use of Ready Mix Concrete (RMC) is obtioned and permitted at the discretion of the Engineer-in-charge and at no extra cost .

B.15 Water and Super plasticisers shall be batched by weight or by volume measures as approved by the Engineer. The method of batching shall be such as will ensure an accuracy to 0.2 litres or better for water and 20 ml or better for plasticisers.

The Contractor shall provide the mixer operator with standard measures for dispensing water and plasticisers in accurate quantities as per design. Concrete mix containing water in excess of that specified shall be rejected and shall not be allowed for use in the Works.

B.16 Placing temperatures

During hot weather, concreting shall be in accordance with the procedures set out in IS:7861, Parts I & II.

Fine and coarse aggregates for concreting shall be kept shaded and the concrete aggregates sprinkled with water for a sufficient time before concreting in order to ensure that the temperature of these ingredients is as low as possible prior to batching. The mixer and batching equipment shall be also shaded and if necessary painted white in order to keep their temperatures as low as possible. The placing temperature of concrete shall be as low as possible in hot weather and care shall be taken to protect freshly placed concrete from overheating by sunlight in the first few hours of its laying. The time of day selected for concreting shall also be chosen so as to minimise placing temperatures. In case of concreting in exceptionally hot weather the Engineer may in his discretion specify the use of ice either flaked and used directly in the mix, or blocks used for chilling the mixing water. In either case, the Contractor shall be paid only the cost of such ice delivered on site and nothing extra for additional labour involved in weighing and mixing. The Maximum temperature at the time of placing concrete shall be 31^0 C to 35^0 C

B.17 Transporting, placing, compacting and curing

1. Transporting, placing, compacting and curing of concrete shall be in accordance with IS:456.

2. Transporting :

The mix after discharging from the mixers shall be transported by wheel barrows, buckets, pumps etc., without causing segregation and loss of cement slurry and without altering its desired properties, with regard to water cement ratio, slump, air content, cohesion and homogeneity. It should be ensured that the concrete is moved to its final destination before it attains initial set.

3. Placing :

The height of any single lift of concrete shall not exceed 1.5 m for walls or 2.0 m for columns.

The thickness of horizontal layers shall not exceed 300 mm. High velocity discharge of concrete causing segregation of mix shall be avoided. The concrete shall be placed in the forms gently and not dropped from a height exceeding 1.5m except in columns where the maximum allowed will be 2.0 m. Each layer of concrete shall be compacted fully before the succeeding layer is placed and separate batches shall follow each other so closely that the succeeding layer shall be placed and fully compacted before the layer immediately below has taken initial set. The layers should be sufficiently shallow, to permit knitting of two layers together by vibration.

Concreting of any portion or section of the work shall be carried out in one continuous operation and no interruption of concreting work will be allowed without approval of the Engineer.

4. Compaction

Internal (needle) and surface (screed board) vibrators of approved make shall be used for compaction of concrete

a) Internal vibrators shall be used for compaction of concrete in foundations, columns, beams, buttresses arch section etc. For sections such as slabs, the concrete shall be compacted by surface type vibrators. Depending on the thickness of layer to be compacted, 25 mm, 40 mm, and 60 mm dia internal vibrators will be used. The concrete shall be compacted by use of appropriate diameter vibrator by holding the vibrator in position until :

i) Air bubbles cease to come to surface

ii) Resumption of steady frequency of vibrator after the initial short period of drop in the frequency, when the vibrator is first inserted.

iii) The tone of the vibrator becomes uniform.

iv) Flattened, glistening surface, with coarse aggregates particles blended into it appears on the surface.

After the compaction is completed, the vibrator should be withdrawn slowly from the concrete so that concrete can flow in to the space previously occupied by the vibrator. To avoid segregation during vibration the vibrator shall not be dragged through the concrete nor used to spread the concrete. The vibrator shall be made to penetrate, into the layer of fresh concrete below if any for a depth of about 150 mm. The vibrator shall be made to operate at a regular pattern of spacing. The effective radii of action will overlap approximately half a radius to ensure complete compaction.

5. To secure even and dense surfaces free from aggregate pockets, vibration shall be supplemented by tamping or rodding by hand in the corners of forms and along the form surfaces while the concrete is plastic.

6. A sufficient number of spare vibrator's specially needless, shall be kept readily accessible to the place of deposition of concrete to assure adequate vibration in case of breakdown of those in use.

   25 mm diameter immersion vibrators shall be used in thin, 40 mm diameter immersion vibrators in fairly wide sections and 60 mm diameter vibrators in foundations and arch abutments. Screed vibrators shall be used for precast deck elements and in the in-situ deck slab concreting where the thickness of the slab is 50 mm.

7. Plain concrete in foundations shall be placed in direct contact with the bottom of the excavation, the concrete being deposited in such a manner as not to be mixed with the earth. Plain concrete also shall be vibrated to achieve full compaction, using needle or screed vibrators as necessary.

8. Concrete placed below the ground shall be protected from falling earth during and after placing. Concrete placed in ground containing deleterious substances shall be kept free from contact with such ground and with water draining therefrom during placing and for a period of seven days or as otherwise instructed thereafter. Approved means shall be taken to protect immature concrete from damage by debris, excessive loading, abrasion, vibrations, deleterious ground water, mixing with earth or other materials, and other influences that may impair the strength and durability of the concrete.

B.18 Construction Joints :

Construction joints in all concrete work shall be made as directed by the Engineer. Where vertical joints are required, these shall be shuttered and two coats of approved surface retarders shall be applied as directed by the Engineer on the surface of formwork in contact with concrete. The joint concrete shall

not be allowed to take the natural slope of the concrete. Pouring sequence of concrete should be got approved from the Engineer. Retarders should be used to ensure that the previous layer of concrete does not get initial setting before the next layer is laid on it. Construction chemicals of approved polymer or epoxy compounds shall be used at no extra cost to corporation for maintaining bond between old & new concrete/at cold joints in concrete.

Before fresh concrete is placed against a vertical joint, the old concrete shall be chipped, cleaned and moistened. Where required, suitable expansion joints shall also be provided as directed by the Engineer.

No separate payment shall be allowed to the Contractor for forming joints or chipping and cleaning them and for using chemicals at the joints. When a horizontal construction joint is formed, provision shall be made for interlocking with the succeeding layer by the embedment of saturated wooden blocks or strips bevelled on four sides to facilitate their removal. Prior to the next pour the wooden pieces shall be loosened and removed in such a manner as to avoid injury to the concrete.

B.19 Curing of Concrete:

a) Curing shall be done as specified in I.S. 456

b) Concrete shall be cured with potable water for the specified period after the final setting of concrete.

c) In respect of concrete, where 53 grade cement is used, curing should be started within four hours of placement of concrete.

d) Use of sea water / creek water or brackish water for curing will not be allowed. Only potable water shall be used for curing.

e) Surfaces on which water cannot be retained shall be covered with jute or hessian cloth. The cloth shall be constantly kept wet/moist during the entire curing period.

B.20 Cracks :

1. If cracks develop in concrete construction, which in the opinion of the Engineer may be detrimental to the strength of the construction, the Contractor at his own expense shall test the slab or other construction as specified in Special Conditions. If under such test loads the cracks develop further, the Contractor shall dismantle the construction, carry away the debris, replace the construction and carry out all consequential work thereto.

2. If any cracks develop in the concrete construction, which in the opinion of the Engineer, are not detrimental to the stability of the construction, the Contractor at his own expense shall grout the cracks with polymer cement grout of approved quality and also at his own expense and risk shall make good to the satisfaction of the Engineer the surface finish of ceilings, etc. which in the opinion of the Engineer has suffered damage either in appearance or stability owing to such cracks. The Engineer's decision as to the extent of the liability of the Contractor in the above matter shall be final and binding.

B.21 Defective Concrete :

Should any concrete be found honeycombed or in any way defective, such concrete shall on the instruction of the Engineer be cut out by the Contractor till solid concrete is obtained and the portion is made good by using specially designed mix for such repair work. This shall be done at contractor's own expense.

B.22 Exposed Faces, Holes and Fixtures :

On no account shall concrete surfaces be patched or covered up or damaged concrete rectified or replaced until the Engineer or his representative has inspected the Works and issued written instructions for rectification. Failure to observe this procedure will render that portion of the Works liable to rejection; in which case it will be treated as rejection which has failed to meet specified strength requirements and dealt with according to Clause B.11.

Holes for foundation or other bolts or for any other purposes shall be moulded, and steel angles, holdfasts or other fixtures shall be embedded, according to the drawing or as instructed by the Engineer at no extra cost to the corporation.

B.23 Concrete surface :

The face of concrete for which formwork is not provided other than slabs shall be floated to a smooth finish. The floating shall be done so as not to bring an excess of mortar to the surface of the concrete. The top face of a slab intended to be surfaced with other material shall be left with a spaded finish.

B.24 Other applicable codes of practice for in-situ reinforced construction

All other requirements not covered by the above clauses shall be governed by relevant clauses of IS 456, IS 3370, IS 2571 and other relevant standards as may be applicable.

Tolerances

The following tolerances apply to finished precast products at the time of placement in the structure. The forms must be constructed to give a casting well within these limits :

1. Overall dimensions of members should not vary more than +/- 6mm per 3m length with a maximum variation of +/- 20mm.
2. Cross-sectional dimensions should not vary more than the following :
   +/- 3mm for dimensions less than 150mm thick
   +/- 4mm for dimensions over 150mm & less than 450mm
   +/- 6mm for dimensions over 450mm to 1000mm
   +/- 10mm for dimensions over 1000mm
3. Deviation from straight line in long sections should not be more than +/- 6mm upto 3m, +/- 10mm for 3m to 6m, +/- 12mm for 6m to 12m.
4. The above deviations are not applicable to PCC blocks which are dealt with separately.

B.25 Measurement

Concrete and reinforcement shall be paid separately unless otherwise specified.

The volume of concrete measured shall include that occupied by:

1. Reinforcement and other metal sections
2. Cast in components each less than 0.01 m3 in volume
3. Rebates fillets or internal splays each less than 0.005 m2 in cross sectional area.
4. Pockets and holes not exceeding 0.01 m3 in volume.
5. For PCC below foundations no payment shall be made for any shuttering used. The cost for this if any should be included in the rate for this item.
6. Rates for precast concrete are inclusive of cost of casting yard, moulding, and remolding, concreting, handling, storing, curing transporting and erecting at site, including all clamping, bracing that may be required during erection including erection equipment and filling of joints in cement mortar etc. complete.

_____

Signature of Tenderer

Date :

SECTION - C

FORMWORK

C.1 Definition :

The term "Formwork" or "Shuttering" shall include all forms, moulds, sheeting, shuttering planks, alers, poles, posts, shores, struts and strutting, ties, uprights, wallings, steel rods, bolts, wedges and all other temporary supports to the concrete during the process of setting.

C.2 Design :

The formwork shall be designed and constructed so that the concrete can be properly placed and thoroughly compacted to obtain the required shape, position and level subject to specified tolerances. It is the responsibility of the Contractor to obtain the results required by the Engineer, whether or not some of the work is sub-contracted. Approval of the proposed formwork by the Engineer will not diminish the Contractor's responsibility for the satisfactory performance of the formwork, nor for the safety and coordination of all operations.

To avoid delay and unnecessary rejection of the formwork the Contractor shall obtain the approval of the Engineer for the design of forms and the type of material used before fabricating the forms. (ref. ACI 347 Formwork for Concrete or equivalent I.S. Code).

The Contractor shall prepare detailed formwork drawings indicating the sizes of all the members he proposes to use for formwork for raft, plinth beams, staircase, walls, columns top, slabs, floor beams, precast piles etc., and get approval from the Engineer before fabrication and erection.

The deflection of all members used in formwork shall not be more than 1/360 of span of the member or 3 mm, whichever is less.

The foundation of all shores shall be designed to suit the bearing capacity of soil to support the designed loads without settlement. If required the bearing capacity of soil shall be improved by providing compacted metal packing or lean concrete below the bearing plate and mudsills.

The Contractor shall make a mock-up of the formwork for typical members and carry out trial castings to establish the suitability of formwork, of mould oil proposed to be used on formwork as a releasing agent and also to prevent surface blemishes etc. The pattern of formwork for exposed concrete work shall be approved based on the result of mock-up.

The Contractor shall prepare detailed shop drawing showing the arrangement of formwork for all structural members including shoring system, horizontal and diagonal bracing system, details of foundation etc. The sizes of individual members shall be as per approved design calculations.

C.3 Materials :

1. All facing formwork to come in contact with concrete in different elements of the structure hall be of such material and size as specified on drawings or as instructed by the Engineer. Plywood whenever used for such concrete shall be changed after five repetitions or even earlier if instructed by Engineer.

2. Timber facing formwork to come in contact with concrete for "Exposed Concrete Surfaces" shall consist of lap jointed or tongue and grooved planks as directed by the Engineer and no joint shall permit leakage of mortar at all from cast-in-situ concrete.

3. All joints in shuttering and between shuttering and the surface of earlier concrete lift shall be sealed with 5 mm thick compressible material such as sponge or other approved materials so that no joint permits leakage of slurry.

4. The materials for other backing and supporting formwork and their sizes shall be selected by the Contractor and shall be subject to the approval of the Engineer.

C.4 Formwork for Exposed Concrete Surfaces :

The facing formwork, unless indicated otherwise on drawings, or specifically approved by the engineer in writing, shall generally be made with materials not less than the thickness mentioned below for different elements of the structure :

1. Plain and sloping slab soffits, and sides of beams, girders, joists ribs and sides of walls shall be made with :

   a. Plywood plates not less than 12 mm thick (IS:4900 - Specification for Plywood for Concrete Shuttering Work) or 3mm thick with a 20 mm actual thickness timber plank backing, of specified sizes stiffened with a suitable timber frame-work.

      The thickness of plywood for curved members shall be such that it can be bent to the required curvature, and shall be stiffened adequately to support the loads.

   b. Steel plates not less than 3.15mm thick of specified sizes stiffened with a suitable structural frame work fabricated true to plane with a tolerance of $\pm$ 1 mm within the plate.

   c. Timber planks of not less than 20 mm actual thickness (about 25 mm nominal thickness, but actual thickness shall prevail) and of specified surface finish, width and reasonable length.

2. Bottoms of beams, girders and ribs, and sides of columns shall be made with :

   a. Steel plates not less than 5mm thick of specified sizes stiffened with as suitable structural frame work, fabricated true to plans with a tolerance of(+/-)1mm within the plate

   b. Timber planks of 35 mm actual thickness and of specified surface finish, width and reasonable length,

   c. Plywood plates not less than 12 mm thick, of specified sizes stiffened with a suitable timber framework.

3. Grooves :

   At all construction joints, proper grooves as per design shall be provided by fixing additional profiled timber strips to the formwork in such a way that the joint line is recessed and the cement mortar does not leak through the formwork during the concreting of the next pour.

C.5 Erection of Formwork:

The following shall apply to all formwork :

1. All shutter planks and plates shall be adequately backed to the satisfaction of the Engineer by a sufficient number and size of walers or framework to ensure rigidity during concreting. All shutters shall be adequately strutted, braced and propped to the satisfaction of the Engineer to prevent deflection under deadweight of concrete and superimposed live load of workmen, materials and plant, and to withstand vibration. No joints in props shall be allowed. Shuttering for sides of beams shall be properly supported by inclined rakers or horizontal struts.

C.6 Vertical props shall be made of adjustable steel such as Acrow and shall be supported on wedges or other measures shall be taken where the props can be gently lowered vertically during removal of the formwork. Props for an upper storey shall be placed directly over those in the storey immediately below, and the lowest props shall bear on a sufficiently strong area. Props shall have proper horizontal and vertical cross bracings to prevent any sway or bucking under load.

1. Care shall be taken that all formwork is set plumb and true to line and level or camber or batter where required and as specified by the Engineer.

2. Provision shall be made for adjustment of supporting struts where necessary. When reinforcement passes through the formwork care shall be taken to ensure close fitting joints against the steel bars so as to avoid loss of fines during the compaction of concrete. The props shall rest on firm base and shall not be found loose and wobbling.

3. If the formwork is held together by bolts or wires, these shall be so fixed that no such iron fixtures iron will be exposed on surfaces against which concrete is to be laid. In any case wires shall not be used with exposed concrete formwork. The Engineer may at his discretion allow the Contractor to use tie-bolts running through the concrete and the Contractor shall decide the location and size of such tie bolts in consultation with the Engineer. Holes left in the concrete

   by these tie-bolts shall be filled as specified by the Engineer at no extra cost.

4. In the shuttering for beams, columns, and walls provision shall be made for a port hole of convenient size so that all extraneous materials that may be collected could be removed just prior to concreting.

5. Formwork shall be so arranged as to permit removal of forms without jarring the concrete. Wedges, clamps and bolts shall be used wherever practicable instead of nails.

   The formwork for beams and slabs shall be so erected that forms on the sides of the beams and the soffit of slabs can be removed without disturbing the beam bottoms or props under beams.

6. Surfaces of forms in contact with concrete shall be oiled with mould oil of approved quality. If required by the Engineer the Contractor shall execute different parts of the work with different mould oils to enable the Engineer to select the most suitable. The use of oil which results in blemishes on the surface of the concrete shall not be allowed. Oil shall be applied before reinforcement has been placed and care shall be taken that no oil comes in contact with the reinforcement while it is being placed in position. The form work shall be kept thoroughly wet during concreting and the whole time that it is left in place.

7. Immediately before concreting is commenced, the formwork shall be carefully examined to ensure the following :

   a. Removal of all dirt, shavings, sawdust and other refuse by brushing, washing, or by compressed air.

   b. The tightness of joints between panels of facing forms and between these and any hardened core.

   c. The correct location of tie bars, bracing and spacers, and especially connections of bracing.

   d. That all wedges are secured and firm in position.

   e. That provision is made for traffic on formwork not to bear directly on reinforcing steel.

f. Properly cured concrete cover blocks of the same mix as per parent concrete with binding wire embedded therein shall be used in sufficient number for maintaining specified concrete cover for reinforcement at the sides and bottoms of reinforced concrete members. These cover blocks should be adequately fastened to the reinforced steel by the binding wire embedded in the cover blocks. Alternatively use of approved plastic cover blocks may be allowed at the discretion of the Engineer-in-charge. Use of stone or marble pieces as cover blocks shall not be permitted.

8. The Contractor shall obtain the Engineer's approval for dimensional accuracies of the work and for the general arrangement of propping and bracing. (IS:3696 - Safety Code of Scaffolds and Ladders, IS:4014 Steel Tubular Scaffolding I & II) It is imperative that for scaffolding heights of 3.6m and above timber posts or steel scaffolding be used with adequate bracings in horizontal and vertical planes. Bracings with bamboos will not be permitted. When timber posts are used the bracings shall consist of minimum 25mm thick wooden planks fixed to each post with at least two nails. The Contractor shall be entirely responsible for the adequacy of propping, and for keeping the wedges and other locking arrangements undisturbed through the decentering period.

(IS 8989 safety code for erection of concrete framed structures)

9. Formwork shall be continuously watched during the process of concreting. If during concreting any weakness develops and formwork shows any distress the work shall be stopped and remedial action taken.

C. 7 FORMWORK & FINISHING OF EXPOSED CONCRETE WORK

The surface finish for formed and unformed surfaces are classified and defined as below. Surface irregularities permitted for the various classes of finishes are termed either "abrupt" or " gradual". Fins or offsets caused by displaced or misplaced form sheathing ,lining or form sections, by loose knots in form lumber or by otherwise defective form lumber are considered abrupt irregularities. All other cases are described as gradual irregularities. Gradual irregularities will be measured with a template consisting of a straight edge for plain surfaces or its equivalent for curved surface. The length of template for testing gradual irregularities on formed surfaces shall be 1.5 m in length, the permissible gradual irregularities being measured over this length of the template.

Special surface, finish and treatment falling outside of these classes but defined elsewhere by the Engineer/Architect shall also form part of these specifications.

C. 8 Camber:

Forms and false work shall be level or cambered as indicated in the drawings or as instructed by the Engineer.

C. 9 Tolerances:

In accordance with IS:456.

C.10 Age of Concrete at Removal of Formwork

In accordance with IS:456.

The Engineer may vary the periods specified in IS:456 if he considers it necessary. Immediately after the forms are removed, they shall be thoroughly cleaned with a jet of water and a soft brush. Thorough cleaning Buffing of steel shuttering material after each use by mechanical buffing machine is a must.

C.11 Stripping of Formwork

Formwork shall be removed carefully without jarring the concrete, and curing of such exposed surface of concrete shall be commenced immediately. Concrete surfaces to be exposed shall, where required by the Engineer, be rubbed down with carborundum stone to obtain a smooth and even finish. Where the concrete requires plastering or other finish later the concrete surface shall be immediately hacked lightly all over as directed by the Engineer. No extra charge will be allowed to the Contractor for such work on concrete surfaces after removal of forms.

C.12 Reuse of Forms

The Contractor shall not be permitted reuse of timber facing formwork brought new on the Works more than 5 times for ex posed concrete formwork. 5 uses shall be permitted only if forms are properly cared for, stored and repaired after each use. The Engineer may in his absolute discretion order rejection of any forms he considers unfit for use for a particular item, and order removal from the site of any forms he considers unfit for use in the Works. Used forms shall not be brought on the site. Pitted, perforated, damaged, bent, warped or out of shape steel plates shall not be used as shuttering materials under any circumstances.

C.13 Formwork for Precast Concrete :

1. The Provisions in this section shall be considered supplementary to the general provisions stated under Formwork. Precast concrete members and panels shall be made in accurately constructed steel moulds, on a properly prepared casting bed. All aspects of the making, curing and erection of precast units shall be subject to the approval of the Engineer.

2. The formwork should be so designed that it does not restrain the shrinkage movements. The formwork shall be of sturdy construction with special consideration to shutter vibrators when used. At edges and joints the formwork should be designed and sealed so that no cement grout can escape and there is no wedging or keying to the concrete. The effect of curing on the formwork should be given special consideration depending on care, curing , erection and maintenance after stripping the following number of uses can be made. Steel Moulds - 50 to 100 number of uses.

3 Stripping :

As soon as the precast units have attained sufficient strength, the formwork shall be stripped. The precast unit shall be lifted uniformly out of the formwork without being subjected to tilting or restraint effects.

_____

Signature of Tenderer

Date :

SECTION - D

REINFORCEMENT

D.1 Steel :

Steel used in the Works shall be high yield strength deformed steel bars conforming to IS:1786-1985 (latest revision) manufactured by those agencies having BIS license. Any other steel specified for reinforcement shall conform in every respect to the latest relevant Indian Standard Specifications and shall be of tested quality under the ISI Certification Scheme.

All reinforcement work shall be executed in conformity with the drawings supplied and instructions given by the Engineer and shall generally be carried out in accordance with the relevant Indian Standard Specifications (IS:2502).

D.2 Inspection & testing :

Every bar shall be inspected before assembling on the Works and any defective, brittle, excessively rusted or burnt bars shall be removed. Cracked ends of bars shall be cut out.

Specimens sufficient for three Tensile Tests for each different size of bar for each consignment delivered, or for 2 tonnes of supply of that size, whichever is less shall be sampled and tested by the Contractor. Batches shall be rejected if the average results of each batch are not in accordance with the specifications.

D.3 Lapping & Welding :

1. As far as possible bars of the maximum length available shall be used. Laps shown on drawings or otherwise specified by the Engineer will be based on the use by the Contractor of bars of maximum length. In case the Contractor wishes to use shorter bars, laps shall be provided at the Contractor's cost in the manner and at the locations approved by the Engineer. In any case laps , provided will not be measured for payment purpose . The rate is inclusive of all such provision.

2. As and when necessary welded laps shall be provided as specified by the Engineer, and shall be in accordance with I.S. code 2571 requirements.

D.4 Spacing, supporting and cleaning

1. All reinforcement shall be placed and maintained in the positions shown on the drawings.

2. The Contractor shall provide approved types of supports as specified on the drawings for maintaining the top bars of the slab in position

during concreting. All cover blocks shall be of concrete (not sand cement mortar) and of the same strength as that of the surrounding concrete and properly compacted and vibrated on a vibrating table.

They shall be annular in shape and not cubical. They shall be cured for a minimum period of 21 days before they are used in the Works.

3. 18 S.W.G G.I. wire shall be used as binding wire. All frame Crossing one another shall be bound with this wire twisted tight to make the skelton on network rigid so that the reinforcement is not displaced during placing of concrete.

4. Bars must be cleaned before concreting commences of all scale, rust or partially set concrete which may have been deposited there during placing of a previous lift of concrete.

The bars shall be cleaned with dry gunny bags if they are coated lightly with rust or other impurities. On no account shall the bars be oiled or painted nor shall mould oil used on the formwork be allowed to come in contact with the bars. Cement wash to bars will not be permitted.

D.5 Welding

1. Wherever specified all welding shall be carried out in accordance with IS:2571. Only qualified welders shall be permitted to carry out such welding.

2. For cold twisted reinforcement welding operations must be controlled to prevent supply of large amounts of heat larger than what can be dissipated. The extreme non twisted end portion shall be cut off before welding. low hydrogen electrodes with rutile coating should be used.

3. The welding procedure shall be approved by the Engineer and tests shall be made to prove the soundness of the welded connection.

D.6 Measurement for payment Reinforcement shall be measured in length separately for different diameters as actually used in the works excluding overlaps and over weights. From the length so measured the weight of reinforcement shall be calculated in tonnes on the basis of standard weights as per IS:1732. Lengths shall include hooks at ends. Wastage, overlaps, coupling, welded joints. spacer bars, chairs overweight of bars above standard weight etc., and annealed G.I. wire (18 SWG) for binding shall not be measured and cost of these items shall be deemed to be included in the rates of reinforcement.
The contract unit rate for reinforcement shall include cost of all steel, its bending, placing ,binding, welding if required and fixing in position as shown on the drawings and as directed by the Engineer. It shall also include cost of all devices for keeping reinforcement in approved position, cost of jointing as per approved method , and all wastage, overlaps and spacer bars.

The rate for anti-corrosive treatment shall be per metric tonne of the steel treated and use in work and shall be deemed to include infrastructure and all material required for anticorrosive treatment, labour and expertise required to carry out the work and transportation, if any. The rate shall be quoted separately. The basis for measurement being same as under reinforcement. Laps, spacer bars, chairs etc. will have to be treated., however they will not be considered for measurement purpose.

6.0 PAINTING

6.1 Surface Preparation

Steel surface to be painted shall be prepared in thorough manner with a view to ensuring complete removal of mill scale by grit and shot blasting to achieve finish to grade SA 2.5.

Primary coat shall be applied as soon as practicable after grit and sand blasting. All slag from welds shall be removed before painting. Care shall be taken to brush the surface clean prior to painting. Surfaces shall be maintained dry and free from dirt and oil. Work out of doors in frosty or humid weather shall be avoided. The undercoat and finishing coat shall be of the same manufacturer. Successive coats of paints shall be of different shades and colours and each shall be allowed to dry thoroughly before the next is applied. Particular care shall be taken with the priming and painting of edges corners, welds and rivets.

6.2 Final Paint:

All paints shall be prepared and applied in strict accordance with the manufacturer’s data sheets or written instructions. No thinners or cleaners shall be employed other than those recommended by the paint manufacturer. Paint with a limited shelf life shall not be used after the period stated in the manufacturer's data sheet.

After materials have been accepted by the Contractor as being in proper condition, he shall be responsible for their safety and protection from loss or damage of any nature until the completion of work. The contractor shall be similarly responsible for surplus materials until they are returned and accepted by the Engineer-in-Charge.

- **Contractor should take prior permission of engineer & representative of Asian paint before application of white cement, primer, every painting coat & before removal of scaffolding in writing.**

7.0 ERECTION:

7.1 Preliminaries:

a) The Contractor shall complete all preliminary works at site, well before the arrival of structural steel, such as keeping in readiness electrical winches, mobile cranes, gin poles, compressors, all tools and tackles, rivet guns, welding sets, torque wrenches etc. and work that may be necessary so as to start erection immediately after the arrival of steel at site.

b) The contractor shall furnish at his own expenses, the necessary non-inflammable staging and hoisting or equipment's required for the erection work and shall remove and take them away after the completion of the job. The contractor shall also provide necessary passage ways, fences, safety belts, helmets, lights and other fittings to the satisfaction of the Engineer-in-Charge and for protection of his men and materials.

7.2 Approval of Erection Scheme:

All structures shall be erected as shown on drawings. The contractor shall carry out all erection work in the sequence required by the Engineer-in-Charge. The method of erection and complete erection scheme shall be subject to the approval of the Engineer-in-Charge and shall be modified as required by the Engineer-in-Charge. This, however, will not relieve the Contractor of the responsibility for safe and expeditious completion of the work, its quality and accuracy.

7.3 Workmanship:

a) Unless specified herein, all erection work will be carried out in accordance with the latest edition of Indian Standard code of practice for use of structural steel in General Building Construction IS 800 and AISC code wherever applicable.

b) Drifts should be used only for drawing the work into position and must not be used to such an extent so as to destroy the holes. Drifts of a larger size than the nominal diameter of the holes or burrs must be rectified to the satisfaction of the Engineer-in-Charge. Correction of minor misfits and reasonable amount of reaming and cutting of excess stock from field rivets, if any, shall be considered as a part of erection. Any error in shop work which prevents proper

fit on a moderate amount of reaming and slight chipping or cutting shall be immediately reported to the Engineer-in-Charge. The contractor's work shall also include straightening and repairing of materials slightly damaged and drilling some holes in members where required. This shall all be included in the unit rate quoted.

c) Structural steel frames shall be erected plumb and true to tolerances indicated elsewhere in these specifications. All steel columns and beams shall be checked for plumb and level individually before and after connections are made. Temporary bracings shall be introduced wherever necessary to take care of all loads to which the structure may be subjected including erection equipment and the operation thereof. Such bracings shall be left in place as long as may be required for safety. Proper size steel cables, slings etc., shall be used to avoid any damage due to accidents.

d) As erection progresses, the work shall be securely bolted to take care of all dead load, wind and erection stresses. No final welding or bolting shall be done until the structure has been properly aligned and approved by the Engineer-in-Charge.

e) The Engineer-in-Charge shall be immediately informed of any errors observed/found in the fabricated steel which prevents proper assembling and fitting up of parts in field by a moderate amount of repairing.

f) The contractor shall protect all existing plants, embedded parts, all piping, conduits, equipment and facilities against damage during erection. The contractor shall perform his work in a manner which in no way endangers the operations of any existing plant or structures or hinders other construction activities.

g) Holes may be required to be drilled at site for installing equipment or steel furnished by other manufacturers or other contractors. The information for this will be supplied to the Contractor by the Engineer-in-Charge before or after erection of the steel.

h) In case of any faulty erection, all such dismantling and re-erection required will be at Contractor's cost.

i) Shim stock of mild steel plates required for erection will be set, levelled and prepared for grouting. Where flat bearing beams occur, bearing plates shall be set, levelled and prepared for grouting.

7.4 Tolerance.

The erection shall be carried out to the requirements stated in Section 7 (h) of AISC Code Standard practice, except that Structural Steel members be erected plumb with a tolerance not exceeding in 1000. Column splices and other compression joints which depend upon contact bearing, upon completion, shall bear with respect to the centred of the contact area.

At least 65% of the entire contact area shall be in full bearing and the separation of any remaining portion shall not exceed 0.5 mm except locally at toes of flanges where a 50% greater separation is permissible. Otherwise corrective measures as specified by the Engineer-in-Charge shall be taken.

7.5 Connection

a) H.S.F.G. Bolts :

The Contractor shall obtain the prior written approval of the Engineer-in-Charge for the method proposed to be adopted for tightening the High Strength Friction Grip bolts. For preliminary assembly and before use of these bolts he shall use his own erection bolts.

b) Bolting / Riveting :

In general bolts and rivets will conform to the relevant Indian Standards. The methods of establishing connections use of equipment, etc., shall be as approved by the Engineer-in-charge.

c) Welding :

Welding where specified shall be performed by the shielded electric are, gas or other approved methods, using coated electrodes and/or low hydrogen electrode conforming to IS:814. The welding process and the qualification of the welding operators shall conform to IS:81 7 and IS:823 and shall be got approved before commencement of any work of welding.

All field assembly and welding shall be executed in accordance with the requirements for shop fabrications excepting which manifestly apply to shop conditions only. Where the steel has been delivered, painted, the paint shall be removed before field welding for a distance of at least 50 mm on either side of the joints. All welds should be free from defects like blow holes, lack of penetration, slag intrusion etc. All welds shall be cleaned of slab or flux and

shall show uniform smoothness of weld metal, feather edges without overlap and free from porosity. Where a thick weld is required the weld metal shall be deposited in successive layers. Each layer except the last, shall be preened moderately before the next layer is applied. The contractor shall be responsible for the quality of the work performed by his welding group.

If required, the Engineer-in-Charge may test the welds by non-destructive tests. Any defective welds shall be made good by the Contractor at no extra cost and the cost of non-destructive testing for such defective welds shall be borne by the Contractor.

d) Specification for pin and pinned connections:

Pin Material:

Rolled steel pins and rollers, including those made from slabs shall comply with the requirements of IS: 226 - Specification and structural steel and IS:2062 - Specification for structural steel (fusion welding quality) or IS:961 - Specification for high tensile structural steel.

Forged steel pins shall have a tensile strength of 44 to 50 kg/Sq.mm. or 57 to 63 kg/sq.mm. to conform to IS:1875 - Specification for carbon steel billets, blooms and slabs for forging. Steel casting for cast steel pins shall conform to grade 1 or 3 of IS: 1 030.

Pin Holes:

Pin holes shall be bored true to gauge, smooth, straight, at right angle with the axis of the member and parallel with each other unless otherwise required, in built up members the boring shall be done after the members have been welded. The specified dia of pin shall be its minimum dia. Hole dia can be maximum + 0.5 mm more than pin dia.

Pins:

The pins shall be parallel throughout and shall have a smooth surface free from flaws. At ends of pins there shall be slot to facilitate in driving the pin.

Pins more than 175mm in length of diameter shall be forged and annealed. Coffer pins shall be provided on both sides of the pin**.**

8.0 MESURMENTS & RATES:

The contractor will be paid on the basis of unit rates quotes for structural steel work. Measurements will be based on the actual weight of structural steel erected as shown on drawings or as specified.

The weight of the temporary bracings, shims and erection bolts, fields welding, if any will not be taken into account for purpose of payment. The rate for erection shall be inclusive of structural welding wherever specified and painting as called for the specification and drawings. All bolts, nuts and washers which are permanently incorporated in the structures other than those specifically paid for separately shall be provided by the contractor and the rate quoted for the erection of structural steel shall include the cost of supply and erection of such bolts, nuts and washers.

The unit rates shall include all materials, labour, supervision, tools and plant, apparatus, conveying equipment, incidental expenses etc., other than those supplied free by Engineer-in-Charge, nuts, bolts and washers etc. The unit rate also includes removal of paint from members encased in concrete.

8.1 Grouting of Foundation Pockets

This specification refers to the grouting of pockets left in the machine foundation to be filled up later after the installation of the machinery and also the grout injected below the base plates.

The pockets are to be grouted with concrete grit made of 1 part of cement with 2 part of grit (size 10mm and below) by weight. The water added shall be just sufficient to make the mix workable. In any case water cement ratio should not exceed 0.4 to 0.45. The grit is nothing but smaller particles of the coarse aggregate.

Non-shrinkage additive should be added to the six as per manufactures specifications. The mix shall be poured into the pockets layer by layer, with each layer not exceeding 10 cm in depth. Each layer shall be well vibrated before the next layer is laid, after the pocket is completely filled. The top shall be travelled smooth. Curing shall start 12 hours after the finishing of work and shall be continued for 15 days. Curing shall be done as per the good practices.

8.2 Measurement and Payments

The measurement is based on volume of the pocket grouted or the volume of grout filled up below the plates, as the case may be rounded off to the nearest 0.01 Cu. m. The unit of payment is in Cu. m of grout.

9. STEEL TUBES FOR STRUCTURAL PURPOSES.

All structural steel tubular members shall confirm to IS: 1161-1979, grade of steel shall be Yst : 240. All other specifications including fabriation, erection, painting, measurement etc. shall conform to the detailed specifications given under structural steel works.

SECTION - E

MASONRY - BRICK WORK

1.0 **Indian Standards to be followed are :**

All relevant Standards as specified elsewhere in this Volume are applicable.

Indian Standards to be followed are :

1.	IS 226	Specification for steel standard quality.
2.	IS 269	Specification for ordinary and low heat Portland cement.
3.	IS 405	Specification for lead, sheet and strips.
4.	IS 412	Specification for expanded metal steel sheets for general purpose.
Part 1		Mild steel and medium tensile steel bars.
6.	IS 712	Specification for building lime.
7.	IS 1069	Code of Practice for laying damp proofing treatment using bitumen felt.
8.	IS 1077	Specification for common burnt clay building bricks.
9.	IS 1322	Specification for Bitumen felts for waterproofing and damp proofing.
10.	IS 1635	Code of Practice for field slaking of building lime and preparation of putty.
11.	IS 2116	Specification for sand for masonry mortar.
12.	IS 2212	Code of Practice for Brick work.
13.	IS 2250	Code of practice for preparation and use of masonry mortars.
14.	SP 27	Handbook of method of measurement for building works.

2.0 **MATERIALS**

2.1 Bricks

2.1.1. Bricks shall be sound, hard, well-burnt, uniform in size, shape and colour, homogeneous in texture, giving a metallic ringing sound, free from flaws, cracks, holes, lumps or grit and arises should be square, straight and sharply defined. They shall not break when struck against each other and dropped flat from a height of 1m to the ground. They shall conform to Table No. 1 (reproduced as table 2 of enclosed Annexure) of IS 1077 giving classes of common burnt clay bricks.

2.1.2. Bricks shall be as specified and detailed in the ITEM (INCLUDES) BUILT-UP AREA RATE SCHEDULE. It shall have to be approved prior to procurement. Bricks shall be obtained from an approved source and shall be of uniform colour, size, shape. Bricks shall have smooth rectangular faces with sharp straight rectangle edges. Maximum absorption shall not be more than 15% of its dry weight on immersion in water for 24 hours. Minimum crushing strength shall be 35 kg/sq.cm if not specified in the ITEM (INCLUDES) BUILT-UP AREA RATE SCHEDULE.

2.1.3. Bricks of approved quality and quantity shall have to be procured by the contractor at the desired time. No delay or extra cost due to non-availability shall be accepted. The contractor is obliged to carry out the work as specified. It shall be the responsibility of the contractor to procure sufficient quantities of bricks and stack them at site or elsewhere to avoid delays.

2.2 Mortars

2.2.1 Mortars for masonry shall be prepared in accordance with IS 2250 code of practice for preparation and use of masonry mortars.

2.2.2 Cement

Cement used shall be ordinary portland cement conforming to IS 269 or as approved by the Engineer-in-charge.

2.2.3 Lime

Lime used shall conform to IS 712 specification for Building Limes. Field slaking shall be done as per IS 1635 code of practice for field slaking of lime and preparation of putty.

2.2.4 Water

Water used for masonry shall be clean and free from injurious amounts of deleterious materials and shall conform to specification given in concrete and mortar section.

2.2.5 Fine aggregate (sand)

Sand shall conform to IS 2116 specification for masonry mortars.

2.3 Damp proof course

Deleted

2.4 Metal reinforcement

Metal reinforcement used in brick masonry shall conform to the following Indian Standards Specifications.

a. IS 432 Specification for Mild steel and Medium tensile steel bars.

b. IS 1566 Specification for steel fabric or hard drawn steel wire.

c. IS 412 Specification for Expanded metal steel for general purpose.

d. IS 226 Specification for other suitable reinforcement such as galvanized hoop iron.

3.0 MORTAR

Mortar shall be as specified under the respective item in the ITEM (INCLUDES) BUILT-UP AREA RATE SCHEDULE. Its preparation and material shall comply with concrete and mortar section of this volume.

4.0 WORKMANSHIP

4.1 Bricks used for masonry in cement mortar or cement-lime or mortar shall be soaked by immersing in water (so as to prevent bubbling) at least one hour prior to start of actual laying.

4.2 Bricks shall be laid in English bond unless otherwise specified. Half or cut bricks shall be used only for the purpose of bond and at no other place. Cut bricks shall be allowed in work.

4.3 Work shall be true to horizontal lines and perfect plumb. Vertical joints shall be truly vertical and those in alternate courses shall be in the same vertical line. Joints of each course shall be within the limit of 6mm to 10mm depending upon the size of bricks. Total height of 9cm brick with the 5 courses and 5 mortar joints shall be 50cm. In no case shall joint thickness of horizontal and vertical be more than stated above. Joints should be filled to full depth and checked each time.

Prior to start of work it must be noted and checked that bricks on top are full-size bricks (flat or brick on edge). To achieve this, precautions should be taken from the start of the first layer. Thickness of joints shall so adjusted so as to have full bricks on top. Also it must be noted and checked that all horizontal joints on every floor are at the same level, so as to allow proper bonding at junctions.

Required datum levels must be established throughout the floor and only then should work start.

It is equally important to take into account levels of window sills, lintels, etc. while finalising courses and joint thickness.

In normal practice architects do take care of these while finalising levels, but it is difficult to expect the ideal situation at all places. In such situation, the decision of the EIC shall be taken and in providing brick on edge, concrete sills, etc.

In addition, for convenience and speed, gauge boards of exact width shall be fixed at the edges of masonry to correct line and plumb. These boards shall be marked with course levels to achieve exact height of each course and full bricks at the top.

4.4 One or half brick thick wall shall have minimum one face in true plumb.

4.5 It is imperative to raise the brick work uniformly over complete work joined together. If this is not possible, racked brick work shall be done at 45 degrees to the vertical. To thing shall not be accepted.

4.6 All iron fixtures, pipe outlets, hold-fasts for doors and windows shall be fixed when the brick work is in progress. It must be embedded in cement mortar or concrete as specified or as directed by the EIC. Required treatment to fixtures shall be carried out prior to embedding.

4.7 To achieve better results and proper working, the following tools should be available with masons working at site :

1. Spirit level.
2. Wooden/Aluminium straight edge : 3m long.
3. 3 meter steel tape
4. Right angle 1/2 meter long
5. Line and pin strings
6. Plumb
7. Storey rods

4.8 Joint thickness shall be provided as discussed above. Joints shall be filled to full depth before second course is laid. Frogs shall be upward at all times. Joints shall be raked back to a minimum 10 to 15 mm while the mortar is wet. Surface of brick work shall be cleaned with coil string, wire brushes, etc. to keep the surface free for the next operation. All dropped and spoiled mortar, brickbats, etc. shall be cleared from the floor before work is closed for the day.

4.9 Protection and curing .

Wet work shall be protected from rains by suitable covering. Masonry in cement or cement-lime mortar shall be kept constantly moist on all the faces for a minimum period of ten days. The top of masonry shall be left flooded with water at close of the day.

In case of brick work in lime mortar, curing shall commence two days after laying of masonry and shall continue for the next seven days.

4.10 Scaffolding independent of brick work i.e. double scaffolding shall be provided. It should be tied to brick work or structure at suitable intervals in both directions. Two rows of plank shall be provided all around. Planks shall be at least 50mm thick and well-tied to scaffolding. Railing to the outside face shall be provided. While erecting scaffolding. the following points must be noted and closely followed :

1. Minimum number of holes in the horizontal direction. Holes shall be formed by omitting header brick.
2. No holes in pillars under 1 meter in width.
3. No holes near the skew backs of arches.
4. Scaffolding must be sound and strong and easy to maintain.
5. Holes left must be closed white finishing the plaster.

5.0 TYPES OF BRICK WORK.

5.1 Walls 230mm thick or more.

5.1.1 Walls of 230mm thickness or more shall be constructed with approved and selected bricks. Mortar shall be as specified in the ITEM (INCLUDES) BUILT-UP AREA RATE SCHEDULE.

Points discussed above shall be followed for workmanship.

Brick wall of 230mm thickness shall be constructed from one side and one face shall be true and plumb. Thicker walls shall be constructed with masons on both faces and both the faces shall be true and plumb.

5.1.2 Measurements shall be in cubic meters.

5.2 Half brick work - plain or reinforced.

5.2.1 115mm thick brick work shall be called as half brick work. It shall be built by laying bricks in stretcher bond. Mortar shall be as specified in the ITEM (INCLUDES) BUILT-UP AREA RATE SCHEDULE.

These walls may be used for forming cavities or partition wall inside building. Brick work shall reinforced with 6mm M.S. dia bars, 2 bars at every third layer. Other reinforcing materials such as GI metal lath GI hoop iron 25mm x 1.6mm shall be used at every third layer as detailed by the manufacture. Embedding of reinforcement shall be done very carefully. All precautions shall be taken so that edges are not exposed. Lapping of bars and lath shall be proper and staggered.

5.2.2 Measurement shall be in square meters. Reinforcement shall not be measured separately.

6.0 **RATE**

6.1 The rate shall include the cost of all the materials and labour as described in their respective items of work and for all the operations as detailed in the respective specifications for the varies items of work. Brick on edge courses, cut brick corners, splays, reveals, cavity walls, shall be included in BRICK WORK - for the purpose of payment.

6.2 The following operations shall be included in the rate for BRICK WORK :

a. Raking out joints for plastering or for pointing done as a separate process or for finishing joints flush as work proceeds.

b. Preparing tops and sides of existing walls and the like for raising :

c. Rough cutting and waste for forming gables, cores of arches, splays at leaves and the like and all rough cutting in the body of brick-work, unless otherwise stated;

d. Plumbing to angles and battered surfaces.

e. Forming reveals to jambs where fair cutting on exposed faces is not involved.

f. Leaving holes for pipes, etc.

g. Building-in holdfasts, air bricks, fixing bricks, etc.

h. Building-in ends of beams, joists, slabs, lintels, sills, trusses etc.

i. Forming opening and flues for which no deduction is made.

j. Bedding wall plates, lintels, sills, roof tiles, corrugated sheets, etc. in or on walls, if not covered in their respective trade.

k. Leaving chases of section not exceeding 50cm in girth.

SECTION - F

PLASTERING & POINTING

1.0 INDIAN STANDARDS

All relevant standards as specified elsewhere in this Volume are applicable.

1.1 Indian Standards to be followed are :

1.	IS 383	Specification for coarse and fine aggregates from natural sources for concrete.
2.	IS 412	Specification for expanded metal steel sheets for general purposes.
3.	IS 1542	Specifications for sand for plaster.
4.	IS 1635	Code of practice for field slaking of building lime and preparation of putty.
5.	IS 1661	Code of practice for field slaking of building lime and preparation of putty.
6.	IS 2394	Code of practice for application of lime plaster finish.
7.	IS 2402	Code of practice for external rendered finishes.
8.	IS 2645	Specifications for integral cement waterproofing compound.

2.0 MATERIALS

2.1 Cement, lime, surkhi, water shall conform to the respective specifications of Section II : (concrete & Mortar) of this volume.

2.1.1 Coloured cement may be either ready-mixed material or may be obtained by mixing pigments and cement at site. The pigments to be mixed with cement shall conform to Appendix ‘A’ of IS 2114 code of practice for laying in-situ Terrazzo floor finish.

2.2. Sand required for plastering work shall conform to IS 1542 specification. For white or coloured rendering, only quartz or silica sand shall be used. For textured finishes produced by treatment of freshly applied final or finishing coat with a tool coarser, particles used shall be screened through 3.35mm IS sieve or 2.36 mm IS sieve. For torn texture a slightly larger portion of material coarser than 4.75 IS sieve shall be used.

2.3 Aggregate shall conform to IS 383.

2.4 Marble dust obtained from crushing of hard marble stone shall not contain more than 8% of dust determined by field test. Fineness modules shall be greater than 1.0

2.5 Integral waterproofing compound shall conform to I.S. 2645 (specification for integral waterproofing compound).

2.6 Neeru shall be obtained by mixing lime putty and sand in equal proportions and chopped jute @ 4 Kg/cum of mortar and ground to fine paste in the chemical grinder to give fine butter like paste.

3.0 **WORKMANSHIP**

3.1 Preparation of mortar mix.

3.1.1. The material used in preparation of plastering mixes shall be measured by volume using gauge-boxes or by weight.

3.1.2 When cement is measured by weight, 1440 Kg. of material shall be taken equivalent to one cubic meter.

3.1.3. Mix proportion of lime, unless otherwise stated, generally refers to the volume of lime putty.

3.2 Mixing

3.2.1 Mixing shall be done mechanically or manually if approved by the EIC. Machine mixing shall be preferable to hand mixing for cement mortar. Each mortar batch shall be used within half an hour. Hand mixing shall be carried out on a clean, watertight platform. The mixing operation shall be continued with addition of necessary quantity of water until a uniform appearance and consistency of mortar is obtained.

3.3 Cement-lime or cement-sand-mortar shall be prepared as follows :

A. Lime putty and sand shall be mixed first and kept from drying out. Cement shall be added as and where required and mixed with water if necessary to the minimum extent to give a working consistency for the plaster.

B. If fine sand is used, cement and sand shall be dry mixed first. Lime putty, thinned with water, shall be added to the mixer and mixed until a satisfactory mortar obtained.

C. Cement and sand shall be mixed dry in required proportion to obtain a uniform colour, and water shall then be added to get the required consistency for the plaster.

3.3.1 Surfaces to be plastered must be clean and free from dust, loose material, oil, grease, mortar droppings sticking of foreign matter, traces of algae, etc. It is very important to ensure that there should not be any chance of the plaster getting debonded due to presence of materials harmful for bonding.

3.3.2 Raking out of joints is expected to be carried out along with masonry but it should be checked thoroughly so as to receive good key.

3.3.3 Walls should be sufficiently damp prior to plastering. Water from plastering mortar must not be absorbed by masonry under any condition.

3.3.4 Any unavoidable projections in masonry and concrete surfaces shall be chiselled back. Care shall be taken that surrounding surfaces are not damaged and reinforcement is not exposed.

3.3.5 Thickness of one coat should not be more than 12mm and less than 8mm for single coat finished plaster.

3.3.6 In case of multi coat plaster, sufficient time shall be allowed for the undercoat to harden (cured, dried and shrunk properly) before subsequent coats are applied.

3.3.7 Undercoats shall be scratched or roughened before they are fully hardened to form a mechanical key.

3.3.8 The method of application is also important and hence it is recommended that the mix be thrown on the surface rather than stuck with trowel. This increases the adhesion.

3.3.9 Scaffolding should be rigid, allowing free and safe movement on the platform and it should be at sufficient distance or height from the working areas. Scaffolding with railing gives more confidence to workers and increases the quality of work.

3.3.10 Actual plastering shall be undertaken only on the approval of the EIC. Plaster work should follow the steps mentioned below :

a. Surface must be thoroughly cleaned.

b. Plaster area must be provided with level dabs or spots allowing working and checking with 2-3 metre straight edge. Depth of plaster must not be less than 8mm at any point.

c. Required concealing services must be completed and tested before starting plastering work

d. No further cutting of masonry must be required.

e. Repairs carried out to masonry or concealing work must be cured and dry.

f. Surface must be sufficiently damp.

g. Plaster dabs are checked for plumb and level by the EIC or his representative.

h. Joints concealing and repairing areas must be covered with chicken mesh as per EIC’s instruction.

3.3.11 Corners, external or internal, shall be finished along with final coat and will be rounded if so instructed by the Architect.

3.3.12 Plaster shall be cured for 14 days by wet curing except in neeru finish plaster. During this period plaster shall be protected from exposure to extremes of temperature and weather.

3.3.13 Plaster shall be levelled and lined by aluminum hollow section, 2-3m long, (This will give even and levelled surface). There shall not be more than 2mm difference in level when checked with 3m straight edge. It is important that enough pressing and beating is done to achieve compact filling of joints and that the area is fully compacted.

3.3.14 Finishing of plaster may be carried out with wooden float (randhas) or trowelled smooth with sheet metal trowels as specified. Care shall be taken to avoid excessive trowelling and over working of the wooden float.

3.3.15 All corners, internal or external, shall be truly vertical or horizontal. These shall be finished with a proper template to achieve best workmanship for rounding and chamfering as specified or directed.

3.3.16 Plaster shall be cut to correct horizontal or vertical line at the end of the day or if work requires to be suspended for any reason.

3.3.17 It is advisable to limit the area of plaster to 15 sq.mt. To avoid cracks due to thermal movements of dissimilar material in contact, it is advisable to provide joints treated with groove or any other detail as suggested by the Architect. These joints if not specified shall be treated with 150mm wide reinforcing chicken mesh (approved by the EIC) fixed over joints by G.I. nails and the area plastered.

4.0 TYPE OF PLASTER

4.1 12mm thick ordinary cement sand plaster.

Single coat cement-sand plaster with cement-sand mix in proportion of 1:4 shall be carried out over the entire area as detailed above. This shall be finished with wooden float to give the best smooth surface possible. This may be for internal or external areas. Thickness may be from 10 to 15 mm maximum or as specified in the item or drawing.

4.2 18 to 25mm ordinary cement sand plaster.

This is the same as for the 12mm thick single coat plaster except that this shall be carried out in two coats. Maximum thickness of the undercoat shall be 12mm and balance in the second finishing coat. All operations remain the same and are as detailed in point 3.0

4.3 Neeru finish plaster

12 to 18mm thick internal plaster shall be carried out as above in single or two coats respectively. 2 to 3 mm thick neeru shall be applied over the plaster when it has just hardened. It shall be finished smooth by a steel trowel and worked over to achieve smoother finish. Curing shall start only after 24 hours after neeru punning has been

completed. This shall not be hosed down like other plaster but kept wet by a slight sprinkling of water for a period of 10 days.

4.4. Cement finished plaster.

This shall be carried out in the same manner as in 4.1 and 4.2 for specified thickness in single or double coat. Then it shall be finished uniformly over the entire area with a paste of neat cement when the plaster has just hardened and finished smooth with a steel trowel. It shall be worked over again to achieve a smooth levelled surface. Quantity of cement applied shall be about 1 Kg/sq.mt.

4.6 Sand face plaster

4.6.1 This shall generally be carried out on the outside face and exposed area of masonry work and concrete work. It shall be of minimum **25mm thickness and shall be in two coats. 12 to 15mm first coat & 8 to 10mm finish coat.** The coat shall be C.M. 1:4 (1 cement and 4 sand) mixed with waterproofing compound 2% by weight of cement applied as usual and surface shall be keyed.

4.6.2 The second coat shall be applied after 7 to 10 days and shall be of C.M. 1:4 (1 cement and 4 sand). Mortar shall be mixed with slightly coarse sand. Mix shall be worked over with a gauge or wooden float to achieve an uniform surface.

4.6.3 The surface shall be allowed to harden sufficiently for sponging operation. Sponging shall be done by dipping sponge in cement water and removing fine particles and exposing large sand particles. The movement of sponge shall be such that no patches develop nor is excessive material removed from the surface. There shall not be a difference of more than 7mm when checked with 2m long straight edge.

5.0 **POINTING**

5.1 Pointing shall be done as soon as possible to achieve a good bond in the raked joint. Surface preparation shall be the same as specified in clause 3 above. Mortar shall be prepared as detailed in section 2. Minimum depth of mortar in joint shall be 10 to 12 mm. Mortar shall be set in or pressed into the raked joint with a pointing trowel. Care shall be taken not to spread the corner edges or surface of masonry. It shall be further finished with a pointing tool. Pointing shall be cured for 7 days by hosing water.

5.2 Types of pointing.

5.2.1 Flush Pointing

The mortar shall be pressed into the joints and shall be finished, flush and levelled. The edges shall be neatly trimmed with a trowel and straightened.

5.2.2. Cut or weather struck pointing

The mortar shall first be pressed into joints. The top or horizontal shall be pressed back 3mm with the pointing tool so that the joint is sloping from top to bottom. The vertical joint shall be ruled pointed. Vertical and horizontal joint lines shall be at true right angles.

6.0 MEASUREMENT

6.1 Plaster and pointing work shall be measured in square meter to the second place of decimal.

6.2 Thickness of plaster shall be the minimum depth of plaster as specified. But if extra thickness occurs due to bad quality of bricks, stones or blocks or due to bad workmanship, the repairs required to be carried out shall be at the cost of contractor.

6.3 a. Grooves, pattas in continuation of large areas or plaster areas shall be considered as part of the plaster and not measured separately.

b. Isolated areas and width below 300mm shall be specified and detailed separately in the ITEM (INCLUDES) BUILT-UP AREA RATE SCHEDULE and measured in running meter.

c. Ceiling plaster, including ribbed beam slab shall be measured in square meters.

d. Beams and columns in continuation of masonry shall be measured in square meter.

6.4 Jambs, sills, coves, cornices, etc. shall be a part of plaster and no separate payment shall be made towards these items.

6.5 Deduction

a. Deduction for an opening in plaster shall not be for area less than 0.5 sqm. Same shall be applicable for pointing.

b. In case the opening area is 0.5 sq.m to 3.0 sq.m only 50% area shall be deducted from each face. Same shall be applicable for pointing.

c. In case the width of door or window frames are equal to masonry, full area of opening shall be deducted.

6.6. Plaster to ceiling and walls shall be measured separately if specified in the ITEM (INCLUDES) BUILT-UP AREA RATE SCHEDULE.

7.0 RATE

7.1 Description of item in the ITEM (INCLUDES) BUILT-UP AREA RATE SCHEDULE, unless otherwise stated, includes, wherever necessary, conveyance and delivery, handling, unloading, storing, fabrication, hoisting, all labour for finishing to required shape and size, setting, fitting and fixing in position, straight cutting and waste, return of packing and other incidental charges.

7.2 Levels and heights shall be as indicated in ITEM (INCLUDES) BUILT-UP AREA RATE SCHEDULE.

7.3 Preparation of surface shall be as approved by the EIC.

7.4 Trimming off the projections on masonry shall be included in the price.

7.5 Scaffolding and working platform shall be included in the price.

7.6 Materials as detailed and as required to complete item as specified shall be included in the price.

7.7 Curing of plaster or pointing shall be included in the price.

7.8 Cleaning of adjacent areas, windows, doors, frames etc. including masonry surfaces in exposed masonry work, shall be included in the price.

7.9 Forming grooves, for joints, between beams/columns and masonry etc. shall be included in the price. Any special treatment if detailed shall be measured separately and billed in ITEM (INCLUDES) BUILT-UP AREA RATE SCHEDULE.

7.10 Providing & fixing chicken mesh at junction of R.C.C. brick work, edges, corners, chiselled and repaired brick to plaster over concealed conduit etc. shall be as directed by the EIC it shall be considered as part of item and no separate charges will be payable.

SECTION - G

DOORS & WINDOWS

1.1 Aluminum windows : IS: 1948 & IS:1949.

Aluminum alloy shall conform to IS:733 and IS:285. Contractor shall submit for approval a sample of section he is proposing to use for the frame. He shall also indicate weight of section per one metre length. he shall also submit for approval the sample of hinges, handles, pegstays or any other item that may require the approval of the Engineer.

The glass panes, unless otherwise specified, shall be of a thickness 6mm for windows and shall be free from flaws, specks and bubbles. They shall have proper squared corners and straight edges. Fixing to frames shall be done with approved glazing pins and approved quality rubber beading.

Corners of frames consisting of extruded hollow tube sections or other profiles shall be to a true right angle. The hinges shall be either projection type, or friction hinges. Necessary coupling of approved shape shall be provided for composite windows. All holes required for fixing frame and for fixing glazing shall be provided. Only brass screws shall be used for fixing the frame to concrete members.

Vertical and horizontal members shall be of adequate rigidity to resist lateral forces. Design calculation shall be submitted for deflection of members.

All the fixtures for centre hung shutters, top and bottom hung shutters, or side hung shutters shall be got approved before they are used. The fixtures used should be such that it should be possible to open the shutter to any angle.

Unless otherwise specified, aluminium windows shall be provided with floor springs of approved quality and make.

All aluminium members shall be supplied in either matt or polished finish including anodising them by electrochemical process to an approved colour and to a thickness of average of 0.25mm. The frame shall be protected with a layer of clear transparent lacquer based methacrylates or cellulose butyrate. Temporary coating on Aluminum Sections. The coating shall be removed after installation is completed and after completing finishing work in the adjoining area.

The erection of frame shall be same as detailed under steel windows. Where aluminium frames come in contact with steel members, they shall be separated by either a 3mm thick rubber gasket for full width of aluminium member or any other approved film so as to avoid metallic corrosion.

1.2 Mode of payment and measurement:

Aluminium windows: The rate quoted shall include the cost of supplying, fabricating and fixing in position frames, glass panes, rubber beading, all fixtures etc. anodising, applying protective cover embedding the holdfasts in concrete and/or fixing the frames to concrete members with rawl plugs and brass screws and where necessary

the cost of rubber gasket (3mm thick) barrier between aluminium member and steel member etc. complete.

Measurement shall be on square metre basis for the actual work provided.

Rolling shutters: The rate quoted shall include the cost of supplying, fabricating, fixing in position with shell anchors, or rawl plugs, bolts, all necessary fixtures including surface preparation and applying paint as specified and shall be paid on square metre basis for the area of clear opening.

SECTION – H

WATERPROOFING

J.1 Bitumen felts based waterproofing and damp-proofing :

IS - 1322 Specification for bitumen felts for waterproofing and damp-proofing.

IS - 1346 Code of practice for waterproofing of roofs with bitumen felts.

IS - 1609 Code of practice for laying damp-proof treatment using bitumen felts.

IS - 3067 Code of practice for general design, details and preparatory work for damp-proofing and waterproofing of building.

IS - 1580 Specifications for bituminous compounds for waterproofing and caulking purposes.

J.2 The waterproofing work shall be got carried out by approved contractors such as M/S. Overseas Water Proofing Co., or M/S. Leak Proof etc. who have experience in doing waterproofing work and shall give a guarantee on a stamped paper for good performance of the waterproof treatment for a minimum of seven years period and shall, at their own cost, rectify the defects if any found during the guarantee period.

If approved by the Engineer, in situ fibre glass tissue reinforced bitumen layers equivalent to bitumen felt may be used.

J.3 Surface preparation :

Concrete and masonary surface :

Any cracks in the surface (other than hair cracks) shall be cut to V-shape, cleaned and filled with cement mortar 1:2 or with bitumen conforming to IS-702 as directed by the Engineer.

All fungus growth, if any, moss, dust shall be removed by wire brushing.

Masonary drain mouth shall be widened to two and a half times the diameter of the drain and rounded with cement mortar.

When a pipe passes through RCC slab a cement concrete fillet shall be built around the pipe and waterproofing taken over the fillet.

In brick parapet walls a chese shall be made in the parapet wall to terminate the bitumen felt. No chasing shall be made in the RCC parapet walls.

J.4 Bitumen based waterproofing shall consist of either Normal Treatment or Heavy Treatment or extra heavy treatment as specified.

J.5. Waterproofing of roof, bathroom, water tanks etc. by cement based waterproofing compounds and by injection grouting :

Where specified this work shall be carried out by the Contractor who has specialized in carrying out this work. The contractor shall give a 10 year guarantee on a stamped paper for good performance of his work and shall undertake to rectify the work at his own cost if any defects are observed during the guarantee period.

In general the waterproofing shall be carried out as per specification of the specialist but duly approved by the Engineer.

The roof surface before waterproofing shall be cleaned thoroughly and watered and shall be kept wet at least 12 hours prior to carrying out of waterproofing. If any leakage is observed the source of leakage shall be located and it shall be treated either by injection grouting or by closing of the cracks with application of cement mortar 1:2 after cutting a V-shape groove. The treatment shall be continued till the leakage is stopped.

Brick-bat coba in special waterproof cement mortar shall be laid to required slope, and shall be well compacted. A40 mm thick IPS type finishing using waterproof extensive trowelling. A flase square shall be provided by pressing string, 3 mm dia, on the surface. The top finish shall be continued upto 300 mm height in the parapet wall (in the case of bathroom it shall be carried out upto 1000 mm high without fillet). Necessary grooves shall be provided in the walls to terminate the waterproofing treatment. At the junction of the wall and the floor a round or triangular fillet of size 200 mm x 200 mm shall be provided. The entire surface shall be cured for minimum 14 days, by storing water to a depth of at least 150 mm in the entire area. During this period if any leakage is observed the same shall be rectified.

J.6 Underground water tanks, basements, subways and service ducts:

Waterproofing shall be carried out by boxing including injection grouting as specified.

1. P.C.C. to be laid using super plasticizer and W.C. ratio as given in the specification.

2. The P.C.C. surface shall be thoroughly prepared , cleaned and scrubbed dry with wire brushes etc. Loose material will be removed and the surface finished smooth.

3. Apply minimum three coat of proprietory brand waterproofing coating using acrylic latex copolymers free from SBRs or modified SERs mixed and well stirred with cement in the ratio specified by the manufacturer. The thickness of the three coats should be as specified by the manufacturer but not less than 500 micron in any case. An interval of 24 hours to be kept between successful coats, first being the primer coat.

4. After two days of applying the third coat, provide a 1:3 waterproof cement mortar 20 mm thick plaster using approved integral waterproofing compound in specified proportion and cure as per relevant IS Specification.

5. Place steel of raft and RCC walls as required and concrete as per specification.

6. Carry out injection grouting at 1 mtr. Centre to centre in both direction and at all construction joints using cement slurry with polymers based acrylates fee from SBRs or modified SBRs.

7. Clean the external side of the retaining wall surface and scrub dry with wire brushes etc.

8. Apply to the external side of the retaining wall minimum three coats of proprietary brand waterproofing coating using acrylic latex copolymers free from SBRs or modified SBRs mixed and well stirred with cement in the ratio specified by the Manufacturer. The Thickness of the three coats should be as specified by the Manufacturer but not less that 500 micror in any case. An interval of 24 hours to be between successive coats, first being the primer coat.

9. After two days of applying the third coat, provide a 1:3 waterproof cement mortar 20mm thick plaster using approved integral waterproofing compound in specified proportion and cure as per relevant IS specification.

10. Complete back filling.

Notes :

a) The waterproofing course shall be continued without break along the external surface after the vertical elements are constructed.

b) If an honeycombing is noticed, the same shall be prepared good by injection grouting.

c) The bonding coat of approved material to be applied at construction joints to old concrete before commencing fresh concreting operations.

J.7 Track slabs/ Roof slabs / Deck slabs :

Waterproofing shall be carried out as follows :

1. Surface should be thoroughly prepared , cleaned and scrubbed dry with wire brushed etc.

2. Apply minimum three coats of proprietory brand waterproofing, coating using Acrylic Latex Copolymers free from SBRs or modified SBRs mixed and well stirred with cement in the ration specified by the Manufacturer. The thickness of the three coat should be as specified by the Manufacturer but not less than 500 micron in any case. Any interval of 24 hours to be kept between successive coat, first being the primer coat.

3. After completion of work, the deck slab shall be tested for water tightness by ponding water for 48 hrs at a head of 5 cms and observing if there are any

leakages through joints of the track/ roof/deck slab. If any leakage are observed at this stage, the same shall be stopped by injection grouting with cement slurry comprising of cement and polymer based acrylates free from SBRs or modified SBRs and making good the surface of the drill portion on the slab by additional waterproofing coating.

4. Apply mastic asphalt or other coating as specified.

J.8 Test on materials and waterproofing.

Test will be carried out on material and waterproofing as per IS 2645- 1975 , Din 1048 and as specified by Engineer-in-Charge and should meet the IS & Din specification. The following tests to be carried out:

a) Impermeability Test – Will be carried out as per Din 1048 for every 500 M2 of waterproofed surface. Field permeability test will also carried by permeability cup measurements for every 500 M2 of waterproof surface. The permeability results should be 0.0 mm.

b) Salt spray test on MS panel : The coating should meet IS2074 -1962 requirement for 100 hours. A minimum of 1 test should be carried out for every 3000 M2 of waterproofed surface.

c) Infra red analysis : Infra read analysis result would have to be submitted along with the sample of acrylic latex copolymer. The test results should prove that the material is free from SBRs or modified SBRs. Thereafter, one test is required to be carried out for every batch material supplied or every 500 kg. of materials whichever occurs earlier.

d) Solid contend test – one test required to be carried out for every batch of materials supplied or every 500 kg of materials which ever is earlier. The solid content of active polymer (acrlyate) should not be less than 40% by weight of the overall material.

J.9 Mode of measurement and payment :

The rate shall be inclusive of cost all materials and labours including testing samples in laboratory and site as specified testing the slab for water tightness before and after the waterproofing , injection grouting as specified, rectifying defect if any by injection grouting, applying of plaster with waterproofing compound as specified and giving 10 years guarantee in prescribed format. It shall be measured and paid on Sq. M basis of the concrete surface.

WATERPROOFING ROOFS WITH BITUMEN FELTS :

A. PREPARATION OF SURFACE AND PRIMING COAT.

In general , the work shall be carried out as per I.S. code of practice for ' Waterproofing ' roofs with bitumen flats (IS 3146)

The surface to be treated shall have a minimum scope of 1 in 120. This grading shall be obtained with lime concrete, cement concrete of cement plaster with coarse sand, as specified, to the average thickness required and finished smooth and such grading shall be paid for separately.

Junction between the roof and the vertical faces of parapet walls, chimneys etc. shall be eased by running triangular fillets of 3" size in cement concrete 1:2:4 (1 cement : 2 sand : 4 stone ballast 1/4" gauge). The provision of fillets shall be deemed to be covered by the item of waterproofing and shall not be measured and paid for separately.

Where the parapet walls exceeds 18" in height, the waterproofing felt shall be tucked into a horizontal groove of 3" x 3", cut in the wall at a height of not less than 6" from the graded roof surface . After tucking in of the felt, the groove shall be finished smooth with the cement plaster 1:4 (1 cement : 4 Sand). Such cutting of the groove and its finishing smooth shall be deemed to be a part of the waterproofing item and shall not be measured or paid for separately. Where the height of the parapet wall is 18" or less, no groove will be required and the waterproofing treatment shall be carried over the top of the parapet wall to its full thickness.

The graded surface of the roof, concrete fillets and the faces of walls shall be thoroughly cleaned with wire brushes and all loose scales etc. removed. The surface shall then be dusted off. Any cracks in the roof shall be cut to "V" section cleaned and filled up flush with cement mortar slurry 1:4 (1 cement : 4 sand). Such cleaning of the surface or treating the cracks shall not be paid for separately.

A priming coat with a bituminous solution of suitable viscosity shall then be applied with brush on the roof and wall surface at the rate of 0.8 gallon /100 sft. To assist adhesion of the bonding material (i.e. bitumen). Such application of primer shall not be measured and paid for separately.

B. <u>WATERPROOFING TREATMENT</u>

The waterproofing treatment shall consist of a four or six course treatment as specified in the description of the item, each layer of bonding material, self-finished bituminous felt or stone grit being counted as a course. The primer cost shall not count against the number of courses specified.

A four course treatment shall consist of :

i) Initial layer of bonding material applied hot at specified weight per unit area.

ii) Second layer of self-finished bitumen felt of specified brand and manufacture conforming to the type and grade given in the description of the item.

iii) Third layer of bonding material.

iv) Fourth and final layer of stone grit or pea gravel spread at specified volume of material per unit area.

In a six course treatment , the first, second and third layers shall be the same as in the four course treatment. The fourth and fifth layers shall consist of self finished felt and bonding material respectively. The sixth layer shall consist of stone grit or pea gravel.

The bonding material (Bitumen) shall be max phalt. R 85/25 or equivalent grade or as specified. This shall be heated to 350 degree For as recommended by the manufacturers for a particular grade and conveyed to the roof in buckets or pouring cans in weighed quantities. This shall be applied hot at the rate of 30 lbs/100 sft, in first and third layers of four course treatment. The quantity of bitumen to be applied for the first, third and fifth courses in six course treatment shall be 30, 25 and 35 lbs respectively per 100 sft. of area.

The self finished bituminous felt shall be type 3 grade 1 (Hessian base) unless otherwise specified. This shall be of approved make and shall confirm to the requirements of IS : 1322 – 1959. This shall be used in second course of course treatment and second and fourth courses of six course treatment.

The felt shall be cut to required lengths and laid on the roof together with bonding material as per the procedure laid down by I.S. Code of practice for " Waterproofing roofs with bituminous felts" Each strip shall overlap the proceeding one by at least 3" at the longitudinal edges and 4" at the ends.

All overlaps shall be firmly bonded with hot bitumen. In a six course treatment , care shall be taken that the overlaps of felt in fourth layer are stagger from those in the second layer.

Stone grit shall conform to specifications as described under ' Material .. Coarse aggregates' & shall be 1/4 and down size. Where peagravel is used , it shall be hard, round and free from dust, dirt etc. The stone grit or peagravel shall be spread uniformly over the hot bonding material at 2 cft./ 100 cft in 6^{th} layer of six course treatment and shall be pressed into hot bitumen with wooden roller. Stone grit or peagravel shall not be spread over vertical and sloping faces of flashings, and at drain mouths. At those places, the surface shall be painted with two coats of bituminous emulsion.

Waterproofing of roofs with bitumen felts shall be measured in Sq.ft. / sq.m Measurements shall be taken over the entire exposed are of roofing and flashing treatment. Overlap and tucking into flashing grooves shall not be measured. The rate shall include the cost of all labour and materials involved in all the operations described above.

WATERPROOFING BY APPROVED AGENCY.

Waterproofing of Water Storage Tank:

In case of water storage tank, after the plumbing work is complete, the outer surface of the walls is plastered by the & surface methods to floor and walls including partition walls which includes the internal plaster finished smooth with trowel. The thickness of treatment of the floor shall be 6.5 cms, and on the walls 2.5 cms. and finished smooth with the help of trowel. The tank shall be filled immediately after the treatment is completed.

Guarantee for all waterproofing work:

The item of waterproofing shall be carried out by M/s. India Waterproofing company or equivalent to be approved by the Consultants and to their specifications.

A written guarantee in approved form shall be furnished to certify that the waterproofing shall be free from defects of materials and workmanship for a period of 10 years. The leakage, failure to stay in place, splitting, pulling loose, illegatoring, tearing, undue expansion and contraction shall be judged as defective work.

SECTION - I

PAINTING & FINISHING

Painting (General)

All paints shall be of the make approved by the Architect ready mixed paints as received from the manufacturer without any admixture shall be used. If thinner is necessary in the case of ready mixed paints, the name shall be as recommended by the manufacturers.

The Contractor shall bring all the approved paints to the site of work in their original containers in sealed condition. Paints which will be sufficient for the entire work or at least for a fortnight's work shall be brought in at a time. The empties shall be removed from the site only when the item of work has been completed and permission obtained from the Architect.

Paintings shall be started only when the Engineer has inspected the items of work to be painted, satisfied himself about their proper quality and given his approval to commence the painting work.

Painting, except the priming coat, shall be taken in hand only after all other builder's work is practically completed. The entire building cleaned up at least one day in advance of the paint work being started.

The surface to be painted shall be thoroughly cleaned and dusted. All rust, dirt scales, grease etc. shall be removed before painting is started. The prepared surface shall be got approved by the Engineer before painting work is commenced.

The paint shall be thoroughly stirred in their original containers before pouring them into smaller tins for use. While applying also, the paint shall be continuously stirred in the smaller tins so that the consistency is kept uniform. If required, a thinner shall be used to bring the paint to the required consistency.

Two or more coats of painting shall be done either with brushes or by spraying as stipulated in the items of work.

Each coat shall be allowed to dry out thoroughly before the next coat is applied. Each coat except the last coat shall be thoroughly rubbed down with sand paper or fine pumice stone and cleaned of dust before the next coat is applied. The finished surface shall present a smooth and even surface without any hair marks from the brush or clogging of paint puddles.

White painting doors and windows, the putty round the glass panes shall also be painted. Tops of shutters and other similar hidden locations shall not be left out in painting. After painting the glass panes shall be thoroughly cleaned. By using solution available in market specially made for cleaning glasses

All painting work shall be measured in sq.m. unless otherwise specified. In measuring painting of joinery and steel work, etc., the co-efficients as given in IS:1200 - 1964 shall be used to obtain the area payable, unless otherwise specified in the description of the item.

All furniture's, fixtures, glazing, floors, etc. shall be protected by covering and stains, smears, splashing if any shall be removed and any damage done shall be made good by the Contractor at his own cost.

The rate shall include the cost of all labour and materials involved in all the operations described above and any other specifications given under the relevant item.

PAINTING PRIMING COAT ON WOOD, IRON OR PLASTERED SURFACE.

The priming coat shall be as specified in the description of the item. The primer shall be prepared at site or ready made paint of approved brand and manufacture.

At site, the primer for wood work shall be prepared from a mixture of red lead, white lead and double boiled linseed oil in the ratio of 7 lbs: 7 lbs : 1 gallon. For iron work, the same shall be prepared from a mixture of red lead, raw linseed oil and turpentine in the ratio of 29 lbs: 1 gallon : 1 gallon. All the ingredients of primer shall conform to Indian Standard specifications and shall be of approved manufacture and shall be brought to site in their original packings in sealed condition. the primer for the plastered surface shall be either distemper primer or cement primer of approved make.

The surface shall be prepared to receive priming coat as follows:

WOOD WORKS: The surfaces to be painted shall be dry and free from moisture. All unevenness shall be rubbed down smooth with sand paper and shall be well dusted. Knots, if any shall be covered with a preparation of red lead made by grinding red lead in water and mixing with strong, hot glue. The surface treated for knotting shall be dry before the primer is applied.

After the priming coat is applied, the holes etc. on the surface shall be stopped with glazier's putty or wood putty. Stopping shall not be done before the priming coat is applied as the wood will absorb the oil in the stopping and the later is therefore liable to crack.

IRON AND STEEL WORK: All rust and scales be removed by scrapping or by brushing with steel wire brushes. All dust and dirt shall be wiped away from the surface. If the surface is wet. It shall be dried before the priming coat is applied.

PLASTERED SURFACE: Ordinarily, the surface shall not be painted until it has dried completely. Trial patches of primer shall be laid at intervals and when drying is satisfactory, painting shall be taken in hand. Before primer is applied, all holes and undulations shall be filled up specification for doing POP to obtained.
When the surface to be primed is finally okayed the primer shall be applied with brushes, worked well into the surface and spread over and smooth.

PAINTING WITH READY MIXED PAINT:

All ready mixed paints shall be of approved brand and manufacture and of the required shades. The different surfaces to be painted shall be prepared in the same way as described under 'Painting Priming coat in wood, iron or plastered surface". The priming coat shall have dried up completely before painting is started.

The number of coats to be applied shall be as stipulated in the description of the item. the painted surface shall present uniform appearance and glossy finish, free from streaks, blisters etc.

WHITE WASHING WITH LIME:

Double scaffolding or stage scaffolding shall be provided for white washing to walls or ceiling as the case may be. Where ladders are proposed to be used, their tops shall be tied with pieces of old gunny bags to avoid scratches to walls.

Before white washing the new works, the surface shall be properly brushed free from mortar droppings and other foreign matter.

The wash shall be prepared from fresh stone white lime. The lime shall be well slaked, mixed and stirred with sufficient water to make a thin cream. This shall be allowed through a clean coarse cloth. 4 oz. of gum dissolved in hot water, shall be added to each cft. of cream. For making the cream one gallon of water shall be added to 2 lbs of lime.

No. of coats to be seen in description of item shall be applied with brushes on new work till the surface presents a smooth and uniform finish. Each coat shall be allowed to dry before the next one is applied. Further each coat shall be inspected and approved by the Architect or his representative before the subsequent coat is applied.

The finished dry surface shall not show any signs of cracking and peeling nor shall it come off readily on the hand when rubbed.

White washing shall be measured in sq.m of the finished area. The deductions for openings etc. shall be regulated as per IS:1200 - 1964. The rate shall include the cost of all materials and labour involved in all the operations described above.

WATERPROOF CEMENT PAINT.

Water proof cement paint of the brand, make and shade approved by the Architect shall be used.

The surface shall be thoroughly cleaned of all mortar droppings, dirt, dust, algae, grease and other foreign matter by brushing and washing. The surface shall be thoroughly wetted with clean water before the paint is applied.

Waterproof cement paint shall be mixed in such quantities as can be used up within an hour of its mixing. It shall be mixed with water and applied strictly as per manufacturer's instructions. The lids of cement paint drums shall be kept tightly closed when not in use.

The paint solution shall be applied on the clean and wetted surface with brushes or spraying machine. The solution shall be kept well stirred during the period of application. The completed surface shall be watered after the days work.

The second coat shall be applied after the first coat has set for at least 24 hours. before application of the second or subsequent coats, the surface of the previous coat shall not be wetted. Three or more coats as found necessary to get a uniform shade shall be applied on new work.

The specifications for scaffolding, measurements, etc. shall remain the same as described under ‘white washing with lime’.

SECTION – J

MISCELLANEOUS WORKS

ANTI-TERMITE TREATMENT.

PRE-CONSTRUCTION SOIL TREATMENT:

General:

The formation of the chemically treated soil barrier shall be accomplished in stages as the building construction work progresses and due care shall be exercised to ensure that each stage of treatment is well integrated with that previously applied stage so that unprotected avenues of entry are not left open to the termites.

Chemicals.

The Chemicals used for the soil treatment will be any one or of combination of the following with the concentration shown against each in aqueous emulsion.

Treatment to Foundation and Plinth:

a. **Treatment to sides of Col. pits/trenches/basement:**
The bottom surface of the excavations made for column pits, trenches and basements shall be treated with the chemical emulsion mentioned at 5 litres per 10 sft.

b. **Treatment to backfill to Col. pits/Trenches/Basement:**
The return earth in foundations in layers of 6 inches shall be treated as the layers are filled in, in stage at the rate of 20 litres per 10 sft. of the vertical or inclined surfaces of the concrete/masonry foundations. The chemical emulsion should be directed towards the concrete/masonry surface of the columns and foundations walls so that the earth in contact with these surfaces is well treated with the chemical.

c. **Treatment to natural soil surfaces:**
Areas other than those occupied by the plinth beams and masonry walls within plinth area of the building shall be treated with chemicals at the rate of 5 litres per 10 S.F.

d. **Plinth Filling:**

Surface of the earth filled within the plinth shall be treated with chemical emulsions at 5 litres per 10 S.F.

e. **Forming of barrier around the external perimeter of the Building:**

Earth around external perimeter of the building upto a depth of half metres shall be treated at the rate of 1.67 litres per sft. of the plinth wall. In order to create a direct barrier to the path of the pests treatment shall be carried out by driving in 1" solid M.S. rods as close as possible to the plinth walls

at intervals of 12" and upto a depth of 18" and roads moved backwards and forwards in a direction parallel to the wall to break up to the earth so that the chemical emulsions poured into the holes formed mixed intimately with the soil.

f. **Treatment to critical areas:**

Areas such as opening of the trenches made for soil pipes electrical cables, floor draining etc. shall be well soaked with the chemical emulsions.

Measurements:

The rate quoted by the contractor for the item in the Schedule of Quantities for treatment to foundations & plinth shall include for all items specified in clause 3 above. Payment shall, however, be made on the measurements of plinth area (Horizontal plane) i.e. area covered by the depth of foundations excluding areas open sky.

L. ANTI-TERMITE TREATMENT

1. **Guarantee Period and Periodic Inspection:**

Contractor should note that the work done is subject to free service guarantee from the date of completion of Treatment for a period of TEN YEARS against any infestation/and/or damage due to white ants. This guarantee shall be for non-appearance of termites and shall include periodical (once in 3 months) inspection and treatment if necessary to check the damage due to infestation. Amount equivalent to 5% of the value of anti-termite treatment work will be retained from the contractors final bill towards performance guarantee for a period of 10 years However contractor can furnish a Bank Guarantee of equivalent amount in lieu of cash retention on a renewable basis. After the successful completion on 10 years. The B.G. will be released.

2. The work shall be taken up in stages and contractors shall carry out the work in bits as and when he is called upon to do so by clerk of works/any other authorised period. there shall be no claim whatsoever on account of carrying out the work in stages.

3. **Supervision:**

The entire work of termite treatment at various stages of general work building shall be carried out under supervision of clients' representative. The Contractor shall employ experienced staff approved by the Architects to carry out such work. Further, the termite proofing agency shall appoint an experienced representative permanently posted at work site right from the commencement of treatment upto its completion of treatment.

II. ROADS AND WALK WAY : Not applicable for this project.

Dry Rubble Packing

Dry rubble packing shall first be leveled up and thoroughly consolidated by means of heavy log hammer or frog rms. Rubble of specified thickness shall then be laid and set with hand. It shall be consolidated by either, hand roller or wooden leg hammer, free use of water being made during consolidation. All hollows and hammer, free use of water being made during consolidation. All hollows and interstices after consolidation shall be filled up with quarry, spalls, stone ships etc., and the packing blinded with stone grift and watered and consolidated by log hammer.

Rubble packing in road work shall be thoroughly consolidated by means of power roller of 8 ton capacity instead of log, hammers and the surface shall be brought to proper grade and camber. After checking the level, grade and camber the surface will again be watered and rolled to receive road structure.

III. CONCRETE DRIVEWAY :

The concrete driveway shall be constructed as follows :

Laying 15 cm .thick 1:2:4 mix concrete with nominal reinforcement as per consultant's instruction (as per the plain concrete specification) rough finished , surface vibrated laid in alternate panels as directed by the consultants with dowel Bars. The joints to be filled in with a hot mixture of 40% by weight of Mexphalte, 5% by weight of asbestos fire and 55% by weight of clean san. The temperature of hot to be 350 degree F. and poured into the joints and allowed to set. On cooling the surplus mix to be removed from the joints by a heated knife or crowel.

IV. KERB STONES :

These shall be of precast concrete kerb stones of size 45 CM. X 30 CM. X 10 CM and fixing in foundation concrete 1:3:6 mix. The joints between each stone shall be cement pointed.

V. METAL WORK:

Steel used in the manufacture of rolled steel sections shall conform to IS 226 and IS 1977 latest edition or any alternative quality of steel subject to structural Consultant's approval.

SECTION - K

STRUCTURAL REPAIR WORK

1. Structural Treatment to RCC Members:

a. Provide the load release system to the RCC members adjoining the RCC member to be treated. No
work to be started without load release system is provided.

b. Remove the deteriorated concreted concrete portion carefully with small chisel and hammer.

c. Clean the exposed reinforcement steel thoroughly using wire brush and metal scrapper.

d. Apply corrosion control treatment on the reinforcement with soft brush and as per manufacturer's instruction.

e. After cleaning the surface thoroughly, provide & apply passivator coat on the reinforcement with
soft brush and allow the coating to dry as per manufacturer's instruction.

f. Prepare polymer bond coat as per manufacturer's instruction and apply the same on the exposed RCC portion to be treated, wet on wet apply polymer modified mortar in prescribe ratio as mentioned in bill of quantities. Polymer modified mortar to be prepared in small quantities that can be consumed before open time mentioned by manufacturer. The polymer modified mortar should be applied in layers and bond coat to be applied after each layer.

2. Structural repair to RCC Pardi, Chajjas Ceiling using "Non Polymer Built up Method:

a. Remove the deteriorated concrete portion carefully with small chisel and hammer.

b. Clean the exposed reinforcement steel thoroughly using wire soft brush and metal scrapper.

c. Apply corrosion control treatment on the reinforcement with soft brush and as per manufacturer's instruction.

d. After cleaning the surface thoroughly provide & apply passivator coat on the reinforcement with soft brush and allow the coating to dry as per manufacturer's instruction.

e. Prepare polymer bond coat as per manufacturer's instruction and apply the same on the exposed RCC portion to be treated, wet on wet provide cement mortar 1:3 embedding metal No.1 to achieve required RCC surface level.

Note: The Payment of this treatment will be made as per surface area no extra payment will be made for
chemical used.

3. Jacketing of Columns:

a. Provide the load release system to the RCC members adjoining the RCC member to be treated. No work to be started without load release system is provided.
b. Break open the brickwork, up to at least 2' around the structural member to be jacketed.
c. Excavate the floor up to the depth as instructed by the consultant.
d. Provide well compacted 230 mm thick rubble soling and provide 150 mm thick M 15 PCC.
e. Provide reinforcement as per the details given by the consultant. After casting of footing remove the loose concrete portion of RCC members to be jacketed. The exposed steel to be treated by corrosion control treatment followed by passivator coat. If the depth of deterioration is more, immediately micro – concrete to be provided with required shuttering to the deteriorated portion.
f. Provide shear connector as per the details given by the consultant.
g. Provide required formwork around the damaged structural member. The thickness of jacketing should be as per the details given by the consultant. At a time, jacketing should not be done more than 4' in height. The ratio of concrete to be M 25 or as specified by the consultant.
h. Remove the shuttering as per instruction of consultant. After providing proper hacking the surface
should be cover with Jute, cloth and continuously kept wet for minimum 7 days.

Note: 1). Finish surface area will be considered for payment.
2). Reinforcement steel will be paid extra.

4. Repairing of Damaged Brickwork:

a. Rake opens all the loose mortar from the brick joints and cleans the same properly.

b. Apply 1:3 cement sand mortar on the deteriorated areas embedded with small pieces of brick bat to
achieve required level. All the loose joints should be grouting with the mortar.

Note: Measurement for this item will be on per Sq. Met. basis.

5. Waterproofing to Chajja

a. Remove the existing Waterproofing layer completely up to the bare concrete with the help of chisel & hammer using chisel at an angle to ensure that the concrete does not get damaged.
b. Visible cracks in the concrete to be open in "V" groove shape and these cracks to be filled up with cement mortar 1:3 with addition of polymer at 20% by weight of cement.
c. Small pieces of Brick Bat or metal No. 2 to be laid up to 2" thick with CM bedding 1:4. After curing this surface to be finish with 1 ½" thick IPS smooth finish with false marking.
d. Watta to be finish in half round shape with drip mould at the junction.

6. RCC Coping on Parapet Wall Top:

a. Remove the existing treatment on parapet wall top and side.
b. Provide RCC coping complete with shuttering having minimum 1" projection on either side of the parapet wall. The thickness of concrete to be average 4" with slop inside the terrace area. The concrete grade should be M 20.

Note: 1) Reinforcement will be paid extra.
2) The payment will be done on Rmt. unit.

6. External Sand face Plaster – 25mm thick (10 to 15 mm first coat & 8 to 10 mm finish coat :

a. Erect safe & strong double bamboo scaffolding on the external surface without puncturing the walls, Mechanical anchoring can be provided from the RCC surface.
b. Provide ply protection system to the windows and other openable area as per instruction of the consultant. Provide screen of jute / PVC screen / horizontal safety nets around the scaffolding to prevent the flying debris while removing the existing plaster. Intermediate platforms if required to be provided as per instruction of the consultant.
c. Remove the damage plaster using chisel & hammer or using mechanical breaker as per instruction of the consultant.
d. Spot levels on the vertical surface to be taken to assess the thickness of plaster to be provided. If the thickness of plaster goes above 1 ¼" dash coat (extra coat of plaster) to be provided as per instruction of consultant. After curing of dash coat and after completion of structural and other treatments, 1st coat of plaster to be started using cement sand mortar 1:4. Plasticizer and waterproofing compound to be added in this mortar as per instruction of the consultant.
e. After minimum 4 days of curing, carry out the final coat in cement sand mortar 1:3. The final coat should be cured for minimum 14 days.

Note: 1) Pre –washed or pre-packed clean sand in bags to be used for the work.
2) All the mortar should be machine mixed and should be kept in trays.
3) If the existing RCC surface is without any hacking and new hacking is not possible due to hardness of concrete then polymer based bond coat to be provided on the RCC surface, where hacking is not provided, as per instruction of the consultant and this item will be paid separately.
4) In case of patch plaster, demarcation of unsound plaster to be done using Mechanical cutter & at the time of plastering, Polymer based Bond coat to be applied on the edges of the sound plaster.

7. Joint Stitching Treatment for Separation Cracks between RCC Members and Brick Work:

a) Open the joints clean the surface thoroughly by water jet.
b) Apply polymer based bond coat on the surface to be treated as per manufacturer's instruction.
c) Fill up the joint using cement mortar 1:3, Metal No. 1 is to be embedded in this mortar.
d) Grouting nipple to be fixed at the interval of 1.5m each. Pressure grouting is to be carried out to fill up the crevices inside the separation joints.

9. Internal Plaster (15 to 20 mm single coat) :-

a) Erect safe & strong scaffolding wherever required without making any holes in the existing structure.
b) Carefully break the plaster using chisel & hammer. The collected debris should be removed from site on a regular basis, & daily cleaning is to be carried out to avoid inconvenience to the members.
c) Treat the separation cracks between RCC members & brickwork by joint stitching treatment.
d) Provide & apply single coat of Cement Sand Plaster in ratio 1:4 with addition of plasticizer as per instruction of the consultant. The finish surface should be in one

level and to be finish with Neeru / POP as per instruction of the consultant. The curing to be done by sprinkling the water using spray pumps.

10. Plumbing Work Water Supply down take Lines:

a) Contractor should make ready the required pieces of down take lines by way of cutting, threading in advance before starting the work.

b) As mentioned in the BOQ GI /UPVC pipes to be used for the work. Suitable clamping arrangement should be provided to keep pipe lines away from the wall surface at least 2".

Note: 1) This item will be measured in running meter and length of branches and fittings will be added.
2) Temporary lines will be paid extra.

11. Replacement of Connector Pieces:

a) Provide through and through hole in the wall using chisel made out of hollow pipe so that internal tile finishing is not disturbed.
b) Provide new GI connector piece with antioxidant coating and PVC sleeve inside the wall.

Note: 1) This item will be paid per no. of connector pieces (rate shall be inclusive of all accessories,etc.)
2) Due to nature of work chances of damage to the internal surface is likely to happen so contractor to intimate individual member accordingly and the work should be done very carefully with due diligence and workmanship to ensure minimum damage. Despite of all due care, if there are any internal damages, Contractor shall not be held responsible for the same. In case of any such damage occurring due to recklessness, improper work methodology, etc, Contractor shall be held responsible for such damage / loss.

12. External Painting (7 year warranty)
Asian Paint Apex Ultima – 2 coats with one coat primer

a) Erect the scaffolding without making holes in the wall surface. Dry brushing to be done to clean the surface followed by cleaning the surface with water jet machine.

b) The shrinkage and surface cracks using grinder machine and these cracks to be filled up with non shrink cementations crack filling material as instructed by the consultant.

c) Provide and apply the external paint as per manufacturer's instruction. The representative of Paint Company should certify each and every step of external painting work.

SECTION – L

TECHNICAL SPECIFICATIONS OF MISCELLANEOUS ITEMS

1. Scaffolding:

1. Independent or double or double pole Bamboo scaffolding shall be erected with two sets of vertical bamboos 2'6" X 3'0" centre to centre, the inner bamboo being 3" to 6 away from wall surface.
2. No holes shall be made in the walls or slab to support the scaffolding.
3. Every scaffold shall be braced by means of longitudinal & transverse bracing system so as to form a rigid stable structure. So also every scaffold shall be effectively tied to the windows or box grills to prevent movements of scaffold either way or towards the building.
4. Where heavy wind or gale force is expected, it would be necessary to take special precautions and install additional ties to the scaffold to prevent overturning & Collapse.
5. Guide rails and toe boards shall be provided for all working platforms to ensure safety of workmen.
6. Workmen shall not be allowed to work on scaffolds during storm or high winds.
7. During dismantling of scaffolds necessary precautions shall be taken to prevent injury to persons due to fall to loose materials. The bracings and other members of the scaffold shall not be removed prematurely, while dismantling the entire scaffold, so as to avoid danger of collapse.
8. When scaffolds are to be used for along period, the scaffolding shall be inspected from time to time to ensure its stability and rigidity.
9. The ropes and pulleys used in hoisting or lowering materials shall be of durable quality, adequate , strength and free from defects.

2. Protection System for Windows:

The existing Aluminum / Wooden windows of all the flats should be covered carefully with ply wood/ GI sheets. The plywood should be fixed properly with due care and should be fixed in such a fashion that the windows can be opened when the repair work is not in progress. It will be the contractor's responsibility to safeguard the glass panels. Any damage cause to windows / glass panel after providing ply protection will be at contractor's cost.

3. Removing and Re fixing of Weather Shades:

The existing Aluminum weather shades obstructing the repair works should be removed carefully, so as to cause minimum damages to the same. The removed shades should be stacked properly with due care and should be re-fixed with whatever necessary modifications after the entire work is over. If the weather sheds is in deteriorated condition before starting the work, contractor should informed the School and consultant in writing before removing the weather sheds, in such case flat

owner will supply the required material and contractor will complete the work using combination of existing and new material.

4. Removing and Re fixing of M. S. Grills:

The existing MS grills which are projecting out side the building face and obstructing the repair works to be carefully removed by using welding / cutter machine. Contractor has to stack the removed grills carefully with identification marks. After completion of the work the same to be re fixed with addition of MS hold fast or any minor welding work. If the MS grill work is in deteriorated condition before starting the work, contractor should informed the School and consultant in writing before removing the grills.

SECTION- M

BILL OF QUANTITIES

GENERAL

* The Bill of Quantities shall be read in conjunction with Conditions of Contract and Specification as these documents are jointly explanatory and descriptive of the works included in the Contract.

* Special Condition of Contract Specifications and descriptions of work and materials given elsewhere in the Contract documents are not necessarily in the Bill of Quantities and they form part of Bill of Quantities. Reference is to be made to the other documents for information.

* A price or rate in figures is to be entered against the item in the Bill of Quantities, whether quantities are stated or not. Item against which no price is entered will be considered as covered by other prices or rates in the Bills.

* "Providing and Fixing" shall mean that the Contractor has to provide such materials not being procured and borne by the School, but which are required for the items and if no materials need to be provided by the Contractor, the rate shall be only for fixing of the component covered in theitem.

* The quantities of work and material in the Bill of quantities for given scope of work are approximate and may vary based on actual site conditions. Actual quantities executed and measured shall be paid based on certified/approved actual measurements of work by the Consultant.

* Any item whose quantities are exceeding more than 15% of estimated BOQ quantities, the contractor Shall immediate bring to the notice of the School / Consultant. Such exceeded quantities shall be executed only after receipt of confirmation from the School & Consultant. Whenever such item is encountered, the contractor shall evaluate to what extent the quantity of such item may exceed to enable the School/Consultant take a decision on such items. Any items of work executed beyond 115% of the estimate BOQ quantities, without written consent from the School & Consultant, shall not be measured and paid.

* All 'lumpsum' items in the BOQ would be paid on execution of such work and in proportion to the progress of work of those items to which such 'lumpsum' items are related or at the discretion of the Consultant.

* Any work which is specifically not listed out **separately** as payable item, but required for proper completion of any specific item of work in the BOQ, shall be considered deemed included in such specific item of work. No separate payment shall be made for all such incidental works.

* All chemicals, polymers brought to site, which are listed out in BOQ as separately payable item, would be paid only based on actual consumption in work. Consumptions beyond approved proportions / manufacturer's specifications as well as wastages will not be measured or considered for payments.

* Contractor is required to strictly follow the approved mixes/proportions or Manufacturer guidelines (as the case may be) with regard to usage of these chemicals, Polymers. Contractor shall maintain records/logs of usage of these chemicals, viz-a-viz corresponding quantum of work done.

* Working platforms and other enabling works for labour, etc are considered as incidental works and no separate payment for such items would be made. All such incidental works are deemed to be included in the units rates of plastering, painting and other such items for which these incidental works are required.

* All care shall be taken while carrying out dismantling works to avoid damage to other works. Due care shall be taken while dismantling plaster to avoid excessive hacking or damage to the brick/block work.

* Scaffolding, working platforms, Jhula and other enabling works for carrying out Painting Works are considered as incidental to Painting Works and no separate towards this account shall be admissible.

* The acronyms used in the Bill of Quantities.

Cu.Met.	Cubic Meter
Sq.Met.	Square Meter
Rmt.	Running Meter
Kg.	Kilogram
L.S.	Lumpsum
Nos.	Numbers
QRO	Quote Rate Only

SECTION VII
LIST OF APPROVED MAKES/BRAND OF VARIOUS BUILDING MATERIALS

Unless otherwise mentioned specifically, any one of the following approved makes or brands shall be allowed to use. Other makes or brands of the building materials bearing I.S.I. monogram on the material itself will also be allowed to be used.

The Contractors should distinctly understand that it will not be their prerogative to insist on using a particular make/brand from the following list. The final selection will have to be done with the approval of the Architects.

S.NO.	MATERIALS	APPROVED BRAND
1.	Water Proofing Compounds	'IMPERMO', 'ACCOPROOF', 'SUPERSEAL'.
2.	A.C.Sheets	'EVEREST'/CHARMINAR.
3.	White Cement	A.C.C. (Silvicrete) Birla White 'AMBUJA', 'J.K.'.
4.	Rolling Shutters, Rolling grills Sliding & folding grill doors.	'SWASTIK', 'HERCULES'.
5.	C.I.Rainwater soil and waste water pipes and fittings.	'T.D.SULEKHA', 'NAREALWALA 'P.M.PVT. LTD.'.
6.	S.W.Pipes	'NAVROJI VAKIL', 'KHANAPURA', 'CASHIMIRA', 'BURN & CO.', BHARAT.
7.	R.C.C. Pipes	Indian Hume Pipe Co. Premier., Pranali Hume Pipe Industries (P) Ltd, Shreeji Pipe Industries.
8.	Water Pipes and fittings (C-Class)	As per I.S.I. standards wherever available otherwise as per - Hydraulic Engineer's requirement.
9.	Building Hardware	'SHALIMAR (I.S.I. Mark)', 'CIEF'.
10.	Oil paints, Distempers and other paint materials (1st quality brand of - one of the following makes)	

S.NO.	MATERIALS	APPROVED BRAND
	'A' Plastic Emulsions & Synthetic Enamels	'ASIAN', 'JENSON', GOODLASS' 'NEROLAC', 'GARWARE', 'NICHOLSON'.
	'B' Dry Distemper	'JENSON', 'NICHOLSON', 'GARWARE', 'SHALIMAR'/
	'C' Oil Bound Distemper	'ASIAN', 'JENSON-NICHOLSON', 'NOBLE'.
	'D' Water Proof Cement Paint 2 Coats cement paint + 1 coat sand texture. .	'SAND-TEXMATT', ASIAN', COLOURCEM SUPEREME , SNOWCEM PLUS, NEROCEM.
	'E' Wood Primer	'ASIAN', 'JENSON-NICHOLSON', 'GOODLASS NEROLAC'.
	'F' Metal Redoxide Primer	'ASIAN', 'JENSON-NICHOLSON', 'GOODLASS NEROLAC'.
	'G' Aluminium Paints	'ASIAN', 'JENSON-NICHOLSON',
	'H' Anti-Corrosive Bitumenous Paints.	'ASIAN', 'JENSON-NICHOLSON',
	'I' Wood Preservatives	'SHALIMAR', 'GARWARE'.
	'K' Water Proofing	INDIA WATER PROOFING, LEAK PROOF INDIA LTD., OVERSEAS WATER PROOFING.
11.	Soil Treatment Agencies	'PEST CONTROL INDIA PVT. LTD., 'BEE 'N' PAST CHECK'.
12.	Aluminium Doors & Windows	M/S. JUPITAR, JINDAL,M/S. AJIT INDIA PVT. LTD., M/S. CRYSTAL CORPORATION, M/S. LEO ALUMINIUM.
13.	Decorative Texture	M/S. TERRACO.
14.	Structural Glazing	M/S. HINDUSTAN PILKINGTON & TRIVENI.
15.	Thermocol Shalitex Board	Heavy Duty Thermocol, Shalimar Tex product.

S.NO.	MATERIALS	APPROVED BRAND
16.	Expansion Joint Sealant Polysulphide	Chocksey Chemicals, Roff, Pidilite, I.C.I. Asian.
17.	Silicon Sealant	G.I.Silicon.
18.	Cement 53 grade & 43 grade	ACC, BIRLA GOLD, BIRLA SUPER, GUJARAT AMBUJA, RAJSHRI & L& T, VASAVDUTTA/BINAMI
19.	Steel	TATA, SAIL,VIZAG,
20.	Bricks	Clay bricks fully burnt, minimum crushing strength 35 kg/sq.cm. Water absorption maximum 20 %.
21.	Costruction Chemical & water proofing chamical compounds	Protage, construction chemical /Par/Krishna/Conchem/Innovatives / /Force/Sunanda/ Sika/Perma or any other as specifed by consultant
22.	River Sand	Silt less than 5% by valume (Mahad sand not aprroved).
23.	Water	Patable water. .
24.	Anchor Fasteners	Fisher
25.	Epoxy	Ciba
26.	Paver Blocks	Nitco,Gubbi pavers,Suprem,Johnson.

S.NO.	MATERIALS		RELEVANT I.S. NO WITH LATEST REVISION		
20.	Stoneware Pipe & specials	Grade 'AA' of locally available make	I.S. 651	-	1980
22.	C.I.manhole covers frames & gratings.	Best locally available	I.S. P & I-VII & I.S. 5961	-	1726 1970
23.	C.I. S & S 'LA'	I.S.I. marked IISCO or 'KESORAM'.	I.S. 1536	-	1976
24.	Mallcable G.I. specials.	I.S.I. marked of 'R' brand or equivalent. approved.			
25.	Sanitaryware	"Hindustan Sanitary ware, Parryware or Neycer.	I.S. 42556		P & I-IV
26.	PVC 10 litres high or low level tank.	"Commander" "Everlas" "Easyfloor" flushflo or equivalent.	I.S. 231	-	1974
27.	S.S.bed pan	All India Trading Centre Bombay or other approved.			