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I - INSTRUCTION TO TENDERER

1. The successful tenderer will have to enter into a written Contract Agreement with the Employer. The terms and conditions are enclosed herewith.
2. Tenderer must fill in all blank spaces in the form of the tender in neat, legible and correct entries, both the figures and as well as in word. Alterations, erasures and indistinct figures should be avoided. Failure to quote against all the items in schedule of rates/ prices/ materials/ labour, tender is liable for rejection.
3. The tender should be signed in long hand dated and witnessed at all places provided therein. Also, all pages, drawings, corrections/ alternations should be initialised
4. Tendered must be careful to deliver a bonfire tender. Any tender which proposes any alternations to any of the conditions laid down which proposes any other conditions or any description whatsoever is liable to be rejected.
5. Tenderers must include with their tender, a list of clients for whom they have carried out similar work in the past.
6. Intimation of tenderer's quotation by a telegram will not be considered.
7. In view of the postal and other delays, the tenders should be posted sufficiently in advance of the last date fixed for receipt of tenders or be sent by a special messenger. Tender received late shall not be considered for acceptance.
8. Tenderer shall note that the rates quoted against each item shall be valid for execution of that item with that rate at any height/ depth; at any floor, inside or outside the building.
9. Quantities indicated are only approximate and are only for the purpose or providing common basis for evaluation. No claim whatsoever shall be entertained from the contractor if the actual quantities or items of work differ from those indicated in the schedule.
10. Unit prices shall be quoted for all items and shall be firm. If rates or prices are not quoted against any of the item, it shall be deemed to have been covered in prices quoted elsewhere. These rates shall include all plant, labour, materials, all temporary works, supervision, insurance and every incidental and contingent cost and charges whatsoever required to complete the item of work in all respects confirming to related specifications.
11. The tenderer shall be deemed to have been allowed in his rates and prices for the provision, maintenance and final removal of all temporary works of whatsoever nature. No specific item of any or particular temporary shed/ work will be measured and paid separately.
12. Contractor shall submit the list of projects; which includes GMP specification and should have handled projects of equal or more value.
13. Civil and technical bids shall be made submitted in separate envelopes.

14. Audited balance sheets for the last three financial years shall be submitted (refer note below). As a minimum, the average Net Worth for the last three financial years (2014-15, 2015-16 and 2016-17) should be positive.

Note: In the event that the audited accounts for the latest Financial Year are not available, the Bidder shall furnish information pertaining to last three financial years after ignoring the latest financial year. In case the bidder submits audited financial information for the last four or more years, only the figures for the latest three years shall be considered for evaluation.

II - SCOPE OF WORK

1. GENERAL

- 1.1. The contractor shall perform the work and services based on GENERAL as well as SPECIAL TERMS AND CONDITIONS. The scope of work includes complete job with labour and supply of materials including transportation, handling and storage, construction aids, tools and tackles, consumables, supervision, labour, temporary facilities to execute the project work.
- 1.2. The site is situated on the plot of M/s.GANDHAR OIL REFINERY (INDIA) LTD. at TALOJA, MAHARASHTRA. The contractors are instructed to visit the site, assess all local problems like material availability, transport, road access to the site, labour availability, water, electricity, octroi, local taxes etc. before tendering. No extra shall be allowed by the owner for any reason, beyond the schedule rates, once fixed in the tender. Contact Mr. Hemant Keskar (site in-charge) in case of site visit.

2. SCOPE OF WORK

- 2.1. The scope of work covers the supply of materials and construction work of the building and facilities listed below.
- 2.2. Broadly the scope of Work includes construction of the following as described:
 - a) Construction of Process plant, Warehouse & Tank farm including all facilities as per drawings attached along with the tender.
 - b) Construction of In-Plant roads as per layout drawings.
 - c) Construction of compound wall as per drawings and specifications.
 - d) Grading of the entire plot to the required level from the natural ground level as specified (To match with the adjacent plot and the connecting road
 - e) Miscellaneous utility structures like under-ground water tank, transformer area, DG room and pipe racks etc.
- 2.3. Compliance with all statutory regulations as per Project site rule.
- 2.4. Temporary water storage tank for construction and other needs of the Contractor is at contractor's cost.
- 2.5. Providing/installing necessary pipes, fittings, hoses, pumps etc. for distribution water to various points of construction from one source (Provided by client on free of cost) of water supply is at contractor's cost.
- 2.6. Providing / installing necessary fittings, cabling etc. for installing electrical cable earthing, lighting shall be at contractor's cost.
- 2.7. Client will provide temporary connection on free of cost at one point near to the construction site. But the contractor has to arrange necessary cables and fittings for providing power points to required locations.

2.8. Contractor's Supply:

All survey instruments for setting out work, all necessary construction equipments including excavator, mixer machine, welding set, necessary steel scaffolding with all fixtures, shuttering material like plywood, steel plates and other forms, shaws etc. shall be arranged by the Contractor 'free of cost as per instructions of Owner / consultant.

Main buildings			Ground floor in m2	Total Built up in m2
1	Process Plant	RCC (G+1) Structure (60X26)	1560	3120
2	Ware House Building	PEB Structure (48X48)	2304	2304
3	Main Tank Farm Area	Ground RCC Structure ((38.65X20.3) + (27.05X29.3) + (21.25X23.5))	2076	2076
4	Process Plant Tank Farm	Ground RCC Structure (40.5X21.5)	870.75	870.75
Utilities				
5	Rain Water /Fire Water Under Ground Tank	RCC Under Ground Pit (10X6.975)	69.75	
6A	Roads and Drains	WBM Roads with Bitumen (length=425, width=6m) & (length=110m, width=12m)	535RMT	
OR				
6B	Roads and Drains	Cement Concrete	535RMT	

3. LABOUR ACOMODATION

Space for labour camp will be allocated at the location given by site in charge.

III- SPECIAL CONDITIONS OF CONTRACT

FOR CIVIL WORK

1. MOBILISATION

The contractor will mobilize his active manpower within 7 days of Letter of Intent / Order and the work shall commence immediately. Necessary site offices including site office for client/consultant (approximate area 25 sq. m) shall be constructed by him at his cost including cost of cement.

2. STORAGE SHED

The Contractor has to construct the cement storage shed to accommodate at least 5000 bags at his own cost. He shall ensure that the shed is not damaged and bags are sufficiently spread out without undue compaction of the bottom bags. The bags should be covered with moisture-proof material.

3. COMPLETION TIME

- a) Process Plant – Shall be ready for Mechanical erection in 4.0 Months
- b) Non-Plant building – Shall be completed in 6.0 Months

4. SITE SUPERVISION

The contractor should depute at least 1 Sr. engineer, 1 Junior Engineer & Supervisors to look after the site activities continuously. Apart from the above personnel a very senior Executive of the Company shall visit at least once in a week for progress review and management.

Contractor has to provide an organization chart to be deployed at site during construction, along with the tender.

5. CONSTRUCTION FACILITIES

These shall be basically for water and power and shall be in the SCOPE OF CLIENT.

6. PROGRESS REPORTS

All reports, progress charts etc. as required by the Site-in-charge shall be kept available at CONTRACTOR'S site office and he shall also submit at his own expense copies thereof to the Site-in-charge. Contractor has to submit details of construction programme mentioning all activities and time required for construction of each activities in the form of a bar chart for proper monitoring of the Project progress, Daily report is required which contains details of daily skilled and unskilled labours and machine, cement consumption, RCC casting details, fabrication details etc.

7. SECURITY

The Contractor shall be liable for security of all the material brought to site by him issued by the Owner / Engineer.

8. SAFETY

The Contractor shall observe and comply with safety procedures work permit systems and any other such regulations / procedures of Owner and also ensure that the children of workers are not allowed within the working area. All necessary personnel protection equipment (PPE) to worker and staffs as per safety rules such as safety belt, helmets, safety shoes etc. shall be provided during construction.

9. LIGHTING

Providing / installing necessary fittings, cabling etc. for installing electrical cable earthing, lighting shall be at contractor's cost.

Client will provide temporary connection on free of cost at one point near to the construction site. But the contractor has to arrange necessary cables and fittings for providing power points to required locations.

The Contractor shall provide adequate flood lighting for carrying out the works in the night time, if allowed by consultant's site representative in-charge or owner's site engineer.

10. WATER

Providing / installing necessary pipes, fittings, hoses, pumps etc. for distribution water to various points of construction from one source (Provided by client on free of cost) of water supply is at contractor's cost.

11. CONSULTANT APPROVAL

The Contractor shall follow strictly the standard procedures and obtain consultant's representative's approval before proceeding with further work (before concreting contractor will provide pour card before engineer then after checking and approval engineer will give permission for concreting). In case of concerning work at night, adequate lighting shall be available apart from the necessary supervision, use of vibrators, etc. The pour card shall be approved during daytime before concerning. The contractor shall ensure that at least 4 mixer and 8 vibrators in working condition is available all the time at site.

12. RATES FOR EXTRA/DEVIATED ITEMS

Rates for all extra/deviated items shall be derived from the existing rates only. In case it is impossible to derive the same, the rates shall be arrived on the basis of labour plus material plus 5% to 20% overhead. With prior approval before start of work.

13. VALIDITY OF THE RATES

Tender rates shall be FIRM and valid till the completion of work. Also, the rates shall be valid up to the contract value \pm 25%. The quantities indicated are approximate only and are liable to change. However, contractor shall be paid as per actual quantity and the unit rates in BOQ are firm fixed not subject to any escalation during the tenure of the contract.

14. SITE CLEAN UP

The Contractor shall ensure that site is kept clean at all point of time. At the time of completion of works, all work parts shall be cleared off and all unwanted material removed from the site. Proper house keeping all the time shall be maintained by keeping contractor's materials in proper stacks and timely removal of surplus materials and debris etc.

15. PERIOD OF FINAL MEASUREMENT

The final Bill shall be submitted after the completion of work. Final Bill shall be paid within 2 months from the date of submission of the Bill and completion of reconciliation of free issue materials in all sheets shall be done in same manner.

16. CONSTRUCTION MATERIAL

All materials used for construction shall confirm to the relevant IS specifications and would be selected amongst the best within 25 KM from the work site. The Engineers / Consultant will have the authority to reject any material which in his opinion is considered not good.

Sand shall be used after screening for all construction works. Sand shall be brought of approved quality from approved source. For specification of metal (20mm, 40mm) sand, brick and particularly of murrum like sieve analysis, silt content, crushing strength etc refer technical specification.

17. FREQUENCY OF R.A. BILLS

Cumulative R.A. Bills shall normally be raised once in a month and shall not be less than the value of Rs.5,00,000/-.

18. TERMS OF PAYMENT

This is an item rate contract. The terms of payment will be as follows, however necessary modifications or alterations can be done during negotiation.

- a) You will be paid 5% (project cost) mobilization advance against the submission of BG of equal amount, as and which will be deducted from your R.A bills on pro rata basis. The R.A bill amount will be minimum Rs. 5 Lacs.
- b) 60% of R.A. Bill shall be paid within 8 days from date of submission. Balance 30% shall be payable within 3 (three) weeks after due verification and certification from the consultant. However, payment against each R.A. Bill will treated as ad hoc payment.
- c) Retention money shall be deducted by 10% from each R.A bill. Out of this 5 % shall be paid after final completion certificate. The remaining 5 % shall be paid after defect liability period of 12 Months.
- d) Contractor shall be paid 50% of the cost for the amount of material brought on site after getting the bills of material certified by the consultant. Prior to bringing the material to site, client should be informed and permission of engineer – in – charge is should be taken in this regard. The same will be

deducted from the subsequent two running bills equally. Contractor shall be responsible for the safety of material and for the structure under construction till the time of completion of the contract.

(This will be applicable for selected materials only)

Payment shall be made in the form of cheque payment/ RTGS.

- e) Claim for interest on delayed payments will not be entertained by the owner.
- f) Rs. 10 lakh EMD or PG is required on civil cost.

19. CUBE TESTING

Concrete cube tests shall be arranged by contractor at his own cost. Test reports shall be submitted to the Consultant for approval. Contractor shall put a full-fledged lab in site. And details of testing procedures with equipment like cube testing proctor density, welding test, sieve analysis etc...

20. EMPTY CEMENT BAGS

Empty cement bags shall be the property of the contractor @ Rs. 2.0 per bag.

21. WASTAGES

All wastage shall be to the contractors account for materials procured. Site shall be made clean of all wastages like steel scraps, brickbats, sand, aggregate, cement bags etc.

For measurement of weight of round bars, ISI code only shall be considered. No rolling allowance shall be made while making measurement (Measurements shall be as per IS 1200.) Wastage upped the accepted norms will be allowed for materials issued by owner. Wastages beyond the IS specified limits will be back charged to the contractor on a penal rate basis and these rates are:

Rs.400/- per bag for cement

Rs.50, 000/- per metric ton for reinforcement steel

Rs.60, 000/- per metric ton for structural steel.

For all other material procured by contractor all wastage shall be to the contractor's account.

22. Material Reconciliations

22.1. Every month the Contractor shall submit an account of all the materials issued by the Owner / Consultant 'free of cost' and the consumption in the works carried out in the proforma prescribed by Owner / Consultant. This statement of material reconciliation to be submitted with each RA bill and finally in the final bill by maintaining proper control and as per Owner's format.

The following scrap allowance by weight is permissible. The percentage allowance shall be accounted on the basis of consumed quantities in installation / construction as per approved drawings as mentioned below:

Salvageable Method of accounting

Cement unaccountable	-	±0.5%
Reinforcement bars	2.0% wastage	0.5% invisible wastage & 1.5% cut off surpluses.
M.S. Plates & Steel Sections	including rolling margin.	2.0% wastage & 2% cut off surpluses

22.2. Any unused / serviceable quality of material not returned and wastage beyond specified limits shall be charged at penal rate at 125% of last purchased value of that item, i.e. cement, reinforcement steel, structural steel. Cement bags are the contractor's property and the same shall be charged to the Contractor at the rate of 2.00 rupees per bag. Contractor shall return the cut off surpluses to Owner's Stores steel / reinforcement scrap of all sizes shall be acceptable. Contractor shall maintain necessary records. Complete reconciliation statement shall be submitted by Contractor for all materials issued by Owner.

23. FACILITIES TO OTHER CONTRACTORS ON SITE

The contractor shall give all reasonable facilities of access, use of roads, etc. to the other contractors at site and shall keep the roads, drains and building area clear of heaps of earth.

24. CONTRACTOR'S SUPPLY:

All survey instruments for setting out work, all necessary construction equipments including excavator, mixer machine, welding set, necessary steel scaffolding with all fixtures, shuttering material like plywood, steel plates and other forms, shaws etc. shall be arranged by the Contractor 'free of cost as per instructions of Owner / consultant. (Contractor will submit the list of equipments/machineries which will be mobilise at site.)

25. LABOUR ACOMODATION

The contractor shall arrange accommodation for all labours outside the premises at his own cost and accommodation should contain proper WC and bathing arrangement.

26. DAMAGE TO PROPERTY

The Contractor shall take care not to cause any damage to the property fencing, water piping and other structures, monuments, reference points if any at site any damage caused by the Contractor, his employee agents, workmen, machinery, accidentally or otherwise shall be made good by him at his own cost and any expenditure if incurred by the employer on account of any such damages caused and left unattended and or unprepared properly, shall be recovered from any moneys due to the Contractor. Insurance for third party and site insurance for all the workers of contractor will be contractor's responsibility.

27. OVERTIME WORKING

No extra payment shall be made to contractor for overtime working of labours and supervisory staff.

28. No material shall be allowed to be taken out from site without Owner/Consultants approval. All material going out from site shall be through a regular gate pass system.

29. SUPPLY OF CEMENT & STEEL

Cement, reinforcement and structural steel shall be issued **free of cost** from main stores. All loading, unloading, drawing materials from stores etc. shall be carried out by the Contractor at their cost.

Contractor has to furnish the monthly requirement of free issue items and to be submitted to stores in advance duly approved by consultant / engineer – in-charge to avoid delay in material procurement.

30. Taxes levies, duties and royalties:

The tenderer to include all the above in their quoted price including sales tax, as applicable in MAHARASHTRA. In case of any variation on tax, royalty, duty levy from that applicable on the date of submission of revised offer the quoted price affected will be adjusted.

In case of imposition of new duty, tax, levy etc. the same will be reimbursed on production of documentary proof on this account.

31. **Insurance:** ESI on this work is applicable. In lieu of liability against workmen' they will be covered by insurance.
32. TDS on GST as applicable. The contractor shall strictly follow and comply with all statutory rules and regulations viz. Contract Labour Law, insurance coverage under Workmen's Compensation Act, P.F, Minimum Wages Act etc. as applicable as well as safety regulation prevalent as usual. Work Contract Tax shall be at contractor's scope.
33. All works shall be carried out as per approved drawings and will be paid at unit rate indicated in the BOQ. Rate shall be valid for any variation in quantity. No escalation in the rates shall be applicable during the currency of the contract

IV- BILL OF QUANTITIES

PART- A: EARTHWORK, EXCAVATION & BACKFILLING:

SR. NO.	DESCRIPTION	UNIT	QTY.	RATE (RS.)	AMOUNT (RS.)
A	SITE GRADING: -				
A-1	Clearing of all vegetation and objectionable organic materials, scrapping of top 300mm layer of virgin soil for the entire plot including carting away disposing burning, etc. anywhere outside the plot as specified and directed.	M ²	10000		
A-2	Excavation in all kinds of soil other than rock for foundations including trenches pavements, manholes, wall footings, Pipelines, tanks, etc. including shorting, dewatering, back filling in layers not exceeding 230mm, watered, rammed and consolidated carting away surplus excavated earth to areas of disposal within 150m lead where it will be spread and levelled etc. complete as specified and directed. All deviations, etc. shall be carried out at their cost.				
	a) 0.0m to 2.0m	M ³	6000		
	b) 2.0m to 4.0m	M ³	3980		
A-3	Same as item No: A-2 But including dewatering with pumps or manually from excavation pit.				
	a) 0.0m to 2.5m	M ³	Q. R		
	b) 2.5m to 4.0m	M ³	Q. R		
A-4	Earth work for site grading in filling using selected & approved available excavated material up to any height from natural grade level to achieve finish grade level etc. including the initial compaction of the cleared and stripped ground surface, in layers not exceeding 150mm thickness including all leads/ lifts within the plant boundary and including loading from stock piles, carting, unloading, filling, watering, compacting each layer, dressing of final grade level, sides of slopes, levelling and dressing, all labour, tools & tackles, handling, equipment, etc. complete as per specifications, drawings and as directed	M ³	15000		

SR. NO.	DESCRIPTION	UNIT	QTY.	RATE (RS.)	AMOUNT (RS.)
A-5 (i)	Same as item A-2 but in soft rock using chiselling and piece axe for removal				
	a) From 0.0 m depth to 2.50 m	M ³	Q. R		
	b) From 2.50 m depth to 4.0 m depth	M ³	Q. R		
A-6 (ii)	Excavation in hard rock with the help of pneumatic / hydraulic hammer, chisel, etc. including shoring, structing, pumping of water & carting away surplus material & stacking, etc. complete as per drawings specification & as directed by: - From 0.0 m depth to 3.0 m depth. From 3.0 depth to 4.0 m depth	M ³ M ³	Q.R. Q.R.		
A-7	Providing and Filling in plinth, low lying areas, underground tanks, trenches grade slabs etc. with approved quality earth / murrum / sand etc. including transporting loading, unloading and spreading in layers not exceeding 230 mm thickness including ramming, watering, consolidating to attain compaction at optimum moisture content, levelling to required levels and slopes etc. complete as directed and specified as under				
	a. Filling with approved quality earth / murrum, sand etc. available from item No. A-2/A-3 having plasticity Index-12 and max. Laboratory dry density not less than 1.5 gm/cc, well graded with max. Particle size not more than 75 mm.	M ³	4200		
	b. Same as above item (a) but brought from sources outside owner's premises arranged by contractor including purchase of earth excavation, loading, unloading and transporting etc. complete	M ³	4055		
	c. Filling with approved sand, but brought from outside sources including purchase, loading, unloading, transporting etc. complete.	M ³	1400		
A-8	Disposal of Surplus/Unsuitable earth available in above item A-2 outside the plot space including loading, unloading, transportation etc. complete as specified and directed.				
	a. Lead from site up to 1 km	M ³	7715		

SR. NO.	DESCRIPTION	UNIT	QTY.	RATE (RS.)	AMOUNT (RS.)
	b. Same as above(a) but extra over lead from 1 km to 3 km.	M ³	Q. R		
	c. Within Plant premises	M ³	Q. R		
	TOTAL OF PART – A				

PART – B – PLAIN & REINFORCED CONCRETE WORKS:

SR. NO.	DESCRIPTION	UNIT	QTY.	RATE (RS.)	AMOUNT (RS.)
B-1	Providing, mixing, tamping, placing, consolidating and curing plain cement concrete with necessary slopes as specified for foundations, grade slabs, ramps, sills, copings, trenches, filling to space etc. for any thickness and any depths and heights using graded coarse aggregate from 40 mm to 10 mm as specified and directed. (Shuttering if required shall be measured and paid separately under relevant items).				
	a. In 1:4:8 mix	M ³	981		
	b. In 1:3:6 mix	M ³	5		
B-2	Providing, mixing, placing, vibrating, curing and roughening to surface wherever required, reinforced cement concrete of mix M25 grade to required levels and shape at all heights and depths using 20 mm (max) to 6 mm size graded aggregate as per drawing and specifications but excluding reinforcement and shuttering, as specified and directed including all height & depth as per drawing.				
	a. In foundations, footings rafts, piers, pedestals, equipment foundations, pipe supports, plinth beams, columns up to plinth level, etc. inclusive of all required depth.	M ³	1600		
	b. In walls, trenches, sumps, manholes etc. including all required depths & height.	M ³	480		
	c. In floor slabs, beams, landings, balconies, chajjas, canopies, columns, etc. above the plinth level. Column up to 10m	M ³	800		

SR. NO.	DESCRIPTION	UNIT	QTY.	RATE (RS.)	AMOUNT (RS.)
	d. In floor slabs, beams, landings, balconies, chajjas, canopies, columns, etc. above the plinth level. Column between 10 to 20 m	M ³	750		
B-2a	Same as above item no. B-2 but using RMC a. In foundations, footings rafts, piers, pedestals, equipment foundations, pipe supports, plinth beams, columns up to plinth level, etc. inclusive of all required depth. b. In walls, trenches, sumps, manholes etc. including all required depths & height. c. In floor slabs, beams, landings, balconies, chajjas, canopies, columns, etc. above the plinth level. Column up to 10m d. In floor slabs, beams, landings, balconies, chajjas, canopies, columns, etc. above the plinth level. Column between 10 to 20 m	M ³	1600 480 800 750		
B-3	Same as above item No. B-2, but for use of reinforced cement concrete of Mix M15 grade in grade slab ramps, paving, etc.	M ³	Q.R.		
B-4	RCC for heavy duty paving	M ³	Q.R.		
B-5	Gravel Paving (150mm thk.)	M ³	Q.R.		
B-6	Extra over item No. B-3 for self-finished reinforced cement concrete for grade slabs, ramps, paving, etc.(M20) including finishing the top surface by floating the cement slurry and making it smooth to required line and levels etc., complete as specified and directed.	M ³	915		
B-7	Providing and fixing adequate cantering and leak proof, form work / shuttering for concreting to required shape size at any depth and height as per drawing and specifications including staging access and working platforms strutting bracing and removing the same after specified and directed. a. up to plinth level b. From 0 to 10m	M ² M ²	8650 3220		
	c. From 10.0M to 20.0 M	M ²	1450		

SR. NO.	DESCRIPTION	UNIT	QTY.	RATE (RS.)	AMOUNT (RS.)
B-8	Providing and laying at all heights and depths cement grout 1:2 under equipment / column base plates etc., including chipping the concrete surface, cleaning, laying, finishing the surfaces smooth, curing etc. complete as specified and directed.				
	a. 25 mm thick	M ³	3.5		
	b. In pockets of anchor bolts and voids	M ³	1.5		
B-9	Same as above item No. B-7, but with Non-shrinking compound of approved trail GP-2 of fosrock / equivalent, MC Bauchmie ACC.	M ³	0.4		
B-10	Providing and mixing with concrete / plaster / cement mortar additives to obtain guaranteed results as per manufacturer's specification				
	a. Waterproofing compound Impermo'. Payment will be made as per actual consumption.	Kg.	200		
B-11	Providing and placing in position in RCC works Steel reinforcements (including cost of binding wire) as per drawing and specifications, at all height and depths including carting cleaning, cutting, stacking, bending, tying etc. complete as specified and directed (fan hooks will be measured and paid under this item).				
	a. Plain M.S. rounds	M.T.	1		
	b. Tor steel	M.T.	350		
B-12	Fabricating and fixing and embedding in position M.S. plate or structural inserts in concrete or masonry as specified and directed.	M.T.	1		
	a. - do - for G.I. / MS pipe sleeves	Kg.	50		
	b. Fixing pipe inserts with puddle flange (MS/HDPE) (Pipe sleeve supplied by others).	Nos.	Q.R.		

SR. NO.	DESCRIPTION	UNIT	QTY.	RATE (RS.)	AMOUNT (RS.)
B-13	a. Providing and fixing in position holding down bolts in concrete or masonry of various diameters ranging from 12 mm to 50 mm including nuts, washers, sleeves etc. as per drawings including supply and fixing templates, supports, setting out etc. complete as specified and directed. For fixing necessary template shall be made for maintaining accuracy while casting in the concrete, Fabrication, etc. shall be payable as per structural steel fabrication rate.	Kg.	600		
B-14	a. Forming pockets for anchor bolts in concrete up to size of 100 x 100 x 200 including supplying and fixing all necessary templates, supports and setting out, including protecting the pocketing the pockets from filling up with concrete inside it.	Nos.	200		
	b. – do – for depth up to 300 mm.	Nos.	250		
	c. -do- for depth more than 300 mm size and more than 100 square.	Nos.			

B-15	Providing expansion joints around / in between equipment foundation, beams, columns, slabs etc. as shown in drawing with remoulded joint filler 'Shalitex' or equal and sealing with 25 mm deep mastic sealing compound as per IS 1834 type-B etc. complete as specified and directed. a. 12 mm thick b. 25 mm thick	M ² M ²	Q.R. 10		
B-16	Providing, laying and sealing construction joints 20 wide x 75 deep in concrete slab, by Hessian (jute) rope dipped in hot bitumen, tightly packed and sealing with mastic sealing compound as per IS 1834 type-B complete as specified and directed	RM	Q. R		
B-17	Providing and fixing rust proof expansion anchor fasteners at all heights, as per manufacturer's specification including nuts, washer bolts, scaffolding, drilling with electric drill etc. on concrete structures complete as specified and directed. a. For bolts -- 12 mm dia b. For bolts – 16 mm dia	Nos. Nos.	15 30		

B-18	Providing and pouring hot bitumen in the groove (10 mm x 25 mm) at contraction joints in concrete payment including cleaning of the groove, finishing the surface smooth etc. complete as specified and directed	RM	Q.R.		
B-19	Precast cover	M ²	200		
B-20	Providing, laying and embedding PVC pipe sleeve in grade slab, foundation, trenches, etc. including jointing, bending etc. complete as specified and directed a. 100 mm dia b. 150 mm dia d. 200 mm dia	R.M. R.M. R.M.	Q.R. Q.R. Q.R.		
B-21	Providing & fixing in position 6 mm thk. "Dump-Bell" type PVC water bar of FIXOPAN make or approved equipment manufacturer with centre bulb for const. Joints wherever necessary as per the drawings specification & as directed (Laps are not to be considered in measurements). 150 mm wide	R.M	50		

SR. NO.	DESCRIPTION	UNIT	QTY.	RATE (RS.)	AMOUNT (RS.)
B-22	Providing & fixing in position "Shalitex" of STP or approved equivalent pre-moulded expansion joint filler boards in joints as shown in drawing, etc. complete. 25 mm Thk. 12 mm thk.	M ³ M ³	20 5		
B-23	Providing and fixing in position holding down bolts in concrete or masonry of various diameters ranging from 12 mm to 50 mm including nuts, washers, sleeves etc. as per drawings including supply and fixing templates, supports, setting out etc. complete as specified and directed. For fixing necessary template shall be made for maintaining accuracy while, casting in the concrete, fabrication etc. shall be payable as per structure steel fabrication rate.	Kg	1600		
B-7	Providing isolation joints around / in between equipment foundation, beams, columns, slabs etc. as shown in drawing with pre-moulded joint filler of approved make and sealing with 25 mm deep mastic sealing compound etc. complete as specified and directed.				
	a. 25 mm thick	M ²	65		

B-8	25 THK and 25 mm deep joint sealant compound	M ²	13		
	TOTAL OF PART-B				

PART – C – MASONRY, PLASTERING & PAINTING:

SR. NO.	DESCRIPTION	UNIT	QTY.	RATE (RS.)	AMOUNT (RS.)
C-1	Providing and constructing first class country burnt bricks masonry of thickness 230 mm and above in specified cement mortar at all heights and depths for retaining walls, wall footings, parapets, partitions, steps, drains, manholes, trenches etc. including raking out joints, staging, scaffolding and curing etc. complete as specified and directed a. In cement mortar 1:5 in foundation and plinth b. In cement mortar 1:5 in superstructure at all heights	M ³ M ³	Q.R. 100		
C-2	Providing and constructing pre-cast concrete (grade D-5) block masonry in cement mortar 1:5 for walls, trenches, pillars, chambers etc as per specification for super structure for all height.	M ³	948		
C-3	Same as Item No.C-1, but thickness 150 mm in C.M.1:4 including RCC puttas and puttas standards etc. complete at all heights as specified and directed (reinforcement measured separately)	M ³	Q. R		
C-4	Same as Item No.C-1, but thickness 115 mm in C.M.1:4 including RCC puttas and puttas standards etc. complete at all heights as specified and directed (reinforcement measured separately)	M ²	350		
C-5	Same as Item No. C-1 with masonry thickness 350 mm in CM1:5	M ³	Q.R		
C-6	Providing and applying neeru plaster in two layers, base coat in cement mortar 1:4 and finish coat 2 mm thick in neeru to all internal surfaces at all levels including surface preparation, staging scaffolding, roughening, finishing the surfaces, curing etc. complete including bands, grooves, mouldings as specified and directed. a. For Ceiling, 6 mm thick b. For others 12 mm thk.	M ² M ²	Q. R 6450		
C-7	Providing and applying 20 mm thick sand faced plaster to all external surfaces at all levels in two coats, 15 mm thick average base coat in cement mortar, 1:5 and 8 mm thick finish coat, including preparation of surface to uniform texture, staging, double scaffolding, curing etc. complete including bands, grooves, drips, moulds wherever specified and directed.	M ²	2630		

SR. NO.	DESCRIPTION	UNIT	QTY.	RATE (RS.)	AMOUNT (RS.)
C-8	Providing and applying 12 mm thick cement plaster with or without using additive in the proportion of 1:4 C.M. using washed and sieved sand for the surface of walls, shafts, bottom slabs, including roughening of surfaces, finishing plaster, smooth with a coat of neat cement rendering and curing including all staging and scaffolding complete as specified and directed (additive if any, paid separately under relevant items).	M ²	Q. R		
C-9	Providing and applying 20 mm thick waterproof plaster by mixing integral water proofing compound of approved make in cement mortar 1:4 as per manufacturer's instructions to surfaces at all levels including surface preparation staging, scaffolding, curing etc. complete as per specification	M ²	136		
C-10	Providing damp proof course 40 mm thick in cement concrete mix, M15 grade with 10 mm and down size stone chips in two layers of 20 mm thick, with hot bitumen painting over each layer as per specifications, including painting the base surface with hot bitumen etc. complete as specified and directed	M ²	-		
C-11	Providing and applying 2 coats of Oil Bound Distemper of approved manufacture, colour and shade over and including a coat of primer to internal surface including surface preparation, staging scaffolding, etc. complete as specified.	M ²	-		
C-12	Providing and applying 3 coats of approved white wash / colour wash to internal surfaces to give good even shade including surfaces preparation, staging, scaffolding etc. complete as specified and directed	M ²	3540		
C-13	Providing and applying 3 coats of Snowcem or approved equal decorative waterproof cement paint in approved colours to external surfaces of buildings as per manufacturer's printed instructions including surface preparation, staging scaffolding etc.	M ²	2630		

C-14	Providing and applying 2 coats of acrylic emulsion paint of approved manufacturer, colour and shade (Dulux or equal) at all heights to internal / external surfaces including preparation of surfaces with plaster of paris and sand preparing the same, making up all the holes and undulations / depressions, as per specified and directed.	M ²	3900		
C-15	Providing and applying 2 coats of synthetic enamel paint on surfaces like doors, windows, H.R. Tanks, G.I. Roof sheeting etc. of approved name and shade on primed surfaces including staging, scaffolding etc. complete as per manufacturer's specification. For M.S. door only a. On steel surfaces	M ²	Q. R		
C-16	EPOXY PAINTING: Providing and applying minimum two coats of antifungal epoxy paint of thickness 90 to 100 microns DFT and as per approved manufacturer's specifications to concrete and plastered surface etc. including one coat of suitable primers and application of suitable epoxy putty to achieve even & smooth surface.	Sq.	Q. R		
C-17	Providing and applying epoxy coating to existing concrete covings with epoxy approved make and shade including surface preparation to make coving to required uniformity and smoothness, primer, compatible epoxy putty and finished coats of approximately 120 microns DFT all as directed by Engineer / Owner.	M ²	Q. R		
	TOTAL OF PART 'C'				

PART – D – FLOORING, TILING AND WATERPROOFING:

SR. NO.	DESCRIPTION	UNIT	QTY.	RATE (RS.)	AMOUNT (RS.)
D-1	a. Providing and laying 230 mm dry Rubble soling for floors payments, ramps, walls foundations, bases, trenches, pits etc. including preparing sub-grade to required compaction, laying in regular lines, slopes and levels, filling in the interstices with stone chips and spalls, well rammed watered and consolidated etc. complete as specified and directed	M ²	2105		
	b. – do – but 150 mm dry rubble soiling.	M ²	Q.R.		
D-2	Providing and laying 40 mm thick cement concrete granolithic or Indian Patent stone (IPS) flooring laid alternate bays with 1:2:4 concrete in two layers, bottom layer shall be 25 mm thick with 10 mm to 6 mm graded stone aggregates finished rough and top layer 15 mm thick, with 6 mm and down size aggregates and with glass strips in between the joints tamped, trowelled and finished smooth with floating coat and neat cement or non-skid surface including curing, shuttering the edges etc. complete as specified and directed.	M ²	-		
D-3	Providing and laying cement base waterproofing using proprietary integral waterproofing compound as per manufacturer's specifications including brick bat coba laid to slopes (average thickness 150 mm and proof plaster finished smooth with false markings of 300 x 300 mm, continued into vertical walls up to 300, providing vata and curing etc. complete as specified and directed.	M ²	1560		
D-4	Providing and laying to slopes and levels cement concrete screeding 1:2:4 by using 20 mm nominal size metal aggregates including surface preparation, compaction, curing etc. complete as specified and directed.	M ²	Q.R.		
	a. Average thk. 40 mm	M ³	Q.R.		
D-5	Providing and sizing 150 dia rain water down lake pipe with C.1 pipe of approved quality.	R.M.	340		

SR. NO.	DESCRIPTION	UNIT	QTY.	RATE (RS.)	AMOUNT (RS.)
D-6	Same as item D- 2, but i. with 150mm wide and 25mm thk for skirting flush with plaster. (Rate to include chiselling of brick surface to make skirting flush with wall) ii. Coving in concrete 1:2:4 in 75mm radius with IPS smooth finish. iii. Only hardonite topping (Hardonite @3.50 Kg/Sqm.)	M ² M ² M ²	Q.R Q.R Q.R		
D -7	Kotah Stone Flooring: Providing and laying in floor approved quality machine cut, machine polished kotah stones of specified size a thickness in green or grey or approved tint over a bed of 20mm C.M.1:3 and pointing the joints with epoxy of approved make including curing and polishing smooth as per specifications and as directed and instructed by Engineer / Owner. The surface of the kotah stone will be pre-polished, cleaned and of selected approved quality to get one uniform size, shade and colour. Kotah stone of 600 x 600mm / 450mm size a 35 to 40mm thick in floor and staircase landing with prepolished, washed and selected stone to get one uniform size, shade and colour.	M ²	65		
D -8	Vacuum dewatering Providing and laying R.C.C. vacuum dewatering concrete flooring including mixing tamping mechanically consolidating levelling cement concrete of grade M20 in grade slab, 150 thick including suction drying, mechanical trowelling (power float) and finishing, curing, cutting expansion grooves and filling expansion grooves with polysulphide joint filters complete as specified and directed including side shuttering and excluding reinforcement.	M ²	Q. R		
D-9	Same as above but using floor hardener Chapdur of Sika or equivalent to be sprinkled at the rate of 5 kg/sq. m. before mechanical trowelling as per the manufacturer's specifications.	M ²	3350		

SR. NO.	DESCRIPTION	UNIT	QTY.	RATE (RS.)	AMOUNT (RS.)
D-10	<p>Epoxy Flooring: Providing and laying self-levelling epoxy floor topping minimum 2mm thick and about 2-3mm thick of make "FOSROC" – NITOFLOOR-SL-2000 or approved equivalent as per manufacturers specifications and approved colour including 7 days of air curing over the hardwearing, dust free, dry concrete. Surface including checking of adequacy of floor to carry out the work surface preparation etc. all as per manufacturers specifications and as directed (concrete flooring will be paid under relevant items)</p>	M ²	1560		
D-11	<p>Floor to Wall / Floor to Dado Coving: Providing and making epoxy covings at junctions of floors and walls and HVAC air risers, door rebates, to door frames and masonry in mortar of 1:10 with epoxy of Ciba or approved equivalent make with surface preparation, primer, mortar laying with necessary tools and tackles, templates, finishing coats of epoxy of approved shades of about 120 microns DFT complete as instructed and directed by Owner / Engineer.</p> <p>a. Epoxy coving of 50mm finished radius at junction of floor and walls.</p> <p>b. Same as above but for junctions of wall to wall.</p> <p>c. Same as item (a) but for wall to ceiling.</p> <p>d. Same as above but including cutting of edges of existing Kotah stone floor and skirting, surface cleaning and provide epoxy coving of 50mm finished radius etc.</p> <p>e. Epoxy coving of 50mm finished radius at junction of walls and HVAC air ducts.</p>	Rm Rm Rm Rm Rm	Q.R Q.R Q.R Q.R Q.R		
D-12	<p>Providing and laying vitrified antiskid ceramic tiling of tiles with approved quality and make with base course of cement mortar 1:6 and neat cement slurry toping and joints to match suitably and polishing, curing cleaning etc complete.</p> <p>(a) For flooring.</p> <p>(b) For Dado.</p>	M ² M ²	Q.R Q. R		

SR. NO.	DESCRIPTION	UNIT	QTY.	RATE (RS.)	AMOUNT (RS.)
D-13	<p>S.S. Floors drains floor traps: Providing, jointing, fixing and testing SS floor drain assembly consisting of 110mm dia SS floor drain with SS grating, 110mm dia PVC extension piece to suit invert, 110mm dia deep seal 'P' trap, all joints water sealed with suitable sealant including required excavation, refilling etc. all complete as specified.</p> <p>Providing and fixing Stainless Steel (SS304) floor drain traps pot with deep seal including. Outlet of required size and shape welded at bottom and top covered with S.S. Jali which can fit into recessed groove made at top complete as per consultants /owners' specifications.</p> <p>i) 150x150x150 with 75 dia outlet 75 long. ii) 300x300x300 with 100 dia outlet 100 long</p> <p>Providing, fabricating, fixing in positions heavy duty S.S. floor traps of SS 316 quality of size 9" x 9" at top, with S.S. Rim made out of S.S. flat, 18" in straight length. Additional 45-degree sloping length at bottom mirror finish, buffing suitable flange complete as per drawing. The S.S. floor top will be encased in 1:2:4 concrete full height (Concrete shall be paid for separately).</p> <p>Same as above item – providing and fixing S.S. 316 grill (grating) with cover over the S.S. floor trap of size 9" x 9".</p>	Nos Nos Nos Nos	Q.R Q.R Q.R Q. R		
D-14	<p>Providing and laying HDPE pipes for process drainage of approved quality and make to the required slope and level as specified including fixing jointing including bends, elbows and other fittings wherever necessary as per specification and drawings.</p> <p>(1) 100mm dia pipe (2) 150mm dia pipe</p>	Rm Rm	Q.R Q.R		
	TOTAL OF PART- D				

PART-E - DOORS, WINDOWS AND VENTILLATORS:

SR. NO.	DESCRIPTION	UNIT	QTY.	RATE (RS.)	AMOUNT (RS.)
E-1	Providing and fixing M.S. Steel Doors (single or double shutter including outer fixed frame and shutter made out of rolled steel sections. Shutter shall be provided with 16 gauge MS Sheet on one/both sides as specified, suitably stiffened with necessary hold fasts, vision panel etc. including fabricating, fixing, receiving, storing etc. complete with all accessories and hardware as per drawings and specification, including two coats of red oxide zinc chromate primer including proper surface preparation etc. complete as specified and directed (Hinges and hardware to be selected later and cost of procuring shall only be paid separately at actuals on production of vouchers).				
	a. M.S. Sheet on one side of shutter – single shutter door	M ²	Q. R		
	b. M.S. Sheet on both sides – single shutter door	M ²	Q.R.		
	c. M.S. Sheet on both sides double shutter	M ²	Q.R.		
E-2	Providing and fixing in position approved make heavy duty type overhead hydraulic door closer with adjustable spanner and screws including all fixtures, etc. complete as specified and directed	No.	Q.R.		
E-3	Providing and fixing in position M.S. Steel windows and ventilators as per IS:1038 with standard rolled sections including 4 mm thk plain sheet glass with necessary hold fasts oxidised brass fixtures / fasteners, putty, glazing clips, peg stay handle tower bolts, screws etc. complete as per drawing and specifications including two coats of red oxide zinc chromate primer and three coats of oil paint of approved make, colour and shade etc. complete as specified and directed.				
	a. With 60% openable windows/ ventilators	M ²	Q. R		
	b. With 100% openable windows / ventilators	M ²	Q.R.		
	c. With fixed windows / ventilators	M ²	Q.R.		

SR. NO.	DESCRIPTION	UNIT	QTY.	RATE (RS.)	AMOUNT (RS.)
E-4	<p>Providing and fixing in position anodized aluminium doors in 100 x 45 mm bottom, rails, 5.5 mm thick plain sheet glass glazing for top portion, bottom portion provided with 18-gauge aluminium sheet on both the sides, 2 nos. full width handles 150 mm wide x 12 mm thick to each shutter including all accessories like neoprene gaskets, beadings, locking arrangements etc. complete as per specification and drawings for</p> <p>a. Double glazed door with concealed door closer. b. Single glazed door with normal door closer. c. Heavy duty floor springs</p>	M ² M ² M ²	50 25 Q. R		
E-5	<p>Providing & fixing in position anodized aluminium openable or fixed windows in extruded sections, outer frame having weep holes and water drainage section at bottom including PVC weather stripes & glazing channels, nylon glider rubber, bungers in interlocking arrangements etc. complete as per specification and drawings</p>				
	<p>a. 5.5 mm clear sheet glass fixed windows. b. Same as above but for openable window. c. Providing and fixing double glazed vision panel flush with walls including sterile drain with double seal SS 304 and silica gel in gaps as moisture absorbent.</p>	M ² M ² M ²	100 25 25		
E-6	<p>Providing and fixing MS Rolling Shutter of approved manufacturer having 18-gauge sheet latches including pressed steel bottom rails channel guides, ball bearing, pension shaft bolts, screws, foot lock arrangements, and grills for ventilation, etc. as per drawing and specifications including two coats of red oxide zinc chromate primer with surface preparation, etc. complete as per drawing & specification. (Clear opening to be measured)</p>				
	<p>a. Push & Pull Type b. Gear operated</p>	M ² M ²	Q.R. 90		
	TOTAL OF PART- 'E'				

PART-F – MISCELLANEOUS WORK:

SR. NO.	DESCRIPTION	UNIT	QTY.	RATE (RS.)	AMOUNT (RS.)
F.1	Dismantling and demolishing RCC of grade M15 / M20 for foundations, columns, walls, beams, slabs, pavements etc. including separating the reinforcement, straightening it and transporting the debris to a lead of 3.00 KM depositing as directed by Engineer etc. complete with all tools and labourers. (Note: Separated reinforcement shall be a property of the Owner and the same shall be deposited into stores by the Contractor without any additional cost.	M ³	Q. R		
F-2	Dismantling Brick masonry work of walls, partition walls, parapets etc. made with cement mortar from 1:4 to 1:6 proportion covered with either pointing or plaster including removing and transporting, unloading and spreading the debris as directed by engineer up to 3.00 KM lead with all labours and tools.	M ³	Q. R		
F3	a. Providing RCC pre-cast pole made out of M-200 as per IS Code Standard of 2.40 mt. long (0.60 mt. below G/F 1.80 mt. above G/L) of size 4 ½" x 4 ½" at the bottom & 3 ½" x 3 ½" at the top. Poles to be placed at 2.5 mt. G/L apart with two diagonal poles after every 9.0 mt. and at the end bags with M100 pce of size 0.50 x 0.50 x 0.6 below G/L EI 0.30 x 0.30 x 0.30 above G/L & with proper compaction & curing etc. complete.	Nos.	Q.R.		
	b. Providing G.I. barbed wire fencing 10-gauge wire in 13 rows & two diagonal each being with necessary tools for strengthening the wire (by using turn buckle wherever necessary), etc. complete.	R.M.	-		

SR. NO.	DESCRIPTION	UNIT	QTY.	RATE (RS.)	AMOUNT (RS.)
	d. Providing, fabricating and erecting fencing consists of 50 mm mesh X 10 SWG chain link fabric on 65x65x6 mm angle posts with 6mm dia holes embedded in 250 X 250 X 600 mm deep C/C (1:3:6) block spaced at 2m including cutting, wastage etc complete as directed as specified. a. G.I. Chain link fabric	Sq. M	-		
F-4	Providing, supplying, fixing, erecting M.S. gate made out of 62 mm M.S. pipe and 50 mm x 6 mm M.S. flat all round and internally welded to pipes including M.S. welded mesh of size 25 mm x 25 mm. All material included bolts, nuts, washers, clamps, hinges, flats and aldropses including two coats epoxy paints of coal tar of approved paint manufacturer. Column to be made with RCC concrete and shall be paid in the concrete item.	M ²	36		
F-5	Filling below Tankages 75 thk. sand bitumen fillt as per Specification & as directed.	M ²	Q.R.		
F-6	Providing the entire area to be constructed with pre – construction and during construction, anti-termite treatment as per IS: 6313 by Pest Control of India with 5-year guarantee to keep the area free of all subterranean termite infestation. The treatment shall include treating (1) Termite mounds if any. (2) Excavated surface and back filled area if any. (3) Surface of plinth beams Columns/ brick walls below plinth, trenches etc. (4) Top surface of plinth filling and exterior perimeter of the building. (5) Soil around U/G pipes, conduits etc. (6) Expansion joints area.	Sq. M	4000		
F-7	Providing and fixing 600mm dia MS Heavy Duty Manhole Cover for UG Water Tank.	Nos.	1		
	TOTAL OF PART- 'F'				

PART-G – STRUCTURAL STEEL:

SR. NO.	DESCRIPTION	UNIT	QTY.	RATE (RS.)	AMOUNT (RS.)
G-1	Supplying, transporting, fabricating, erection, structural steel work at all levels including cutting, welding, seal welding, bolting, threading wherever necessary and generally as per the enclosed specifications and drawings for trusses, purlins, girts, louvers, brackets, sags, road, columns bracketings, floor beams, girders, built-up sections, lifting beams, monorails, stairs chequered plates, ladders, cage ladders toe board etc. complete as specified and directed. a. Structural steel will be supplied by client at store including 6 thk. chequered plates with all supporting structures, as per requirement.	M.T.	40		
G-2	Apply one coat primer of zinc chromate & two coats finish paint of synthetic enamel to structural steel (The application procedure shall be in accordance with recommendation of the paint manufacturer)	M.T.	40		
G-3	Providing Transporting & fabricating G.I. grating & treads 35 mm Thk. & erecting & fixing of fabricated steel work on operating floors, plat forms, stair landing & treads, etc. including cut out & stiffening arrangements for it. Supply of all fixtures like edge plates for threads, clips, studs tank welding bolts, etc. including nosing for the threads, etc. complete as per drawings, specifications & as directed by owner / consultant (layout & detail drawing of glaring to be supplied by contractor). Note: Contractor to note that the grating should be able to withstand a superimposed load of 750 kg/m ² .	MT	0.2		
G-4	Same as above but for stair case treads and landings	MT	Q. R		

SR. NO.	DESCRIPTION	UNIT	QTY.	RATE (RS.)	AMOUNT (RS.)
G-5	Providing and fixing 1100 mm high hand railing consisting of 32 mm nominal bore MS pipe as vertical posts at 1.5 m centres (max.) with 25 mm nominal bore MS pipe as top rail and mid rail, all medium variety (toe board measured and paid separately under structural steel item No.H-1) as per engineering standards including sockets, elbows, bends, etc. including painting, as per item No.H-2 and H-3 above (Rate shall be per metre of completed railing)	R.M.	60		
G-6	Same as above but with S.S. material	R.M	Q. R		
G-7	Providing and fixing of crash guard on corridors with S.S. pipes or with pressed S.S sheets as per the sketch enclosed including all fittings etc complete.	R.M	-		
	TOTAL OF PART- 'G'				

PART – 'I' - ROADS, DRAINS & CULVERTS.

SR. NO.	DESCRIPTION	UNIT	QTY.	RATE (RS.)	AMOUNT (RS.)
H-1	Scrapping/removing to lose layers of earth and rolling the sub-base for road / shoulders to the required lines and levels including watering, ramming and rolling the surface disposing off the scrapped earth within the plot, etc. complete as specified and directed.	M ²	4940		
H-2	Excavation in all kinds of soil other than rock for foundations including trenches pavements, manholes, wall footings, Pipelines, tanks, etc. including shorting, dewatering, back filling in layers not exceeding 230mm, watered, rammed and consolidated carting away surplus excavated earth to areas of disposal within 150m lead where it will be spread and levelled etc. complete as specified and directed. All deviations, etc. shall be carried out at their cost.	M ³	3705		
H-3	Providing, mixing, tamping, placing, consolidating and curing plain cement concrete with necessary slopes as specified for foundations, grade slabs, ramps, sills, copings, trenches, filling to space etc. for any thickness and any depths and heights using graded coarse aggregate from 40 mm to 10 mm as specified and directed. (Shuttering if required shall be measured and paid separately under relevant items). a. In 1:3:6 mix b. In 1:4:8 mix	M ³ M ³	400 123		
H-4	Providing and laying 230 mm dry Rubble soling for floors payments, ramps, walls foundations, bases, trenches, pits etc. including preparing sub-grade to required compaction, laying in regular lines, slopes and levels, filling in the interstices with stone chips and spalls, well rammed watered and consolidated etc. complete as specified and directed.	M ²	1200		

SR. NO.	DESCRIPTION	UNIT	QTY.	RATE (RS.)	AMOUNT (RS.)
H-5	Providing and placing in position in RCC works Steel reinforcements (including cost of binding wire) as per drawing and specifications, at all height and depths including carting cleaning, cutting, stacking, bending, tying etc. complete as specified and directed (fan hooks will be measured and paid under this item). a. Plain M.S.Rounds b. Tor Steel	MT MT	1 29.5		
H-6	Providing and fixing adequate cantering and leak proof, form work / shuttering for concreting to required shape size at any depth and height as per drawing and specifications including staging access and working platforms strutting bracing and removing the same after specified and directed.	M ²	3560		
H-7	Providing, mixing, placing, vibrating, curing and roughening to surface wherever required, reinforced cement concrete of mix M35 grade to required levels and shape at all heights and depths using 20 mm (max) to 6 mm size graded aggregate as per drawing and specifications but excluding reinforcement and shuttering, as specified and directed including all height & depth as per drawing. Rate shall include creating expansion joints, saw cut joints & treating expansion joints as indicated in road section drawing no OCS-267-GC-001	M ³	774		
H-8	Same as above item no. H-7 but using RMC	M ³	774		
H-8	Same as above item H-6 but in M25 concrete for drains.	M ³	437		
H-9	Paver Block – This item shall include providing and applying readymade paver blocks on shoulders on either side of roads on min. 50mm thick compacted sand. Rate shall include sand bed also.	M ²	535		

SR. NO.	DESCRIPTION	UNIT	QTY.	RATE (RS.)	AMOUNT (RS.)
H-11	Providing, laying and jointing RCC Hume pipes class NP2 to required slopes as per drawing and including collars, jointing with C;M (1:2) cutting of pipes curing and testing all as specified and as directed. a. 200 mm Dia b. 300 mm Dia c. 600 mm Dia	Rm Rm Rm	40 20 20		
H-12	Providing and constructing first class country burnt brick masonry 350thk in C:M 1:5 for drainage walls including racking out joints, staging, scaffolding and curing etc complete	M ³	Q. R		
H-13	Providing and applying 20mm thk water proof plaster by mixing integral water proofing compound of approved make in cement mortar 1:4 as per manufactures instructions to surfaces at all levels including surface preparations scaffolding, curing etc complete as per specification.	M ²	Q. R		
H-14	Providing and applying Bituminous Joint sealing compound at all joint locations and for a thickness specified in drawing including surface preparation, cleaning of old concrete surface of all laitance, groove cutting in concrete, applying primer coat, applying marking tape on both sides of joint, cleaning the exposed portion neat, removal of excess sealing compound etc. complete. Note: - Above methodology is minimum Contractor shall follow however Contractor shall also study manufacturer's specifications and worst of the two shall be referred for execution.	Rat	980		
H-15	Providing and fixing at or near ground level precast cement concrete in curbs, edgings etc. as per approved pattern and setting in position with cement mortar 1:3 (1 Cement: 3 coarse sand), including the cost of required cantering, shuttering complete as per drawing.	RM	1070		
	TOTAL OF PART- 'H'				

SCHEDULE OF RATES FOR LABOUR

Sr. No.	Description	Unit (Per Day)	Rate
1	Mason		
2	Carpenter		
3	Welder		
4	Electrician / Instrument Technician		
5	Skilled Worker		
6	Unskilled labour		
7	Plumber		
8	Foreman (concrete works)		
9	Fitter		
10	Painter		
11	Turner		
12	Steel Erector		
13	Diesel / Petrol Engine Operator		
14	Mechanic		

SUMMARY

PART (Rs.)	DESCRIPTION	AMOUNT
A.	EXCAVATION & BACKFILLING	
B.	PLAIN & REINFORCED CONCRETE WORKS	
C.	MASONRY, PLASTERING & PAINTING	
D.	FLOORING, TILING & WATER PROOFING	
E.	DOORS, WINDOWS AND VENTILATORS	
F.	MISCELLANEOUS	
G.	STRUCTURAL STEEL	
H.	ROADS, DRAINS, CULVERTS	

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V GENERAL CONDITIONS OF CONTRACT

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CONDITION OF CONTRACT

1.0 INTERPRETATIONS:

In construing the Agreement, the Conditions, the specifications, the Schedule of Quantities and Unit rates, Drawings and the General and Special Conditions, the following words shall have the meanings herein in below assigned to them save where the same are repugnant to subject or context.

- a) Company/Owner : Shall mean **M/s. GANDHAR OIL INDIA LTD.** and shall include its successors and assigns.
- b) Engineer/Consultant : Shall mean **M/S OPTIMAL CONSULTING SERVICES PVT.LTD** and its authorised representatives (who are consultants appointed by the owner for the Project).
- c) Contractor : Selected Contractor shall include his (their) legal representative, its successors and assigns.
- d) Drawings : Shall mean the drawing (referred to in the specifications), prepared by the Engineer and approved in writing by the Company.
- e) "Company's Representative" : Shall mean a person or persons appoint from time to time by the Company to act as the Company's Representative and shall include engineers & employees of the consultants that may be appointed by the Company under this contract and whose appointment is notified in writing by that Co. to the Engineer and to the contractor.
- f) Site : Shall mean the site of the Contract Works including any buildings and erection thereon and any other land or building

- which the Co. Permits the Contractor to use for or in connection with erection of the works.
- g) Specifications : Shall mean the specification for materials, workmanship and mode of construction and tests annexed to this contract and forming part of schedules.
- h) This Contract : Shall mean this Agreement, the Conditions, the Appendix, the priced Schedules of quantities and unit rates, Drawings, specifications attached to the Agreement and duly signed by the Company and the Contractor.
- i) "Notice in Writing" or "Written Notice" : Shall mean a notice in written, typed or printed characters sent (unless delivered personally) by registered post to the last known private or business address or registered office of the addressee and shall be deemed to have been received when in the ordinary course of post, it would have reached the addressee.
- j) "Act of Insolvency" : Shall mean an act of insolvency as defined by the Presidency towns Insolvency Act, or the Provincial Towns Insolvency Act or any statutory modification or re-enactment thereof for the time being in force.
- k) "Net Prices" : If in arriving at the said Contract Amount, the Contractor shall have added to or deducted

from the total of the items in the Tender any sum as a percentage or otherwise, then the net price of any item in the Tender shall be the sum arrived at by adding to or deducting from the actual figure appearing in the tender as the price of that item a similar percentage or proportion of the sum so added or deducted by the Contractor, the total amount of any Prime Cost items and provisional sums of money shall be deducted from the total amount of Tender. The expression "net rates" or "net prices" when used with reference to this Contract or accounts shall be held to mean rates or prices so arrived at.

- l) "Variation" : Shall include amendment, alterations, addition, omission and / or substitution.

Words importing persons include firms and corporations, Word importing the singular number includes the plural number and vice versa where the context so requires or admits.

The marginal headings or notes in the Conditions shall not be part thereof or be taken into consideration in the interpretation or construction of this Contract.

2.0 **SCOPE OF CONTRACT:**

- (i) The Contractor shall carry out his work and shall execute and complete the Works in every respect in accordance with this Contract and in accordance with directions of and to the satisfaction of Engineer. Without prejudice to the generality of the above provision, the Engineer may in his absolute discretion and from time to time issue written instructions, details, directions explanations, Drawings and Specifications which are hereafter collectively referred to as "Engineer's Instructions", including inter alias in regard to: -

- a) The variation or modification of or addition to the designs, specifications, quality or quantity or work or the addition or omission or substitution of any work.
 - b) Any discrepancy in the drawings or between the Schedule of Quantities and/or Drawings and/or specifications.
 - c) The removal from the site of any materials brought thereon by the Contractor and the substitution of any other material therefrom.
 - d) The removal and/or re-execution of any work executed by the Contractor.
 - e) The removal of any person employed for execution of the works.
- ii) The Contractor shall forthwith comply with and duly execute any work comprised in such Engineer's instructions. Provided always that verbal instructions, details, directions and explanations given to the Contractor or his employee or representative in regard to the works by the Engineer shall, if involving a variation, be recorded by the Contractor in a letter to the Engineer with a copy to the Company within seven days from the receipt thereof and if there is no dissent thereto by the Engineer's instructions within the scope of this Contract.
- iii) If in compliance with the Engineer's instructions as aforesaid involves work and/or expense and/or loss beyond that contemplated by the Contract, then (unless the same had to be issued owing to some "breach of this Contract on part of the Contractor") the Company shall pay to the Contractor on the Engineer's Certificate, the price of the said work (as "an extra" to be valued as hereinafter provided) and/or expense and/or loss.

(The term "breach of contract on part of the Contractor" shall in this Contract be deemed to include variation, error, or omission on part of the Contractor, substandard or defective materials, material not in accordance with specifications, defects, in construction and / or poor workmanship by the Contractor).

3.0 **DRAWINGS AND SCHEDULE OF QUANTITIES AND UNIT RATES:**

This Contract shall be executed in triplicate. The original shall remain in the custody of the Company, or counterpart shall remain with the Engineer and the other counterpart shall remain with the Contractor. The Contractor shall after the execution of this Contract be furnished by the Engineer free of cost, with a copy of the Priced Schedule of Quantities and Unit Rates, one copy of each of the Drawings and Specifications and one copy of all further drawings and specifications issued during the progress of the Works. Any further copies of such Drawings and Specifications or further Drawings and specifications required by the Contractor shall be paid for by him at such rate as may be fixed by the Engineer. The Contractor shall keep one copy of All drawings at the site and the Engineers or his representative shall at all reasonable times have access to the same. Prior to the issue of the final

Certificate, the Contractor shall return to the Engineer all Drawings and specifications.

4.0 **CONTRACTOR TO PROVIDE EVERYTHING NECESSARY:**

The Contractor shall provide everything shall provide everything necessary for the proper execution of the Works accordance to the intent and meaning of the Drawings, Schedule of Quantities and specifications taken together whether the same or may not be particularly shown or described therein provided that the same can reasonably be inferred therefrom. The Contractor shall be responsible for any discrepancies, errors, or omissions in the drawings and other particulars supplied by him, whether the Engineer has approved such drawings and particulars or not. If at any time the Contractor finds any discrepancy in the Drawings or between the Drawings, Schedule of Quantities and/or specifications he shall immediately and in writing refer the same to the Engineer who shall decide and intimate to the Contractor about the action to be taken.

5.0 **AUTHORITIES:**

- a) The Contractor shall conform to the provisions and requirements of any Act or Statute, Central or State, Rules Regulations, Bye-laws of local authorities, Panchayats, Collector, relating to or in connection with the works or to labour and to the regulations and By laws of any other companies or authorities supplying water, light or other amenities at the site, and shall, before making any variation from the Drawings or Schedule of Quantities or Specifications that may be necessitated by reason of his having to conform to such Acts, Rules, Statutes, Regulations and By-laws, or any modifications or re-enactment thereof for the time being in force, give to the Engineer written notice, specifying the variation proposed to be made and the reason for making it, and apply to it for instruction thereon. In case the Contractor shall not within ten days from the date of receipt of such notice given by him to the Engineer receive from the Engineer such instructions, he shall proceed with such work as may be necessary in order to conform to the provisions of such Act, Rules, Statutes, Regulations or Bylaws in question, and any variation so necessitated shall be dealt with under Clause 13.
- b) The Contractor shall bring to the attention of the Engineer all notices and permits consents, certificates and licenses required by the said Act, Statutes, Rules and Regulations, By-laws or any modifications or re-enactment for the time being in force to be given to or obtained from any Authority and shall be obtain all requisite permits, consents, certificates and licenses which are required in connection with execution of the said works and shall pay at his own costs, to such authority, or to any Public Office all fees, charges, rates or taxes that may be properly chargeable in respect of the works, and promptly lodge the receipts with the Engineer. Without prejudice to the aforesaid, the Contractor shall indemnify the Company against all liabilities, claims and proceedings which may arise in respect of such notices, permits, consents, certificates, licences fees, charges rates or taxes.
- c) All royalties and other sum payable in respect of the supply and use in carrying out the Works of any patented articles, processes or

inventions shall be deemed to have been included of the Contract or inventions shall be deemed to have been included of the Contract Amount. The Contractor shall indemnify the Company from and against all claims, proceedings, damages, costs and expenses which may be brought or made against the Company or to which he may be put by reason of the Contractor infringing or being held to have infringed any patent rights in relation to any such articles, processes and inventions.

6.0 **SETTING OUT WORKS:**

- a) The Contractor shall at his own expense set out all the works and shall be responsible for the true and perfect setting out of the same and for the correctness of the positions, levels, dimensions and alignment of all parts thereof. If at any time any error in this respect shall appear during the progress or on completion of any part of works, the Contractor shall at his own expense rectify and amend such error if so, required to the satisfaction of the Engineer.
- b) The Contractor shall notify the Engineer in writing immediately the trenches or excavation as shown on the drawings are dug or made, or as soon as any ground is cut into, which from unexpected causes appear to need immediate attention. After notifying the Engineer, the Contractor shall await instructions, which shall be given within ten days of receipt of such notices. If the Contractor fails to notify the Engineer or covers up such works before he has received instructions from the Engineers, he is liable to reopen and/or re-execute all works that may at any time be damaged or which may not have been properly done or is not according to the drawings, specifications or the Engineer's instructions or on account of any defect in or insufficiency of the foundations. The Contractor shall, at the request of the Engineer, within such time as the Engineer shall name, open up for inspection any other work; and should the Contractor refuse or neglect to comply with such request, the Company through the Engineer, may employ other workmen at the expense of the Contractor to open up the same. If the work has been covered up in contravention of the instructions referred to above or if, on being open up, it be found to be not in accordance with the Drawings and Specifications or the Engineer's instructions, the expenses of opening and covering it up again, whether done by the Contractor or such other workmen employed by the Company shall be borne by and recoverable from the Contractor and may be deducted by the Company from any moneys due or which may become due to the Contractor. If the work has not been covered up in contravention of such instructions referred to above and if it be found to be in accordance with the said Drawings and Specifications, or the Engineer's instructions, then the expenses aforesaid shall be borne by the Company and shall be added to the Contract sum; provided always that in the case of foundation, or of any other urgent work so opened up and requiring immediate attention, the Engineer shall, within ten days after receipt of written notice from the Contractor that the work has been opened, inspect the same and give the necessary instructions to the Contractor and at the expiration of such time, if such inspection shall not have been made, the Contractor may cover up the same, and shall not be required to open it up again, save at the expense of the Company.

7.0 **MATERIALS AND WORKMANSHIP TO CONFORM TO DESCRIPTION:**

All the materials, goods and workmanship shall be of the respective kinds and standard described in the Schedule of Quantities and/ or Specifications and in accordance with the Engineer's instructions and of high quality and the Contractor shall upon the request of the Engineer furnish him with all invoices, accounts, receipts and other vouchers and such proof as the Engineer may require to prove that the materials goods and workmanship comply therewith. The Contractor shall in addition to his own cost arrange for and/ or carry out such test of any materials or goods as the Engineer may require and shall remove from the site any work, material or goods which in the opinion of Contractor is unable to obtain material or the kind described in the Schedule of Quantities and/or specifications and/ or the Engineer's instruction, then the Contractor shall use his best endeavour to obtain material of a similar type of kind and shall before obtaining and utilizing the same submit samples thereof to the Engineer and obtain his written approval regarding the same.

8.0 **CONTRACTORS SUPERINTENDENCE AND REPRESENTATIVE ON THE WORKS**

The Contractor shall give all necessary personal superintendence during the execution of the Works, and for such period thereafter as the Engineer may consider necessary until the expiration of the Defects Liability Period of twelve months. The Contractor shall meet the Engineer or its representatives, whenever the Engineer or its representative so require and intimate to the Contractor. The Contractor shall also during the entire period of that construction of the Works is in progress, employ competent representative, who shall remain in attendance at the site while work is in progress. If representative or supervisory staff of contractor wants to go on leave, he will get prior permission from client and contractor will make alternative arrangements. Any directions, explanations, instructions or notices given by the Engineer to such representative of the Contractor shall be deemed to be given to the Contractor shall be binding on the Contractor. The Contractor shall from time to time intimate to the Engineer for approval, names and particulars of the representatives who shall be in constant attendance at the site while work is in progress. The Engineer shall have the absolute right and discretion to approve or disapprove of such representatives. In the event of Engineer at any time not approving of any of such representatives, the Contractor shall without delay remove such representatives from the site and employ other person or persons possessing the requisite skill, ability and experience which the work demands and furnish the name and particulars to site for superintendence of the Works.

9.0 **DISMISSAL OF WORKMEN:**

The Contractor shall on the request of the Engineer immediately dismiss from the Works any person employed there by him who may, in the opinion of the Engineer, be incompetent or has misconducted himself, and such person shall not be again employed on the Works by the Contractor or allowed to go on the site without the permission of the Engineer.

10.0 ACCESS FOR ENGINEER TO WORKS:

The Engineer, the Company and their representative and any person authorized by them shall at all reasonable times have free access to the works and/ or to the workshops, factories, or other places where materials for the works are lying or being fabricated or from which they are being obtained and the Contractor shall arrange the same and shall give every facility to the Engineer and his representative necessary for obtaining samples and for inspection and examination and test of materials and workmanship. No persons except persons authorised by the Engineer or the Company and the Contractor on the Works shall allow the representatives of the Public Authorities at any time.

11.0 COMPANY'S REPRESENTATIVE:

- a) The Company's representative shall on behalf of the Company be entitled to inspect the Works and to inspect and examine the materials used and the Workmanship in execution of the Works. The Company's representative shall be afforded every facility and assistance for inspecting the Works. The material and the Workmanship and for checking and measuring time and materials.
- b) The Engineer shall have power to give notice to the Contractor or to his representative of non-approval of any work or material or goods and thereupon such work shall be suspended and the use of such materials shall be discontinued until the decision of the Engineer is obtained.
- c) The materials used and the workmanship in execution of the Works as also the Works will also from time to time be inspected and examined by the representative of the Engineer and by the Company but such examination by them shall not in any way relieve the Contractor from his obligation to remedy any breach of the Contract on the part of the Contractor or any defects which may be found to exist at any stage of the works or after the same is completed. Subject to the limitation of this Clause the Contractor shall take instructions only from the Engineer.

12.0 ASSIGNMENT AND SUB-LETTING:

The whole of the works included in the Contract shall be executed by the Contractor and the Contractor shall not directly or indirectly transfer, assign or underlet the contract or any part thereof or interest therein without the previous written consent of the Engineer, and no such consent shall relieve the Contractor from the full and entire responsibility for erection of the works and of the Contract or from active superintendence of the works during their progress.

13.0 VARIATION NOT TO VITIATE CONTRACT:

No alteration, omission or variation pursuant to the instructions from the Engineer shall violate this Contract, but in case of the Engineer considers it proper at any time during the progress of the Works to make any alternations in or additions to or omissions from the works or any alteration in the kind or quality of the materials to be used therein and gives notice thereof in writing under its hand to the Contractor, the Contractor shall comply with the requirements of such notice, but the Contractor shall not do any work extra

or make any alterations, variations or additions to or omissions from the works or any deviation from any of the provisions of this Contract, without the previous consent in writing of the Engineer and the value of such extras, alternations, additions or of items omitted shall in all cases be determined by the Engineer in accordance with the provisions of Clause 17 hereof, and the same shall be added to or deducted from the said Contract Amount accordingly.

14.0 SCHEDULE OF QUANTITIES:

- a) The Schedule of Quantities and Unit Rates unless otherwise stated shall be deemed to have been prepared in accordance with the Standard Method of Measurement as per Indian Standard IS-1200.
- b) Any error in description or in quantity or any omission by error of items from the Schedule of Quantities shall not vitiate this Contract but shall be rectified and the value thereof as ascertained under Clause 17 hereof shall be added to or deducted from the Contract Amount (as the case may be) provided that no change, correction or rectification shall be permitted in the Contractor's Schedule or Rates on ground of error or otherwise.

15.0 SUFFICIENCY OF SCHEDULE OF QUANTITIES:

The Contractor shall be deemed to have satisfied himself before tendering as to the correctness and sufficiency of his Tender for the Works and of the rates and prices stated in the Schedule of Quantities and/or the Schedule of Rates and Prices which rates and prices shall cover all his obligation under this Contract and all matters and things necessary for the proper completion of the Works and the Contractor shall not (subject the Clause 17 below) be entitled on any grounds whatsoever to increase the rates and prices quoted by him in his Tender and/or mentioned in the Schedule of Rates.

16.0 MEASUREMENT OF WORKS:

- a) Whenever the Engineer decides to have the Works measured it will intimate to the Contractor about the date and time when the Works would be measured and shall send a copy of such letter to the Company and the Contractor shall forthwith attend or send a qualified representative to attend and if called upon to assist the Engineer in taking such measurements and in calculations and shall furnish all particulars or give all other assistance required by the Engineer.
- b) Should the Contractor or his representative not attend then the measurements taken by or on behalf of the Engineer shall be taken to be the correct measurements of the Works. Such measurement as per Indian Standard IS-1200.
- c) The Contractor or his representative who attends may at the time of measurement taken such notes and measurements as he may desire.
- d) All extra works and all omissions and variations made without the Engineer's knowledge, if subsequently sanctioned by it in writing, shall be included or taken into account in such measurements.

17.0 **PRICES FOR EXTRAS, ETC., ASCERTAINMENT AND FINAL MEASUREMENT:**

- i) Should it be found after the completion of the Works from measurements taken (as mentioned in the previous clause) that any of the quantities or amounts or works thus ascertained are less or greater than the quantities or amount specified in the Price Schedule of Quantities and/or Tender for the Works and/or that any variation is made, the valuation of such quantities, amounts or variations, unless previously or otherwise agreed upon shall be made in accordance with the following rules:-
 - a) The net rates per prices in the original Tender shall determine the value of the extra work where such extra work is of a similar character and has been executed under similar conditions as the work priced herein.
 - b) The net rates or prices in the original Tender shall determine the value of the items omitted, provided that if omissions vary the conditions under which any remaining items of works are carried out, the prices for the same shall be valued under sub-clause (c) hereunder.
 - c) Where the extra work is not of a similar character and/or executed under similar conditions as aforesaid or where the commission vary the conditions under which any remaining items of work are carried out or if the amount of any omission or addition relative to the amount of the whole of the Works or to any part thereof shall be such that in the opinion of the Engineer the net rate or price contained in the Printed Schedule of Quantities or Tender or for any item of the work involves loss or expense to the Company or the Contractor beyond that reasonably contemplated by the Contractor is by reason of such omission or addition rendered unreasonable or in applicable, the Engineer shall think reasonable and proper.
 - d) Where extra work cannot be properly or valued, the Contractor shall be allowed day work prices at the net rates stated in the Tender or the Priced Schedule or Quantities or if not so stated, then in accordance with the local days' work rates and wages for the district; provided that in the either case vouchers specifying the daily time (and if required by the Engineer, the Workman's names) and material employed by the delivery for verification to the Architect-Engineer or his representative at or before the end of the week following that in which the work has been executed.
- ii) The measurement and valuation in respect of this contract shall be complete within One month of the completion of the Contract works as defined in Clause 20 hereof.

18.0 UNFIXED MATERIALS WHEN TAKEN INTO ACCOUNT TO BE THE PROPERTY OF THE COMPANY:

Where in any Certificate (under which the Contractor has received payment) the Engineer has included the value of any materials not utilized, placed or kept in the building or the Workshop of the plant or on or adjacent to the site such material shall become the property of the Company and they shall not be removed from the site, save for use in execution of the works, without the written authority of the Engineer and the Contractor shall be liable in the event of any loss or damage to such materials.

19.0 REMOVAL OF IMPROPER WORK:

- a) The Engineer shall, during the progress of the Works, have power to order in writing from time to time removal from the Works within such reasonable time or times as may be specified in the order, of any materials whether already utilised in execution of the Works or not, which in the opinion of the Engineer are not in accordance with the Drawings, Specification, samples and/or the Engineer's ship is not in the opinion of the Engineer of the required high quality or not in accordance with Drawings, specifications and/or the Engineer's instructions and the substitution of proper materials of workmanship, and the Contractor shall forthwith carry out such order at his own cost. In case of default on the part of the Contractor to entitle to deduct from any moneys due or that may become due to the Contractor and/or take such other steps as may be necessary to recover the same.
- b) In lieu of correcting work not done in accordance with the Contract, the Engineer may with the consent of the Company allow such work to remain, and in that case may make allowance for the difference in value of workmanship together with such further allowance for damage to the Company as in his opinion may be reasonable.

20.0 DEFECTS AFTER COMPLETION:

Any defect, shrinkage, settlement or other faults which appear within the "Defects Liability Period" stated in the Appendix hereto or, if non stated, then within 'twelve months or one end of one monsoon'; whichever is minimum, after the virtual completion of the works, arising in the opinion of the Engineer from materials or workmanship not in accordance with this Contract, shall upon the directions in writing of the Engineer, and within such reasonable time as shall be specified therein, be altered and made good by the Contractor, at his own cost, unless the Engineer shall decide that he ought to be paid for such alteration and for making good; and in case of default, the Company may but without being bound so to do employ and pay other persons to alter and make good such defects, shrinkage, settlements or other faults, and all damages, loss and expenses consequent thereon or incidental thereto, shall be made good and shall be borne by the Contractor and such damages, loss and expenses shall be recovered from the Contractor by the Company and may be deducted by the Company, upon the Engineer's Certificate in writing, from any money due or that may become due to the Contractor. The Company may in lieu of such alteration and making good as aforesaid, deduct a sum to be determined by the Engineer, equivalent to the cost of altering and making good such defect

and/or fault in such work from any money due to the Contractor and in the event of such money including amount retained under Clause 33 being insufficient, recover the balance from the Contractor together with any expenses the Company may have incurred in connection therewith. Even though defective work has been done or material supplied by any Subcontractor employed on the Works who may have been nominated or approved by the Engineer, as provided in Clauses 12 and 22, the Contractor shall still be liable to make good in the same manner as if such work or material has been done or supplied by the Contractor and been subject to the provisions of this Clause and Clause 2 hereof. The Contractor shall remain liable under the provisions of this Clause notwithstanding the signing by the Engineer of any Certificate or the passing of any accounts.

21.0 CERTIFICATE OF VIRTUAL COMPLETION:

Virtual completion of the Works shall mean that the Works are completed in all respects including finishing, painting etc. its period of curing and maturing for the purpose of handing over the possession to the Company in pursuance of this Contract. The Contractor shall intimate in writing to the Engineer as and when the works are complete in all respect until the Engineer has certified in writing that they have been virtually completed and Defects Liability Period shall commence from the date of such Certificate.

22.0 NOMINATED SUB-CONTRACTOR:

- i) All Specialists, Merchants, Tradesmen and other executing any work or supplying and fixing any material for which prime cost prices or provisional sums are included in the Schedule of Quantities and/or Specifications, who may at any time either on request of the Contractor or otherwise be nominated or selected by the Engineer are hereby declared to be Sub-Contractors employed by the Contractor and are herein referred to as "nominated Sub-Contractors" shall hereinafter be referred to as "Sub-Contract Work".
- ii) Upon nominated or selection of Sub-Contractor by the Engineer as aforesaid, the Contractor will enter into a Contract (on terms to be approved by the Engineer) with the Sub-Contractor, which Contract shall amongst other provision contain the provision set out hereunder.

Provided however that no nominated Sub-Contractor shall be employed on or in connection with the works against whom the Contractor shall have and make a reasonable objection or (save where the Engineer and Contractor otherwise agree) who will not enter into a Contract providing: -

- a) That the nominated Sub-Contractor shall indemnify the Contractor against all cost, expenses, loss or damage that would be incurred or suffered by the Contractor on account of breach or non-performance of which would in turn make the Contractor liable to the Company under this Contract.
- b) That the nominated Sub-Contractor shall indemnify the Contractor against all claims against the Contractor on account of any Act omission or neglect by the Sub-Contractor, his servants or agents or any misuse by him or them of any

scaffolding or other plant, material or equipment which is the property of the Contractor or under any workmen's Compensation Act in force.

- c) Payment shall be made by the Contractor to the nominated Sub-Contractor within fourteen days from the receipt by him of the Engineer's Certificate authorising the same, provided that before any Engineer's Certificate is issued, the Contractor shall upon Request furnish to the Engineer proof that all nominated Sub-Contractors accounts included in previous Certificates have been duly discharged; in default whereof the Company may pay the same to the Sub-Contractor upon a Certificate of the Engineer and deduct the amount thereof from any sum due to the Contractor. The exercise of this power shall not create priority of Contract as between Company and Sub-Contractor.
 - d) That the nominated Sub-Contractor shall carry out and complete the sub-contract works in every respect to the reasonable satisfaction of the Contractor and of the Engineer, and in conformity with all the reasonable directions and requirements of the Contractor and the Engineer.
 - e) That the nominated Sub-Contractor shall observe, perform and comply with all the provisions of this Contract on the part of the Contractor to be observed, performed and complied with so far as they relate and apply to the sub-Contract work or to any portion of the same.
 - f) That the sub-contract work shall be completed within the period herein specified and that the Contractor shall not without the written consent of the Engineer grant any extension of time of the completion of the Sub-contract work or any section thereof.
 - g) That the Company Engineer and their respective representative shall have a right of access to the workshops and other places of the nominated Sub-Contractor as mentioned in Clause 10 of these conditions.
- iii) The Contractor shall be fully responsible to the Company for all acts, omissions, neglects, and defaults of his Sub-Contractors, their employees, representatives and agents, as if such acts, omission and defaults were his own and indemnifies the Company for any loss, damage, cost and expenses to the Company on account of such acts, omission, neglects and default of his Sub-Contractors including nominated Sub-Contractors their employees, representatives and agents.
 - iv) Nothing in this Contract or any Contract between the Contractor and Sub-Contractor or exercise by the Company or the Engineer of any powers or authority granted under this section shall create any contractual relations between the Company and the Sub-Contractor.

23.0 **OTHER PERSONS ENGAGED BY COMPANY:**

- a) The Contractor and his employees are permitted to enter upon and issue the site for the purpose of executing the Works under this Contract and for putting up temporary hutments for their workers and for no other purpose. The Contractor and his employees shall not have any right, title or interest in the site of the Works.

The Company reserves the right to use the site and/or any portions thereof for the execution of any work by other persons. After the Works is completed all those temporary facilities shall be removed by the Contractor at his own expense to the satisfaction of the Engineer.

- b) The Contractor shall co-ordinate with all other contractors and nominated sub-contractors so as to facilitate the general progress of the works and shall afford them all reasonable facilities for the installation of their work and for the storage of their materials and the execution of their work.
- c) Should the Contractor cause damage to any other contractor or nominated sub-contractor on the work, The Contractor agrees to settle with such contractor or sub-contractor by agreement or arbitration. If such contractor or nominated sub-contractor uses the Company on account of any damage alleged to have been so sustained, the Company shall notify the Contractor, who shall defend such proceedings at the Contractor's expense and without prejudice to the provisions of Clause 24 herein below, if any judgment against the company arise therefrom, the Contractor shall pay or satisfy it and pay all costs incurred by the Company.
- d) If any part of the Contractor's work depends for proper execution or results, upon the work of any other contractor or sub-contractor, the Contractor shall inspect the promptly report to the Engineer and defects in such work that render it unsuitable for such proper execution and results. His failure so to inspect and report shall institute an acceptance of the other contractor or sub-contractor's work.

24.0 **INDEMNIFY & INSURANCE IN RESPECT OF DAMAGE TO PERSONS AND PROPERTY OR ANY OF HIS NOMINATED SUB-CONTRACTOR EMPLOYEES:**

- a) The Contractor shall be responsible for all injury to persons, other contractors and nominated sub-contractors, animals or things, and for damage to Works and to property which may arise as a result of any act, Oomiya-employees, representatives, agents whether such injury or damage arise from carelessness, default, omission, accident or any other cause whatsoever or in any way connected with execution this Contract. The term `damage' in this Clause shall include, inter-ail any damage to buildings whether immediately adjacent or otherwise, and any damage to roads, streets, footpaths, bridges or ways as well as all damage caused to the buildings and Works forming the subject of this Contract as also damage caused to other Contractors or sub-contractors. The Contractor shall indemnify the Company and hold it harmless in respect of all or any expenses, liability, loss, claims or

proceedings whatsoever arising from any such injury or damage to persons or property as aforesaid and also against any claim made in respect of injury or damage under any Acts of Government or statute or at common law or otherwise and also in respect of any award of compensation damages consequent upon such claim.

- b) The Contractor shall at his own cost repair damage of every sort mentioned in this Clause, so as to deliver up the Works complete and perfect in every respect and so as to make good or otherwise satisfy all claim for damage to the property of third parties.
- c) The Contractor indemnifies the Company against, all claims, liability loss and expenses which may be made against the Company by any member of the public or other third party in respect of anything which may arise in respect of the works or in consequence thereof or in respect of any act, omission or neglect by any person during the execution of works, Without prejudice to the aforesaid indemnity given by the Contractor to the Company, the Contractor shall at his own expense arrange to affect and maintain (and regularly pay premium) until the virtual completion of the Contract with such Insurance Company and in such amount as may from time to time be approved by the Company; a Policy or Policies of Insurance in the joint names of the Company and the Contractor (the name of the Company being placed first in such policies) against all such risks as are hereinabove mentioned including inter alia, such insurances are necessary to cover the liability of the Company, the Contractor or as the case may be of such Sub-Contractor and any expense, liability, loss or proceedings which the Company may incur or sustain or suffer, by reason of or in respect of personal injuries to or deaths of any persons or by reasons of loss of or damage to property, moveable or immovable, arising out of or in the course of or carrying out and execution of the Works and covering personal injuries, deaths, injury or damage to property caused by any acts, negligence, omissions or default of the Contractor, his servants or agents. All such Policies of Insurance and the receipts of premiums in respect of such Policies shall on receipt be deposited by the Contractor forthwith with the Company and shall be retained by the Company. The Company shall be entitled to receive money under the said policies of insurance and to apply the same for meeting such expenses, liability, loss, claims aforesaid.
- d) The Contractor shall similarly indemnify the Company against all claims which may be made upon the Company whether under the workmen's Compensation Act or any other Statute in force during the currency of this Contract or any Common law in respect of any employee of the Contractor or of any nominated Sub-Contractor and shall at his own expense effect and maintain until virtual completion of the Works with an Insurer approved by the Company a Policy of Insurance in the joint names of the Company and the Contractor (the name of the Company being placed first in such policies) against such risks and the deposit all such policy or policies and the prima receipt with the Company.
- e) The Contractor shall be responsible to the Company for anything which may be excluded from the Insurance Policies above referred to and also for all other damages to any property arising out of and

incidental to the negligence or defective carrying out and execution of this Contract and the Works. The Contractor shall also indemnify the Company in respect of any costs, charges or expenses arising out of any claim or proceedings and also in respect of any decree, award compensation or damages arising therefrom.

- f) The Company shall be at liberty and is hereby empowered to deduct the amount of any damages, compensation, costs, charges and expenses as aforesaid from any sum or sums due or to become due to the Contractor. Should the Contractor make default in insuring or continuing to insure as provided hereinabove, the Company may in its discretion, but without being bound to do so, itself insure against any risks with respect to which the default in insuring shall have occurred, and shall be entitled to deduct the number of premia from any amount sum or amount due to become due to the Contractor. In case Company will not have any liability in this respect.

25.0 FIRE AND OTHER INSURANCE:

- a) The Contractor shall at the time of signing the Contract insure the works and keep them insured until virtual completion of the Contract against loss or damage by fire, riots and civil commotion with an Insurer to be approved by the Company in joint names of the Company and Contractor (the name of the former being placed first in the policy) for the full amount of the Contract and for any further sum if called upon to do so by the Company. Such Policy shall cover the property of the Company only, and the Engineer and Surveyor's fees for assessing and adjusting the claim and in connection with his services generally in the instatement and shall not cover any property of the Contractor or of any Sub-Contractor or employees. The Contractor shall deposit the Policy and receipts for the premium with the Company within twenty-one days from the date of signing the Contract unless otherwise instructed by the Company. In default of the Contractor insuring as provided above, the Company may in its discretion so insure and may deduct the premiums paid from the money due or which may become due to the Contractor. The Contractor shall as soon as the claim under the Policy is settled, or the work reinstated by the Insurance Office, should they elect to do so, proceed with all due diligence with the completion of the work in the same manner as though the fire, riot or civil commotion had not occurred and in all respect under the same Conditions of Contract. The Contractor, in case of rebuilding, or reinstatement by him shall be entitled to any payment in respect of the repairs of any unfixed material or goods and the removal and disposal of debris, other than the money received under the insurances under this clause.
- b) The amount so due as aforesaid shall be the total value of the works duly executed and of the Contract materials and goods delivered upon the site for use in the Works upped and including a date not more than seven days prior to the date of the said Certificate less the amount to be retained by the Company (as hereinafter provided) and less any instalments previously paid under this Clause provided that such Certificate shall only include the value of the said material and goods and as and from the time as they are reasonably, properly and not prematurely brought upon the site and then only if properly stored and/ or protected against weather.

26.0 **DATE OF COMMENCEMENT AND COMPLETION:**

The Contractor shall be allowed admittance to the site on the "Date of Commencement" i.e. and he shall thereupon and forthwith begin the works and shall regularly proceed with and complete the same except painting or such other decorative work as the Engineer may desire to delay) on or before the "Day of Completion" i.e.

27.0 **DAMAGES FOR NON-COMPLETION:**

The Contractor agrees and undertakes to complete the works on or before the Day of Completion time being of the essence of this Contract. In the event of the Contractor failing to complete the works on or before the Day of Completion or within any extended time fixed under this clause or under Clause 28 of these conditions; the Company shall have an option to terminate this Contract at the risk and cost of the Contractor and also have the Works completed by engaging any other person, firm or company. If, as a result of indirect or direct default on the part of the Contractor in not completing the said works by the aforesaid date any direct or consequential loss or shortfall is occasioned to the Company, the same shall be made good by the Contractor.

Without prejudice to the aforesaid right, Company shall have an option to allow the Contractor to complete the said works and charge the Contractor by way of liquidated damages (and not as penalty), up to a minimum of half percent value of contract amount per week to a max. of 5% of the value of the work as determined by the engineer with the agreement of company.

28.0 **DELAY AND EXTENSION OF WORK:**

If in the opinion of the Engineer the works have been delayed beyond the Day of completion (a) by force majeure or (b) by reason of exceptionally inclement weather or (c) by reason of proceedings taken or threatened by or dispute with adjoining or neighbouring owners or public authorities arising otherwise than through the Contractor's own default or (d) consequent to the delay of other contractors or tradesmen engaged or nominated by the Company or the Engineer and not referred to in the Schedule of Quantities and/or specification provided the Contractor shall have given previous written notice thereof to the Engineer or (e) by reason of Engineer's instructions as per Clause 2 or (f) by reason of civil commotion, strike or lock-out affecting any of the building traders in which case the Contractor shall immediately give written notice thereof to the Engineer or (g) in consequence of the Contractor not having received in due time necessary instruction from the Engineer for which he shall have specifically applied in writing, then the Engineer shall in writing make a fair and reasonable extension of time for completion of the works. Provided further that the Contractor shall constantly use his best endeavour to the satisfaction of the Engineer to proceed with the works.

Nothing herein shall prejudice the rights of the Company under Clause 27 hereinabove.

29.0 **FAILURE BY CONTRACTOR TO COMPLY WITH ENGINEER'S INSTRUCTIONS:**

If the Contractor after receipt of written notice from the Engineer requiring compliance within ten days fails to carry out and execute any work in accordance with the Contract and

or to comply with Engineer's instruction then the Company with the consent of the Engineer and without prejudice to its right to terminate this Contract and provided in Clause 30, may employ and pay other persons to execute any such work whatsoever that may be necessary to give effect there-to, and all costs incurred in connection therewith shall be recoverable from the Contractor by the Company on the Certificate of the Engineer as a debt and may at the option of the Company be deducted by him from any money due or to become due to the Contractor.

30.0 **TERMINATION OF CONTRACT BY THE COMPANY:**

If the Contractor being an individual or a firm commit any 'Act of Insolvency' or shall be adjusted as insolvent or being incorporated Company shall have an order for Compulsory winding up made against it, or pass an effective resolution for winding up or subject to the supervision of the Court or shall be unable without seven days after notice of the Engineer to him requiring him to do so, to show to the reasonable satisfaction of the Engineer, that he is able to carry out and fulfil the Contract and to give security therefore; if so required by the Engineer

or if the Contractor (whether an individual, firm or Incorporated Company) shall suffer execution to be issued. or shall suffer any payment under this Contract to be attached by or on behalf of any of the creditors of the Contractor.

or shall assign or charge encumber or sublet this Contract without the consent in writing of the Engineer first obtained.

or shall charge or encumber this Contract or any payment due or which may become due to the Contractor thereunder.

Or if the Engineer shall certify in writing to the Company that the Contractor:

- i) Has abandoned the Contract, or
- ii) has failed to commence the Works, or has without any lawful excuse under these conditions, suspended the progress of the works for 14 days after receiving from the Engineer written notice to proceed or
- iii) has failed to proceed with the Works with such due diligence and failed to make such due progress as would enable the works to be completed within the time agreed upon, or
- iv) Has failed to remove materials from the site or to pull down and replace work for seven days after receiving from the Engineer written notice that the said materials or work were condemned and rejected by the Engineer under these conditions, or
- v) a) has used sub-standard or inferior material not according to the specifications or has employed inferior workmanship in carrying out

the works or part thereof or has not exercised due diligence in execution of the said work, or

- b) has neglected or failed persistently to observe and perform all or any of the acts deeds, matters or things by this Contract to be observed and performed by the Contractor for three days after written notice shall have been received by the Contractor requiring the Contractor to observe or perform the same, or
- vi) has to the detriment of good workmanship or in defiance of the Engineer's instructions to the contrary, sub-let or sub-contracted any part of the Contract, or
- vii) has failed to comply with the Engineer's instruction or
- viii) has in the opinion of the Engineer committed any breach of this contract. then and in any of the said cases the Company may notwithstanding any previous waiver, after giving seven days' notice in writing to the Contractor, determine the Contractor, but without hereby affecting the right of the Company or the powers of the Engineer or the obligations and liabilities of the Contractor in respect of work, this Contract shall continue in force as fully as if the Contract has not been so determined and the obligations of the Contractor in respect of work subsequently executed shall continue as if the Works subsequently executed had been executed by or on behalf of the Contractor. Any further, the Company by its agents or servants shall be entitled forthwith to enter upon and take possession of the works ad all plant, tools scaffoldings, sheds machinery, steam and other power implements, machinery equipments and materials lying upon the site or the adjoining lands or roads and use the same as its own property and to employ the same by means of its own servants and workmen in carrying on and completing the works or by employing any other contractor and the contractor shall not in any way interrupt or do any act, matter or things to prevent intimidate or hinder such other contractor or other person or persons employed for completing and finishing or using the materials and plant for the Works. When the Works shall be completed or as soon as thereafter as convenient, the Engineer shall give a notice in writing to the Contractor to remove his surplus materials and plant, and should the Contractor fail to do so within a period of 14 days after receipt thereof by him, the Company shall sell the same either by public auction or a private sale and shall give credit to the Contractor for the amount realized. The Engineer shall thereafter ascertain and certify in writing under his hand what (if anything) shall be due or payable to or by the Company for the value of the said plant and materials so taken possession of by the Company, the expense or loss which the company shall have been put to in procuring the works to be completed, and the amount, if any owing to the Contractor and the amount which shall be so certified shall thereupon be paid by the Company to the Continentals or by the Contractor to the Company, as the case may be, and the Certificate of the Engineer shall be final and conclusive and binding on the parties hereto. In the event of termination under this clause, the Company shall not be bound by any provision of this Contract to make any further payment to the Contractor until the said works are completed.

31. **PRIME COST AND PROVISIONAL SUMS:**

- a) Where "Prime Cost" (P.C.) prices are provisional sums of moneys provided for any goods or work in the specification or Schedule of Quantities, the same are exclusive of any trade discounts or allowances, discount for cash, or profit which the Contractor may require and of carriage and fixing.
- b) All goods or work for which prime cost prices or provisional sums or money are provided may be selected or ordered from any manufacturers or firms at the discretion of the Engineer or the Company and the Company reserves to itself the right of payment direct for any such goods or work and deducting the said prices or sums from the amount or Contract. Should any goods or work for which prime cost prices or provisional sums are provided or portions of same be not required, such prices or sums, together with the profits allowed for the same and such additional amounts as the Contractor may have allowed for carriage and fixing, will be deducted in full, from the amount of the Contract.

Whether the goods be ordered by the Contractor or otherwise, the Contractor shall, at his own cost, fix the same if called upon to do so and the Contractor shall also receive and sign for such goods and be responsible for their safe custody as and from the date of their delivery upon the works.

- c) In cases in which the provisional quantities of material are contained in this Contract, the Contractor shall provide such material to such amounts or to greater or less amounts as the Engineer shall direct in writing at the net rates at which he shall have priced such items in his Schedule of Quantities. Should however, any such items be entirely omitted, which omissions shall be at the Engineer's discretion, no profit on such items shall be allowed to the Contractor.
- d) No prime costs sum or sums (or any portion thereof) shall be included in any certificate for payment to the Contractor, until the receipted accounts relating to them have been produced by the Contractor to the Engineer. Such accounts shall show all discounts and any sum or sums in respect of such discounts shall be treated as a trade discount. Provided always that should the Contractor in lieu of producing such receipted accounts request the Engineer in writing to issue a Certificate on the Company for such sum or sums due either on account in settlement to a Sub-Contract direct, the Engineer shall, upon satisfying himself that the sub-contractor is entitled to the same, so issue the certificate, and such sum or sums shall be deducted from the amount of the Contract at the settlement of accounts and any profit or further sum to which the Contractor is properly entitled in respect of such Sub-Contract and which is in conformity with the terms of the Contract, shall be allowed to the Contractor at the settlement of accounts as though the amount of such certificate to the sub-contractor had been included in a Certificate drawn in favour of the Contractor.

- e) If the Contractor neither produces the receipt nor gives authority to the Engineer to issue a Certificate in favour of such Sub-Contract direct, the Engineer may upon giving the Contractor seven days' notice in writing of his intention to do so, issue to the Sub-Contractor such Certificate direct on the Company and obtain the receipt from the Sub-Contractor, which receipt shall be deemed a discharge for the amount of such Certificate as though given by the Contractor. In the event of such default on the part of the Contractor, he shall not be allowed any profit he may have added in the Schedule of Quantities upon such Sub-Contract.
- f) The exercise of the option before referred to by the Contractor and the issue of Certificates as before described to Sub-Contractor upon the Contractor's request for the issue to the Sub-Contractor direct of Certificates by the Engineer shall not however relieve the Contractor from any of the liabilities in respect of insufficient, faulty or incompleted work of the Sub-Contractor, for which he may be liable under the terms of the Contract.
- g) If any provisional items are provided for work of a nature usually carried out by the Contractor in the ordinary course of his business, the Company shall give the contractor an opportunity of tendering for the same without prejudice to the Company right to reject the lowest or any Tender.

32. **CERTIFICATE AND PAYMENTS:**

The Contractor shall be paid by the Company from time to time by instalments under Interim Certificates to be issued by the Engineer to the Contractor on account of the Works executed when in the opinion of the Engineer, work to the approximate value Rs.75,000/- of "Value of work for Interim Certificates" has been executed in accordance with this contract, subject however to a retention of 5% of value of the bill hereto as "Retention percentage for Interim contract. For purposes of Interim payments, Contractor shall submit to the Engineer a detailed statement of the work done till the date of preparing the bill with supporting details, in triplicate, one of which will be returned to him duly certified. And the Contractor shall be entitled to the payment of the final balance in accordance with the Final Certificate to be issued in writing by the Engineer at the Expiration of the period, (referred to as "the Defects Liability Period") from the date of Virtual completion or as soon after the expiration of such period as the works shall have been finally completed and all defects made good according to the true intent and meaning hereof whichever shall last happen, provided always that the issue by the Engineer of any Certificate during the progress of the Works or at or after their completion shall not relieve the Contractor from his liability under Clauses 2 and 20, nor relieve the Contractor of his liability in cases of fraud, dishonesty, misrepresentation or fraudulent concealment relating to the works or materials or to any matter dealt with in the Certificate, and in case of all defects and insufficiencies in the works or materials, goods or workmanship which a reasonable examination would not have disclosed No. Certificate of the Engineer shall of itself be conclusive evidence that any works or materials, goods, or workmanship to which it relates is in accordance with the contract. The Engineer shall have power to withhold any Certificate if the Works or any parts thereof are not being carried out to its satisfaction. The Engineer may by any Certificate make any

correction in any previous Certificate, which shall have been issued by it. Payments upon the Engineer's Certificate shall be made within 7 days and after such certificate have been delivered to the Company.

33. A. No signs of advertisement will be allowed to be displayed by the Contractor or Sub-Contractor at the site or works without the prior consent of the Company in writing.

B. **CLEANING:**

The Contractor shall at all times keep the site free from accumulation of waste materials or rubbish caused by his employees or work, and at the completion of the Works, he shall remove all this rubbish from and about the building and all his tools, scaffolding and surplus materials and shall leave his work 'broom clean' or its equivalent unless more exactly specified. In case the Contractor fails to do so, the Company may remove the rubbish and recover the cost thereof from the Contractor or may deduct the same from any money due or may become due to the Contractor.

C. **SECURITY:**

The Contractor shall continuously maintain adequate protection of his work from damage and shall protect the workmen and other person or persons on the site or works and Company's property from any injury or loss arising in connection with this Contract and shall arrange for security measures and provide such security staff as may be necessary or as may be directed by the Engineer from time to time.

The Contractor shall erect and properly maintain at all times, as required by the conditions and progress of the work, all necessary safeguards for the protection of workmen and the public and shall post danger signs warning against the hazards created by such features of construction as protruding nails, hoists, well holes, elevators hatchways, scaffolding, window openings, stairways and falling materials.

In an emergency affecting the safety of life or of the work or of adjoining property, the Contractor shall immediately take such actions, under advice to the Company and the Engineer, as may be necessary to prevent such threatened loss or injury and if so, instructed by the Engineer or Company, he shall immediately carry out such instructions.

D. **SECURITY AND LIEN:**

The design basis and all engineering studies, drawings, transparencies, flow sheets, plans, process information, specifications, documentary material and other papers or documents or material and goods supplied by the Company or the Engineer shall at all times remain the sole and exclusive property of the Company and shall be delivered to the Engineer or the Company as may be directed, on completion of the works, or earlier termination or determination of the Contract unless called for earlier by the Engineer or the Company, without claiming any lien whatsoever thereon and shall be treated as

secret and confidential by the Contractor and no such disclosure shall be made by the Contractor or to any person except to its personnel as is strictly necessary for the performance of the works under this contract.

E. PAYMENT DUE FROM THE CONTRACTOR:

All costs, damages, or expenses for which under the Contract the Contractor is liable to the Company may be deducted by the Company from any money due or becoming due to the Contractor under the Contract or may be recovered by such action at law or otherwise from the Contractor, as the Company may deem it necessary or expedient.

34. MATTERS TO BE FINALLY DETERMINED BY ENGINEER:

The decision, opinion, direction, Certificate (except for payment) of the Engineer, with respect to all or any of the matters under clause 2a,2b, 3,4,7,12,19,28, (a, b, c, d, f) and 30 hereof, (which matters are herein referred to as "the excepted matters") shall be final and conclusive and binding on the parties hereto and shall be without appeal. Any other decision, opinion, direction, (certificate or valuation or the Engineer or any refusal of the Engineer to give any of the same shall be subject to the right Arbitration and review in the same way in all respect (including the provision as to opening the reference) as if were a decision of the Engineer under the following Clause.

35. FORCE MAJEURE:

Neither party will be liable for non-performance either in whole or in part of responsibility due to reasons unforeseen and beyond its control, such as strikes, lock-outs, interruption of traffic, act of God, acts of Government, war, fire etc. In such an event, the other party will be notified immediately in writing detailing the full facts of the case and revised schedules having regard to the interference. The foregoing shall not, however be considered as a waiver of the obligations of the parties and as soon as such occurrence shall cease the party or parties affected thereby shall promptly fulfil their previously unfulfilled obligations.

36. ARBITRATION:

If any dispute or difference arises between the Company and the Contractor at any time during the tendency of the contract in relation to anything or any matters arising out of this or under this contract, or the interpretation of any of the provisions of this contract, the same shall be referred to arbitration by a single arbitrator if the Company and the Contractor agree upon one, otherwise to two arbitrators one to be appointed by each party. These two arbitrators shall appoint an umpire before proceeding on the reference. The arbitration proceedings shall be conducted in Bombay and shall be subject to the provisions of the Indian Arbitration Act, 1940 or any rules/amendments thereof or thereunder for the time being in force.

Work under the contract shall, unless otherwise directed by the Company, continue during the arbitration proceedings and no payment due or payable by the Company shall be withheld on account of such proceedings provided.

However, it shall be open for the arbitrator or arbitrators to decide whether or not the work should continue during arbitration proceedings.

VI TECHNICAL SPECIFICATION

CONTENT

- I EXCAVATION FILL AND BACKFILL**
- II REINFORCED AND PLAIN CEMENT CONCRETE⁵**
- III STRUCTURAL STEEL**
- IV BRICK MASONRY, MORTAR, POINTING AND BRICK-BAT COBA**
- V UNCOURSED RUBBLE MASONRY**
- VI PLASTER**
- VII FLOORING**
- VIII SEALING OF JOINTS**
- IX T.W. DOORS, WINDOWS, VENTILATORS**
- X STEEL WINDOWS VENTILATORS AND DOORS**
- XI METAL DOORS, FRAMES AND ALUMINIUM WINDOWS**
- XII ROLLING SHUTTERS**
- XIII GLASS AND GLAZING**
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- XV ASBESTOS CEMENT SHEET ROOFING/CLADDING**
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- XVIII SANITARY WORKS, SANITARYWARES & PIPING**
- XIX SEWERS, MANHOLES, STORM WATER DRAINS**
- XX SUSPENDED CEILING**
- XXI FIELD PAINTING**
- XXII MISCELLANEOUS METAL WORK**
- XXIII ROAD WORK**
- XXIV SPECIFICATIONS FOR POLYMER MODIFIED CEMENT MORTAR**

I - EXCAVATION FILL AND BACKFILL

1. **SCOPE OF WORK:**

The work covered includes all excavations, fill and backfill as hereinafter specified and required by the drawings.

2. **GENERAL:**

It is essential that the Contractor have a representative visit the site and satisfy himself by such methods as he may choose as to the actual conditions at the site.

3. **EXECUTION OF THE WORKS:**

It must be clearly understood that the contract rates are intended to cover the full cost of finished work, Banks such slopes as may be specified in each case, work before being finally paid for is to be certified and approved by Consultant as having been correctly raised to or excavated down to proper level, and to have been otherwise completed in accordance with the specification. Until final measurements have been made, all banks cuttings are to be maintained by the contractor, who will be held responsible for their transfer in proper condition, and for their restoration to such condition, if necessary.

4. **GENERAL REQUIREMENTS:**

The Contractor shall provide all stakes, bamboo's string and pegs for profiles requisite for the correct execution of the work, and for marking out borrow pits and their slopes. He shall provide labour for setting out the same and shall be responsible to maintain it.

The Contractor shall take charge of and sign all bench marks, centre line, tangent points, demarcation and other field stones for preserving then until the work is completed. It will be the responsibility of the Contractor to see that excavated earth is deposited to such widths, depths and heights, and in such places as may be from time to time directed by Consultant.

5. **USE OF EXPLOSIVES:**

The contractor shall notify Consultant at least 24 hours in advance of any blasting operations and furnish a schedule showing the size of shots contemplated, the precise time of each shot, and the shortest distance from each contemplated shot to existing buildings, utilities or structures. No blasting shall be done without the approval of Consultant.

Transportation handling, storage and use of explosives shall be directed by Consultant of proven experience and ability in blasting operations, These operations shall be in accordance with the procedures and practices recommended by Consultant. In the absence of any instructions available from Consultant corresponding procedures followed by State or Central Government shall be followed and shall be approved by Consultant. Any modification exceptions to the above provision shall be cleared with Consultant before any work is undertaken. Any license or permission of

collector or Police authorities required for blasting shall be obtained by the contractor at no extra cost to Consultant.

6. **PROTECTION:**

From the date when the Contractor start work under this contract, or from the required contract date, whichever is earlier, the Contractor shall assume all responsibilities for

earth and rock banks. Such responsibility shall continue to the date when all work under the contract is completed and accepted by Consultant. The contractor shall provide all sheeting, shoring and bracing shall be maintained in place until immediately before filling or backfiring and then shall be removed by stages as the filling or backfiring progresses. Consultant reserves the right to specify or bracing as may be deemed necessary by them.

Any settlement or washing away of filled or backfilled areas, and earth and rock banks, that may occur from the action of the elements, or any other cause, prior to acceptance or work shall be repaired and grades reestablished to the required elevations and slopes, at no additional cost to Consultant.

7. **PUMPING:**

The Contractor shall provide, maintain and operate sufficient pumping equipment of approved capacity to keep the area of construction free from water during the construction period. If soft spots occur in the excavated area as a result of improper maintenance by the contractor, the contractor shall remove the unsuitable material and shall backfill the area as hereinafter specified, at no cost to Consultant. Pumping shall be controlled to dispose of water to adequate draining ditches and shall not be routed to inconvenience existing plant operations.

8. **SETTING OUT:**

The centre longitudinal or face line and atleast one main cross line are to be marked by means of small masonry pillars, built clear of the point to which the slopes of the excavation will extend. On each pillar there must be an accurate mark to enable the odolite to be set up over it for setting out purposes. These pillars must be adequately protected from any possibility of damage during the course of the work. The provision and protection of pillars will be at the expense of the contractor, and shall be included in the rates in the absence of closer trail pit results the bottom of the footing elevations are based on the linear interpolation between the two nearest available test pits however, the actual depths shall be determined in the field according to the actual soil conditions on the basis of the assumed design capacity of the soil, as approved by Consultant.

9. **DEFINITION OF TERMS:**

a) FILL - shall be earth, sand, stablised aggregate, or other material specified to bring the existing grade to a proposed grade.

BACKFILL - Shall be earth, stablised aggregate, or other material specified to replace earth or rock, removed during construction.

- c) ROCK - material classified as rock shall be solid or ledge rock, concrete, or other hard material in place, which ordinarily cannot be removed without blasting or quarrying, and all detached rock, boulders or concrete having a volume of not less than 0.25 cubic metre.

10. **EXCAVATION:**

a) **Depth Of Excavation:**

Structures shall be measured according to neat lines shown on the plans or as ordered in writing by Consultant for special cases. Deductions will be made for unauthorised excavation. Excavation performed beyond the required neat lines, or slope stakes not be measured for payment. Where suitable bearing material is not encountered at the elevations shown on the drawings, Consultant may direct in writing that the excavation be carried out elevations below those on the drawings.

b) **Preparation Of Ground Surfaces For Fill:**

All vegetations, such as roots, bush, heavy sods, heavy growth of grass, all decayed vegetable matter, rubbish and other unsuitable material within the area on which fill is to be placed shall be stripped or otherwise removed before the fill is started.

c) **Grading For Areas To Be Torsoiled:**

Shall be performed so that graded surfaces shall be 10 cm below finished grades.

d) **Unauthorised Excavation:**

Below the elevations or beyond other required limits indicated on the drawings or in these specifications the excavation shall be restored to meet specifications with lean concrete or other material as directed by Consultant at the Contractor's expense.

e) **Trench Excavation:**

Unless otherwise indicated on the drawings, trench excavation shall be by open cut. Bottom of trenches for piping shall be accurately graded so that the pipe is uniformly supported along its entire length. After trench bottom has been graded, bell holes or depressions for other type of piping joints shall be cut below the bottom of the trench to the depth necessary for the particular joint. When rock is encountered at the bottom of the trench, it shall be removed for not less than 15 cm below grade of pipe and backfilled with approved earth or sand.

f) **Rock Excavation:**

Any rock encountered in excavation work shall be removed as necessary to the lines, grades and dimensions indicated on the drawings.

The minimum distance between rock and the top of concrete sidewalks, and between rock and the top of subgrade for roads and parking areas shall be 15 cm. Should any excavation be taken below the specified levels, the contractor shall fill in such excavation at his own cost, with lean concrete 1:4:8 well rammed in position until it is brought to the proper level. Filling in with excavated material shall not be permitted for this work.

g) **Disposal Of Excavated Material:**

No excavated material is to be heaped within 6 metre of the top edge of excavation unless permitted in writing by Consultant. Excavated any material suitable for and required for fill and backfill shall be stored in stock piles in areas on the site as approved by Consultant. Other excavated material not suitable for or required for fill and backfill shall be neatly spread to bring the adjacent ground to a specified grade (if necessary) or otherwise shall be removed from the site and disposed of as directed by the Consultant. No extra payment shall be made for doing this work.

h) **Rates For Excavation Of Foundation Shall Be Also Include:**

- i) All incidental charges thereon such as shoring, pumping, baling, removal of slips cables, etc. and all other works of whatever description necessary for carrying out works satisfactory.
- ii) All lead of 60 metres and stacking excavated rock as instructed by Consultant.
- iii) Refilling the space between the building up wall and the sides of trenches with excavated soil laid in 15 cm layers, watered and rammed.
- iv) Refilling foundation pits and drain trenches to the original surface or as directed.

11. **EARTHFILL AND BACKFILL:**

- a) Materials for each fill and backfill shall be free from organic and vegetable matter, rubbish large clods earth, boulders, broken rock or concrete over 15 cm in largest dimension, and other unsuitable material and shall be suitable material from required excavation at the site or shall be obtained from a borrow area specified and approved by Consultant.

Earth fill and backfill shall be placed in horizontal layers not exceeding 15 cm in thickness (loose depth), unless otherwise authorised by Consultant wetted as required, and compacted by approved hand or mechanical tempers, or other compacting equipment to a density of at least 90% at optimum moisture content.

After completion of construction below grade, all forms shall be removed and excavation cleared of all waste materials and debris.

Excavation shall be backfilled as soon as this work can be done without injury to the concrete. Fill and backfill when placed on sides of piers, walls and free standing structures, shall be deposited on both sides at the same time to approximately the same elevations. Proper provision shall be made to prevent any wedging action against the walls or structures.

b) **Trench Backfill:**

Trench backfill shall be rodded along the bottom and sides of pipe and solidly compacted backfilling of trenches for pipe lines shall be done first over the middle portion of each length of pipe, bring the cover to a depth of at least 30 cm over the top of the pipe while leaving all field joints exposed. The field joints shall be left in this condition until after the pipe has been tested for tightness. After all required tests on piping have been approved by Consultant the remaining trench backfill shall be accomplished. Extreme care shall be exercised during backfilling operation to prevent damages to coated or wrapped piping. The use of the steel tamping implements in this instance in the immediate vicinity of the piping is forbidden.

12. **ALLOWANCE FOR WORKING SPACE:**

The contractor shall make allowance for the working space required to carry out the subsequent construction portion. The measurement of plan area will be based on PCC dimensions as indicated in the drawings.

II - REINFORCED & PLAIN CEMENT CONCRETE

1.0 SCOPE OF WORK

The work covered consists in furnishing and the installing of concrete work in strict accordance with this specification and applicable drawings.

2.0 GENERAL

All embedded items, buried piping and cables shall have been inspected approved before concrete is placed in position. It shall be the responsibility of the contractor to see that all embedded and buried items remain in proper position while concreting is being done.

Unless otherwise specified all work and materials shall conform to latest applicable issue of I.S.I. specification.

3.0 MATERIALS

a) Cement:

Cement shall be ordinary portland Cement conforming to I.S. 269-1967. Only one brand of each type of cement shall be used for concrete in any individual structure. Cement reclaimed from cleaning bags or leaking containers shall not be used. Cement shall be used in the sequence of receipt of shipments unless otherwise directed.

Immediately upon receipt at site of work, cement shall be stored in a dry weathertight, properly ventilated structure, with adequate provision for prevention of absorption of moisture.

The brand and source of supply of cement to be got approved from consultant.

b) Sand:

1) General:

The sand used shall conform to IS-383-1970 be obtained from a source approved by Consultant.

Use of sea-sand will not under any circumstances be allowed for any description of mortar or concrete by Consultant to be determined to the strength, appearance or the dryness of the works.

The sand shall be well graded, coarse in texture, clean, gritty to the touch, hard strong durable and free from salt, mica, clay, earth coal, any animal vegetable and bituminous matter, any soluble sulphate gypsum and any other harmful material. Unless initially clean, and sand shall be thoroughly and carefully cleaned by screening and washing in fresh and clean water. All fine aggregates shall be stored on the works in such a manner as to prevent the instruction of foreign matter.

2) Grading:

- i) Fine aggregates shall conform to the following sieve Analysis:-

<u>SIEVE</u>	<u>% PASSING</u>
3/8	100
No. 4	95 - 100
No. 8	80 - 100
No. 16	50 - 85
No. 30	25 - 60
No. 50	10 - 30
No. 100	2 - 10
No. 200	0 - 5

- ii) The fine aggregate shall have not more than 45% retained between any two consecutive sieves, and its fineness module shall be not less than 2.2 nor more than 3.2.

- iii) Should the fineness modules vary by more than 0.20 from the value assumed in selecting the proportions concrete, the fine aggregate shall be rejected unless suitable adjustments are made in concrete proportions to compensate for the difference of grading.

- iv) Bulking:

Moist sand when loosely into a container occupies a larger volume than it would occupy when dry. When sand is measured by loose volume, it is necessary in such a case to increase the measured volume of the sand in order that the amount intended for nominal mix is used. The increase in the volume shall be equal to the percentage bulking, to be determined by laboratory tests for each batch.

c) Coarse Aggregate:

Coarse aggregate shall conform to I.S.383-1979, and shall be graded from fine to coarse, within the prescribed limits. The testing and maximum size of aggregates shall be in accordance with the I.S. 383-1970. To get affected control of quality materials, which do not conform, to I.S.I. Specifications shall not be brought to site of work. Washing, ridding etc. Of aggregate shall be done away from the job site. Storage piles of aggregate shall have good drainage to exclude inclusion of foreign matter, and preserve the gradation.

Sufficient live storage shall be maintained to permit segregation of successive shipments, placement of concrete at required at rate and such procedures as inspection and testing. Max. size of coarse aggregates shall be 20mm.

d) Water:

Water shall be clean and free from deleterious matter. such as oil, acid, alkali, sugar and vegetable matter. Every attempt shall be made to used directly from the supply mains.

e) Inserts:

Inserts will be specified on drawings. Inserts for bolt hangers be either threaded or bolted as required by the type of hanger to be used. Threaded inserts shall have integral lugs to prevent turning.

f) Reinforcement:

All M.S. Reinforcing bars shall conform strictly to I.S.432-1966 and Ribbed Torsteel to IS-1786-1966. Reinforcing bars shall be fabricated to shapes and dimensions shown and shall be placed where indicated on the drawings, or where required to carry out intent of drawings and specifications. Before being placed reinforcement shall cleaned of loose rust, mill scale, or coating that would reduce or destroy the bond.

Following any substantial delay in the work, previously placed reinforcement left for future bonding shall be thoroughly inspected and cleaned. Reinforcement left for future bonding shall be thoroughly inspected and cleaned. Reinforcement shall not be bent or straightened in a manner injurious to the material. Bare with kinds or bends not shown on drawings shall not be placed. Reinforcement shall not be spliced at points or maximum stress. Laps or splices shall be of adequate length to transmit stresses. Splices in adjacent bars shall be staggered. Splices in columns, piers and shafts shall be lapped sufficiently to transfer the full stress by bond.

The reinforcing bars shall be placed as directed by Consultant and shall be kept rigidly in position while concreting is being done. The correct clearance from the form work, as indicated under paragraph 9 shall be maintained.

4. **FORM WORK AND CENTERING:**

a) Material used for form work in various parts of the structures shall be as follows:-

<u>PART</u>	<u>TYPE OF FORMWORK</u>
Foundation	Unwrought
Columns below ground level	Unwrought
Plinth beams, Roof beams Floor beams, Roof beams, Lintels, etc.	} Unwrought
Walls	Unwrought

Stairs

Unwrought

In general, all shuttering and formwork to be used shall be unwrought, unless otherwise stipulated.

Wrought formwork if required to be used for work shall be: wooden form work lined with plywood or metal plates without indentation or 'Anchor Board' shuttering or equivalent approved by Consultant. When the wrought type of formwork is used, the concrete surfaces after the removal of formwork shall not require any plaster.

Unwrought Formwork: Wooden plank used for this type of Formwork shall be as available from the saw mills. They need not be further planned. When this type of formwork is used, the concrete surfaces after the removal of formwork shall be plastered only where necessary, as required by Consultant.

- b) The framework shall be so constructed that it is rigid enough to remain free from any bulging, sagging or any movement during the placing of the concrete, and that it can be subsequently removed without damaging concrete. The formwork shall be sufficiently watertight to prevent loss of liquid from the concrete. All formwork shall be fixed to proper elevation. No concreting shall be undertaken by the contractor until the level, size, suitability, etc. is approved by Consultant.
- c) Wooden forms for reinforced cement concrete shall be least 25 mm thick. All rubbish shall be removed from the interior of the forms and the surface of formwork and thoroughly treated with oil. The oil shall be applied before the reinforcement is placed and care shall be taken that no oil comes in contact with steel while it is being placed in position. The joints of forms shall be made watertight by plugging them with good clay and jute, or by other approved means before applying oil. The form shall be so fixed that only sight marks are visible on the surface of the concrete after stripping the forms.
- d) No plug, bolts, ties or any appliances whatsoever for supporting the shuttering shall be fixed permanently in the structure, nor be placed temporarily in such a manner that damage to the structure would result from their removal at the time of striking the forms and supports.
- e) No forms shall be removed or staging struck until it is safe to do so and approved by Consultant. All vertical centering members shall be sufficiently braced with stiff members. Bamboo shall not be used as bracing members.

All formwork shall be removed without shock or vibration and without damaging the new concrete. The side forms shall be so fixed that while removing them the supporting form and posts are not disturbed to any extent. In no circumstances, should the supporting form be struck until the concrete reaches a strength of at least twice the stress to which the concrete may be subjected at the time of striking. Under normal conditions, the periods shown below are the

minimum which should be allowed between the placing of the concrete and the removal of the forms.

Removal of Form Work	Normal Portland Cement weather temperature above 21C
Side of beams, walls and Columns	48 hours
Shuttering under slabs and beams soffits	7 days
Supports or props under horizontal members	2 weeks for spans less than 6 meter 3 weeks for spans over 6 meters.

- g) Formwork shall be cambered as described below, unless otherwise shown or specified. Deflection reading of various elements shall be taken as directed.

<u>Type of member</u>	<u>Compressed steel as</u> <u>percentage of tensils steel</u>	<u>Camber</u> <u>coefficient</u>
Simple span	0	0.066
	50%	0.037
Continuous or	0	0.032
Restrained span	50%	0.020
Cantilover span	0	0.086
	50%	0.046

Camber $K = \text{camber coefficient}$
 $L = \text{Length of member in ft}$
 $D = \text{Depth of member in ft.}$

5. MIXING OF CEMENT CONCRETE:

The quantities of cement shall be determined by weight. Ordinary Portland cement shall be taken to weight 1442 kg/m.

The quantities of fine and coarse aggregates shall be determined either by volume for ordinary concrete and by weight for controlled one. The proportions of volume or weights specified are based on dry aggregates, due allowance is to be made for bulking or variation in weight of aggregates according to I.S 2386 (Part III) - 1963.

All concrete shall be mixed in a mechanical mixer until there is uniform distribution of the materials, and the mass is uniform in colour and

consistency, but in no case shall the mixing be done for less than two minutes. Hand mixing shall not be allowed for any concreting work on the job.

6. **TRANSPORTING AND DEPOSITING OF CONCRETE**

No concreting shall be started until the surface on which it is to be deposited has been checked and approved by Consultant.

Concrete shall be transported from the mixer to the place of final deposit as rapidly as practicable, and by methods which will prevent segregation or loss of ingredients. Equipment for chuting, pumping and pneumatically conveying concrete shall be of such size and design as to insure a practically continuous flow of concrete at the delivery and without any separation of materials. The chute shall be of metal-lined wood, with slope not less than 1 vertical to 3 horizontal, nor more than 1 vertical to 2 horizontal. The discharge end of the chute shall be provided with a baffle plate to prevent segregation.

Concrete shall be deposited as nearly as practicable in its final position to avoid segregation due to rehandling or flowing. The concreting shall be carried on at such a rate that the concrete is at all times plastic and flows readily into the spaces between bars. No concrete that has partially hardened or been contaminated by foreign material shall be deposited on the work, nor shall retempared concrete be used.

When concreting is once started, it shall be carried on as a continuous operation until the placing of the section is completed. the top surface shall generally be made level as far as practicable. When concrete is to be placed as a roof slab contractor shall organise the placing so that the entire slab and supporting R.C.C. beams etc. are poured in one operation and without joint breaks.

In foundation trenches or such other situation, concrete should be carefully deposited and not thrown from a height.

If transported to the work in barrows the barrow may be tipped from a height of not more than 1 meter above the bottom of the layer being deposited. If the height exceeds 1 meter the concrete must be tipped on to an inclined plane or spout. Water shall be removed from excavation before concrete must be tipped on to an inclined plane or spout. Water shall be removed from excavation before concrete is deposited. Any flow of water shall be diverted through proper side drains and shall be removed without washing over freshly deposited concrete.

Before fresh concrete is deposited upon or against any concrete which has already hardened, the surface of the hardened concrete shall be well roughened by chipping and all laitance removed, the surface shall then be swept clean with wire brushes, thoroughly wetted and covered with a thin layer of mortar composed of equal volume of cement and sand.

An excess of cement shall be provided in the concrete in contact with the old work.

Concrete footings shall be placed upon undisturbed clean and hard surfaces of specified bearing capacity.

Special care shall be taken in placing of concrete to prevent cracks, voids or projections and to provided true straight and smooth surfaces.

7. **COMPACTION:**

No concrete work to start unless an adequate number of vibrators are at hand. Concrete shall be placed in layers not over 30 cm deep. Each layer shall be compacted by mechanical internal vibrating equipment, supplement by hand spading, rodding and damping as directed, Vibrators shall in no case be used to transport concrete inside forms. Use of form vibrators will not be permitted. Duration of vibration shall be limited to time necessary to produce satisfactory consolidation without causing objectionable segregation, and shall be at last 3.5 minutes per square meter of exposed surface. The vibrator shall not be inserted into lower courses that have begun to set. Pan type of vibrator shall be used for slabs, flooring and at places as directed by Consultant.

8. **GROUTING:**

Grout for anchor bolt sleeves and other metal items shall be composed of equal parts of sand and portland cement, with water sufficient to produce required consistency.

a) **CONCRETE COVER OVER REINFORCEMENT**

Shall not be less than the following thickness:-

Footings and other principal structural members in which concrete is deposited against ground	50mm between steel & ground
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When concrete surfaces, after removal of forms, are exposed to weather or ground:-

For beams & girders:

For bars more than 16 mm in diameter	25 mm
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For bars 16 mm or less in diameter	25 mm
------------------------------------	-------

When surfaces are not directly exposed to weather or ground

For slabs and walls	15 mm
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For columns	40 mm
-------------	-------

All covering, except at ends of reinforcing bars to be equal to the diameter of the bar at 12 mm minimum. At each end of reinforcement bar, not less than 25 mm more nor less than twice the diameter of such rod

The covers shall be maintained either by plastic cover block or mortar cover blocks in cm 1:2 with binding with placed in it.

b) steel in walls

Unless otherwise shown, shall be continuous throughout the length of the various members, splices shall not occur at critical sections.

c) All reinforcing bars shall bent and extended for at least 60 cm around all corner or to fully develop the bar.

d) Where embedded items interfere with reinforcing bars, the spacing of the bars on either side of the embedded item shall be decreased to maintain the required steel area.

10. **CURING:**

All cement concrete after placing shall be covered with a layer of sacking, canvas hessian, or similar absorbent material, and kept wet continuously for not less than a fortnight. All water used, both in the preparation and final wetting to be clean from sediment of any kind and generally fit for drinking. The work shall be protected from drying winds and direct sunrays.

11. **EMBEDDED ITEMS IN CONCRETE:**

The contractor shall furnish and install all ladder rungs as and where indicated on the drawings. All costs for accurate placing or inserts and for all modifications to formwork shall be included in rate.

12. **CONSISTENCY:**

For reinforced cement concrete work, plastic concrete, which will flow sluggishly into the forms and around the reinforcement without any separation of coarse aggregate from the mortar shall be used. The degree of plasticity shall depend on the nature of work and whether the concrete is vibrated or hand tamped. The following slumps in the standard slump test shall be adopted for different types of work.

<u>TYPE OF WORK</u>	<u>SLUMPS</u>
1. Mass concrete in R.C.C. foundation footings and retaining walls	12mm to 25 mm
2. Beams, slabs and columns simply reinforced.	25 mm to 40 mm
3. Thin R.C.C. section or section with congested steel	40 mm to 50 mm

to determine the required quantity of water per of cement for the proper consistency, the slump tests shall be carried out at site with a standard slump cone twice a day and also when it is desired by Consultant.

13. **STRENGTH OF CONCRETE:**

For all items of R.C.C. work, the grading and quality of aggregate shall be such as to give minimum compressive strength for different mixes as given below:

Minimum cube crushing strength in work tests

<u>MIX</u>	<u>AT 7 DAYS</u>	<u>AT 28 DAYS</u>
M 150	100 kg/cm ²	150 kg/cm ²
M 200	135 kg/cm ²	200 kg/cm ²
M 250	170 kg/cm ²	250 kg/cm ²
M 300	200 kg/cm ²	300 kg/cm ²
M 350	235 kg/cm ²	350 kg/cm ²
M 400	270 kg/cm ²	400 kg/cm ²

Note: Controlled concrete shall be designed in accordance with IS 456 1964. The mix proportions of ordinary concrete shall be per Table No.III of IS 456-1964.

14. **FINISH OF CONCRETE SURFACES:**

Slight honey combed minor defects shall be patched with cement mortar of 1 part cement to 2 parts fine aggregate after approval of Consultant.

15. **STRENGTH TEST DURING THE WORK:**

Samples of concrete shall be taken as often as considered necessary by Consultant and tests carried out in accordance with IS 516-1959 sample size frequency and acceptance criteria shall be in accordance with IS 456-1964. In case the strength obtained is less than specified minimum strength after 28 days Consultant shall reject the defective portion of work and the Contractor shall be required to dismantle all (such work together with the other work structurally connected with the same) at his cost and risk. In case however the less strength obtained is acceptable to the Engineer in charge, the rate of concrete for the quantity represented by the sample tested shall be reduced in proportion to the strength actually obtained after 28 days. Consultant shall decide the quantity of work for which the rate is to be reduced or the part of the structure required to be dismantled.

Samples shall be taken from each 50 cubic meter of concrete made during the progress of the work, or when a days concrete work does not amount to 50 cubic meter from each day's pour, Six cubes or cylinders as approved by Consultant shall be made for every sample, and three of the test result of 28 days test by taking an average of three test specimens shall be considered for the action contemplated above. The results of test conducted by any of the recognised laboratories shall be taken as final and binding on the contractor.

Moulds shall be furnished by the contractor and he shall arrange for testing of cubes a laboratory specified by Consultant at no extra cost of Employer.

The Contractor shall furnish the labour and facilities required for taking samples and handling and storing of concrete test cube/cylinders at the site of the work, without any cost to Consultant.

16. **JOINTS CONSTRUCTION**

Concreting shall be carried out continuously up to construction joints, the position details of which shall be predetermined by Consultant.

When the work has to be resumed on a surface which has hardened, such surfaces shall be roughened, the surfaces shall then be thoroughly cleaned, and all paintings removed with the wire brushes and compressed air. In addition to that the surface should be completely wetted and slushed with coat of neat cement grout immediately before placing of new concrete. The first layer of concrete to be placed on these surfaces shall not exceed 15 cm thickness and shall be well rammed against old work, particular attention being paid to corners and close spots, shear keys not less than 5 cm deep and equal to 50% of the gross sectional area shall be provided to all construction joints.

Reinforcing rods shall be extended thirty five diameters beyond construction joints unless otherwise indicated.

Joints shall be kept at places where the shear force is minimum and these shall be at right angles to the direction of main reinforcement. In the case of columns, the joints shall be horizontal and about 15 cm below the bottom of the deepest beam framing into the column head, and the portion of the column between the stopping off level and the top of the slab shall be concreted with the beam.

At least two hours must elapse after depositing concrete in the columns or walls before depositing in beams, girders column capitals and haunches shall be considered as part of the floor system and shall be monolithically placed herewith.

When stopping the concrete on a vertical plane in slabs and beams an approved stop board shall be placed with necessary slots for reinforcement bars to pass freely without hindering or any other obstruction. The construction joint shall be keyed by providing a triangular or trapezoidal fillet nailed on the stop board Inclined 'feather' joints shall not be permitted.

17. **PLAIN CEMENT CONCRETE:**

For all items of P.C.C. work, the proportions shall be either:-

- | | | |
|----|--------------------|--|
| i) | 1 part (by volume) | cement |
| | 4 part (by volume) | sand |
| | 8 part (by volume) | graded coarse aggregate from 40 mm size for thickness above 75 |

mm and 25 mm to 6 mm size For thickness 75 mm or less.

OR

- | | | |
|-----|-------------------|---|
| ii) | 1 part (by volume | cement |
| | 3 part (by volume | sand |
| | 6 part (by volume | graded coarse aggregate from 40mm to 6mm size, for thickness above 75 mm and 25mm to 6 mm size for thickness 75 mm or less.as specified on the drawing. |

18. **MEASUREMENTS:**

- i) Concrete quantities shall be measured and indicated in the schedule of quantities.
- ii) Reinforcement shall be measured on weight basis and on the basis of reinforcement schedule to be submitted by contractor and approved by Consultant. Laps other than approved shall not be paid for.
- iii) If specified as an item separately payable as per schedule of quantities formwork shall be measured on the basis of area in contact with concrete. Modifications of formwork, if any, for fixing inserts embedded items shall be included in the rate for formwork. Any rendering/finishing work, required to be carried out as a result of faulty formwork shall be carried out by the contractor at his own cost, in a manner, approved by Consultant.

III - STRUCTURAL STEEL

1. **SCOPE OF WORK:**

The work covered consists of supply, fabrication and erection of structural steel, pipe racks and cable trays in strict accordance with this specification and applicable drawings.

2. **GENERAL:**

The current rules and practices set forth in the specification for the design fabrication and erection of structural (BS-5950-1990) shall govern this work, except as otherwise noted on the drawings or as otherwise specified. All structural steel shall conform to BS-5950-1990 and other relevant BS specifications on welding.

3. **SHOP DRAWINGS:**

The contractor shall submit three (3) copies of shop and erection drawings showing erection sequence, for approval and no fabrication work shall be undertaken until written approval is obtained from Owner. The Contractor shall submit five copies of approval shop and erection drawings to Owner for their record.

4. **FABRICATION:**

All workmanship shall be equal at least to the best practice in modern structural shops.

a) **STRAIGHTENING:**

All material shall be clean and straight. If straightening or flattening is necessary it shall be done by a process approved by Owner and in a manner that will not damage the material. Sharp links or bends shall be cause for rejection.

b) **GAS CUTTING:**

The use of a hand cutting torch is permissible if the metal being cut is not subject to substantial stress during the operation. Gas cut edges subject to substantial tensile stress shall be cut by a mechanically guided torch, or it hand cut, shall be carefully examined and gas cutting shall be clean reasonably square, and free from any distortion and should the inspector find it necessary, the edges shall be subsequently ground.

c) **HOLES:**

Holes for rivets or unfinished bolts shall be 1.5mm in diameter than the nominal diameter of the rivet or bolt. If the thickness of the material is not greater than the nominal diameter of the rivet or bolt plus 3 mm the holes may be punched. If the thickness of the material is greater than the nominal diameter of the rivet or bolt plus 3 mm the holes shall be either drilled or sub-punched, 3 mm less in diameter and

reamed to required size. The die for all sub-punched holes and the drill for all sub-drilled holes, shall be at least 1.5mm smaller than the nominal diameter of the rivet or bolt.

Holes that must be enlarged to admit the rivets shall be reamed. When the number of thickness to be riveted exceeds three or the total thickness is 88 mm or more, the holes shall be drilled or reamed in position after assembly.

d) RIVETING:

Rivets shall be driven by power riveters, of either compression or manually operated type, employing pneumatic, hydraulic or electric power. After driving they shall be tight and their heads shall be in full contact with the surface. Rivets shall ordinarily be not driven and shall completely fill the holes and their finished heads shall be of approximately hemispherical shape, and of uniform size throughout the work for the same size of rivet. Any loose rivets will be removed and replaced at the expense of the contractor. Finished rivet heads shall be concentric with the holes.

e) BOLTING:

All turned and fitted bolts shall be paralleled throughout the barrel within the tolerance or only minus 13 mm unless otherwise specified and faces of heads and nuts bearing on steel work shall be machined. All such bolts shall be provided with washers not less than 6 mm thick, so that when the nut is tightened, it shall not bear on unthreaded body of the bolt.

In all cases where the full bearing area of the bolt is to be developed, the threaded portion of the bolt should not be within the thickness of the parts bolts project through the nut by a at least one thread. Tapered washers shall be provided for all heads and nuts bearing on bevelled surfaces.

f) WELDING:

All welding shall conform to BS:5135.

Welds shall be made only by operators who have been previously qualified by tests. A welder shall produced satisfactory evidence of his ability to produce a connection of the strength required. Evidence of welders qualification tests shall be produced if required by Owner.

Surfaces to be welded shall be free from loose scale, slags, rust, grease, paint and other foreign material and shall be wired brush and cleaned prior to welding.

Parts to be fillet welded shall be brought into as close contact as practicable and in no event shall be separated more than 5 mm. If the separation is 1.5 mm or greater, the size of the fillet welds shall be increased by the amount of the separation.

Abutting parts to be butt-welded shall be carefully aligned together within 3 mm gap. Welding sequence shall be followed to avoid needless distortion and minimize shrinking stresses.

g) **CONNECTIONS:**

Connections shall be shown as on the drawings. Where details are not given, standard beam connections shall be followed. In any case connections shall be enough to develop the full strength of the member and shall be approved by Owner. One sided, or eccentric connection will not be permitted, unless they are shown in detail on the drawing and are approved by Owner.

All shop connections shall be bolted or welded as approved by Owner.

Welded connections shall be made only where indicated on the drawings or approved by Owner. Holes shall not be made or enlarged by flame, nor will flame out of unfair in the holes of the shop or in the field be acceptable. Grout holes shall be provided in the steel members as shown in the drawings and holes shall be provided in members to permit connections of supported items.

h) **ASSEMBLY:**

All the parts assembled for bolting or welding shall be in close contact and all bearing stiffeners shall bear tightly at both at top and bottom without being drawn or caulked. All parts of bolted or welded members shall be well pinned or bolted and rigidly held together while bolting or welding.

i) **CLEARANCE:**

The erection clearance for cleated ends of members connection steel to steel should preferably be not greater than 1.5mm at each end. The erection clearance at ends of beams without web cleats should not more than 3 mm at each end, but where for practical reasons, greater clearance is necessary, suitable designed seating should be provided.

5. **INSPECTION:**

Materials and workmanship at all times shall be subject to inspection by Owner. All inspection as far as possible shall be made at the place of fabrication and the contractor shall co-operate with Owner, inspector and permit access for inspection to all places where work is being done.

However, such inspection shall not relieve the contractor of his responsibilities to furnish satisfactory work.

Materials or workmanship not conforming to provisions of the specifications may be rejected at any time defects are found during the progress of the work.

6. **ERECTION:**

Structural steel shall be erected in accordance with BS-5950-1990. Crane rails shall be as detailed on drawings and designed to permit horizontal adjustments of the rails. Rail joints shall be provided with spliced bars.

Field bolts (except high strength bolts) in work which will be exposed to the weather upon completion shall be dipped in to red lead paint just before they are put in place. Loose column base plates and bearing plates for beams and similar members shall be supported to proper elevations before erecting the supported members. Attached base plates and bearing plates otherwise properly positioned and shall then be grouted in place.

7. **LADDERS AND RUNGS:**

Contractor shall provide and install all iron ladders and rungs where indicated and as detailed on the drawings. He shall also include baseplates, fastening, anchor bolts, guard rails/rings, safety chains etc.

8. **PAINTING:**

a) Surface preparation : As given in drawing.

b) **Primer Coat:**

One primer coat as per drawing shall be applied after final shop inspection.

c) **Intermediate Coat:**

One intermediate coat shall be applied as per drawing after primer.

d) **Finishing Coat:**

Finish coat shall be done after erection as per drawing spec.

e) **INACCESSIBLE PARTS:**

Parts inaccessible after assembly, shall be given two coats of shop paint preferably of different shade. No spots of bottom coat shall show through.

f) **FINISHED SURFACES:**

Machined finished surfaces shall be protected against corrosion by an approved coating.

g) **SURFACES TO BE FIELD WELDED:**

Surfaces which are to be welded after erection, shall, where practicable not receive a coat of paint. If painted, such paint shall be removed before field welding for a distance of at least 5 cm on either side of the joints.

Surfaces to be painted at the side should be dry and thoroughly clean before painting is begun. All rivet and bolt heads and surfaces which have been damaged during transport or otherwise should be cleaned and made good before application of the paint. Paint should not be applied in damp or foggy weather.

9. **MEASUREMENTS:**

All structural steel work shall be measured by weight, weights being calculated on the basis of standard weights of sections used. No allowance shall be made for rolling welding or for bolts, rivets etc. The rate shall include painting of the structural steel work wherever required including shop coat and site coat of zinc chromate.

10. **REFERENCE DRAWINGS:**

1. 1443 - 400
2. 1443 - 401
3. 1443 - 402
4. 1443 - 403
5. 1443 - 300
6. 1443 - 301

11. **STRUCTURAL STEEL MTO:**

For structural steel MTO, please see the attached sheet. This MTO does not cover the connecting plates, gusset plates etc.

IV - BRICK MASONRY, AND MORTAR, POINTING AND BRICK-BAT COBA

1. **SCOPE OF WORK**

The work covered shall consist in furnishing and installing brick masonry, as shown in the drawings and in accordance with this specification.

2. **GENERAL**

Cement shall be delivered to the site in manufacturer's standard packages. Mortar shall be prepared in batches, as required, and shall be used before initial set takes place, but, in no case after 30 minutes. Retempering will not be permitted.

Storage piles, stacks or bins shall be so located as to avoid being disturbed or shall be barricaded to protect these materials from damage by construction operations.

3. **MATERIALS**

A) **BRICKS**

Bricks shall be of standard size, table moulded, made of clay uniformity Burnt and first class quality, approved by Consultant. Size of bricks shall 75x115x230 mm with tolerances of plus or minus 1.5 mm in depth, 3-mm width, and 6 mm in length. All cost of testing of bricks as required by Consultant shall be borne by the Contractor.

All exposed exteriors shall be similar in texture, colour, range and appearance. Faces of exposed bricks shall be free from chips, pits blemishes, broken edges and corners. Bricks shall give a ringing sound when struck with a mallet. No brick, after 24 hours immersion in water, shall absorb more than 15% of its own weight or water.

B) CEMENT, SAND WATER (Refer to Section II, Item, 3)

4. **PROPORTIONING**

Cement and sand shall be mixed in the specified proportions by volume. The sand shall be measured in boxes of suitable size. The cement shall however not be actually measured, but a bag of cement of 50 kg. Shall be taken as .035 Cu. meter.

5. **MIXING**

The measured quantity of sand shall be levelled and cement bags emptied on top. The cement and sand shall be thoroughly mixed with each other in a dry by being turned cover, backwards and forwards several times until the mixture is of a uniform colour. The mixture shall be made into the form of a frustum of a hollow cone, and water poured into the hollow and the mix dropped into the water from the sides gradually, turned and mixed, until mortar of the required consistency is formed. All mixing work shall be done over hard standing clean and level platforms.

6. **CONSISTENCY**

A minimum quantity of water shall be added to ensure to ensure that the mixed mortar can be used without risk of joints remaining unfilled. In other works, the mortar shall be firm enough not to run out, and yet be capable of easy spreading.

Mortar shall be mixed only in such quantities, which can be readily used, and shall be used as soon as possible after mixing, and before it has begun to set, and in any case within 30 minutes after water is added to the dry mixture.

7. **CONSTRUCTION**

Every brick shall be thoroughly soaked in water before using, till bubbles cease. No half or broken bricks shall be used, except as closures. The closures shall be horizontal and the wall raised plumb. Joints shall not more than 1 cm thick. Each unit shall be adjusted to its final position in the wall while the mortar is still soft and plastic. Any unit which is disturbed after mortar has stiffened shall be removed and relaid with fresh mortar.

The bond pattern shall be kept plumb throughout. Chases and raked-out joints shall be kept free from mortar or other debris. Spaces around metal door frames and other built-in items shall be kept free from mortar or other debris. Spaces around metal doorframes and other build in items shall be solidly filled with mortar. Anchors, wall plugs, accessories, flashing and other items required to be built in with masonry shall be built in as work progresses. Brick work shall not be raised more than 10 courses a day.

Unfinished work shall be stepped back for jointing with new work. Tooting may be resorted to only if specifically approved by Consultant. Before new work is started, all loose mortar shall be removed and the exposed joint thoroughly cleaned before the lying of new work.

All brickwork shall be maintained wet for 10 days.

All joints shall be raked out while the mortar is still green, to a depth of 12 mm, to assure a good key for plaster.

Double scaffolding shall be provided by the Contractor, and piercing of walls for scaffolding shall not be permitted. The Contractor shall be responsible for any damage or injury resulting from poor scaffolding.

Brickwork shall be raised uniformly, and no part, at time, shall be raised more than 1 meter above adjoining work.

Rates for brickwork shall include scaffolding, watering and curing in addition to brick and mortar and raking of joints.

8. **POINTING**

- a) All joints to be pointed shall be raked out to a depth of at least 2 cm. The raking shall be done carefully, and on no account shall any chipping of the masonry be permitted. In new work, raking out shall be done when the mortar in the joints is still green and fresh.
- b) Before pointer is commenced, the whole raked surface shall be properly cleaned with wire brushes, washed with water, and kept well wetted.

When specially ordered, pointing shall be done as masonry progresses, otherwise pointing shall be done at the completion of the whole work.

Unless otherwise indicated, the mix for pointing shall be one part of cement to two parts of sand properly worked with sufficient water to produce a smooth paste. This mix shall be pushed into the joints and superfluous mortar properly remove with a towel. Pointing lines shall regular and uniform in breadth. Pointed surfaces shall be kept wet for 10 days.

9. **BRICK BAT COBA**

The brickbat coba shall consist of 2 parts of brickbats broken to the size of 4 cm. to 7.5 cm. and lime mortar in the proportion of 1:1.

The above ingredients shall be well mixed and water added in quantities only to make the mixture plastic. The mixed coba shall be laid over the concrete surfaces and shall be well rammed with wooden battens perfect slopes required. The ramming shall be continued and the surface shall be trowelled smooth so as to bring the lime and sand matrix to the surface.

Measurements shall be in sq.meter of specified thickness.

IV - BRICK MASONRY, AND MORTAR, POINTING AND BRICK-BAT COBA

1. SCOPE OF WORK

The work covered shall consist in furnishing and installing brick masonry, as shown in the drawings and in accordance with this specification.

2. GENERAL

Cement shall be delivered to the site in manufacturer's standard packages. Mortar shall be prepared in batches, as required, and shall be used before initial set takes place, but, in no case after 30 minutes. Retempering will not be permitted.

Storage piles, stacks or bins shall be so located as to avoid being disturbed or shall be barricaded to protect these materials from damage by construction operations.

3. MATERIALS

A) BRICKS

Bricks shall be of standard size, table moulded, made of clay uniformity Burnt and first class quality, approved by Consultant. Size of bricks shall 75x115x230 mm with tolerances of plus or minus 1.5 mm in depth, 3-mm width, and 6 mm in length. All cost of testing of bricks as required by Consultant shall be borne by the Contractor.

All exposed exteriors shall be similar in texture, colour, range and appearance. Faces of exposed bricks shall be free from chips, pits blemishes, broken edges and corners. Bricks shall give a ringing sound when struck with a mallet. No brick, after 24 hours immersion in water, shall absorb more than 15% of its own weight or water.

B) CEMENT, SAND WATER (Refer to Section II, Item, 3)

4. PROPORTIONING

Cement and sand shall be mixed in the specified proportions by volume. The sand shall be measured in boxes of suitable size. The cement shall however not be actually measured, but a bag of cement of 50 kg. Shall be taken as .035 Cu. meter.

5. MIXING

The measured quantity of sand shall be levelled and cement bags emptied on top. The cement and sand shall be thoroughly mixed with each other in a dry by being turned cover, backwards and forwards several times until the mixture is of a uniform colour. The mixture shall be made into the form of a frustum of a hollow cone, and water poured into the hollow and the mix dropped into the water from the sides gradually, turned and mixed, until mortar of the required consistency is formed. All mixing work shall be done over hard standing clean and level platforms.

6. CONSISTENCY

A minimum quantity of water shall be added to ensure to ensure that the mixed mortar can be used without risk of joints remaining unfilled. In other works, the mortar shall be firm enough not to run out, and yet be capable of easy spreading.

Mortar shall be mixed only in such quantities, which can be readily used, and shall be used as soon as possible after mixing, and before it has begun to set, and in any case within 30 minutes after water is added to the dry mixture.

7. **CONSTRUCTION**

Every brick shall be thoroughly soaked in water before using, till bubbles cease. No half or broken bricks shall be used, except as closures. The closures shall be horizontal and the wall raised plumb. Joints shall not more than 1 cm thick. Each unit shall be adjusted to its final position in the wall while the mortar is still soft and plastic. Any unit which is disturbed after mortar has stiffened shall be removed and relayed with fresh mortar.

The bond pattern shall be kept plumb throughout. Chases and raked-out joints shall be kept free from mortar or other debris. Spaces around metal door frames and other built-in items shall be kept free from mortar or other debris. Spaces around metal doorframes and other build in items shall be solidly filled with mortar. Anchors, wall plugs, accessories, flashing and other items required to be built in with masonry shall be built in as work progresses. Brick work shall not be raised more than 10 courses a day.

Unfinished work shall be stepped back for jointing with new work. Tooting may be resorted to only if specifically approved by Consultant. Before new work is started, all loose mortar shall be removed and the exposed joint thoroughly cleaned before the lying of new work.

All brickwork shall be maintained wet for 10 days.

All joints shall be raked out while the mortar is still green, to a depth of 12 mm, to assure a good key for plaster.

Double scaffolding shall be provided by the Contractor, and piercing of walls for scaffolding shall not be permitted. The Contractor shall be responsible for any damage or injury resulting from poor scaffolding.

Brickwork shall be raised uniformly, and no part, at time, shall be raised more than 1 meter above adjoining work.

Rates for brickwork shall include scaffolding, watering and curing in addition to brick and mortar and raking of joints.

8. **POINTING**

a) All joints to be pointed shall be raked out to a depth of at least 2 cm. The raking shall be done carefully, and on no account shall any chipping of the masonry be permitted. In new work, raking out shall be done when the mortar in the joints is still green and fresh.

- b) Before pointer is commenced, the whole raked surface shall be properly cleaned with wire brushes, washed with water, and kept well wetted.

When specially ordered, pointing shall be done as masonry progresses, otherwise pointing shall be done at the completion of the whole work.

Unless otherwise indicated, the mix for pointing shall be one part of cement to two parts of sand properly worked with sufficient water to produce a smooth paste. This mix shall be pushed into the joints and superfluous mortar properly remove with a towel. Pointing lines shall regular and uniform in breadth. Pointed surfaces shall be kept wet for 10 days.

9. **BRICK BAT COBA**

The brickbat coba shall consist of 2 parts of brickbats broken to the size of 4 cm. to 7.5 cm. and lime mortar in the proportion of 1:1.

The above ingredients shall be well mixed and water added in quantities only to make the mixture plastic. The mixed coba shall be laid over the concrete surfaces and shall be well rammed with wooden battens perfect slopes required. The ramming shall be continued and the surface shall be trowelled smooth so as to bring the lime and sand matrix to the surface. Measurements shall be in sq. Meter of specified thickness.

V-UNCOURSED RUBBLE MASONRY

1. SCOPE OF WORK

This specification covers the work of uncoursed rubble masonry contemplated for the building walls, storm drainage channels, drops built in drains and parapets. Masonry work for protection of earthwork, fencing, slopes, and for toe walls, if required to be carried out, shall also be in strict accordance with this specification.

2. GENERAL

- a) Cement mortar for the masonry shall comply with the specifications laid down in chapter III BRICK MASONRY AND MORTAR.
- b) Source and the materials under this specification shall be approved by Consultant.
- c) Stones with defects of skin shall not be used. Sound hard durable and fairly regular of shape stones shall be selected and brought to work site. Headers and coins shall be supplied by the contractors at his own cost. Dressing of edges or coins shall be carried out by the contractors.

3. MATERIAL

Trap granite, quartzite or gneiss stone.

4. CONSTRUCTION

- a) Masonry shall be laid to lines and levels, curves and shapes as required and as directed at site. Openings, fixtures, plugs and frames shall be built in at places indicated on drawings; while building up and not by removal and dismantling of constructed masonry. Stones shall be laid on their natural beds, on their broadest faces to ensure proper mortar packing. Face work and heating shall be worked up simultaneously. Stones shall be bedded in mortar, uniformly, tamped and secured on their seating and voids filled in with mortar before embedding the spalls and small size stones. No hollows shall be left in built up masonry. Headers shall be provided and fixed in position at a rate two headers for 1 sq. m. of face area of built up masonry. Masonry thickness shall be as specified, and all work shall be brought up uniformly as far as possible in level. Every day's work shall be flushed with cement mortar of thin consistency to ensure that no voids are left.

All joints shall be properly filled, packed and flushed off.

All built up work shall be kept wet for a period of not less than seven days. Mortar used shall be in the proportion of 1:5 of cement and sand unless otherwise specified. Headers shall be staggered vertically and shall be distinctly marked on faces. Joints shall not be more than 20 mm in width. Masonry shall not be raised more than 600 mm at a time and fresh masonry shall not be commenced on

earlier laid courses unless the earlier courses have been set for a period of not less than four hours.

- b) Faces rubble masonry shall be pointed with cement mortar in the proportion of 1:4 made with fine sand. Joints shall be raked to a depth of 25 mm and watered prior to commencement of pointing. All joints shall be properly packed with cement mortar, flushed level and excess mortar struck off. Flushed cement mortar joints shall then be finished with wet cement paste. Excess mortar and mortar droppings shall be removed and pointing cured at least for seven days. Work of pointing shall be taken up after the period of curing of rubble masonry is completed.
- c) Scaffolding, ladders, plants, tools for dressing and construction shall be supplied by the contractors.

4. **MEASUREMENTS**

Measurements shall be in cubic metre of constructed work. Openings of more than 0.1 square metre shall be deductible.

5. **RATE**

Rate shall be inclusive of all items and operations of work included in the above specifications, with special reference to the following inclusions:

- a) Supplying, selection, handling of rubble including dressing, hammering, breaking etc, wherever required.
- b) Rubble masonry constructed including provision of mixing, transport and laying of mortar specified.
- c) Cost of headers, coins etc.
- d) Watering
- e) Raking out joints, pointing, finishing and cleaning of surfaces of mortar and cement stains, if pointing is included in masonry item in the schedule of quantities. If payable as a separate item, pointing shall be paid on a sq.m. of area pointed.
- f) If the rubble stones required in the work is supplied to the contractor from stacks within 150m from the work area, the contractor shall give rebate in the rate quoted by him to the extent of the prevailing cost of the material in the locality plus the cost of transport of the same to the work area.

VI - PLASTER

A) EXTERIOR PLASTER

1. PREPARATORY WORK

Surfaces to be plastered shall be thoroughly cleaned of all dust, oil, loose mortar, joints shall be raked to a depth of 12 mm minimum. Care shall be taken not to damage masonry edges while raking. All surfaces of concrete, old plaster and stone shall be roughened sufficiently, for bond. Soft or crumbling brick work and other surfaces shall be dismantled and remade if required. All surfaces to be plastered shall be thoroughly wetted for 24 hours before commencing plaster and shall be kept damp during the progress work. All preparatory works will be inspected by Consultant, and plastering shall not be commenced, until all preparatory works are approved by Consultant.

2. PLASTER - 1st Coat

The first coat shall consist of one part of cement and five parts of sand by volume. The first coat shall be 12 mm thick roughly. Guide strips 15 cm wide and of suitable length will be first put up on the surface for the first coat. These guide stripes shall be brought to absolute plumb vertically and to the same plane horizontally all through. With the help of these guide strips, the whole plaster shall be brought to a level plane. The plastered surface then shall be firmly pressed to a uniform plumb and plane and then sufficiently scratched to receive the second coat.

3. PLASTER - 2nd Coat

The first coat shall be kept wet for 48 hours and then the 2nd coat shall commence. Sand used for the 2nd coat shall be sieved. Sand passing through 3mm sieve shall be taken for the second coat. The sand shall be of uniform size so that when shifted through a sieve of 20 meshes to Centimeter, not more than 10% shall pass through.

The sieved sand shall be mixed with cement in the proportion of one part of cement to three parts of sand by volume. Excess water should not be added to this mortar. The second coat shall be struck uniformly over the first scratched coat and firmly pressed and levelled using a batten. The surface then shall be firmly trowelled and sponge floated to remove the excess moisture and to bring the sand to the surface.

The surface thus prepared shall be uniformly roughened for texture, by running a fine wire brush lightly over the surface.

The surface of plaster shall be kept moist for at least seven days and shall be protected from sunrays.

4. MEASUREMENT

Measurements shall be in sq. meter openings and any unplastered surfaces shall be deducted full. Jambs, reveals, soffits shall be separately allowed.

B) INTERIOR PLASTER

1. All surfaces shall be thoroughly cleaned and wetted 24 hours in advance. Uniform section of surfaces shall be maintained. Before commencement the surfaces shall be uniformly damp but not very wet. All corners shall be finished with 12mm radius and brought to true lines and level. Guide strips of the thickness of the first coat 15mm shall be put on (as in the case of exterior plaster) in advance; so that these guide strips 150mm by 1 meter shall be plump, levelled to one plane. Guide strips shall to be sufficiently hardened at the commencement of plaster. All preparatory works shall be carried out for the inspection and approval by Consultant.

2. PLASTER - 1st Coat

The first coat shall be applied to the prepared surface uniformly.

This coat shall consist of four parts of sand to one part of cement. This coat shall be firmly stuck, levelled and plain and shall be well trowelled. After brining this coat to the uniform plain, it shall be scratched.

The second coat shall be 3 mm thick. It shall consist of neat chunam paste (Neeru). The second coat shall be applied immediately after the first coat has obtained the initial set (4 hours). The second coat shall be well trowelled into the first coat. The second coat shall well trowelled into the first coat. Trowel marks shall be removed and the surface made smooth, even and level. The surface then shall be cured for ten days. The curing shall commence after an initial period for which the surface is allowed to shed its excess moisture.

3. MEASUREMENT

As in the case of exterior plaster.

4. GENERAL

Any damage caused to the plastered surfaces due to the negligence of the contractor shall be made good by the contractor at his own cost, as per methods approved by Consultant.

VII- FLOORING

1. **SCOPE OF WORK:**

The work covered by this specification shall consist of furnishing and installing flooring complete as shown on the drawings, finished schedule and hereinafter specified.

2. **GENERAL:**

Material under this specification shall be delivered in unbroken packages and shall be properly stored to protect from moisture, breakage etc.

No tile shall be set on surface where the work is specified or detailed to be embedded in the tile work until such work has been installed and approved by Consultant.

3. **SAMPLES:**

The contractor shall submit for approval to Consultant samples of different types of colour tiles and rubber cover specified herein to determine their stability, colour, finish and surface characteristics for this particular job.

4. **TERRAZO TILES:**

The tiles shall conform to Indian Standard specifications for 'Cement Concrete Flooring Tiles' and its tint and Consultant shall approve size. The wearing face of the tiles shall be plain and free from projections and depressions without cracks and shall be parallel to the bottom surface of the tiles. The tiles shall be uniform in size, true and square with sharp edges and free from twist, cracks or other defects. The wearing layer for colour terrazo tiles shall consist of coloured terrazo finish using marble chips of best available variety. The tiles shall be machine moulded on hydraulic press producing pressures of over 211 kg. per sq.cm. The contractor must produce the certificate from the manufacturer of the tiles stating that the tiles conform to I.S. specifications.

The floor bus to which the tiles are to be fixed shall be roughened and cleaned free of dust, etc. and shall be thoroughly wetted. A layer of cement mortar (1:50) or lime mortar (1:3) as approved by Consultant. Just enough for 3 to 4 tiles shall be evenly spread over the firm base and sprinkled with fine sand. Before laying, the tiles shall be soaked in water for a least 20 minutes and then allowed to dry for about 10 minutes.

It is necessary to have tiles damp, but not wet when they are laid. The tiles shall be truly and evenly set in a thin paste of neat cement applied on the sides and bottom. As the tiles are placed in the mortar they shall be tamped down with the handles of hammer or trowel until their elevation is exactly in line with that of the other tiles. The joints in this flooring shall be as thin as possible. The extra cement that oozes out through the joints to the surface shall immediately be wiped clean.

The work shall be kept and protected for seven days before starting the polishing and no one shall be allowed to walk on the floor during the 1st 24 hours after it is laid.

When ready for polishing the joints shall first be rubbed with a carborundum stone so that slight projections or edges rising above the surface are levelled. The whole surface shall then be polished by hand or machine, first with a softer variety of carborundum stone and finally with a pumic stone. The whole surface shall be finally washed with a weak solution of soft soap in warm water.

In case of the dimensions of the room do not fit a multiple of the tiles dimensions, after the border is allowed for a fractional tiles may be used to fill the space. When this extra space is less than 2.5 cm. it may be filled with a mortar of equal parts of cement and sand coloured and finished to match the tiles.

5. **GLAZED TILES:**

Glazed Tiles:

Glazed tiles shall be approved by Consultant Tiles shall be delivered in unbroken packages and properly stored to protect the tiles from moisture.

No tiles shall be set on surface where other work is specified or detailed to be embedded in the tile work until such work has been installed and approved.

All tiles shall be sound, hard well and evenly glazed, free from twists and cracks, with true and sharp edges. free from crazing.

The surface on which the tiles are to be fixed shall be rough, clean, free of dust and thoroughly wetted. The tiles shall be soaked in water for a minimum period of six hours before fixing. A layer of cement mortar (1:3) of thickness not less than 12 mm and just enough for about 3 to 4 tiles shall be evenly spread according to the slope required. The tiles shall then be laid in neat thin cement paste, and pressed in positions. The tiles shall be laid from the centre line of the room and brought to meet the walls. floor tiles shall always go under the dado tiles.

All joints shall be uniform and as thin as possible. They shall run in straight lines in floors and shall break joints in dados. Dados shall be 1.5m in height unless otherwise specified in drawings.

All rooms or spaces in which tiles floors are being laid shall be closed to traffic or other work and kept closed until the floors are completed and tiles are firmly set as approved by Consultant. Rate shall include all specials wherever required.

The contractor shall protect all work at his cost until it is handed over to consultant.

R.C.C. FLOOR FINISH 1:2:4

(i) **BASE SLAB**

The surface of the structural base slab shall be finished left rough and struck off at a level not less than 2.5 cm. below the required finish grade.

ii) PORTLAND CEMENT:

Shall be standard A.C.C. manufacture or equivalent.

iii) AGGREGATES:

Fine aggregate shall consist of clean, hard sand of crushed stone screening free from dust, clay, loam or vegetable matter and shall be graded from coarse to fine to meet the following requirements:

	Percent %
Passing 10 mm sieve	... 100
Passing No. 4 sieve	... 95 to 100
Passing No. 16 sieve	... 45 to 65
Passing No. 50 sieve	... 5 to 15
Passing No. 100 sieve	... 0 to 5

Coarse aggregate shall consist of clean, hard gravel or crushed stone free from dust, clay, loam or vegetable matter, and from coatings which will tend to weaken the bond. It shall contain no soft, flat or elongated fragments and shall be graded to meet the following requirements:

Passing 12 m/m sieve	... 100
Passing 10 m/m sieve	... 95 to 100
Passing No. 4 sieve	... 40 to 60
Passing No. 8 sieve	... 0 to 5

All aggregate shall be selected with care and shall be of an approved character. Samples of proposed material shall be submitted to Consultant for approval prior to use.

iv) MIXTURE:

The nominal mixture shall be 1 part of portland cement, 1 part of fine aggregate and 2 parts of coarse aggregate by volume. This nominal mix may be slightly varied, depending upon the local conditions, and as Consultant direct. If the aggregate is very coarse, the gravel or stone may be reduced, but in no case shall the volume of the coarse material be less than 1.5 times the volume of the fine.

The mixture shall be determined by Consultant and one established shall not be changed except upon their written order.

Not more than 18 litres. of mixing water, including, the moisture in the aggregate, shall be used for each sack of portland cement in the mixture when floating is done by machine.

The mixing of the concrete shall continue for at least 1.5 minutes after all ingredients are in the mixer.

v) CONSISTENCY:

The Concrete shall be of the driest consistency possible to work with a sawing of the strike off board, on straightedge. Changes in consistency shall be obtained by adjusting the proportions of fine and coarse aggregate within the limits specified. In no case shall the specified amount of mixing water be exceeded.

vi) PLACING AND COMPACTING:

Water and laitance which raise to the surface of the base slab shall be removed before applying the wearing course. After concrete in the base slab has settled sufficiently so that water does not rise to the surface but within 2 hours of placing the base slab, the wearing course shall be applied and brought to the established grade with a straightedge. After striking off the wearing course to the established grade. It shall be compacted by rolling or tamping, and then floated with a wood float or power floating machine. The surface shall be tested with a straight edge to detect high and low spots, which shall be eliminated.

Following additional points shall also be observed:-

- a) Max. bay size for one single point to be approx. 15 m².
- b) Before placing the topping a slush coat of cement and water mixed to the consistency of thick paste shall be thoroughly broomed into the wet surface of base slab.
- c) The topping shall be placed immediately before the slush coat dries, Excess water and grout puddles shall be swept away.
- d) Concrete shall be thoroughly over the surface and not heaped to prevent segregation.
- e) Concrete shall be thoroughly compacted by tamping, rolling and by using vibrator rammer.

vii) FINISHING BY TROWELING:

Floating shall be followed by steel thoroughly after the concrete has hardened to prevent excess fine material from working to the surface. Floating shall be finished normally within 3 to 3.5 hours of laying the topping. The finish shall be brought to a smooth surface free from defects and blemishes. No dry cement nor mixture of dry cement and sand shall be sprinkled directly on the surface of the wearing course to absorb moisture or to stiffen the mix. After the concrete has further hardened, additional trowelling may be required.

This shall be done as may be directed by Consultant. Surfaces to be ground shall be swept with soft brooms after rolling to remove

any water and surplus cement paste that may be floated and once lightly trowelled, but no attempt shall be made to remove all trowel marks. The edges of the panels of topping shall be concrete finally sets.

viii) **CURING AND PROTECTION:**

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

As soon as the concrete has hardened sufficiently to prevent damage thereby, it shall be covered with at least 2.5 cm of wet sand or other covering satisfactory to Consultant and shall be kept continually wet by sprinkling with water for at least 7 days when using high early strength portland cement. In lieu of other curing methods, the concrete may be covered with colourless curing compound or with asphalt-impregnated, water proofed paper. All seams of such paper shall be overlapped and sealed with tape.

8. **FLOOR HARDENER FINISH:**

i) **MATERIAL:**

Floor hardener shall be metallic aggregate approved product "Ironite" or equal. The metallic aggregate shall be specially processed size-graded iron particles. Hardener shall be applied to those surfaces indicated on the drawings and shall be applied in accordance with the manufacturer's specifications with prior approval of Consultant.

ii) **INSTALLATION:**

The topping shall be two layer construction as indicated in the finish schedule and hereinafter. Sprinkling of finish surface with neat cement will not be permitted. The base slab shall be levelled below the finishing level per drawing. The topping shall be laid in two layers as under.

A-1) **DEFERRED CONSTRUCTION:**

As screeded bed of IPS approximately 40 mm thick or as specified in the schedule of items in the proportion two parts of cement, one and half parts of clean sharp sand and four parts 6 mm - 20 mm clean granite stone aggregates or gravel.

A-2) A second course of metallic mixture approximately 20 mm thick consisting of one part of metallic aggregate five of cement by weight and two parts crushed stone aggregate or gravel of size 6 mm and down, shall be laid monolith with the bottom course. A minimum of 1.5 kg/sq.m of hardening material shall be provided.

B. INTEGRAL CONSTRUCTION:

A course of metallic mixture approximately 20 mm consisting one part of metallic aggregate, five of cement by weight and two parts crushed stone aggregate or gravel of size 6 mm and down, shall be laid monolith the base slab. A minimum of 1.2 kg/sq.m. of hardening material shall be provided.

The floor topping shall be cured for a minimum period of 14 days by impounding 25 mm layer of water by bounding method.

9. STONE FLOORING:

i) MATERIAL:

The stone slabs shall be 60 x 60 x 2.5 cm average thickness. Total thickness of floor including mortar bedding shall be 5 cm. Stones slabs shall have true, machine-cut and square edges. Top surface shall be single polished before laying. Slabs shall be uniform in colour and free from all defects, to which a natural stone is liable to Joints to be nearly indistinguishable. Skirting shall be 15 cm high, 2 cm thick minimum.

ii) INSTALLATION, CURIG AND Polishing:

Shall conform to specifications as detailed under section 3 (d) of this chapter under caption "Terrazo Tiles".

10. ACID PROOFING STONE FLOORING:

i) MATERIAL:

The stone slabs for flooring and dado shall be "Vera", "Kheemuch" or "Mandana" 25 mm average thickness, double polished. Slabs shall be cut to have true edges.

Slab shall be uniform in colour, texture and free from all defects. The stones shall be resistance to the following acids.

Sulphuric Acid (H₂SO₄)

Hydrochloric Acid (Hcl)

Sodium hydroxide (NaOH)

ii) INSTALLATION:

The floor and wall surfaces to which the stone slabs are to be fixed shall be thoroughly clean and dry. a coat of bitumen shall be applied to the surface acid proof cement "ACCOCID" or approved equal mortar as a bedding to a thickness of 20 mm for flooring and 10 mm for wall tiling. The joints shall be nearly indistinguishable, approximately 2 mm thick. All materials and tools shall be wiped dry

before use. Only the liquid components shall be used as a thinner for the mortar.

Mortar shall be prepared in the proportions according to the manufacturer's printed instructions.

Any mixed cement which has started hardening shall not be used.

iii) CURING:

The work shall be air-cured for at least 4 days in hot and dry weather and 7 days in winter and wet, weather on air-curing apply 25% commercial materials acid (HCL) across the joints and left for at least 24 hours before traffic is allowed.

iv) Contractor shall submit a test certificate for the acid proof stone or tiles for Consultant approval.

11. MASTIC ASPHALT FLOORING:

- i) Mastic Asphalt used for flooring shall conform to IS:1995-1958. Coarse aggregate when mixed at site shall conform to the following requirement.

	% By Weight
Passing through 0.9525 cm mesh	100
Retained on IS sieve 240	95

ii) INSTALLATION:

The subfloor shall be cleaned and levelled before the flooring is laid. If necessary, a thin coat of mastic asphalt or an under lay shall be laid to level up the irregularities in the surface.

The remelting Plant shall be set up as near to the site of work as possible so that the hot molten may not be carried over long distance. The floor shall be divided into number of spreaders available. Mastic asphalt blocks shall be broken into pieces of suitable size and the required quantity of dry coarse aggregates added in successive operations until the entire quantity is thoroughly incorporated. The temperature of the asphalt shall be controlled such that it does not exceed 205°C at any stage.

The mastic asphalt flooring shall be laid in one coat at one stretch. The molten mastic asphalt shall be spread to specified thickness by means of suitable hand tools, gauges, straight edges and hand levels being used to ensure accuracy. If "blows" occur they shall be stabbed and the area affected carefully made good whilst the mastic is still not. A cross fall of not less than 1 in 100 shall be provided if specified or directed. Further skirtings of design as specified or directed. Further skirtings of design as specified shall be provided at suitable positions to drain off the water. Junctions of bays shall be evenly and neatly finished. Where the asphalt laying

work has been stopped temporarily, it is necessary that the new hot mastic shall be properly bonded to the mastic laid previously.

iii) FINISH:

The mastic asphalt shall be floated to a uniform level or to an approved across fall, free from flaws, blows and other surface imperfections due to insufficient working or unsuitable compounding. The surface shall have either matt finish or polished finish as specified.

To obtain matt finish the surface shall be rubbed with a dusting of fine sand or other suitable fine powder, while the final floating of the surface is being carried out. The sand or other powders used shall be clean and free from clay and other injurious matter. The loose sand or powder lying on the surface after this operation shall be removed.

To obtain polished finish, the surface shall be finished using only a hand float and without the use of any dusting powders.

Skirting shall have polished finish.

iv) PROTECTION OF SURFACE:

The flooring shall not be put into service until the mastic asphalt has cooled throughout to the surrounding temperature.

Concrete or mortar shall not be mixed directly on the mastic asphalt surface.

Oil, paint and distemper droppings shall be avoided. The floor shall also be protected from solvent chemicals hot surfaces and open fires.

Care shall be taken to avoid damage to the surface through careless handling of scaffolding or other builder's accessories.

VIII - SEALING OF JOINTS

1. SCOPE OF WORK

The work covered by this specification shall consist of furnishing installing floor joints finishing as per manufacturer's instructions and completing the work in neat and clean manner.

2. GENERAL

Material to be used for this work shall be approved by consultant. Contractor shall supply all information and samples of the materials are called upon by Consultant. The sealing compound shall be "Shaliji" or equivalent hot applied bituminous sealing compound which is rubberised, tenacious and resilient. The material should be able to with stand extremes of temperature without showing signs of becoming brittle or soft. Material shall be brought to the sight in sealed containers, and shall be properly stored.

3. CONSTRUCTION

The sealing of the joints shall be carried out strictly in accordance with the manufacturer's instructions. Suitable receptacles shall be used for pouring compound into the performed joints; at a steady rate so as to avoid any spillage of the compound over surrounding floor areas. The filling shall be finished flush with the floor level, or with a slightly concave surface. The joints shall be cleaned up of all excess pour or drops to the satisfaction of Consultant. Prior to commencement of the work, the joints shall be thoroughly cleaned of all dust, loose water, rubbish and loose earth or mortar. Clean sand passing 3 mm sieve shall be mixed will with hot equal quantity of bitumen (80/100) and stirred continuously, till the "cooked" product forms a thick uniform mass. This "cooked" bitumastic filler shall then be poured in the joints carefully to fill the joint up to the required height (from base of the slab) into operations. The joint shall be so filled in up to the extent of 1" below the finished surface. The "salijet" sealing compound shall then be filled in to work up to the required level. Prior to the commencement of sealing with "Salijet" sealing compound, the joints shall be approved by Consultant.

4. Measurements shall be on the basis of Running Meter of the joints filled and sealed as specified above.

5. Rate shall include all preparation, cleaning of joints, preparation of and filling with bitumastic filler, sealing cleaning and finishing.

IX - T.W. DOORS, WINDOWS, VENTILATORS

1. **SCOPE:**

The work covered by this specification consists of furnishing and installing of timber doors windows and ventilators in strict accordance with this specification and applicable drawings.

2. **NO PATCHING:**

All pieces after being finished are to hold their full figured dimension, as indicated on the drawings, without patching or plugging of any kind.

3. The doors/Window frames shall be made with dovetailed tenoned joints and shall be fixed to brick or concrete work with mild steel hold fasts of sizes mentioned in the Bill of quantities immediately before the shutters are hung. The rates shall include cost of forming or keeping necessary holes for the hold fasts and grouting them in cement concrete. Door/Window frames shall be formed, rebated, rounded, moulded and grooved as in drawing and the contractor shall retouch all surface defects properly after erection and shall take adequate precautions to protect them from injury either by his own or men belonging to other contractors. The faces of the frames in contact with brickwork or concrete shall be painted with two coats of approved wood preservatives before fixing.

4. a) **FRAMED AND paneled SHUTTERS:**

The styles, top, bottom, lock and friezeraills shall be moulded on both sides with oval and fillet moulding or as may be otherwise specified. The panels shall be feather tongued into styles and rails.

b) **FLUSH DOORS:**

Flush doors shall be solid core type and shall be commercial faced or veneer as specified. The doors shall be lipped and edged with hardwood strips at the sides and shall be fitted and hung to the frames.

5. **GLAZED SHUTTERS:**

The styles and rails shall be rebated 13 mm to 16 mm (1/2" to 5/8") on inside as directed by Consultant, and on the outside they shall be moulded as specified for paneled work. The sash bars where provided shall be 32 mm (1.25") wide with thickness equal to the thickness specified for the joinery. The sash bars shall be moulded and mitered on the outside and rebated 13 mm (1/2") wide on the inside to receive the glass. The glazing should be done according to the specifications `XV' on `Glazing'

6. **BUILDERS HARDWARE OR IRON MONGERY:**

- i) All articles of iron mongery shall be new, soundly and strongly made of heavy pattern, well finished, and equal in quality to samples approved by Consultant.

- ii) All iron mongery shall be fixed to joinery in a secure and efficient manner. Special attention shall be paid to the size of screws in counter sunk holes to ensure that the head of screw does not protrude.
- iii) Articles of iron mongery, etc. damaged during fixing shall be removed new ones fixed in their place and the surface of joinery made good where affected at the contractor's expense.
- iv) Butt and similar hinges shall be counter sunk on joinery edge and wood frame to a depth equal to the thickness of the hinge leaf.
- v) Metal sockets - The metal sockets shall be provided to all towers, barrel and all drop bolts where the shoots enter brick, stone, or concrete. These shall be securely fixed flush with the surface into mortises and cemented. Mortise plates over holes shall be used in a situation where the shoots enter wood.
- vi) All locks, bolts, springs and other items of iron mongery with moving parts shall be properly oiled by the contractor before handling over the building.

7. **TIMBER:**

Timber for woodwork in Joinery, door/window/ventilator frame shall be best quality C.P.Teak approved for use by Consultant. All timbers shall be of natural growth, uniform in texture, well seasoned and free from any defect such as large loose dead or cluster or knots, waves, borer holes, shakes, rot decayed dots, discolouration, soft or spongy spots, hollow cracks, pith or centre heart. Timber shall be free from any blemishes and defects.

All timbers shall be rough and all workmanship shall be of the best standard. All Joinery work shall fit truly without wedging or filling. Woodwork in frames shall be wrought and framed joints fitted together with white lead and pinned with hardwood pins.

Any shrinkage and defects due to bad workmanship detected after execution the contractor shall at his own cost replace refix such works as may be required by Consultant.

8. **FRAMES AND SHUTTERS:**

Shutters of flush doors shall be 38 thick block-board construction with smooth finish. Shutters shall be single leaf or double leaf types mentioned on drawings. All necessary rebates, holes, recesses, required for fixtures shall be worked to lines, centres and in workmanlike manner.

Teakwood in frame shall also be specified above. Frames headings, mullions, shutters, tipping etc. shall be smoothed by sand paper.

Vision panels and louvers wherever shown on the drawings shall be provided with teak beading on sides and sheet glass to suit.

9. **FINISHES:**

Finishes shall be strictly in accordance with the schedule of finishes, using approved make and colour of paint, finished with stripped and uniform texture.

10. **HARDWARE FOR DOORS:**

Hardware for doors shall conform to the hardware schedule given in drawings. All hardware shall be approved in advance by Consultant.

Samples of all hardware fixture and fittings shall be collected by the contractors for Consultant approval and approved maintained on board in Consultant site office. Selected pieces of hardware shall be used. All aluminium hardware shall be anodized.

11. **MEASUREMENTS:**

Doors shall be measured for the area of the inside clean size of shutters closed. The rate shall include frames hardwares, vision panels, hold-fasts and painting or polishing stipulated in the finish schedule. Mortice locks, mortice latches, door closers will be paid extra.

X- STEEL WINDOWS VENTILATORS AND DOORS

The work covered by this specification consists of furnishing and installing steel windows, ventilators and doors accordance with IS:1038-1975 unless shown otherwise on applicable drawings.

The contractor shall, if so directed obtain and submit two sets of shop drawings giving full details of each type of window and door including sections, position of all fittings and fixtures for approval before manufacture.

The windows ventilators and doors shall be obtained from an approved manufacturer and samples submitted to consultant for prior approval before actual delivery.

The rates shall include cost of frames, boards, glazing of the panels with type of glass as stipulated, fixing, grouting, clamping approved type of fastenings and accessories wherever stipulated and painting complete.

STEEL OPENABLE WINDOWS FILLED WITH FLY-SCREENS

The window shall be standard window with galvanized fly-screeb if 28 SWG and equivalent to IS-Sieve 100 in metal frame applied to inside frame. The operation of the shutter shall be with a rotor operator at the sill to permit the operation of the shutter. No peg stay shall be provided. Galvanising shall be hot dipped not less than 0.5 kg/m².

XI- METAL DOORS, FRAMES AND ALUMINIUM WINDOWS

1. SCOPE OF WORK

The work covered by this specification consists in furnishing and installing hollow metal doors and frames including sliding and rolling doors complete in strict accordance with this specification and the applicable drawings.

2. GENERAL

Doors - unless otherwise noted, shall be standardised hollow metal, flush type and shall be furnished by the door manufacturer with doors mortised, machined and prepared for hardware attachment. All doors shall be approved by Consultant before any painting work is undertaken by the contractor or manufacturer regarding the quality of works. Steel sheets shall conform to the requirements of the Indian Standard specification I.S. 513/1973.

3. SHOP DRAWINGS

The contractor shall submit three copies of drawings covering all items of work of this specification. The drawing shall show all dimensions, all details of construction, installation, relation to adjoining and related work where same requires cutting or close fitting and shall show all reinforcement, gauges of metal, insulation, reinforcing, anchorage and other worked required for complete installation.

4. MATERIALS

- a) Steel for all hollow metal doors and frames shall be cold rolled best quality furniture steel of gauges as specified in Door Schedule and details, free from any defects which might impair its durability or appearance. Door surface shall be flat and level to within 2.5 mm in 1 meter length.
- b) All doors and frames shall be thoroughly cleaned of all oil, grease, rust and other impurities. Shop painting of all metal furnished under this specification shall consist of gray rust inhibitive prime coating.
- c) Sections shall be formed true to details with clean straight sharply defined profiles and free from defects impairing strength or durability.

5. FABRICATION

All work shall be accurately formed to the required dimensions true and level in all directions and properly sized to suit the several thicknesses of partitions and shall be of the shape and type indicated on the drawings.

Glazing beads and stops shall be of 18 gauge.

All joints shall be continuously reinforced at back, fitted and continuously welded along abutting edges. Surfaces along joints shall be machined and buffed to attain a smooth level surface, even and flush with adjoining

surfaces. The edges of frames in contact with the finish wall surfaces shall be bent back as detailed on a true even line.

All frames shall be properly reinforced for the attachment of hardware. Frames shall be cut and suitably reinforced with steel plates to suit hardware templates for securing butts, strikes, checks and other hardware as required.

All frames unless otherwise shown or required shall extend to the floor slab and bottoms shall be provided with removable steel angle spreaders and with suitable angle clips for securing jambs to floor slab in an approved manner. The heads of frames for openings wider than 1.2M shall be

Reinforced to prevent sagging or deflection when installed. All frames shall be numbered according to the designated types as shown on drawings to facilitate erection of the same.

Hollow metal swing and sliding doors shall be of the type, design, thickness and size called for on drawings. Doors shall be flush and shall be constructed of 18 gauge furniture steel plates and dressed to produce invisible joints.

All doors shall be entirely insulated with approved insulating material to eliminate metallic sounds.

Sliding doors shall be complete with brackets, track, rollers, guides, door stops, pull and push flush type handles.

All doors shall be mortised and reinforced for all required hardware Gaskets where indicated shall be installed so as to prevent leakage of air. Continuous sponge rubber gaskets contained in bronze channels shall be provided at heads of door frame, while at doors sill gaskets shall be attached to bottom of doors. Samples of each type of finished door shall be submitted for approval to Consultant.

ALUMINUM DOORS & WINDOWS

Material and workmanship shall conform to I.S. 1948-1961 unless otherwise noted herein, and shall be the standard product of the manufacturer approved by Consultant. All sections shall be INDAL or approved equal. Aluminium surfaces in contact with concrete or masonry shall be given two coats of heavy-bodied bituminous paint. The finish shall be polished and acquired unless otherwise specified in the drawings. All joints shall be screwed (mechanical) type using cadmium-plated screws.

All frames shall be properly reinforced with 10 ga. aluminium sheet for the attachment of hardware. Narrows stile entrance doors shall be "Ajit's" "Alumilite" or approved equal.

All hardware shall be anodised aluminium. Doors shall anodised finish wherever specified on the drawings and or in the schedule.

XII - ROLLING SHUTTERS

1. SCOPE OF WORK

The work covered by this specification consists of furnishing and installation of rolling shutters in strict accordance with this specification and applicable drawings. The brand name to be furnished.

2. ROLLING SHUTTERS

Rolling shutters shall be obtained from manufacturers approved by Consultant and shall consist of interlocking corrugated slats fabricated from hot dipped galvanized sheets 18 gauge. Each slat shall be rolled from continuous strips into easy curves; free from crimps and sharp bends. Each alternate slat shall be provided with end locks shaped to the concave ends of slats. So designed to maintain alignment and protect the slats against abrasion in the guides. All joints shall be air and weather tight. The shutter shall be supported by means of spring barrels supported by steel brackets of the closed type forming end closures for hoods. The shutter shall coil on the spring barrel. Operation of the shutter shall be by means of a worm and worm-wheel and shaft arrangement and so designed as to make it possible to operate the door both from inside and outside. A strong hood of galvanized steel sheet shall be provided, mounted on the lintel above. The shutter shall be capable of withstanding horizontal forces up to 98 kg/square meter without appreciable deflection.

3. The door shall completely cover the opening and shall not obstruct any parts of the opening when in open position. Installation shall be mounted plumb, square and true on the sides of the opening. When completed, the doors shall operate smoothly under normal conditions.
4. The rate quoted by the contractor shall be inclusive of provision of a suitable framework of not galvanized steel sections, necessary handles and locking arrangements, lining edges of shutters coming in contact with the framework, cutting chases and groves, on the sides of openings and finishing them after completion of installation. The rate shall include provision and installation of guide frames, hoods and worm and shaft opening arrangements and necessary accessories.
5. Measurements shall be of the clean opening area in sq. meter covered by the rolling shutters.

XIII - GLASS AND GLAZING

1. **SCOPE OF WORK:**

The work covered by this specification consists of furnishing and installation of all glass for doors and windows complete and strict in accordance with the specifications and applicable drawings.

2. **GENERAL:**

The size of the glass indicated on the drawings are approximate only. The actual sizes required shall be determined by measuring the frames to receive the glass.

All glass shall be factory labeled on each pane and labels shall not be removed until Consultant authorizes such removal. Glass shall be free from defects of all types.

Glazing for the northlight truss shall consist of wire reinforced glass of 6-mm thickness and approved quality.

Unless stipulated otherwise, glazing for the windows and ventilators shall weight 9.76 kg/m. and 6 mm thick wired glass approximately and shall be of approved quality.

Glass to be used for version panel in the doors and the louvers, and window panes shall be of thickness, weight and size as specified on the drawings or as noted above.

3. **SAMPLES:**

The contractor shall submit for approval the required size without damaging the edges.

4. **INSTALLATION:**

The glass shall be cut exactly to the required size without damaging the edges.

Glass shall be protected against damage. After inspection any labels, paint smears and spot shall be removed from glass and the glass shall be washed clean. Damaged or broken glass shall be removed and replaced at the contractor's expense before final acceptance.

XIV - FINISH HARDWARE

1. **SCOPE:**

The work covered by this specification consists of furnishing and installation of hardware specified herein and in the Door, and window schedules.

2. **MATERIAL:**

Material, design and quality of construction shall conform to the following IS unless otherwise noted.

IS : 204	TOWEL BOLTS
IS : 205	BUTT HINGES (NON-FERROUS)
IS : 208	DOOR HANDLES
IS : 1341	BUTT HINGES (STEEL)
IS : 363	HASPS AND STAPLES
IS : 1823	FLOOR DOOR STOPPERS

Door hardware shall be of the type indicated on the drawing and as manufactured by approved make or equivalent. These shall be supplied with screws, bolts and nuts and other fastenings for attaching hardware. These shall be of the same finish as the material to which they attach. Working and moving parts of locks shall be accurately fitted to smooth close bearings and shall be free from rattle.

All knob handles and pulls and other exposed items shall be suitably wrapped and protected. All hardware shall be free from defects, which may affect the appearance and serviceability.

3. **SAMPLES:**

Contractor shall obtain Consultant approval of samples of all items of finish hardware as to the quality, finish and design.

4. **TYPE OF HARDWARE:**

a) **BUTT HINGES:**

Butt hinges shall be steel with brass pins and washer of heavy-duty type, first quality.

b) **PROJECTING TYPE HINGES:**

Projecting Type hinges:

Projecting type hinges shall be pressed steel with brass washers and pins, first quality.

- c) THREE-WAY BOILING DEVICE:
Three-way bolting device for emergency doors.
- d) TOWER BOLTS:
Tower bolts shall be manganese brass, flush type, vertical bolts, heavy duty 20 cm half round, 35 cm at top and 20 cm at bottom of double shutters of first closing leaf (LH shutter locking from inside).
- e) TWO-POINT HANDLES:
Two point handles shall be manganese brass or cast-iron or diecast zinc base alloy.
- f) PEG STAYS:
Peg stays shall be manganese brass or die cast zinc base alloy to keep the shutters at least open in three different positions up to 90.
- g) MORTICE LOCKS:
- i) Mortice locks shall be fitted in the second closing leaf. Looking from inside heavy duty type, 150 MM size, 5-lever, brass and steel construction, approved make or equivalent and smooth in operation, double throw and level handle of chrome finish.
 - ii) MORTICE BATHROOM LOCKS:
Mortice bathroom locks 5-lever, with long handles, Godrej make or approved make chrome finish, with catch for bolting the door from inside (operated from inside).
- h) BAR HANDLES:
Bar handles shall be manganese brass or zinc base plain design.
- i) PADLOCK:
Padlock shall be 7 lever, brass, steel shackle, Godrej make or equal.
- j) PUSH PLATES:
Push plates shall be brass with round corners and edges, plain design.
- k) KICK PLATES:
Kick plates shall be 16 ga. aluminium, natural finish screwed on both sides of doors.
- l) DOOR CLOSERS:

Door closers shall be `Everite' (or approved equal) hydraulic (liquid control type) surface mounted, with regular arm; checking fluids shall be lubricating and non-freezing. Finish shall be dull bronze. The mechanical device shall be such as to close doors, positively and be quite in operation with a smooth, steady motion and without rebound. Suitable adjusting wrench shall be provided. Regulating valves shall be accessible and provide Castings shall be positive adjustment. All Castings shall be sound and all joints effectively sealed against leakage.

m) ALDROPS:

Aldrops shall be plain design, C.P. brass.

n) KEYS:

Keys shall be stainless steel, provided in duplicate.

o) FLOOR SPRINGS:

Floor springs shall be double-action floor springs, oil-tight and waterproof quality. "De's" manufacture, or approved equal. The mechanical device shall be such that the adjustments shall be possible; i.e. adjustment of the door itself both laterally and vertically and adjustment of the force of the closing action.

XV - ASBESTOS CEMENT SHEET ROOFING/CLADDING

1. GENERAL:

The work covered by this specification consists in furnishing and installing asbestos cement sheet roofing and cladding in strict in accordance with this specification and the applicable drawings.

2. HANDLING AND STORAGE AT SITE:

The asbestos cement sheets shall be handled and stored in the best possible manner so as not to injure the sheets in any way. All damage caused due to careless handling or storing shall be borne due to careless handing or storing shall be borne by the contractor. The sheets shall be stacked on firm and level ground laid on wooden battens according to the slacking methods specified by the manufacturers and protected from damage. When they are stacked for any length of time, they shall be stored under cover.

3. CUTTING AND DRILLING WHERE NECESSARY:

Asbestos cement materials shall be cut with a saw and drilled with brace and twist drill THE HOLE SHALL ON NO ACCOUNT BE PUNCHED. The hole shall be 1/8" (3mm) larger than the diameter of the fixing bolts, and shall always be drilled through the crown of the corrugation and never on the flats or valleys. The holes for fixing the sheeting shall be drilled in the exact position to suit the purlins, i.e. on the centre line of the purlins, if these are of timber and square head coach screws are used, or as close as possible to the back of the purlin if steel and angles are used. To achieve this object it is necessary to drill the holes on the roof after the sheeting is put in the correct position.

4. CRACKED SHEETS:

All sheets and accessories found to be cracked after fixing shall be replaced by new ones. The cracked sheets so removed shall be salvaged by the contractor by cutting into smaller but sound lengths where ordered. Nothing extra shall be paid for such work.

5. BITUMEN WASHERS:

The nuts of J-bolts, crank bolts or heads of coach screws should bear on a galvanised iron washer which in turn shall be bedded on an approved type of bitumen washer. The screw of bolts shall be tightened sufficiently only to seat the bitumen washers properly over the corrugations; if they are tightened too much the natural movement in the sub-structure of the roof is likely to damage the sheeting.

6. MITRES:

Unless otherwise specified in the manufacturer's instructions, where 4 corners of sheets overlap, two of the MUST BE mitred (cut off).

7. **MANUFACTURER'S INSTRUCTIONS:**

Asbestos cement sheets and accessories shall be laid in strict accordance with the manufacturer's instructions which must be obtained before starting the work.

8. **MEASUREMENTS:**

All works shall be measured net as fixed. No allowance for laps wastage, etc. shall be made. Opening measuring 0.37 sq.m. or more shall be deducted. No extra would be permissible for all work involved in making and fixing openings. Stopped roof would be measured along the slopes of the roof and portion covered by ridges, hips and other curves covering shall be included in measurements of the roof. A.C. ridge covering, hip coverings, north light curves etc. shall be paid on r. meter basis for complete

Work without any allowance for cutting, laps etc. Finals wherever required shall be fixed and the cost thereof shall be included in the rate for the ridges.

9. **RIDGE VENTILATORS/EXTRACTORS:**

a) **RIDGE VENTILATORS:**

Ridge ventilators would be fixed in positions as shown on drawings. The work shall include provision and fixing of ventilators making required openings in the sheet and fixing the ventilators properly with seam bolts, all as per manufacturer's instructions.

b) **EXTRACTORS:**

These would be perfectly fitted over the trimmers provided for the purpose between purlins. The extractors would be fixed to the steel frames together with required 6 mm thick asbestos cement flat sheeting, lead flashiness properly tucked into the sheeting and properly extending over the corrugations as per Manufacturer's specifications, and instructions. Complete work including cutting of sheets for opening provision of additional 'J' seam bolts, lead flashing using lead sheets weighing not less than 29 kg.m extended in a close fitting manner to the required extend and fixing the same as per Manufacturer's instruction shall be paid by humpers of extractor fixed. No allowance for cutting sheets, wastage bolting washers, lead flashings, flat sheeting etc. would be made.

10. **FALSE CEILING WITH ASBESTOS CEMENT SHEET.**

i) **GENERAL:**

Work covered by this specification consist of provision and installation of A.C. sheet false ceiling with necessary framework as indicated on drawings in strict in accordance with this specification.

ii) **HANDLING, STORAGE AND CUTTING OF SHEETS:**

A.C. plain sheets, obtained from sources approved by consultant, shall be handled and stored in the best possible manner, so as to avoid injury or damage to the sheets. Sheets will be stacked on firm and level ground, over wooden battens strictly as per instructions of the Manufacturer. Sheets shall be protected from damage of all sorts during handling stacking, construction period and the defect liability period. When sheets are to be stored for a long period, they shall be stored under the cover. All damage to sheets, caused due to careless handling and storage shall be borne by the contractor.

Sheets shall be cut by wood saw. Holes will be drilled with brace and not punched.

iii) CRACKED SHEETS:

Refer para four.

iv) MANUFACTURERS INSTRUCTIONS

Refer para seven

v) MATERIALS

A.C. plain sheets shall be 6 mm thick, strong, uniform textured without cracks, holes or any other defects. All cuttings drilling of holes, making openings shall be made to true dimensions and in a workmanship like manner. Timber framework shall be constructed with approved timber using sections as indicated on drawings. AC sheet shall be of 'Everest' brand only.

vi) CONSTRUCTIONS:

A.C. Sheet shall be fixed to timber framework with countersunk screws or as directed. All holes shall be filled in with approved tiller after fixing screws. The finished surface shall be left plain and without any projections. All butt joints in sheets shall be neatly close jointed and sealed with approved filler. The finished work shall be neat and tidy and present a uniform appearance. All filling work shall be carried out after written instructions of Consultant.

vii) MEASUREMENTS:

The work shall be measured as the area covered by sheets. The rate shall include the provision, construction and painting of the timber frame work wherever directed by Consultant.

XVI - BUILT UP ROOFING AND ROOF INSULATION

1. SCOPE OF WORK:

The work covered consists in furnishing and installing built-up roofing and insulation for all roofs, complete in accordance with this specification; applicable drawings and the manufacturer's instructions.

2. DEFINITION:

Built-up roofing is defined as layers on top of insulating material to prevent the penetration of moisture into the roof. Insulation is the layer on top of the roof for insulation against heat.

3. ROOF INSULATION (FOAM CONCRETE)

a) GENERAL:

The roof insulation shall be of poured in place foam concrete or any other light weight concrete of 321 kg/M³ density.

The contractor shall provided all the materials, labour, equipment hoisting and scaffolding to perform the operations in the best and most workmanlike manner to the satisfaction of Consultant.

b) MATERIAL:

i) Portland cement shall conform to Standard I.S. specification. The Contractor shall ensure that the quality of cement supplied is suitable for his work.

ii) Water shall be clean and free from deleterious amounts of acid, alkali and organic materials.

c) INSTALLATION:

The Contractor shall first ensure that the surface of the roof panels is rough enough to have proper bond for his foam concrete. The surface shall be cleaned of all loose material with stiff broom before starting of the operation. The Contractor shall install poured in place foam concrete of average thickness of 10 c.m. (from 12.5c.m. to 75 c.m.) in all areas indicated on the drawings, in strict accordance with the standard specifications. The concrete shall be carefully deposited and screened in continuous operation until a panel is completed. The panel shall consist of the section between expansion joints. No joints shall be allowed in the panel.

d) CURING AND PROTECTION:

The surface of freshly finished concrete shall be prevented from drying out for not less than three days, or sufficiently long to allow the concrete to develop the desired strength. The curing shall start immediately following partial set of the concrete. Wet gunny bags with

frequent water sprinkling shall be used for curing and all exposed surfaces shall be protected from excessive heat or rains. The surface left for application of built-up roofing shall be of satisfactory hardness, smooth and firmly bound, and shall have adequate bonding characteristics. The concrete shall be allowed to dry as thoroughly as possible following curing and before applying the built-up roofing. The minimum curing strength for the foam concrete shall be 40 kg/cm².

e) SURFACE HARDNESS:

The hardness of the surface shall be considered adequate when it will withstand foot traffic and other light operations, of roofing without damage, but must be protected from gouging or excessive loading.

f) SURFACE FINISH:

The surface shall be firmly bound and free of all loose material. The screened surface shall be from extreme roughness capable of interfering with proper bonding and damaging for felt.

4. BUILT-UP ROOFING:

a) GENERAL:

The built-up roofing shall consist of 6 courses of heavy treatment. Bitumen saturated roofing felt shall be applied to the roof surfaces as detailed on the drawing and hereinafter specified.

b) MATERIAL:

i) FELT:

Felt shall be self finished type 3, grade 1 and shall comply with the requirements laid down in I.S.S-1322-1959. It shall have minimum weight of 2.27 kg. per square meter. The felt shall be free from visible external defects such as holes, ragged and identifications and shall be uniform throughout. The felt shall not crack or be sticky as to cause injury when unrolled at temperatures between 50 degree and 90 degree. The surface of the felt shall not be coated or covered with the substances which would tend to interfere with the adhesion between felt and the plying cement. The used of mineral dusting powder like talc, mica, slate etc. passing through I.S. sieve 60 shall be permitted. The surfaces shall be uniform smooth and shall be free from areas or patches of unabsorbed saturant and superficial dry spots.

iii) BONDING MATERIALS:

These shall consist of blown type bitumen conforming to IS-702-1955 or residual bitumen conforming to I.S. 73-1950 or a mixture thereof, selected to withstand local conditions of prevailing temperature and gradient of roof surface. The

penetration of bitumen shall be limited to 40 when tested in accordance with I.S. 1203-1958.

c) **SAMPLES:**

The contractor shall submit four samples of the far felt for approval to Consultant.

d) **PREPARATION AND INSTALLATION:**

The construction of any bay or section for roof shall be completed before roofing work is begun. Roofing shall not start until roof surfaces are smooth, firm, dry and free from dirt and foreign materials, and have been inspected and approved by Consultant. Vents and other projections through roof shall be properly flashed and secured in position and projecting nails shall be driven firmly home.

The fillets at junction of parapet and roof reglets and treatment at penetrations shall be as shown on the drawings.

The built-up roofing shall be laid all in accordance with I.S 1346-1966 in 6 courses for heavy treatment as follows:

- i) Hot applied bitumen @ 1.2 kg per sq. minimum.
- ii) Hessian-base self finished felt type 3, Grade I.
- iii) Hot applied bitumen @ 1.2 kg per sq.m. minimum.
- iv) Hessian base self finished felt type 3, Grade-I.
- v) Hot applied bitumen @ 1.2 kg. per sq.m. minimum.
- vi) Dry and clean pea-sized gravel or grit @ 0.006.m. per sq.m.

Bitumen shall be heated to the proper temperature and maintained to that temperature until applied. The application of the bitumen bonding material shall be uniform to cover the entire surface. At no place will felt touch felt. The felt shall be laid so as to be free from wrinkles and buckles so that pronounced ridges are not formed at laps of each roll of tar felt shall be overlapped 750 mm by the ends of subsequent rolls. The full lap shall be mopped so that no surfaces of overlapping tar felt are in contact. Seams of adjacent strips shall be staggered. Longitudinal seams shall be lapped 150 mm.

5. **THE CONTRACTOR:**

This work shall be performed by a firm that has made specially of this kind of work at least for 5 and that can show at least 3 similar installations that have proved successful.

6. **GUARANTEE:**

The contractor shall furnish a guarantee which shall be agreed upon in the Contract to ensure the successful performance of the Contract and he shall

agree that there is in the above specification which will prevent such successful performance. The guarantee shall be for a period of 10 years against any leakage. Any work required to be carried out as a result of any defects in workmanship or use of defective material during the period of guarantee shall be carried out by the Contractor at his cost. The Contractor also guarantee that foam concrete insulation shall not have more thermal conductivity than .06 kilo calories/hr./sq.m./deg.c./mtr.

7. **MEASUREMENT:**

The work shall be measured for payment as net and without allowance for lapse etc.

XVII - DAMP PROOFING & WATER PROOFING

1. SCOPE OF WORK

The work covered consists of furnishing and installing damp proofing in accordance with this specifications, applicable drawings and as per the manufacturer's instructions.

2. GENERAL

Membrane waterproofing shall be polythene, asphalt or tar type, as approved by Consultant.

Where pipes pass through walls to be waterproofed and for other projections on walls, the waterproofing shall be carried out around the projections and pipes and properly sealed to the walls approved by Consultant.

3. MATERIALS

All materials shall be delivered to the site in sealed containers bearing the manufacturer's original labels.

(a) Polythene membrane shall be 700 G.

(b) ASPHALT

It shall be free from inorganic matter, and shall have as softening points:

Maximum - 171o F and Minimum - 140° F.

(c) ASPHALT PRIMER

Asphalt primer shall consist of an asphaltic base, thinned to suitable brushing consistency with a volatile solvent. It shall have as softening points:-

Maximum - 171° F and Minimum -131° F.

(d) ASPHALT/COAL TAR SATURATED FABRIC

Materials shall be composed of woven cotton fabric impregnated with asphaltic/coal tar saturant. It shall be free from visible external defects, such as ragged or untrue edges, breaks and rents. The mesh of the fabric shall not be completely closed or sealed by the asphalt/coals tar saturant. There shall be sufficient porosity to allow the moppings of asphalt/coal tar pitch-plying-cement to come through. The fabric shall not stick when unrolled at temperature between 500 Deg F; and 90 Deg F to such an extent so as to cause injury. The surface of the fabric shall be uniformity smooth and free from irregularities, folds, and knots. It shall not be coated with talc, portland cement, or other substances which would tend to interfere with the adhesion between the fabric and the plying cement. The use of powdered silica or wood flour, shall be permitted. Weight of

the fabric shall be between 0.34 kg. to 0.5 kg. per square meter (10 to 15 ounces per sq. yard).

(e) COAL TAR PITCH

Freshly melted material shall be uniformly glossy, and on aging one week, its surface shall not become dull or show any separation of oily constituents. Freshly fractured material shall present a shiny black surface. It shall have as softening points:

Maximum 140° and Minimum 126° F.

f) CREOSOTE OIL

Creosote primer shall be distillate of coal-gas tar or coke-oven tar and shall conform to the following requirements.

Water not more than 1%

Consistency at (41°F) Entirely fluid and crystal free.

Specific gravity 38@ Not less than 1.06
60 F.

Matter insoluble in Not more than 0.5%
Benzol

Coke residue Not more than 2%

(g) For dam proofing of floor slab 700G Polythene film or equivalent, as approved by Consultant may be used and 400G for roof slab.

4. **PREPARATION AND LAYING**

Surfaces to receive waterproofing shall be clean and dry. All holes, joints and cracks shall be pointed flush with mortar, and high spots shall be cut off or ground smooth. Before water proofing is applied, the surfaces to be covered shall be carefully swept to remove all dust and foreign matter, and shall have been inspected and approved by Consultant. Cost of all preparatory works as stipulated by Manufacturers shall be included in the rate.

For tar type water proofing concrete surfaces shall first be given a priming coat of creosote oil, which shall be allowed to dry. They shall then be coated with a hot mopping of coal tarpitch into which the coal tar saturated fabric shall be embedded. For asphalt type waterproofing the surfaces shall be given a coat of asphalt primer which shall be allowed to dry and then shall be coated with a hot mopping of asphalt into which asphalt saturated fabric shall be embedded. The pitch or asphalt shall be heated to flow freely but not above 375° F for pitch and not above 400° F for asphalt. The pitch or asphalt coating shall hot when the fabric is embedded therein. The fabric shall be so

applied as to be free from wrinkles or buckles. The entire surface shall then be given a final mopping using not less than 70 pounds pitch or 60 pounds of asphalt per 200 square feet. (3.4 kg., of pitch or 293 kg. of asphalt per sq. meter).

5. **TYPE OF MEMBRANE**

Only approved membrane waterproofing shall be applied where a water proof membrane is turned up at vertical angles in walls, and at any other place where the membrane may be subjected to unusual strain strips consisting of two additional piles, of saturated fabric and alternate moppings of asphalt or pitch shall be applied. Such strips at wall angles shall be of sufficient width to extend at least 8 inches on the horizontal and 4 inches up the wall. Strips at vertical corners shall extend at least 125 mm on each of the corner.

6. **PROTECTION**

Waterproofing applied to duct walls against which backfill is to be placed shall be protected by bricks on edge as shown in the applicable drawings.

7. Any work required to be carried out as a result of any defects in workmanship shall be carried out by the contractor at his cost, with the concurrence and prior approval by Consultant.
8. The Contractor shall supply complete information of the process and type of water proofing he proposes to use.
9. The work would be measured for payment as net and without allowance for extra corner protection and lapse etc.

XVIII-SANITARY WORKS, SANITARYWARES & PIPING

1. GENERAL

- 1.1 All sanitary wares shall be of vitreous china of fire clay as specified in the schedule, and shall be best quality and Hindustan Twyford's make or approved equal. The sanitary wares shall be free from any warb, cracks, blemishes and shall have a smooth surface, free from crazing, blisters, deformities and uneven glazing.
- 1.2 All sanitary fittings and fixtures shall be approved by Consultant prior to installation of fixtures and the approved samples shall be maintained at site till the completion of the work.
- 1.3 All rates for fixing shall include the provision for making holes in walls providing wooden plugs and cleats where necessary, cutting floors, chasing in walls and floors etc, and making good and restoring the same to original conditions. The rates are for the completed work as laid down in the schedule, and the contractor is not entitled for any payment except in cases of any dismantling and for reconstruction of any brick masonry or concrete structures, (such cases being of special nature in the opinion of Consultant. Prior permission of Consultant shall be obtained for all dismantling work, which shall be made good to the satisfaction of Consultant by contractor.
- 1.4 The contractor in carrying out the construction work shall take effective steps to carefully open out all existing channels, culverts, bridges, pipe lines, conduits, water courses, sewers, drains, electric cables, transmission lines, and their supports and all other works buried or otherwise, where such have to be interfered with for the purpose of the construction of the works. He shall provide and arrange all necessary, temporary supports and diversions if necessary therefore, across, under, over, through and alongside of the trenches and all other parts of construction work and shall leave all such existing channels culverts, bridge, pipe lines, conduits, water courses, sewers, electric cables transmission lines, telegraph and telephone lines, and all other works in their original condition to the satisfaction of their owners and Consultant.
- 1.5 The Sanitary fittings and fixtures will be handed over complete in all respects on the completion of work. No incomplete items will be taken over. Any loss damage of these due to any reason whatsoever before the handing over shall be at the contractors cost and charges.
- 1.6 All exposed pipes and specials C.I. or G.I. Shall be painted with three coats of approved paint of approved colour shades. The rates for all piping shall be inclusive of cost for such painting.

2. CEMENT CONCRETE (1:4:8)

The rates shall include for providing and laying all the necessary materials, labour and tools and plant required for the same. It shall consist of 50 kg. of cement to 14 cu.m. of clean washed coarse sand and 28 cu.m. of well graded washed aggregate 20 to 40 gage. It shall include cost of laying

formwork, rough molds, boxing and curing. The rate shall include the cost of laying of concrete to grade or to shapes as required.

3. CEMENT CONCRETE (1:3:6)

The rate shall include for providing and laying all the necessary materials and providing labour, tools and plants required for the same.

It shall consist of 210 kg. of cement to 0.44 M³ of clean washed sand and 0.88 M³ of well graded aggregate 20mm to 40mm. It shall include cost of laying, formwork, rough molds, boxing and curing. It shall include the cost of laying of concrete to grades or to shapes as required.

4. CEMENT CONCRETE (1:2:4)

The rate shall include for providing and laying all the necessary materials and providing labour, tools and plants required for the same. It shall consist of 300 kg. of cement to 0.41 M³ of clean washed sand and 0.82 M³ of hard stone aggregate 10mm to 25mm gauge. It shall include cost of laying, boxing, mixing in a mixer, formwork and curing. The rate shall include cost of laying of concrete to grades or to shapes as required.

5. WORK

The rate shall include for providing and laying all the necessary materials, labour, tools and plants required for the work. It shall be in 1st class bricks in a mortar consisting of 425 kg. of cement and 0.9 3 of clean washed sand or in the proportion as in the schedule of quantities. It shall include the cost of scaffolding and curing.

6. 20mm, 12mm THICK CEMENT PLASTER

The rate shall include for providing and laying all necessary materials, labour, tools and plants required for the work. The plaster shall be 20mm/12mm thick and shall consist of 425 kg. cement to 0.9 M32 of clean washed sand or in the proportion as in schedule of quantities 1mm thick floating coat of neat cement will be given on the plaster. It includes the cost of raking out the joints of brick masonry, finishing smooth the floating.

7. M.C.C. 1:2:4

The rate shall include for providing and laying all the necessary materials, labour tools and plants required for the work. It shall consist of 300 kg. of cement to 0.41 M³ of clean washed sand and 0.82 M³ of hard stone aggregate 10mm to 25mm gauge and M.S. reinforcement up to 110 kg M³ of concrete. The rate shall include the cost of cleaning, cutting bending, binding, and scaffolding. The rate shall also include rendering and finishing of all exposed surfaces, and edge smooth, with neat cement.

8. SANITARY FIXING TO APPURTENANCES

8.1 EUROPEAN WATER CLOSET SUITES:

The rate shall include providing and fixing the following components as described in schedule.

- (a) Wash down closet in white vitreous chinaware
- (b) 'P' or 'S' trap with or without vent
- (c) Solid plastic seat of approved type with rim, C.P. brass pillar hinges, with rubber buffers.
- (d) Pressed steel porcelain enameled low level flushing cistern 15 litres capacity, with C.P. fittings mounted on a pair of porcelain enameled m.s. brackets, valve less syphon, 12mm silent acting ball cock, C.P.flush bent.
- (e) 12mm lead inlet connecting with 12MM C.P. stop cock, C.P. overfloor pipe of required length.
- (f) C.I. Soil pipe and bend with cleaning cap up to outside face of wall, and vent piping up to outside face of wall.
- (g) Making chases and opening in walls and floors and good the same to match complete.

8.2 INDIAN WATER CLOSET SUITES

The rate shall include providing and fixing the following components as described in the schedule.

- (a) Best Indian type water closet pan in white vitreous china ware with 'P' or 'S' trap with or without vent with raised foot treads, the size of the pan as shall be as described in the schedule.
- (b) High level pressed steel flushing cistern 15 litres capacity porcelain enamor "Fordham" or equal mounted on porcelain enameled M.S. brackets, 32mm G.I. flush pipe of appropriate length and bends with joints embedded in wall. G.I. pull chain and 12mm G.I. Over flow pipe lead, supply pipe with C.P. stop cock G.I. branch including C.S. push tap and all fittings of the cistern complete exposed piping shall be painted with 3 coats of approved paint and shade.

The rate shall also include cutting, floor and structural members excavation of pit and fixing the closet pan in cement concrete 1:2:4 and make good the surface to original conditions complete.

8.3 EUROPEAN WATER CLOSET-SYPHONIC PATTERN

The rate for this items shall include for providing and fixing the following components (as per makers name and catalogue Nos. if specified) and as described in the schedule.

- (a) European water closet syphonic pattern within integral 'P' or 'S' trap in vitreous China ware.
- (b) Cistern with lid (15 litres capacity) in vitreous China ware.

- (c) Complete fittings for syphon cistern, flush bend, air pipe etc.
- (d) Solid plastic seat of approved colour
- (e) Rubber joints for inlet connections
- (f) 12mm lead inlet connections 12mm cp. brass, stop-cock easy clean type.

8.4 WASH-HAND BASINS

The rate shall include for providing and fixing the following components (as per makers name and catalogue No. of each component specified).

- a) Wash basins of size as specified in the schedule in Vitreous China ware with anti-splash rim with one sidetap hole on the left side.
- (b) Supporting bracket at specified
- (c) 12 mm cp. pillar cock with triangular knob marked 'C'
- (d) 32mm cp. brass waste coupling with rubber plug and chain
- (e) 32mm cp. brass bottle trap with extension pieces and C.P. wall flanges.
- (f) 12mm cp.brass stop cock and 12mm lead inlet connection necessary pipe connection complete.

8.5 LAVATORY SUITE (WITH PEDESTAL BASIN)

The rate shall include for providing and fixing the following components (as per makers name and catalogue No. specified in the schedule).

- (a) Vitreous China ware lavatory basin of size as specified in schedule with anti-splash rim and centre tap hole.
- (b) Pedestal as specified in schedule
- (c) 32mm chromium plated brass waste, heavy quality with rubber plug chromium plated brass chain and stay.
- (d) 32mm lead trap
- (e) 12mm chromium plated brass pillar tap heavy quality one no.
- (f) 12mm chromium plated brass stop cock heavy quality one no.

8.6 SHOWERS

The rate shall include provision and installation of chromium plated brass rose of 175 mm dia and 12mm C.P. brass arm of appropriate length, C.P. wall flange, (as per makers name catalogue no. specified in the schedule).

8.7 MIRRORS

The mirrors shall be of the size specified in the Schedule with beveled edges, (Pilkington's make) mounted on asbestos sheet fixed to walls with C.P. brass screws with detachable C.P. caps. The rate shall include for making necessary holes in walls and fixing plugs, etc.

8.8 SOAP DISPENSER

The soap dispenser shall be of C.P. of glass with chromium plated brass cap anodised or aluminium fixed on the chromium plated brass holders brackets. The rate fixing to walls with C.P. brass screws complete.

8.9 TOILET PAPER ROLL HOLDER

a) The toilet paper roll holder shall be of size specified in the schedule in white glazed earthenware (surface-mounted type) . Rate includes for fixing the holder to wall with necessary rawl plugs and C.P. brass screws.

b) C.P. Projecting type.

8.10 TOWEL RAILS

The towel rails shall be of C.P. brass tube with a pair of C.P. brackets. Materials to be of best and approved quality and of sizes as specified in schedule. The rates shall include fixing the towel rails to walls with necessary C.P. screw with required provision of wooden plugs, etc. complete.

8.11 STOP COCKS AND BIB TAPS

They shall be of C.P. brass approved heavy quality "Ego" make or equivalent easy clean type with capstan head. The size shall be as specified in the schedule.

8.12 LEAD CONNECTIONS

These shall be of specified size, appropriate, length made out of heavy lead with brass union and wiped solder joint, cost includes being, to proper shape, fixing, painting, etc. complete.

8.13 G.I. PIPE WORK

The galvanized iron pipes and specials shall be of C class, heavy type, first quality and shall conform to I.S.No. 1239.69. The rate includes for cutting to required lengths, threading, jointing, fixing, testing, and removal of leakages. When fixed to walls exposed and

the pipes shall be fixed on wooden packings, with G.I. clamps and screws, such that they are away from the wall to the extent required. All pipes and specials shall be got approved by Consultant before incorporation in work. The rate includes for cutting thoroughly whenever pipes are concealed to the entire satisfaction of Consultant. The pipes shall be tested for 91.5 m. head of water and the pressure maintained for 12 hours. Leakages if any, shall be made good by the contractor, and the pipes and specials ended absolutely water tight. The measurement for the finished work shall be taken along the longitudinal axis of the pipe line. The rate for pipes with 3 coats of approved paint to the exposed surfaces, as instructed by Consultant.

8.14 PEET VALVES

The peet valves shall be of gun metal heavy quality and of approved make provided with hand wheels, The rate shall include testing and make good leakages.

8.15 C.I. SOIL WASTE VENT, ANTISYPHONAGE PIPES AND RAIN WATER PIPES.

The soil waste, vent and antisiphonage pipes and specials shall be of approved quality and make. The rate shall include provision of specials with access doors wherever necessary, jointing with spun yarn and lead including caulking, testing and removal of leakages. The rate shall also include making holes in walls, floors etc. and making good the surfaces and restoring to original conditions. All measurements shall be taken along the longitudinal axis of the pipeline. The pipes in exposed position shall be fixed to walls by M.S. or heavy flat iron clamps on wooden packings, 5 cm thick or any other manner as instructed by Consultant so it at the stacks are not least 5 cm away from wall surface.

8.16 NAHANI TRAPS

The nahani trap shall be of cast iron with the outlet of required size. The rate shall include fixing the trap in cement concrete 1:2:4 and C.P. brass hinged heavy type grating on top.

8.17 LEAD PIPING

The lead pipes shall be of the diameter and weight as specified in schedule. The rate shall include cutting, jointing with wiped solder joints, bending, fixing the pipes as required, brass thimbles, cleaning eyes, wherever required complete.

8.18 WHITE GLAZE TRAPS FOR URINALS

The traps provided for urinals shall be of type and size specified with approved C.P. hinged dome grating to match. The traps shall be fixed in cement concrete 1:2:4 to correct elevations.

8.19 HALF ROUND CHANNELS FOR URINALS

The half round channel for urinals shall be of best Indian make white glazed earthenware and of the specified size. They shall be bedded on 7.5cm thick cement concrete bed (1:2:4) laid to proper slope and pointed with cement mortar 1:3

8.20 MARBLE PARTITIONS FOR URINALS

The marble partitions shall be 40 cm thick, best Indian white marble, machine cut and polished with rounded corners, and of sizes as specified, built 2.5cm into the wall, including cutting grooves in the wall where required and fixing, etc. complete.

8.21 AUTOMATIC FLUSHING TANKS FOR URINALS

The automatic cistern shall be porcelain enameled C.I. "Nomos", "fordham" equivalent of capacity as specified in schedule, supported on a pair of porcelain enameled brackets fixed to the walls as directed and the rate shall include the following fittings in addition to the cistern.

- a) C.P.Brass distributors as required for the range.
- b) 12 mm C.P. spreader, C.P. wall clips, as required for the range.
- c) 12 mm G.I. overflow pipe with specials from the cistern up to 15 cm above floor level terminated with 13 mm C.P. brass perforated cap complete.

8.22 VALVE CHAMBER

The rate for these items shall include excavation of dimensions as required.

- a) 1:4:8 cement concrete of specified thickness in foundation. This shall have 7.5 cm offset over the overall size given in the schedule.
- b) Brick masonry in cement mortar as specified to give the inside clear size given in the schedule.
- c) 12 mm cement plaster (1:3) from inside with 8 mm thick floating coat of neat cement, and outside with trowel finish.
- d) C.I. manholes cover and frame of specified clear opening and weight fixed in cement concrete 1:2:4. The C.I. covers and frames shall be painted with three coats of anticorrosive black bitumastic paint.

8.23 AUTOMATIC BALL VALVES

These shall be of best Indian make of available for high pressure and of heavy quality. The connecting rod from the valves to the copper float shall be of brass shall withstand the high pressure encountered. The float shall be of copper. This shall be soldered/

brazed to render it leakproof. The material will be as approved by Consultant.

8.24 C.I. MANHOLES FRAME AND COVERS

The C.I.M.H. Frame and cover shall be of size and weights as specified in schedule. The rate shall include providing and fixing in position and finishing. The cover and frame shall be painted with three coats of anti-corrosive paint.

8.25 M.S. TANKS

These shall be of required dimensions, welded construction together with suitable internal stays and support frames. The rate shall provide for all accessories like inlet, outlet scour and overflow by welding flanges, painting inside and outside surfaces of the Tanks with 3 coats of paint of approved colour and shade. The rate for item shall include transport, access frame and cover with locking arrangements, 2m. long 12 mm diameter G.I. overflow pipe with brass mosquito proof coupling.

The rate shall also include for necessary staging as described in the schedule.

8.26 FIRE CLAY SINKS

The rate for this item should include provision and fixing the following components:

- a) Best Indian make white glazed fire clay sink of size and type as specified in the schedule.
- b) 4 cm chromium plated brass waste, heavy quality, with rubber plug C.P. chain and stay.
- c) 4 cm C.P. brass bottle trap with C.P. wall flanges and extension pieces to suit.
- d) A pair of C.I. Cantilever brackets built into the wall, painted of approved colour.

8.27 STAINLESS STEEL KITCHEN SINKS

The kitchen sinks shall be of stainless steel of size noted in the schedule. These shall be of approved type seamless one piece pressing. The rate shall include for necessary waste coupling, bottle trap and piping up to waste pipe, and placing or fixing over the benches or Tables in a manner as required by Consultant.

8.28 SOAP TRAY

The soap dish shall be of size 15 cm x 7.6 cm white glazed earthenware (recessed type). Rate includes for fixing the holder to wall with necessary rawl plugs and C.P. brass screws.

8.29 TUMBLER HOLDER

The tumbler holder shall be white vitreous china ware as described in the schedule.

8.30 FLAT BACK URINAL

The rate shall include for providing and fixing the following components (as per makers name and catalogue No. each component specified).

- a) Flat back urinal approved Indian makes in white vitreous chinaware with automatic flushing cistern.
- b) C.P. brass bottle trap with extension piece.

C.P. Spreader pipe 10 mm lead connector with C.P. Stop cock to flushing cistern G.I. overflow pipe complete.

8.31 LABORATORY SINK

The rate shall include for providing and fixing the following components (as per makers name and catalogue No. specified in the schedule).

- a) Plain edge sink of approved India make in white vitreous china ware.
- b) Supporting C.I. Brackets painted with 3 coats of Deluxe or approved white enamel paint.
- c) 32 mm C.P. brass waste coupling with rubber plug including C.P. chain and stay.
- d) 32 mm C.P. brass bottle trap with extension piece up to C.I. waste pipe, C.P. wall flanges and 12 mm dia C.P. bib cock all complete.

8.32 C.P. COAT HOOKS

The rate shall include for providing and fixing the following components. C.P. coat and hooks C.P. screws and raw plugs for fixing to wall.

XIX- SEWERS, MANHOLES, STORM WATER DRAINS

1. SCOPE OF WORK:

The work covered by these specifications consists of furnishing labour, materials, tools, plant, equipment necessary for the proper execution for work and installation of drains/ sewers in strict accordance with the stipulation and applicable drawings.

2. GENERAL:

- a) The general arrangement of drains/sewers and all related works shall be as indicated in drawings. If actual field constructions or any other causes necessitated any modifications to the arrangements detailed in the drawings, the contractor shall submit to Consultant details information report and drawings, showing such proposed modifications for approval, prior to the commencement of the works. The contractor shall carefully examine all related drawings, sketches specifications, schedules and shall be responsible for proper installation and workmanship.
- b) Contractor shall be responsible for the provision of all materials, fittings and also for the workmanship which shall be of the highest standard. All materials forming part of the installation work shall be submitted by the contractor to Consultant, for approval prior to the commencement of works. The contractor shall submit all technical literature and other information in regard to the proposed materials, if required and asked for any Consultant.

The Contractor shall investigate all actual conditions and other details affecting the planning execution of his work and shall arrange the work accordingly, so as to procure and furnish all materials, plant and workmanship to meet such conditions and to meet the demands of the work.

- c) Dismantling and cutting of any constructed work shall be undertaken by the contractor, after receipt by him of a written permission by Consultant. Any damage to the buildings, piping wiring, other installations in the area, surrounds, property, roads, lawns, etc. caused as a result of the contractor's dismantling or cutting of the existing construction work or as a result of his opening trenches for drainage works, shall be made good by him at his own cost, by employing skilled tradesman for such repairs.

3. ALIGNMENT AND GRADES:

- a) S.W. Drains and sewers shall be laid to the alignment and grades as shown on drawings, subject to such modifications as shall be required by Consultant from time to time, to meet the requirement of the works. No deviations from the lines, depths of cuttings gradients of drains and sewers shall be permitted except by the specific prior approval of Consultant in writing.

- b) Before commencement of work, accurate surveys and levels of the ground proposed to be excavated or filled up, shall be taken jointly by the representative of Consultant and the contractors. These surveys and levels shall then be plotted and drawings prepared. These drawings/sketches and information shall be signed by the contractors and consultant. Quantities and measurements, to the extent applicable, obtained from these signed and accepted documentary basis, shall be final and binding on both parties, subject however to the powers of Consultant to vary the works. If the contractor or his agent shall fail to present himself at the time of such survey and levels, the same shall be done by Consultant, through any suitable agency, at the cost of the contractor. Quantities and measurements to the extent applicable drawn out of such surveys and levels shall be binding on the contractors.
- c) All lines, levels, surveys referred to above, shall be based on bench marks and other related data which shall be informed by Consultant. The contractor shall make his own arrangements to obtain for use at site such instruments necessary for surveys, and levels, as may be indicated by Consultant. These instruments unless permitted otherwise shall be kept and shall be made available for use works, whenever asked for by Consultant.
- d) The contractor shall provide all materials required for the construction and maintenance of all bench marks and other reference points that would be required and determined by Consultant to be established at site for the execution of the work. All pegs, iron rods, pipes, indicators, concrete, brick pillars, paints etc. shall be so provided by the contractor in accordance with the direction of Consultant.

4. **SETTING OUT WORKS:**

- a) S.W. Drains and sewers shall be laid in accordance with the lines and grades and at such inverts as shown on drawings and as instructed by Consultant. The drains / sewers shall be laid and constructed with a true grade and in straight lines between chambers; with the aid of suitable bonning rods and sight rails, which shall be fixed to suit the requirements of work as determined by Consultant at intervals of not exceeding fifty feet.
- b) All sight rails and boning rods shall be provided fixed and maintained by the contractor. Necessary survey and levelling instruments in accurate order, shall be provided and maintained at site by the contractor.
- c) The Contractor shall set out the alignment, position and levels of the S.W.Drains / Sewers according to the drawings given and/or as per instructions given by Consultant and he shall be responsible for the accuracy and correctness of the same throughout the work. The contractor shall, at his own cost, provide all labour, materials and instruments to Consultant to enable Consultant to check the levels and dimensions of the work.
- d) All sight rails and posts shall be of well seasoned timber and of such sizes would be required by Consultant sight rails and boning

rods shall be accurately planned. No warped or otherwise defective timber shall be used. All post shall be fixed sufficiently away from the edges of trenches, shall be properly embedded in concrete and shall be truly vertical.

Sight rails shall be fixed to posts by heavy wrought steel clamps so that they are rendered immovable with respect to the correct lines and levels. All boning rods shall be suitably shod with iron. The sight rails and boning rods shall have the centre line accurately marked thereon by a thin saw cut and shall be painted black and white.

- e) At any time, at least four separate sight rails shall be always maintained in correct level and alignment along the centre line of pipes/drains/sewers. Wherever required the contractor shall provide, erect and maintain such additional sight rails as Consultant would require. The contractor shall at all times, see that his workmen/agents or other unauthorised persons do not accidentally or otherwise tamper with or interfere with sight rails alignment and level marks etc.
- f) At every place where the work is proceeding the alignment levels and centres of sight rails shall be checked atleast twice a day in order to ensure that no disturbances or interference of the alignment of levels and centres has occurred.
- g) Locations of sight rails, additional sight rails, posts etc. numbers of sight rails, constructions of sight rails and boning rods, number of securing sight rails to posts, type and sizes of timber to be used for sight rails and boning rods shall be as approved by Consultant.
- h) All bends and changes in the directions of the alignment shall be set out in a manner as directed by Consultant to avoid kinks.

5. **EXCAVATION:**

- a) Excavation for S.W.drains/sewers and for other works shall normally be in open cutting, unless otherwise directed by Consultant in writing. Consultant may order excavation to be made partly in open cutting and partly by tunneling, if necessary. On the merits of location, Consultant may order the contractor to remove excavated soil at once and to bring it back for refilling. Under such circumstances, the contractor shall be paid extra on the basis of mutually agreed rates. The contractor shall be responsible to provide and maintain during the progress of works, at all times, all necessary traffic diversion arrangements, barriers along trenches across roads, danger signals, red lights, watch and ward and personnel to guide traffic, to the requirements of Consultant.
- b) Excavations shall be approved in advance by Consultant. Unless permitted otherwise not more than 20 meters of any trench in advance of the end of the already laid drains, sewers shall be open at any time. Trenches shall be excavated to their full depths for a distance of atleast 5 meters more than the minimum length of pipe drains permitted to be laid in such trenches.

- c) Maximum widths of trenches in respect of which payment shall be allowed for excavation in soils shall be as follow:
- i) Trenches not exceeding 2 meter in depth 60 cm plus the external diameter of barrel of pipe to be laid.
 - ii) Trenches exceeding 2 meter but not exceeding 5 meters in depth 67.5 cm + the external diameter of the barrel of pipe to be laid.
 - iii) Maximum widths of trenches in respect of which payment shall be allowed for excavation in hard rock shall be decided by Consultant at site. These shall not however be more than those indicated in (c) (i) and (ii) above.
 - iv) Minimum widths of trenches down to the crowns of barrels for pipe drains of 45 cm in diameter or less shall be the external diameter of barrel of plus 20 cm on each side; and for pipes above 45 cm in diameter, the clearance on each side shall be 22.5 cm. All such trenches shall have a clear width at the bottom equal to widths of the cradles of the pipe drains to be laid in them. The minimum clear width of trenches for other pipe drains shall be the greatest external width of structures to be built therein.
 - v) For manholes, junctions with junction chambers, storm water overflows, and such similar works, the minimum dimensions of excavation would be that contained in a prism with vertical sides and a horizontal section equal to the smallest rectangle enclosing such structures with their foundations and 30 cm of clear working space all around.

Consultant shall have power to order in writing to the contractor modifying the dimensions of excavation and maximum and/or minimum widths and other dimensions for excavation in all soils, including bad soils and in rock.

- d) During excavation of road surfaces, soiling, road metaling, pavement, kerbs, turf and rock (excavated) shall be stacked as directed by Consultant and preserved for reinstatement. Prior to reinstatement, road metal shall be shifted carefully. All filled up area shall be properly consolidated and surfaces dug shall be properly restored and maintained till the completion of works to the satisfaction of Consultant owners of the roads, access and/or owners of other properties using such roads. The contractor shall not cut any fences, cables, pipes, drains, culverts and any other construction in the line of excavation. Such obstructions shall be brought to the notice of Consultant and instructions obtained as soon as such obstacles are met with or foreseen. All such constructions met with during excavation shall be properly supported, to the requirements of consultant. Employers and owners of such services, trees on alignment or nearby shall not be cut unless permitted by Consultant.

The contractor shall clear the area to be excavated of all shrubs, grass, tree roots, stumps and other burden; affecting the work to

keep the area of work clean. During execution of work, excavated soil shall be sprinkled with water to avoid dust nuisance.

The contractor shall not occupy or obstruct more than half the road width when working along/across such roads. No vehicular traffic shall be obstructed by the contractor unless specific written permission of Consultant is obtained to that effect. Sturdy footwalks etc.

- e) Any offensive matter (like filther, night soil etc). met with during excavation shall not be deposited along the trench but shall be remove away as directed by Consultant.
- f) All excavation shall be taken to required depths, so that inverts are placed at levels given by Consultant in bad or slushy ground, Consultant may instruct the contractor to excavate deeper than required and to fill up the extra depth with concrete or broken stone or gravel or other material. Incase of such extra work the contractor shall be paid extra at the rates in schedule or at rates derived therefrom. Should the contractor excavate deeper than required by drawings, without specific written order by Consultant he shall fill up the e extra excavated portion at his own cost, as directed by Consultant and to the satisfaction of Consultant.
- g) The Contractor shall, at all times, support effectively, the sides of the trenches and other excavation by suitable method of timbering, piling, sheeting, which shall be close timbered in all loose or sandy straits and below subsoil water level. Cost of timbering, shoring, piling, planking and any other supporting and protection works shall be borne by the contractor and shall be deemed to have been included in the rates of excavation. All timbering, etc. shall be removed as work proceeds. Any timbering, unless ordered to be left in place, by Consultant in writing, shall be removed. No claims shall be considered if the contractor retains timbering excavation without written order of Consultant.

Consultant may require any portion of timbering, piling sheeting to be left in the ground for protection of sides. In such cases, written orders shall be given by Consultant to contractor, detailing sections where such precautionary measures are required, quantity of timber to be left in place, etc. Such left in-place timber shall be paid for at negotiated rates on the basis of ct.ft. of timber so left. In soft or waterlogged ground close planking with tongue and grooved joint's shall be close driven to such depth below the bed level, as shall be ordered by Consultant and no extra shall be payable to the contractor for such extra work.

All timbering shall be of adequate dimensions and shall be placed at required centres as instructed by Consultant. Timbering shall be fully braced and strutted to avoid any falls, side slips, subsidence and all cevaties shall be solidly filled in. In case of left-in-trench timbering all cavities behind such sheeting and timbering shall be solidly filled in as directed by Consultant. The contractor shall be responsible for sufficiency of all timbering, bracing, sheeting, piling, strutting and for

all damage to persons, property and surrounds due to improper quality, strength, placement, maintenance and removal of timbering.

The contractor shall shore up all buildings, walls foundations other structures, stability of which is -in the opinion of Consultant is liable to be endangered by the execution of work, the contractor shall be fully responsible for any such damage to persons, properties and surrounds, resulting from any accident to any such structures.

- h) The contractor shall resort to blastering operations with prior permission of Consultant. Adherence to regulations regarding blastering, permits, storage, upkeep, accounting of blasting material shall be always observed by the contractor. Blasting shall be carried out by the contractor with all precautions, at appointed times as decided in advance by Consultant in such a manner so as to avoid damages to buildings plant, personnel, workmen and structures at site. Numbers of holes, to be blasted type of blasting materials to be employed, extent of charge per hole, location of blasting operations, and names of actual agencies and workmen employed for blasting operations shall be sent to Consultant 24 hours in advance and Consultant orders permitting these operations obtained prior to commencement of work of blasting.

In trenches and other excavation, at locations where blasting is likely to cause damage to surrounds, structures, plant, there operations shall be muffled by use of steel plates of weights and dimensions as required by Consultant or alternatively by the use of close woven solid bamboo mattings weighted down by rubble. Blasting shall not be permitted in such area where these operations in the opinion of Consultant shall constitute danger, vibrations injurious to equipment installed in plants and buildings, danger to equipment or workmen.

The contractor shall be responsible for all claims out of his blasting operations and shall keep consultant and Employer indemnified in respect of the same. He shall at his own cost apply for arrange and be in possession of valid blasting permits and licences for storage upkeep and use of blasting materials.

- i) At all times during the progress of works, the contractor shall keep the trenches and excavation free of water which shall be disposed of by him in a manner which shall not cause injury to public health, property, access, roads as well as to completed or in progress.

The contractor shall, always, provide adequate plant materials labour, fuel, lubricants, spare parts, other contingent items stores and accessories required for dewatering trenches and excavation. The contractor shall plan in advance such contingency. Particulars of dewatering arrangements shall be periodically reviewed for adequacy and Consultant informed of the same, by the contractor. The contractor shall keep all trenches and excavation free of water at all times, in a safe, proper and effective manner and shall be fully responsible to all risks, damages to neighbouring building, plants, roads, areas and structures.

The contractor shall take adequate precaution to ensure the safety of trenches and excavation. Under no circumstances shall be dewater the trenches to such an extent as to cause the sandy bottom of excavation to flow, thereby endangering nearby buildings, plants, structures and surrounds.

In case any damage to buildings, property, plants accesses and surrounds is caused due to contractor's dewatering and pumping operations, he shall be wholly responsible for the same, and shall pay and satisfy all such claims or otherwise make good all such damages at his own cost. If he fails to do so, with diligence Consultant and/or Employer shall be at liberty to take such adequate steps as may be considered essential and sufficient by them and Consultant and/or Employer shall be at liberty to pay the costs of such damages and to get the work done by other agencies, and deduct the amount expended from any moneys due or may become due to the contractor. Decision of Consultant and/or Employer in respect of adequacy of action to be taken in respect of such damages and in respect of expenses and costs towards damages, shall be final.

- j) After laying of drains/sewers and completion of construction in parts/in full, after testing for water tightness and after approval of Consultant to commence backfill, the excavation shall be refilled with most case to avoid all damages to works constructed, piping and other constructions. Backfill in haunches and up to 75 cm from the crown of piping laid, shall be done with fine selected earth, laid in 15 cm layers, each layer being profusely watered and consolidated. The rest of the backfill shall be made, in similar, in 15 cm layers, watering and consolidating each layers, using excavated soil, after keeping aside rubble, boulders, concrete lumps, etc. During backfilling, timbering shall be removed or withdrawn gradually, carefully, in stages, so as to avoid damages. During the withdrawal of timbering the same shall be extracted after the refilling is done, in a manner, ensuring that the sides of excavation are not left unsupported.

The contractor shall make his own arrangements at his own costs, for the removal of surplus and for its disposal at places as instructed by Consultant. In case the surplus is not required at site, the contractor shall make his own arrangements at his costs, for removal and dumping at any place to be selected by him and approved in writing by Consultant. In case the side of disposal is located within the areas, belonging to the Employer or otherwise required by the Employer to be filled and reclaimed, the contractor at his own costs make arrangements to fill up the same with surplus soil, and to level up the same at levels ordered by Consultant. The site of works shall be rendered tidy, clean, even and to original conditions by the contractor.

In the event of the surfacing materials excavated stacked and stored from the excavations, being insufficient to restore surface to original conditions, the contractor shall arrange to make up the efficiency with his own materials of identical quality, at his own costs. The contractor shall at his own cost replace all such surfacing or otherwise useful materials, removed / excavated

during the progress of works, and rendered unsuitable on faulty storage or worn out or damaged during the execution of works.

- k) The Contractor shall, at his own costs and charges, expeditiously, make good, during the complete period of works, any settlement that may occur in surface of roads, berms, footpaths, gardens open spaces, public or private, used by his excavations. He shall be liable for any accidents caused thereby. He shall, at his own costs and with his own materials, make good all damage to buildings, roads, gardens, footpaths, and surrounds as required by Consultant and Employer. If he fails to make good or to pay and satisfy the expenses he fails to make good or to pay and satisfy the expenses of making good such works expeditiously, Consultant and/or Employer shall be at liberty to get the work done by any other means, and expenses incurred and paid therefore, shall be recovered from any moneys due or that may become due to the contractor, in any other manner according to the laws of the land.
- l) The rates for excavation shall be deemed to include operations described in V (a) to (k) above.

6. **LAYING AND JOINTING OF PLAIN AND REINFORCED CONCRETE PIPE DRAINS.**

- a) Pipes shall be of Clause "A" and shall comply with related I.S. specification for R.C.C. spun pipes. Pipes shall be approved by Consultant in advance. R.C.C. spun pipes shall be laid on concrete bed or cradles if specified in the schedule or otherwise directed by Consultant.
- b) After laying concrete in bed or in cradles as required by Consultant the R.C.C. spun pipes shall be lowered gradually and carefully into the trenches, in position. Extra earth shall be scooped and holes made for the collars, depending upon their locations, and length of pipes. Pipes shall be levelled properly so that they are in alignment and grade as required. and they rest on the bed at every point on alignment, throughout the length. In cases where concrete bed and/or cradles are used, the undersides of pipes shall be grouted with a thin slurry made out of cement mortar and clean fine sand in the proportion, of 1:3 of cement and sand, in order to ensure that the pipes laid and aligned previously rest at all points throughout their lengths.
- c) The contractor shall take care to see that no dirt, earth or any other foreign matters is allowed over the cradles or concrete beds if provided. After alignment is completed and then grouting if required shall proceed if the alignment and levels and gradients are found to be correct. Concrete bedding or cradles shall be cured for three days prior to commencement of laying of pipes. In case of any damages to bedding or cradles, the same shall be made good by repairs/replacement, as directed by Consultant by the contractor at his own cost.

Joint shall be made with collars. Connecting space shall be minimum possible. Collars shall have a rough inside face to secure

good grip. Adjacent pipe ends shall have concentric grooves or recesses and matching projections so that, the joint of pipes is fitted properly. Cement mortar in the proportion of 1:2 of cement and sand shall be placed in the concentric grooves or recesses and the pipe barrels and collars then be caulked thoroughly with cement mortar 1:2 made with fine sand. Every joint shall be finished off smooth at an angle of 45 deg. with the longitudinal axis of the pipe on either sides of the collar. Curing then shall be carried out as per requirements of Consultant. Interior of the pipe shall be cleaned of all foreign loose matter and dirt.

- d) After joints are sufficiently cured, and when required by Consultant the pipe drains shall be tested under a head of at least 1.2m of water above crown of pipes. Water head of more than 6 m. shall be added to the water for testing. Pipes shall also be tested for ingress of subsoil water into the drains. All testings shall be carried out as per Consultant instructions. Any defective pipes shall be replaced or rendered watertight as leakages shall be made good again. Removal of all defects shall be carried out by the contractor at his own cost. Such joints where leakage persists after repairs shall be rendered watertight by embedding the same completely with 1:2:4 cement concrete boxed to required dimensions, laid, compacted and sufficiently cured prior to commencement encasement works or backfilling. The pipe drains shall then be retested to required pressure to ensure their water tightness. The test shall be continued at head. All costs and expenses on account of test, replacement of defective pipes, collar, joints, dismantling of joints racaulking and rejoining, placing 1:2:4 cement concrete at such joints as are persistantly leaking and retesting the drains to the satisfaction of consultant shall be borne by the contractor and shall be included in his rate for the items in contract.
- e) If required, by Consultant and if ordered by Consultant in writing, specifying the locations, extent, method and dimensions of bedding and/or encasement of pipe drains in plain cement concrete of specified proportion, the contractor shall carry out the same in a manner that would ensure proper protection to constructed work.

Consultant shall have the power to eliminate, reduce, increase or alter the dimensions of the encasement. Rate for pipes shall include all operations (a) and (e) above.

MANHOLES AND CHAMBERS ETC.

- a) The contractor shall build and construct various manholes/ chambers etc. at locations and as shown on drawings or at places as directed by Consultant.
- b) The floors shall be in cement concrete as per dimensions, thickness and proportions of concrete as detailed in drawings and as instructed Consultant. Side walls shall be in masonry/concrete as given in drawings. Proper channels shall be formed across the manholes as instructed, made with the use of concrete of given proportions, and finished in a workmanlike manner, so as to lead the effluent / storm one pipe to another without interruption to flow and without kinks,

sharp bends. All pipe required for branch pipe drains shall be built into walls at inverts shown in drawings and as instructed by Consultant. When these pipes are to be built in masonry, the contractor shall provide relieving arches in order to prevent any undue load on pipes. All ladders, step irons shall be of such sizes and materials as required by Consultant and they shall be solidly built into walls as instructed by Consultant.

c) i) Foundation and floor of manholes and chambers shall be in cement concrete, plain or reinforced, and of such dimensions and depths as detailed in drawings or as otherwise instructed by Consultant laid at required levels.

ii) Sides of manholes, chambers shall be in masonry or in concrete. When the sides are to be constructed in concrete relevant specifications of concrete, formwork, aggregates, workmanship, mixing, placing, vibration, curing and finishing shall be followed.

c) All bricks to be used on construction of manholes/chambers shall be table moulded, of good quality, of a deep red colour, homogenous in texture, free from flaws, cracks, stone, floats, nodules of lime and such other undersirable blemishes. Bricks shall have sharp edges and uniform sizes. Bricks shall not be stratified, overburnt and soft. Bricks shall not absorb water more than 20% of their own weight, after 24 hours of immersion in water. The contractor shall get the bricks, he proposes to use tested at the institute approved by Consultant at his own costs, and shall submit test reports to Consultant whenever asked for. Brick shall be well soaked in water, before use, till the bubbles cease to come up. No half or quarter bricks shall be used except as horizontally placed closures. All brick work shall be raised uniformly and in plumb. Joints of brickwork shall be 10mm thick. No more than ten courses of bricks shall be raised in a day. All brickwork shall proceed in lines. levels in plumb and shall be raised uniformly so that no part of brickwork is more than three feet above the level of any other part. All joints shall be thoroughly flushed with mortar at every course. Care shall be taken to see that bricks are properly placed and bedded and all joints fully filled in. All brickwork shall be constructed with the use of cement mortar as stipulated in the schedule. All joints shall be raked clean to a depth of 12 mm, to receive plaster. All brickwork shall be cured for seven days, and shall be watered at least thrice a day. All piping, step irons, supports for ladders, rungs etc. shall be built into the brickwork at approximate stages.

e) Sand and cement to be used for plaster shall be of the best quality and shall be approved by Consultant, Clean sharp, siliceous and free from organic and inorganic impurities, dust, clay, and calcarious matter shall be washed, taken for use and mixed with Portland Cement in the specified proportions. Mixing shall be done on an approved hardstanding and well set platform. The materials shall be first dry mixed and then clean water shall be added to this mixture so as to bring the mortar mass to the required plastic condition. Use of water shall be avoided. Use of mortar which has commenced setting partially, shall not be permitted. Such mortar shall be removed from site.

Surface to be plastered shall be soaked with sufficient water 24 hours in advance. Joints shall be raked clean, to a depth of 12 mm. Plaster shall be applied in two coats, for the required thickness. First coat shall be of thickness, enough to cover the unevenness of the brickwork and shall be floated and well pressed on to the surfaces, and made rough to receive the next coat which shall be applied to make up for the required thickness while the first coat is still raw, the second shall be well floated and firmly pressed to form an even true and plain surface. On completion of the second coat, a floating coat of about .8 mm thick of neat cement, while the second coat is raw, shall be given, trowelled and floated and finished smooth.

External cement plaster shall be carried out using cement mortar in the proportion as given in schedule and shall have the neat cement floating coat as specified plaster shall be cured for a period of not less than seven days to the satisfaction of Consultant. Mortar falled on floor, during the process of plastering shall not be re-employed for use.

- f) Channels inside the manholes and chambers shall be formed to shapes, sizes and inverts, in 1:2:4 p.c.c. as shown on drawings. Width of the channels shall be to the full width of the pipes. Depths and slopes of the channels shall be as detailed in drawings. Where branch drains join in manholes/chambers, to the main channel, suitable curved channels of suitable widths, depths and shall be made, with suitable slopes. All concrete, plain or reinforced, shall be carried out according to relevant specifications for concrete.

Sharp bends, kinks, sharp edges reentrant angles, etc. shall be avoided. All the manholes floor shall be suitably sloped to channels. All work in benching and channeling carried out inside manholes/chambers shall be finally finished to required levels, inverts, with a 8 mm thick floating coat of neat cement, floated troweled and finished smooth. Curing shall be continued at least for seven days.

- g) Manholes/chambers frames and covers shall be of the clear sizes and weights specified. They shall be of cast iron, best foundry grey metal, close grained, tough, without any flaws, blisters, and all other casting defects. They shall be clean and accurately moulded, close fitted. They shall have smooth and even surfaces. Frames and covers, their sizes, weights and quality shall be approved by Consultant. All frames and covers shall be set to correct levels and alignment and shall be embedded in layer of cement mortar of 1:2 proportion. All exposed surfaces of embedments shall be finished smooth with neat cement rendering. All frames and covers shall receive three coats of anti-corrosive black bitumastic paint to be approved by Consultant.
- h) All manholes shall be watertight. To achieved this requirement, all internal surfaces of the manholes shall be neatly plastered rendered smooth and the floating coat of neat cement .8 mm thick shall be worked to polished surfaces. Manholes shall be tested alongwith the pipe drains. During testing, the external surfaces shall

be checked for any visible signs of leakages. Any leakages found shall be corrected in a manner to be approved by Consultant. All expenses and costs incurred for the testing, inspection, corrective measures, and retesting to satisfaction of job requirements shall be borne by the contractors. On completion of the testing, the excavation shall be refilled and portions of drains between two adjacent manholes shall be flooded with water. The manholes shall be examined from inside for any leakages into the manholes. If any such spots are observed, the same shall be redone in a manner to be approved by Consultant. Rate for manholes /chambers shall include all operations (a) to (h) above.

8. **STONEWARE PIPES:**

- a) S.W. pipes shall be of the best quality stoneware, salt glazed, thoroughly burnt throughout the whole piece and thickness, free from air holes, fire blisters, cracks and other blemishes. They shall be of a close and even texture. They shall be of the manufacture approved by Consultant.
- b) Pipes shall be properly stacked and protected against all damage. Stacking and laying shall be done without inconvenience to public, traffic and other works.

Cracked pipes at barrels and/or sockets shall be rejected. All pipes shall be fitted on ground to ensure a close fitting. before lowering.

Barrels, Spigots, sockets shall then be cleaned, scrapped and brushed. Pipe shall be carefully lowered by hand to the bottom and placed on the bottom of trench carefully.

- c) Pipes shall be laid carefully, to the alignment, levels and gradients as given in drawings, care being taken to prevent any foreign matter, earth, sand and mortar entering into the pipes during laying. Pipes between manholes shall be laid to correct line and slopes without undulations, vertical or horizontal. All inverts shall be laid and fixed from the slight rails with the help of boning rods, S.W. pipes shall be laid, sockets facing up the gradient, beginning at the lower end up and all sockets laid to levels in the holes or scoops cut for the purpose. Each pipe shall be laid singly and brought up to the exact placement.
- d) Jointing shall be commenced after the alignment is made gradients and inverts checked by Consultant. A gasket of tarred hampyarn shall be placed around the joint, between the annular space between the spigots and sockets and the same shall be inserted by suitable tools. Additional strands of yarn shall be added if necessary and the yarn rammed home. The additional yarn be moistened to avoid absorption of water from cement mortar.

After full and complete caulking operations, cement mortar in the proportion of 1:1 of cement and sand, or as otherwise specified in schedule, shall be made in suitable small quantities and shall be packed with wooden caulking tools to fill up the annular space completely and fully. On finishing of caulking of cement mortar,

each joint shall be struck off at 45 Deg. to the longitudinal axis of drain using the same mortar and finishing the joint with neat cement rendered smooth. Depths of sockets, yarn depths, mortar depths shall be as follows:

Dia.of Pipe Internal clear	Depth of socket	Depth of yarn	Depth of mortar
100mm	50mm	22 mm	29 mm
150mm	57mm	29 mm	29 mm
230mm	62mm	29 mm	35 mm
300mm	75mm	32 mm	45 mm

Each joint shall be adequately cured by placing wet gunny bags or canvas, wrapped around the joints and kept wet continuously. After the joints are completed the pipe drain shall be tested, to a waterhead of 1.8M in a manner to be approved by Consultant.

Testing shall be deemed to be satisfactory if the water level does not fall by more than 1.2 cm in a length of 100 M. of piping filled with water to a head of 1.8M kept standing for at least one hour.

Upon application of test head, all joints shall be inspected for any leakages and leakages if any shall be corrected after water is drained off. Final retest shall then be made. On satisfactory completion of testing further works such as embedments, filling with selected fine earth, etc. shall proceed; after Consultant orders in writing to the contractor to do so.

Rate for pipes shall be inclusive of provision, laying, jointing and testing and all other operations detailed in (a) to (d) above.

Depths of manholes shall be measured from the top of the C.I.cover to the top of the foundation concrete. For the purposes of classification for payments on the of depths of 0.15M. and above shall be taken as 0.30M and depths of 0.0 to 0.15M shall be taken as 0.0M.

XX - SUSPENDED CEILING

A. STEEL AND ALUMINIUM FALSE CEILING:

1. SCOPE:

The work covered by this specification consists of furnishing and installation of the suspended ceiling specified herein and shown on the referenced drawings and finished schedule.

2. MATERIALS:

- i) The ceiling shall be as specified on the drawings Ceiling insulator tiles shall be approved make such as specified in the schedule of items, lay-in units type, not less than 12 mm thick and of size 600 mm x 600 mm. Units shall have square edges and standard finish end plain or perforate design. The tiles shall be free from sagging for the type of installation.
- ii) Suspension tile shall be the exposed alum. grid system consisting of standard main and cross tees extruded INDAL section or approved equal, in natural finish, including aluminium edge trim angle or MS Main and cross tees including MS edge firm angle section in paint finish approved by Consultant. The Dimensions of grids shall be approx. 600 mm x 1200 mm or 600 mm or as specified on the drawing.
- iii) Hanger Rods

M.S. hanger rods shall be 6 mm diameter hooked at one end and painted with one coat of red-lead based paint.
- iv) Fasteners

Fasteners shall be either propriety fasteners of the type suited for the system being used or fabricated aluminium strap hangers.

3. INSTALLATION:

Units shall be laid out in the joint pattern as shown on drawing. Units shall be laid out from the mid point of the long axis of area so that opposite borders will be of equal width, unless specifically indicated on the drawing. Cut outs for ventilating and electrical outlets shall be provided as shown on the drawings. Joints shall be flush and level. Units shall be tightly butted and neatly jointed to connecting work. Aluminium edge angles or MS angles shall be provided along the perimeter or each ceiling area. The hanger rods for attaching aluminium framing shall not exceed 1200mm centres on every main tees.

B. ACOUSTIC THERMAL ALUMINIUM FALSE CEILING SYSTEM:

1. **SCOPE:**

The work covered by this specification consist of furnishing and installation of the suspended Ceiling specified herein and shown on the referred drawing and finish schedules.

2. a) **MATERIALS:**

- i) Aluminium panels, flat, plain, with or without groove flat and square edged for the fine line joints, chemically treated. Hold on hangers, height levelling nuts including suspension angles, suspension runners made out from rugged galvanized steel as per manufacturers make specified in schedule.
- ii) Supplying and installing 'AKOSTI GROVE' aluminium exposed one directional Tee-ceiling system:

SPECIFICATIONS OF PANEL:

The panels shall be fabricated from 0.45mm thick aluminium rolled sheets, perforated diameter 3 mm distance centre to centre 12.5mm and shall have 'V' groove in the centre and 'Z' grooved on both the edges. The panel shall be treated with first phosphoric acid and caustic solution for preparing surface to receive paint. The panels shall be spray painted with acrylics paint. Panel size: Length 1216 mm x width 305mm. Samples shall be submitted to Consultant.

iii) **ACOUSTIC THERMAL PAD:**

Shall be FIBREGLASS CROWN 100 thickness 25 mm covered in polythene bags not thinner than 100 gauge, and not thicker than 150 gauge.

INSTALLATION DETAILS:

Wall perimeter shall be provided with aluminium angles thickness 16 SWG (1.63MM) 20 MM X 20 MM and screwed in to the wall by m.s. screws size 20 mm by providing rawl plug at a distance centre to centre not more than 1372 mm. The aluminium Tees size 25 mm x 25 mm thickness 16 SWG (1.63mm shall be suspended by galvanised wire size 14 SWG) soft type and anchored into m.s. hook which will be embedded into the ceiling slab. The hook hole shall be filled with Graphic plugging compound. The aluminium Tee shall be provided at 1220mm distance centre to centre from the wall. The tees supporting hook and wire shall be provided at a distance not more than 1372 mm and the lower end of the wire shall be inserted and fixed into the Tee's drilled hole. The Tees shall be extended by a galvanised angle coupler size 12mm x 12 mm and length not less than 127 mm fabricated from not more than 20 SWG galvanised sheet. The coupler shall have minimum 4 holes shall be fixed to another Tee. One or both sided may be riveted by an aluminium rivets or by m.s. screws samples shall be submitted to Consultant.

The stabiliser bare shall be fabricated from 0.45 mm thick aluminium sheets size 20 mm x 20 mm length 1270 mm, slotted at 1220 mm distance. The stabiliser bars shall be so fixed to the wall perimeter and second slot shall rest on the tee-top at a distance centre to centre not more than 1832 mm. The first and second Tee shall be provided with the stabiliser bars in such a way that the Tee-tops rest into the slot at both the sides at distance of 1220 mm at a distance centre not more than 1980 mm. The pattern of stabiliser bar shall be staggered.

The panels shall be rested on the tee and tee/angle flanges so that the flange of one panel is covered by the flange of the other panel and visa versa. The Polythene covered pads shall be provided over the panel and wherever necessary panel stabilising clips will be provided. All the area shall be covered with pads.

External appearing portion shall be either anodised silver finish or painted to match the colour of panels. However little variation of shade is not ruled out as the Tees and angle final finish shall be carried at site.

The samples of accessories shall be submitted to Consultant.

- 2b i) Supplying and installing 'AKOSTISIL' aluminium exposed one directional Tee-ceiling system.

SPECIFICATIONS OF PANEL:

The panel shall be fabricated from 0.61 mm thick aluminium sheet, perforated diameter 3 mm distance centre to centre 12.5 mm and shall be square edged. The panel's length 1216 mm width 305 mm and shall be submitted for Consultant: approval however length and width tolerance shall be + or - 2 mm. The panel shall be treated with phosphoric acid solution and then caustic solution for preparing surface to received paint. The panels shall be spray painted with acrylic paint.

- ii) ACOUSTIC THERMAL PAD: Detail as per specifications item No. B-2a iii.

INSTALLATION DETAILS:

Specifications of wall perimeter angle aluminium Tee, as well as their installation system shall be as per No.B-3.

The panels shall be installed on the flanges of Tee or Tee and angle and galvanised clips from 20 SWG shall be so provided that the clip holds both and flaps as well as tee-top. Stabiliser bars specifications as per item B-2a-II shall only be provided on the wall side to form rigidity in the structure.

Acoustic thermal pad installation as per item No. B-2a-III.

External appearing portion shall be painted at site. Little variation in the Tee colour is not ruled out as per item no.B-3.

The sample of panel holding clips shall be submitted to Consultant for approval.

- 2c. i) Supplying and installing 'AKOKSTISIL' aluminium concealed ceiling system.

SPECIFICATIONS OF PANEL: Specifications of panel, aluminium sheet, perforations, chemical treatment and paint shall be as per specification sheet Item 2b -II).

- ii) ACOUSTIC THERMAL PAD: Specification as per specification sheet Item B-2a-iii).

3. SUSPENSION SYSTEM: The mould shall be fabricated from aluminium sheet thickness 0.56 mm length 2428 mm. The shape and size details as per sample submitted. The wall shall be provided with wall mould as a desired level and screwed in to the walls at a distance not more than 1372 mm. The angles fabricated from 20 SWG galvanised steel shall be fixed in the ceiling at a distance 1220 mm (Panel length i.e. 1216 mm) distance centre to centre not more than 2286 mm. The supporting angle 12 mm x 12 mm shall be screw to the angle and the other lower and shall be fixed with hold on hanger. The hold on hanger shall be fabricated from 16 SWG. Aluminium strips with a slot to adjust the level. The suspension runners fabricated from 20 SWG aluminium sheet shall be inserted into the holdon hangers and side tabs of hold on hanger shall be pressed for rigid holding. The runner shall be coupled with a galvanised SWG 20 coupler. (Samples shall be submitted to Consultant for approval.

The panels shall be snapped into the runners and side flanges, if necessary, shall be provided with ga, clips.

Acoustic thermal pad installation as per Item B-2a-iii.

Tolerance: Tolerance of fixed panels at the edges shall not be more than 2 mm.

C. **TEAK-WOOD FALSE CEILING SYSTEM:**

1. **SCOPE:**

The work covered by this specification consists of furnishing and installation of the suspended ceiling specification here in and shown on the reference drawings and finish schedule.

2. **MATERIALS:**

The ceiling material shall be best quality Indian Teak wood frame work on approved grid including two coats of wood perservative to all surfaces.

3. Suspension system shall be with m.s. or T.W. hanger boarding and tiling as described in the schedule of items fitted with V groove joints wherever specified and allows for cutting, wastage and making openings for lighting fixtures, A/c. grills etc. Complete as specified schedule of items and as per drawings and details.

D. BESTLOK SUSPENDED FALSE CEILING:

1. **SCOPE:**

The work covered by this specification consists of furnishing and installation of suspended false ceiling as per manufacturers make and specification and detail system described in their product information drawings.

2. **MATERIAL:**

Bestlok Aluminium runner Tees, cross runner tees, wall angles ceiling cleats, holding cleats, splice plates, spring clips, M.S. twisted strap hangers/adjustable suspended rods, coach screws including ceiling boards/ tiles such asferolite wood wool insulation boards/thermocole/jolly insulex boards, jolly insulex/tiles, sitalex tiles, particle boards/novateak super boards, alutex/A.C. sheets plain/with or without crown fibre glass insulations pads as described in the schedule of items.

XXI - FIELD PAINTING

1. **SCOPE OF WORK:**

The work covered by this specification consists of accomplishing field painting, complete and in strict accordance with this specification and the applicable drawings.

2. **GENERAL:**

Unless otherwise specified the following materials shall not be field painted - Copper, Bronze, Chromium Plate, Nickel, Stainless Steel and Aluminium.

Bearing surfaces, screw threads and other surfaces where painting would be detrimental to the planned operation shall not be field painted.

All surfaces of factory finished items such as lockers, mechanical and electrical items which have been slightly damaged shall be touched up with paint to match the factory finish and if heavily damaged, shall be re-finished to match factory applied finish.

All colours of paints shall be subject to the review and prior approval of consultant.

Paint shall be well ground, shall not settle badly, cake or thicken in the container, shall be readily broken up with a paddle to a smooth consistency

and shall show easy brushing properties. All paint materials shall be delivered to the job in original, unbroken containers with labels and tags intact.

Surfaces to be painted shall be indicated on the Finish Schedule and as hereinafter specified. Surfaces shall be thoroughly clean and shall be dry when the paint is applied. Paints colours not specified otherwise shall be as directed by Consultant. Surfaces which are inaccessible after erection shall be treated and primed prior to erection.

Succeeding coats of the same type and/or colour of paint shall vary sufficiently from the colour of the proceeding coat to permit ready identification. Damaged painting shall be retouched before applying the succeeding coat. Finished surfaces shall be smooth, even and free from defects. The number of paint coats specified shall be in addition to the shop priming coats. Storage of paints and paint materials and the mixing of paints shall be restricted to the locations directed by Consultant.

In all areas where the finish schedule calls for finish painting of walls and ceilings, all bare pipes, pipe covering, conduits, ducts, hangers, supports, anchors, registers, structural steel and wall sleeves shall unless otherwise specified be finish painted the same colour as indicated on the finish schedule for the adjacent wall or ceiling.

Where non-galvanised ferrous metal surfaces are specified to be finish painted and have not received a shop applied prime coat, they shall be given a coat of red lead base paint or approved equal. Where a shop supplied prime coat is abraded and where field rivets, bolts and spots marred by welding occur, surfaces shall be spot primed with the same type of paint coat or shall be spot primed with an approved equal.

Hardware, hardwares accessories, plates, lighting fixtures and similar items in place prior to painting, shall be removed during painting operations and refixed upon completion and after drying of each space or shall be otherwise protected. Except as otherwise specified, all surfaces to be painted shall be clean, smooth, dry and free from dust and grit. All work shall be done in a workmanlike manner leaving the finished surface free from drops, ridges, waves, laps and brush marks. Paint shall be applied under dry and dust-free conditions and unless otherwise approved by Consultant or paint manufacturer no paints shall be applied when the ambient temperature is over 90F. All primer and intermediate coats of paint shall unscarred and completed integrate at the time of application of each succeeding coat. Sufficient time shall be allowed between coats to ensure proper drying. Paints shall be thoroughly stirred and kept at a uniform consistency during application and shall not be thinned in excess of the printed directions from the manufacturer. Paint containers shall not be opened until required for use. Floors, roofs and other adjacent work shall be properly protected by drop cloths or other coverings.

3. **SAMPLES:**

Samples of each type of paint and each colour proposed for use shall be submitted to Consultant for approval. Samples shall consist of one pint of each kind of paint and three displays of each type and colour of paint applied to wood strips 5 x 15 cm.

4. **MATERIALS:**

All materials under this specification shall strictly conform to relevant Indian Standards shall be approved by Consultant before use.

5. **SURFACE PREPARATION:**

All dirt, rust, scale, loose particles, grease, oil and other deleterious substances shall be removed from all surfaces which are to be painted or otherwise finished.

Before painting concrete and masonry surfaces which may have been damaged during construction, shall be repaired.

- a) Dirt, fungus, grease and oil shall be removed from all concrete masonry surfaces and cleaning shall be approved by Consultant before any painting work is begun. Any water, air pits or large holes in the surface shall be thoroughly chipped out and filled with cement grout (1:1). Plastered wall shall be allowed to dry thoroughly for a minimum period of eight to ten months before any normal painting work with synthetic enamels can be carried out. However, with plastic emulsion paints the painting work can be carried out within six to eight weeks after the plaster work is complete, provided the main brick wall has been allowed to dry out for a minimum period of 6 months.

New concrete wall shall be allowed to dry for a minimum period of 4-8 weeks before any normal painting work with synthetic enamels as well as plastic emulsion paints is carried out. For under ground or enclosed concrete wall, this period shall be extended to at least 4 to 6 months depending upon the atmospheric conditions.

The method of surface preparation shall be left to the discussion of the contractor, provided satisfactory results are obtained.

- b) Steel surfaces to be painted shall be thoroughly cleaned of scale, dirt and rust by the use of steel scrapers, wire brushes, sand blast, or other equally suitable tools or methods. Oil and grease shall be removed with suitable solvent.

c) **GALVANISED FERROUS METAL:**

Surfaces shall be properly cleaned and prepared so that the paint will bond well and adhere permanently thereto. Oil and grease shall be removed by washing the surface with turpentine or mineral spirit. Galvanised surfaces shall be given a coat of zinc dust- zinc oxide primer.

6. **APPLICATION OF PAINT:**

- a) Paint shall be applied by brushings, roller, coating spraying or a combination of these methods.
- b) To the maximum extent practical, each coat of paint shall be applied as a continuous film of uniform thickness and free of pores. No

portion of the paint film shall be less than the thickness specified, nor shall the film thickness be so great that either the appearance or the service life will be affected detrimentally.

- c) Prime coats of paints shall be at least 1.5 mils thick when dry, and each intermediate finish coat shall be at least 1.0 mil thick when dry. Vinyls, lacquers and emulsions deviate from this thickness. These coatings shall be applied at the specified thickness recommended by manufacturers of paints for the particular material.
- d) Each coat of paint shall be in a proper state of cure or dryness before the application of the succeeding coat. Paint shall be considered dry when the additional coat can be applied without development of any detrimental film irregularities.
- e) Finish coats shall not be applied to surfaces on which the primer coat is scratched or damaged until such damage areas have been cleaned and reprimed.

7. **WORKMANSHIP:**

Workmanship shall be first class in every respect. Paint enamel and varnish finish shall be applied carefully with good clean brushes, approved rollers, or approved spraying equipment except the the initial coat on any surface shall be applied by brush. The work shall be so conducted private property in the area. Any damage thereto shall be repaired by the Contractor at his expense. Exterior paint shall not be applied during foggy or rainy weather. Each coat shall be in proper condition before the next coat is applied. All primer and intermediate coats of paint shall be unscarred and completely integral at the time of application of each succeeding coat. Each coat of paint shall be of sufficient thickness to cover completely the previous coat of surface.

8. **SPECIAL REQUIREMENTS:**

- a) Materials shall be stored in a location approved by Consultant. Storage space shall be kept clean, neat and free from fire hazards. Oily and paint stained rags when not in use, shall be kept in covered metal receptacles located in a locker detached from the paint storage space and preferably out of door.
- b) Painting shall be done at such time as permitted or requested by conditions and progress of construction or as ordered by Consultant, Surfaces which will become inaccessible in final stages of construction, but which require painting shall be painted while still accessible.
- c) Any surfaces painted under this specification which become marred prior to final acceptance shall be touched up to match the adjacent finish.
- d) All misplaced paint and drippings shall be removed from all surfaces.
- e) All surfaces which do not require paint, shall be protected from drips and spatters incident to painting activities in adjacent areas. The cost of the protection shall be borne by the contractor.

9. **COLOUR SCHEME:**

Consultant shall provide the colour schedule for the entire job. As soon as possible after receiving such schedule the contractor shall prepare samples of all finishes as indicated in the item showing colour and finishes together with a list of manufactures whose products are to be used without any cost to the client. When the building is ready for paint, the contractor at his expense shall apply large sized samples to walls for determining the exact colour shade as directed by Consultant.

XXII - MISCELLANEOUS METAL WORK

1. SCOPE OF WORK:

The work covered consists of furnishing and installing all miscellaneous metal in strict accordance with this specification and the applicable drawings including;

- a) Ladders and rungs
- b) Anchor bolts
- c) Sleeves
- d) Steel lintels
- e) Access openings

2. GENERAL:

Work included under this specification shall be installed by the Contractor at the proper time and as rapidly as progress of the adjacent and connecting work will permit. Work to be set by others shall be delivered when required. The contractor shall consult with the various contractors installing adjoining work regarding the methods to be employed in connecting the several materials. Moles and connections for the work of other trades shall be provided as necessary.

All work shall be erected and secured plumb and true to line, and finished smooth and free from noticeable irregularities of the marks.

Contractor shall verify all measurements in the field, as required, for work fabricated to fit conditions as the building. Before starting work, he shall examine all adjoining work on which the work of this specification is in any way dependent for perfect workmanship and fit. He shall apply such corrective measures to adjoining work, as may be necessary, to make the work comply with this specification.

3. SHOP DRAWINGS:

Contractor shall submit three (3) copies of shop and erection drawings showing erection sequence for approval, and no fabrication work shall be undertaken until written approval is obtained from Consultant. The Contractor shall submit five copies of approved shop and erection drawings to Consultant for their records.

4. MATERIALS:

a) LADDERS RUNGS:

Contractor shall provide and install all iron ladders and rungs where indicated and as detailed on the drawings.

He shall also include goosenecks, base-plates, fastenings, anchor bolts, guard rails/rings, etc.

b) ANCHOR BOLTS

Anchor bolts shall be of steel or iron rod, with bend ends, threads for setting in concrete as shown and specified in the drawing. Bolts shall be provided with hexagonal head nuts and washers.

c) SLEEVES:

Sleeves shall be of cast iron or mild steel. If they are load-bearing, they shall be fastened by anchor straps in concrete, and shall be placed at proper elevations as shown on drawings. The diameters of the sleeves and other pertinent details shall be as shown on the drawings.

d) STEEL LINTELS

Steel lintels shall be the full thickness of the masonry, bearing at least 200 mm on masonry at each jamb to support all openings over 450 mm wide in masonry walls, partitions etc.

e) ACCESS OPENINGS

Access openings shall be provided in underground ducts for any maintenance work that may be required. Access opening covers shall be of R.C.C. and shall be flush with the floor.

5. **FABRICATION AND ERECTION:**

- a) All miscellaneous metal work shall be fabricated and erected in a thorough workman like manner by skilled personnel. All exposed joints shall be close fitting and all exposed bolts, screws, etc. All finished fabrication shall be straight, true and free from imperfections of any kind.
- b) All shop and field connections shall be specified on the drawings. When standard are not applicable, connections shall be capable of developing the full strength of the connected members. Holes, both field and shop shall be punched or drilled, but not flame cut.
- c) Welding shall be executed according to the Indian welding code. Welding which is exposed to view or contract shall be ground smooth and flush.
- d) Cutting shall be by sawing or shearing. Flame cut material will be acceptable for concealed work, or for exposed work if edges are ground back to clear straight lines.
- e) Miscellaneous metal work continuous with concrete or other masonry shall be provided with anchors for rigid fastening, and shall be cut, punched, drilled and tapped, as required, for the attachment of other work, or where instructions for the same are given, prior to or by approval of the shop drawings.
- f) Work under this specification shall be properly co-ordinated with all other trades. All supplementary parts such as bolts and clip angles necessary to complete each item shall be included even though not specified.

- g) Riveting, where exposed shall be flush, unless otherwise specified or shown. Bolting, where permitted, shall be done with proper sized bolts with nuts drawn tight and threads upset. All items shall be accurately fitted and secured in place. Where removal is required they shall be arranged in such a manner that no damage occurs to adjacent work.
- h) Where dissimilar metal parts are in contact with each other, parts shall be kept from direct contact by a heavy coat of alkali resistant bituminous paint to prevent electrolysis. Anchors for use with masonry construction shall be 40 m/m x 5 m/m steel flats and shall extend 200 m/m into masonry with ends bent up 50 m/m, or as shown in the drawings.

6. **PAINTING:**

All work under this section other than galvanized work, aluminium, or stainless steel shall be thoroughly cleared carefully painted with approved oil based red oxide paint in the shop after fabrication, and before delivery or exposure to weather.

Shop coats shall be free from runs for blisters, and be thoroughly dry before delivery, and any parts scraped exposing the bare metal, shall be retouched without delay. After erection, all nuts, bolts and all spots where paint has worn off, or has been removed during erection, as also the newly erected structures, shall be given another coat of approved synthetic or oil based redlead paint. A final coat of oil based paint of approved colour and manufacture shall be applied to the entire structure.

XXIII ROAD WORK

1. **GENERAL:**

The road work shall consist of water bound macadam road, fully grout asphalt over it and final seal coat.

2. **WATER BOUND MACADAM:**

The ground shall be excavated to the required level for making water bound macadam road. Surface dressing has to be made wherever required and to be rolled by 6 to 8 tonnes sheeps foot roller. A layer of stones 100 mm size to be placed in the layer of 150 mm and to be rolled by a power driven roller. This is to be followed by another layer of 100 mm stones and these are also to be rolled, thus making the consolidated stone pitching approximately 230 mm. All spaces, voids etc. to be filled in with grit, watered thoroughly and rammed and pressed with roller of 10 tonnes. The water bound macadam to be rolled to proper slopes, camber etc. and to be 600 mm extra on either sides.

3. **FULL GROUT SURFACES**
PREPARATION OF BASE :

Prior to the spreading of the graded aggregate, the base shall be brought to a uniform grade and cross-section. It shall be well compacted and swept free of all loose and foreign matter.

APPLICATION OF COARSE AGGREGATE :

- a) Following the preparation of the base course, the coarse aggregate 50 mm size, shall be spread to sufficient depth as will provide the specified thickness of approx. 75 mm on compaction to have consumption of $9M^3/100M^2$.
- b) The surface of the loose aggregate shall be carefully shaped by hand or by mechanical means, and all high or low spots remedied by removing or adding aggregate as may be required.
- c) The aggregate shall then be rolled with a power, three wheel roller of 10 to 12 tons in weight. Rolling shall start longitudinally at the sides, and proceed towards the centre of the road, overlapping on successive trips by one-half the width of a rear wheel of the roller.
- d) Any irregularities that appear during or after rolling shall be remedied by the addition or removal of aggregate as required followed by further rolling until compacted to a uniform surface.
- e) Rolling shall be stopped immediately the aggregate shows signs of crushing or rounding.

FIRST APPLICATION OF BITUMEN :

Upon the consolidated graded aggregate, hot Bitumen shall be applied uniformly by hand pouring cans or pressure sprayer at the rate of 3.5 kg/M² at the temperature of 160 deg.C.

INTERMEDIATE AGGREGATE APPLICATION :

Immediately after the hot Bitumen has been applied to the coarse aggregate and, while it is still warm, clean, dry aggregate 20 mm size shall be spread to fill the voids in the first course at the rate of $1.8\text{M}^3/100\text{M}^2$. Rolling shall continue until the aggregate is thoroughly compacted and the surface shows no movement under the roller wheels.

4. **SEAL COAT:**

A seal coat shall be applied within a few days of completion of the grouted surface. The surface shall be clean of all foreign material and Bitumen shall be applied at the rates of $1.75 \text{ kg/M}^2 @ 160^\circ\text{C}$. The Bituminous binder shall be immediately blinded with a layer of clean, dry stone chippings (100mm) standard size, uniformly distributed by hand or by means of a mechanical spreader at the rate of $1.2\text{M}^3/100\text{M}^2$. Hand or mechanical brooming shall follow the application of the chippings prior to rolling.

Rolling : Immediately after spreading and brooming, the stone chippings shall be rolled with a roller weighting from 6 to 8 tons. Excessive rolling shall be avoided to prevent crushing of the aggregate. The surface shall remain closed to traffic for 24 hours or such period as specified by the Consultant.

XXIV - SPECIFICATIONS FOR POLYMER MODIFIED CEMENT MORTAR

1. GENERAL

1.1 The cement-based polymer modified mortar shall be prepared at site adding ordinary Portland cement, polymer and aggregate or using ready to use components supplied by manufacturer's in sealed containers/bags subject to approval of Engineer.

1.2 QUALITY ASSURANCE

1.2.1 LABELING

Contractor shall clearly mark all containers with following information.

- a) Name of manufacturer.
- b) Manufacturer's product identification.
- c) Manufacturer's instruction for mixing.
- d) Warning for handling and toxicity.

1.2.2 APPLICATION CONTROL

The contractor shall submit mixing application procedure for approval prior to use.

1.3 PRODUCT DELIVERY AND STORAGE

1.3.1 DELIVERY OF MATERIAL

Contractor shall deliver all materials in sealed containers with labels legible and intact.

1.3.2 STORAGE OF MATERIAL

Contractor shall arrange to store all materials at the temperature and as recommended by manufacturer.

2. MATERIAL

2.1 CEMENT

The cement used shall be ordinary Portland cement of 43 grade conforming to IS: 269.

2.2 SAND

The sand shall be sharp washed, well grade and free from excessive fines. Quartz sand 16/30 mesh size shall be used for all polymer modified work.

2.3 WATER

Water used for cementitious polymer modified mortar shall conform to the requirement of IS: 456

2.4 POLYMER

Polymer used shall be either synthetic latex or acrylic base.

3. EXECUTION

3.1 PREPARATION OF CONCRETE SURFACE

- 3.1.1** A good base or foundation shall be prepared for successful application of polymer concrete.
- 3.1.2** Proper support must be provided to members under repair before exposing the same for repair. It is mandatory for the contractor to seek consultants approval for the support system. The ultimate responsibility of the support system lies with the contractor. The gist of the point being the paramount importance of the safety of the building under repair.

The props must be tight against any jerks and jolts. The system should ensure that all load of slabs, beams and other superimposed loads are properly redistributed without transferring the same to the column to be repaired. Necessary length of wall etc. can be dismantled.

- 3.1.3** All unsound/weak concrete material shall be first removed upto the required depth as directed by engineer. Chipping shall continue until there are no offsets in the cavity which will cause an abrupt change in the thickness of repaired surface. While removal of cover, care is to be taken that core of the column is not disturbed.

Exposed steel is to be cleaned, the steel surface is to be evenly coated twice by any rust converter and subsequently coated twice with passive coat of polymer:cement of approved make.

- 3.2** After it has been ensured that the surface to which polymer modified cement mortar is to be bonded is sound, it shall be cleaned off all loose and foreign materials by means of shift wire brushing as directed by engineer.

3.3 METHODOLOGY

3.3.1 BOND COAT

The contractor shall wet the surfaces ensuring that they are saturated but free of surface water. Prepare a bonding slurry of 1.5 to 2 part of cement to 1 part of polymer mixed to a lump free creamy consistency. Alternatively the primer (bonding slurry) shall be made as per manufacturer's recommendation. The bonding slurry shall be worked well into the surface of the parent body using stiff brush ensuring that no pinholes are visible. Bonding slurry shall not be applied at a thickness in excess of 2mm. If the opinion of engineer a second coat is necessary the same shall be applied after the first coat is touch dry. The second coat shall be applied at right angle to the first tying in new reinforcement wherever specified in the form of bars or welded wire fabric. Cement base polymer modified mortar shall be applied as soon as possible after application of bonding slurry but always during the open time of adhesive.

3.32 APPLICATION OF POLYMER MORTAR

Mixing of polymer with cement shall be done in proportion as recommended by manufacturer. Normally 10-15 kg of polymer is to be mixed with 50 kg of cement.

The mixing shall be carried out in efficient concrete mixer. However the engineer may allow hand mixing in case total weight of mix per batch is less than 25 kg.

The mixer shall be charged with required quantity of sand and cement and pre-mixing shall be carried for approximately one minute. Desired quantity of polymer shall then be poured mixed with dosing water and further mixing shall be done for two minutes only to avoid excessive air entrainment. Water cement ratio must be controlled at all the stages.

Rendering of cement based polymer modified mortar shall be done immediately after applying the bonding slurry to the prepared surface, preferably in coats of approximately 12-15mm thickness, as greater thickness may lead to slumping. Further coats shall be applied fairly in rapid succession within 15-30 minutes. After application of mortar the surface shall be closed using a wood float or steel trowel.

In case of prepackaged components are used the procedure for mixing application and curing shall be strictly followed as per manufacturer's specifications.

4. INSPECTION AND QUALITY CONTROL

The mortar application work shall be continuously inspected by a qualified supervisor, who shall check materials, application of mortar, curing etc.

Each completed work shall be systematically sounded with a hammer to check for drummy areas after hardening. In suspected areas or whenever directed by the consultant, contractor shall drill the cores from the finished work after 7 and 28 days of mortar application. The cores shall be examined for evidence of poor workmanship by the engineer and if he feels that either bonding work or the subsequent layer of mortar are not of the required workmanship, the contractor, at the instruction of the engineer, shall dismantle such areas of work as required by the engineer and redo the same after re-preparing the surface by chipping of mortar work and abrading the bonding slurry interface.

5. PAYMENT

- 5.1 Measurement shall be on sq. m /sq. ft basis of the actual exposed surface for repairs. All the measurement shall be taken before starting of application work of polymer modified cement mortar.
- 5.2 The rate shall include the cost of treatment given to old and new reinforcement and application of bond coat to exposed concrete surface and every successive layer.
- 5.3 Quartz sand shall be supplied by the contractor.

- 5.4 The rate is exclusive of providing and fixing of reinforcement.
- 5.5 The rate shall include the cost of scaffolding and working platform at all heights and levels.
- 5.6 The rate is inclusive of providing and applying of two coats of rust converter.
- 5.7 In case of polymer is either directly supplied by client or paid on actual consumption basis to contractor, its usage shall be strictly controlled and payment of polymer shall be made only after verifying the reconciliation statement of consumption of polymer with respect to consumption of cement/quartz sand and actual consumption of polymer as per the daily material consumption record book.

Quantity of polymer shall be calculated in following manner.

- a) For various dosage in P.M.C.: Against consumption of 3 bags of quartz sand of 50 kg each, it shall be calculated that one (1) bag of cement i.e. of 50 kg. is used. Now based on the % dosage of polymer recommended polymer consumed shall be calculated.
- b) for bond coat consumption shall be calculated @ 1 kg. of polymer per 50 sq.ft.
- c) Any wastage more than 5% shall be the responsibility of the contractor and will be recovered from the contractor's bill.

VII ARTICLES OF AGREEMENT

ARTICLE OF AGREEMENT made at this day of between its offices at (hereinafter called "The Contractor") of the Other Part.

WHEREAS the Employer being desirous of getting the Engineering Works (hereinafter in this Agreement and in its conditions, the Specifications, the Schedule of Quantities and Unit Rates, Drawings and Special Conditions referred as the "Works") - for proposed Gandhar Oil refinery India Ltd, Taloje, Maharashtra has caused Drawings and Specifications relating to and describing the works to be prepared by M/S Optimal Consultancy Services Pvt, Ltd being its Architects-Engineers (hereinafter referred to be "Architect - Engineers).

AND WHEREAS the said Drawings, Specifications and Schedule of Quantities and Unit Rates relating to the works have been signed by the parties hereto AND WHEREAS the Contractor has agreed to execute upon and subject to the Condition set forth herein after referred to as "the Said Conditions") as also the Appendix, the General and the Special Conditions, the works shown upon the said Drawings and/or described in the said specifications and included in the said Schedule of Quantities and Unit Rates for such sum as may be ascertained to be payable in terms of the Bills of Quantities (hereinafter in the Agreement, and in the Conditions, the Specifications the Schedule of Quantities and Unit Rates, Drawings and General and Special Conditions referred to as "the Said Contract Amount") and which sum is estimated to be

NOT THIS AGREEMENT WITNESSETH AND it is hereby agreed by and between the parties hereto as follows:

1. In consideration of the said Contract Amount to be paid at the time and in the manner set forth in the said conditions, the Contractor shall upon and subject to the said Condition and the General and Special Conditions execute and complete the works shown upon the said Drawings and described in the said Specification and Schedule of Quantities and Unit Rates set out in the Schedule.
2. The employer shall pay the contractor the said Contract amount or such other sum as shall under the Conditions become payable at the time and in the manner hereinafter specified in the said Conditions.
3. The term "Architect-Engineer" in this Agreement and in the said conditions and the specifications, the Schedule of Quantities and Unit Rates, Drawings and General and Special Conditions, shall mean or in the event of it ceasing to be the Architect-Engineer for the purpose of this contract, such other person as shall be employed for that purpose by the Employer. The term "Architect-Engineer" shall in relation to supervision of Works under this contract including the engineer or engineers of the Architect-Engineer supervision at the site and whose name or name are from time to time notified in writing by the Architect-Engineer to the Contractor and to the employer.
4. Tender documents containing the said Conditions and also the General and Special Conditions, the Appendix there to, Drawings, specification, Schedule of Quantities and Unit Rates shall be read and construed as forming part of this Agreement, and the parties hereto shall respectively

abide by comply with the same and perform the obligation required to be performed by them under the same.

5. Only the rates quoted in this Tender are binding on the Contractor, the figure of total cost mentioned herein being for guidance only. Variation in quantities with plus and minus is expected. The contractor shall be paid for the work carried out according to actual measured quantities at the rates contained in the Schedule of Quantities or as provided in the said Conditions the Appendix and the Special and General Conditions, under no circumstances shall work be performed prior to the establishment of a unit rate which shall have agreed to by the Employer.
6. The Employer through the Architect-Engineer reserves to himself the right of altering drawings and nature of work, of adding to or omitting any items of work, and/or of having portions of the work carried out by other parties, without prejudice to this contract.
7. Time shall be the essence of this Agreement and the Contractor hereby agrees to commence and to complete the entire work in the period as specified in the Appendix, subject, nevertheless, to the provision in the Conditions for extension of time. Though the work is to be carried out expeditiously, the workmanship by the Contractor shall be of high quality and as per relevant are specifications.
8. This Agreement and Contract shall be deemed to have been made in Bombay and any question or dispute arising out of or in any way connected with this Agreement and Contract shall be deemed to have arisen in Bombay and only the appropriate court in Bombay shall have jurisdiction to determine the same.

As Witness our hand this day of

SIGNED

ADDRESS

CONTRACTOR

WITNESS

EMPLOYER

WITNESS

APPENDIX HEREINAFTER REFERRED TO:

1. Date of Commencement :
2. Period of completion : Mechanical Process Plant shall be ready for Erection in 4 months
Other non-plant building shall be completed in 6 months
3. Earnest Money Deposit : Rupees 1000000 (10 lakh only)
4. Refund of Earnest Money Deposit : 1 week after awarding contract to unsuccessful bidder
5. Security Deposit : B G of 50 Lakhs.
6. Refund of Security Deposit : Completion of work.
7. Retention through running : 7%.
8. Defects Liability period : 12 Months or end of one immediate monsoon after virtual completion.
9. Submission of running bills : Once in a month (not Less than Rs 5,00,000/-).
10. Period of final measurement : within 2 Months from the date of submission of the final bill.

The bidder hereby agrees to comply with all the terms, conditions, specifications and accepted Schedule of rates for the successful completion of this contract.

Date :

Signature :

Designation :