

PARTICULAR SPECIFICATIONS (Contd.,)

1.0	<u>GENERAL</u>
1.1	(a) Work under this contract shall be carried out in accordance with Schedule 'A' particular specifications, Special conditions, drawings and General Specifications and other provisions in MES Standard Schedule of Rates (here in after called MES Schedule Part-I 2009 Specifications and Part-II 2020 read in conjunctions with each other and their upto date amendments.
1.2	(b) Term "General Specifications" referred to here-in-before as well as referred to in IAFW-2249 (General conditions of Contracts) shall mean the specifications contained in the MES Schedule Part-I and their upto date amendments.
1.3	(c) General Rules, specifications, Special Conditions and all preambles in the MES Schedule shall be deemed to be applicable to the work under this contract, unless specifically stated otherwise in those documents in which case the provisions in these documents shall take precedence over the aforesaid provision in the MES Schedule. The term as specified "wherever appears in tender documents and drawings relates to relevant particular specifications and in its absence general specifications. All references to MES Schedule (Standard Schedule of Rates) in these specifications relates to Part-I of MES Schedule unless otherwise mentioned. Reference to only some paragraphs of MES Schedule has been made in these particular specifications but other paragraphs and provision as applicable are also to be followed for all parts of Schedule 'A' even though not particularly mentioned here in after.
1.4	(d) Where specifications for any item of work are not given in MES Schedule or in these particular specifications, specification as given in relevant Indian Standard or code of practice shall be followed.
1.5	(e) Any drawings which is mentioned on the drawings forming part of the tender but not specifically mentioned in the list of drawings shall be deemed to be forming part of the tender. The tenderer shall see such drawings/details in the office of Accepting Officer.
1.6	(f) The unit rate quoted for a particular item and/or lumpsum quoted by the tenderer shall be deemed to include for all minor details/items of work and/or constructions which are obviously and fairly intended and which may not have been included in these documents but which are essential for the execution and entire completion of the work. Decision of the Accepting Officer as to whether any minor details of work and/or constructions is obviously and fairly intended to be included in the contract or not shall be final, conclusive and binding.

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2.0	<u>EXCAVATION AND EARTH WORK</u>
2.1	<u>PREPARATORY WORK</u>
2.1.1	Before setting out the buildings/structures and commencing the construction, the contractor shall carry out the preparatory work, such as removal of grass, vegetation and small trees having a girth not exceeding 30cms etc., trimming surface dressing of the 'area' for all items of Sch 'A' Part – I as per clauses 3.6 & 3.10 of MES Sch Part - I, to the entire satisfaction of Engineer-in-Charge. In building portion upto edge of plinth protection for all items of Sch 'A' Part – I , surface excavation not exceeding 30 cm deep and getting out in hard / dense soil and disposal not exceeding 50 m shall be carried out. The 'Area' referred to implies the entire building plot extending upto 3 m all around the outer edge of plinth protection of the building block. The cost of such work shall be deemed to be included in the contractor's lumpsum quoted under items of Schedule "A" Part – I .
2.2	<u>EARTHWORK AND EXCAVATION</u>
	(a)Unit rates for buildings and other structures in Schedule 'A' Part-I shall include for excavation and earth work in hard/dense soil as described here-in-after. During execution any other type of strata is met with, the same shall be regularized through deviation order. Also refer clause 2.6.1 here-in-after.
	(b) If rock/boulder is met at site, Contractor shall immediately notify the fact to the GE in writing, who will after due verification, regularize the change through proper deviation order. The rock/boulder so obtained shall be sorted out and neatly stacked as directed by the Engineer-in-Charge, without any extra cost to Government. This rock/boulder should be neatly stacked at site and shall be entered in the measurement book duly signed by the contractor and Engineer-in-Charge. This rock/boulder shall become the property of the contractor for which necessary recovery will be effected at the rate of Rs 450.00 per cubic metre. Quantity for recovery purpose shall be same as quantity paid for excavation i.e after deducting 50% for voids from stack measurement, irrespective of the quality of useful rock retrieved. The rock thus obtained may be permitted to be used for hardcore/WBM, if conformed to the specification and other requirements.
	(c) Timbering to excavation if required and specifically ordered by the GE in writing, it shall be paid as deviation.

(d) Bailing/pumping out of water where required shall be carried out as described in clause 3.17 of MES Schedule Part - I. The cost of such work as may be necessary shall be deemed to be included in the quoted by the Contractor's lumpsum.

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2.3	<u>FILLING IN TRENCHES/UNDER FLOORS</u>
2.3.1	The approved earth obtained from excavation of foundations shall be used for filling in trenches, under floors and any other situations after removing big stones, grass, roots and vegetables and other organic matter. Earth mixed with small stones/pebbles (if approved by GE) is permitted for use in filling under floors and foundations. The fillings around pipes after the pipes are laid and tested shall, however be with earth free from pebbles/stones. Any additional earth required for the purpose of filling shall be arranged by Contractor at no extra cost to the Department from outside of the Defence land/ KV School. For purpose of lumpsum the entire earth obtained from excavation except surface dressing and surface excavation shall be deemed to be fit for reuse. Lumpsum price (Schedule 'A' Part – I) shall include for any extra soil, if required, for filling even after reusing all the useful excavated soil obtained by the contractor from his own source without any extra cost to the department.
2.3.2	Filling under floors/sides of trenches shall be in layers not exceeding 250 mm and each layer shall be compacted by rammers of 7 to 10 Kg weight. Earth filling shall be adequately watered for achieving maximum compaction. Filling shall be carried out as specified in Clause No. 3.19.1 to 3.19.3.1 of MES Schedule Part – I and to the entire satisfaction of Engineer-in-Charge.
2.3.3	Surplus soil (if any) shall be removed and spread at places as directed by the Engineer-in-Charge, at a distance not exceeding 200m.
2.4	<u>TRENCHES FOR FOUNDATION AND PIPES</u>
2.4.1	The excavation shall be restricted to dimensions shown on the drawings and as specified in MES Schedule. Excavation made, if any, in excess of required depth/width shall be made good by the Contractor with cement concrete 1:7:12 type F2 without extra cost to the Government. The excavation shall be carried out manually otherwise written permission is necessary from the GE.
2.4.2	The beds of the trenches shall be watered and well rammed and any depressions thus formed shall be filled with approved earth as required to the level and slopes as directed by Engineer-in-Charge.
2.5	<u>DRESSING AROUND BUILDINGS</u>
2.5.1	After construction of buildings/structures under Sch 'A' Part-I before handing over, the area all round the buildings/sheds upto 3m from the outer edge of plinth protection shall be dressed and spoil obtained from such dressing shall be removed to a distance not exceeding 50m, spread and leveled as directed by Engineer-in-Charge. The cost of dressing and removal of soil is included in the unit rates quoted by the contractor against respective items of Schedule 'A' Part-I.

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2.6	<u>FOUNDATION AND PLINTH</u>
2.6.1	The lumpsum for works under Schedule 'A' Part-I shall be for the construction of the buildings/structures as per the contract drawings. Any change in foundation/plinth necessitated due to undulating ground, which may have to be carried out as per the decision of the GE, shall be adjusted through a proper deviation order.
2.6.2	For the purpose of reckoning the depth of the foundation the average level of the ground after preparatory work (surface dressing & surface excavation as mentioned vide clause 2.1.1 here-in-before) shall be considered. Methods of Treatment (By chemicals) As per MES SSR Part-I, Clause 3.31.3 in accordance with MES SSR Part-II item No 3047 to 3051.
2.7	<u>HARD CORE</u>
2.7.1	The material for hardcore shall be locally available best quality and as per sample kept in GE's office.
2.7.2	Hard Core shall be of stones/boulders (broken of gauge) not exceeding 63mm. Hard core shall be deposited spread and leveled in layers not exceeding 15 cm thick and well watered, rammed to a true surface and compacted. The thickness of the hard core specified or as indicated in the drawings, is the thickness after consolidation.
3.0	<u>CONCRETE</u>
3.1	<u>MATERIALS</u>
3.1.1	<u>CEMENT</u>
3.1.1.1	<u>General</u> : Cement required for the work under the contract shall be procured, supplied and incorporated in the works by the contractor under his own arrangement. Cement shall be of tested quality and shall comply with the requirements mentioned in the drawings, MES schedules, IS Specifications as amended and particular specifications given hereinafter.
3.1.1.2	Type of cement for the subject work shall be ordinary Portland cement grade 43 (forty three) in accordance with IS 8112-2013 for all works.
3.1.2	<u>SOURCES OF PROCUREMENT</u>
3.1.2.1	Cement shall be procured by the contractor from any of main producers/manufactures of cement listed in Annexure here-in-after.
3.1.2.2	The contractor shall furnish the particulars of the manufacturer of cement alongwith the date of manufacturing of cement to the Garrison Engineer for

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	every lot of cement separately.
3.1.2.3	For each lot of cement brought by the contractor, before acceptance of the cement the following actions will be taken by the GE and Engineer-in-Charge:-
	(a) Inspect the lot and verify the general conditions of the cement.
	(b) Obtain the vouchers (IN ORIGINAL) of the manufacture of cement for each lot containing the date of manufacturing, from the contractor.
	(c) Obtain from the contractor for each lot of cement the manufacturer's Test Certificate (IN ORIGINAL) alongwith Test Sheets giving the result of each physical test and chemical composition of cement or authenticated copy thereof duly signed by manufacturer. The Test Sheet should include the results of the following mandatory test :-
	(i) Specific surface by Blains air Permeability method.
	(ii) Soundness Test by Le" Chatlier method.
	(iii) Initial setting time.
	(iv) Final Setting time.
	(v) Compressive strength test at 3, 7 & 28 days as specified in the relevant IS code.
	(vi) The test report should also show the chemical properties of the cement as per relevant IS Codes.
	(d) Verify the documents listed at Clause Nos 3.1.2.3 (b) & (c) above given by the contractor from the manufacturer.
3.1.2.4	The cement so brought shall be fresh and in no case older than 60 days from the date of manufacture. The GE accordingly in consultation with the contractor will work out the Schedule of procurement and ensure that the same is adhered to. The document in support of the purchases of cement shall be verified by the Engineer-in-Charge. Before placing the order for supply of cement by the contractor, he shall obtain written approval from the GE regarding name of manufacturer, quality of cement etc. Cement shall be procured for minimum requirement of one month and not procured for minimum requirement of more than two months at a time and should match with the physical progress of the work. The cement shall be consumed in the work within three months after receipt. Cement shall conform to the requirement of Indian Standard Specification and each bag of cement shall bear relevant ISI mark. The weight of each consignment shall be verified by the GE and recorded. The content of cement shall be checked at random to verify the actual weight of cement per bag. However, the content of cement per bag shall be 50 Kg only subject to tolerance given in relevant IS code. The Contractor may procure cement in bags/bulkers. If cement is procured in

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	bulk,ers, the same shall be stored, preserved, accounted and maintained as per Standard Engg practice and as per direction of GE.
3.1.3	<u>TESTING OF CEMENT</u>
3.1.3.1	The contractor shall submit the manufacturer's test certificate in original or attested true copy alongwith test sheets giving the results of each physical test as applicable in accordance with relevant IS provision and the chemical composition of cement or authenticated copy thereof duly signed by the manufacture with each consignment, as per the following IS provision :-
	(a) Method of sampling hydraulic cement as per IS-3535 Reaffirmed 2004.
	(b) Method of physical test for hydraulic cements as per IS-4031 (Part-I to VI) Reaffirmed 2005.
	(c) Methods of chemical analysis of hydraulic cement as per IS-4032 Reaffirmed 2005.
3.1.3.2	The test certificate and test sheet shall be furnished with each batch of manufacture. The Engineer-in-Charge shall record these details in cement acceptance register to be maintained by him which will be signed by Junior Engineer (Civil), Engineer-in-Charge, Garrison Engineer and the contractor as given in the format hereinafter for verification.
3.1.3.3	The contractor shall however organize, setting time and a compressive strength test of cement through designated approved laboratory on samples collected from the lot brought at site before incorporation in work. The contractor will be allowed to use the cement only after satisfactory compressive strength test results of three days & seven days. To meet this requirement contractor is required to keep minimum 10 days stock before any new lot brought at site which can be used in the work. The contractor shall be required to remove the cement not meeting the requirement from site within 24 hours. Seven days strength test will be relied upon to accept the lot of cement to commence the work. 28 days compressive strength test will be the final criteria to accept/reject the lot.
3.2	<u>INDEPENDENT TESTING OF CEMENT BY GE</u>
3.2.1	The GE shall carry out independent testing as per the tests mentioned in the 'CEMENT SUPPLY/ACCEPTANCE FORM' (Physical and Chemical requirement) of random samples of cement drawn from various lots and sample shall be tested for each lot/week as defined in IS 3535 Reaffirmed 2004. The testing shall be carried out through National test house, SEMT, CME, Regional Research Laboratories, Govt approved Laboratories, Zonal Laboratories, from any Govt Engg College, NIT Trichy, Govt aided College or NABL labs as per IS-3535 (method of sampling hydraulic cement), IS-4031 (method of physical test for hydraulic cement) and IS-4032 (Method of chemical analysis of hydraulic cement) referred to above. The decision as to where the testing of cement is to be done shall be taken by GE. In case the

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	cement is not of requisite standard despite manufacturer's test certificate, the contractor shall remove the total consignment from the site within 24 hours at his own cost after written rejection order of the consignment by the GE. The cost of testing, transportation and of material used in testing etc. shall be borne by the contractor irrespective of the results of testing and no extra claim whatsoever shall be admissible.
3.3	<u>SAMPLING FOR INDEPENDENT AND ADDITIONAL TESTS</u>
3.3.1	Sample of cement from each lot should be collected by the Engineer-in-Charge and GE in accordance with IS 3535-1986, Reaffirmed 2004, for independent or additional tests. The cement shall be tested within 1-3 weeks on supply but before incorporation of the same in works. The cost of testing, transportation and of material used in testing etc. shall be borne by the contractor irrespective of the results of testing and no extra claim whatsoever shall be admissible. The record of such samples selected by the GE for testing shall be properly maintained in the 'Cement Testing Register' giving cross reference to relevant consignment of cement and quantity received etc.
3.3.2	Cost of transportation of samples to the approved laboratory/test house and all testing charges including cost of sample shall be borne by the contractor.
3.4	<u>DOCUMENTATION</u>
3.4.1	The following documents will be maintained by the Engineer-in-Charge/GE for cement supplied by the contractor in addition to the documents specified here-in-before :-
	(a) Original vouchers of cement shall be kept in the concerned file of the contract in GE's office, serially numbered on each page.
	(b) Original Test Certificate and Test Sheet should also be kept in the concerned file of the contract in the GE's office duly numbered.
	(c) Cement Acceptance Register as per Appendix 'A' .
	(d) In/Out Register for Cement as per Appendix 'B' .
	(e) Register containing results of independent and additional testing by GE.
	(f) Register containing records of surprise checks and BOO's.
	(g) Inspection Register.
3.4.2	The contractor shall submit original purchase vouchers for the total quantity of cement supplied under each consignment to be incorporated in the work. All consignments received at the work site shall be inspected by the GE alongwith the relevant documents to ensure the requirements as mentioned hereinbefore, before acceptance. The original purchase vouchers and the test certificates

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	shall be verified for subject contract and defaced by the Engineer-in-Charge and kept on record in the office of the Garrison Engineer duly authenticated and with cross reference to the consignment/control number recorded in the Cement Acceptance Register. The cement acceptance register shall be signed by the Junior Engineer (Civil), Engineer-in-Charge, GE and the contractor. The contractor shall maintain schedule of supply of cement for each consignment.
3.5	<u>STORAGE/ACCOUNTING/PRESERVATION OF CEMENT</u>
3.5.1	Cement shall be stored in covered godown over dry platform at least 20cm high in such a manner as to prevent deterioration due to moisture or intrusion of foreign matter. In case of store room, the stack should be at least 60cm away from floors and walls. Different lots of cement received will be stacked separately displaying the control number and date of receipt of cement. It will be ensured that the tested and untested cement are segregated and stored with distinct identification. For proper accounting and control of cement brought by contractor a double lock system in the contractor's cement godown will be followed. The stacking of cement shall be done as specified in relevant IS. The storage accounting and preservation of cement supplied by the contractor shall be done as per standard engineer practice till the same is incorporated in the work and the cost of the same shall be deemed to be included in the unit rate/amount quoted by the tenderer.
	The Engineer-in-Charge shall inspect once a day to verify that cement lying at site is stored, accounted, preserved and maintained as per the norms. The cement shall be stored so as to differentiate each lot separately with distinct identification. If the GE is not satisfied with the storage/preservation of cement, he may order for any test(s) of cement as applicable for that consignment to ensure its conformity to the quality mentioned in the manufacturer's test certificate. The contractor shall bear the cost of necessary testing(s) in this regard and no claim whatsoever shall be entertained.
3.5.2	Stacking of cement shall be done as per relevant IS and as under :-
	(a) Each cement consignment shall be stacked separately and shall be issued to work on the basis of 'First come First go'.
	(b) Adequate top cover will be provided.
	(c) Stacks in no case shall be higher than 12 bags. The maximum width of each stack shall be 3.00 m. If the stack is to be more than 7 or 8 bags high, the bags shall be arranged in header and stretcher fashion, i.e., alternatively lengthwise and crosswise so as to tie the piles together and avoid danger of toppling over.
	(d) Adequate space shall be kept between two stacks.
3.5.3	Cement godown shall be provided with two locks on each door. The key of one lock at each door shall remain with the Engineer-in-Charge or his representative and that of the other lock with the contractor's authorised agent at site of works so that cement is removed from the godown only according to

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	daily requirement with the knowledge of both the parties. During the period of storage, if any cement bag(s) found to be in damaged condition due to whatsoever reasons, the same shall be removed from the cement godown on written orders of the GE and suitable replacement for the cement bag(s) so removed shall be made and no claims whatsoever shall be admissible on this account.
3.5.4	Cement shall be removed from the store only according to daily requirement with the knowledge of both parties and daily consumption of cement shall be recorded in cement consumption register which shall be signed by the Engineer-in-Charge and the contractor. Cement constants given in Appendix 'C' which shall form the basis of consumption of cement for various items of works (except for design mix concrete) unless specifically indicated otherwise which is enclosed herewith. For design mix concrete the cement constant shall be as mentioned here-in-after. For item not covered under Appendix 'C' the cement consumption for the same shall be worked out based on actual requirement at site through a Board convened for the purpose including a representative from the contractor. The design mix approved shall not be changed unless a fresh design mix is made due to change of source and quality of material.
3.5.5	In case the consumption of cement as per cement consumption register is found to be more than the estimated quantity of cement due to whatsoever reason, the contractor shall not have any claim, whatsoever, for such excess consumption of cement.
3.6	<u>SCHEDULE OF SUPPLY</u>
3.6.1	The contractor shall procure the cement timely as required in accordance with CPM chart agreed between GE and the contractor. The contractor will forfeit his right to demand extension of time if the supply of cement got delayed due to his failure in placing order in time to the manufacturer.
3.7	<u>MEASUREMENTS AND PAYMENT OF CEMENT</u>
3.7.1	The entire quantity of cement shall also be suitably recorded in the Measurement Book for record purposes as 'Not to be abstracted' before incorporation in the work and shall be signed by the Engineer-in-Charge and the contractor.
3.8	<u>RELEASE OF PAYMENT</u>
3.8.1	The payment shall only be allowed after production of original purchase vouchers, certified copies of test certificates from manufacturer for each consignment and results of testing carried out in laboratory on receipt of cement (7 days compressive test) are found satisfactory after testing as specified hereinbefore and taking action on points enumerated in Para 3.1.3 here-in-before and completing the documents in this regard as mentioned in Para 3.4 . Cement shall be paid as material lying at site as per Condition 64 of IAFW-2249.

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3.9	<u>ACCEPTANCE/REJECTION OF CEMENT</u>
3.9.1	The contractor will keep a separate stack of cement brought at site for inspection, away from the accepted lot of cement. In case the new lot is rejected by the GE it will be removed from the site within 24 hours, at the cost of the contractor. The cement may be rejected if it does not comply with any of the requirement as per relevant IS codes. The cement should be weighed and each bag shall be of nominal average net mass of 50 Kgs. The tolerance on weight of the cement shall be as per the relevant IS Codes.

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Appendix 'A'

CEMENT SUPPLY & ACCEPTANCE REGISTER

1. CA No. & Name of Work :
2. Control No.* :
3. Name of Manufacturer/Brand Name/Gde of Cement (A) Manufacturer (b) Brand (c) Grade
4. Qty of Cement & Lot No/Week No (in Bags) : (a) Qty (b) Lot No./Week No.
5. Manufacturer's test Certificate No.
6. Random Test Details (a) Physical test report from vide their letter No. (Name of approved Lab/Engg College) (b) Chemical test report from vide their letter No. (Name of approved Lab/Engg College)
7. Details of Physical & Chemical properties :

	Physical Requirements (As per IS 4031)									Chemical Requirements (As per IS 4032)								
	Specific surface 2 (M / Kg)	Soundness by Le Chatliar	Soundness by Auto Clave	Initial Setting Time(Minutes)	Final Setting Time(Minutes)	Compressive Strengths (Mpa)			Temp during testing 0 C	Standard Consistency (%)	Lime Saturation Factor (Ratio)	Alumina iron Ratio (Ratio)	Insoluble Residue (%)	Magnesium (%)	Sulphuric Anhydride (%)	Loss on ignition (%)	Alkalis (%)	Chlorides (%)
						03 Days	07 Days	28 Days										
As per relevant IS																		
As per manufacturers test certificate																		
As per random test certificate																		

Remarks with signature

Accepted/ Rejected

Contractor Junior Engineer Engineer-in-Charge Garrison Engineer

Remarks of BOO/Inspecting Officer/CWE * To be allotted serially by GE Consignment wise

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Appendix `B'

IN/OUT CEMENT REGISTER

Sl No	Date	Cement IN		Cement OUT			Qty Balance (In Bags)	Signature		Re mar ks
		Qty (In Bags)	Contr ol No.	Qty (In Bags)	Reasons*	Age of cement		Contra ctor	AGE /GE	
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(j)	(k)	(l)

*NOTE: The following reasons may be mentioned for taking out cement from store:-

- (a) For testing purpose
- (b) For use in work
- (c) Rejected cement taken out of site

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APPENDIX 'C'

CEMENT CONSTANTS

SI No.	DESCRIPTION OF ITEM	MIX BY VOLUME	UNIT	CEMENT CONSTANT IN KG.
1	2	3	4	5
	CEMENT CONCRETE			
1.	Mixed Cement concrete delivered on bunkers	1:1.5:3 1:2:4 1:2:5 1:2.5:3 1:3:6 1:4:8 1:5:10 1:7:12	CUBIC METRE	402.83 308.53 268.55 253.18 213.20 161.95 129.15 104.55
2.	Mixed cement concrete using all in aggregate delivered on bunkers	1:5 1:6 1:8 1:12	CUBIC METRE	312.63 264.45 206.03 138.38
	MORTARS			
3.	Cement and sand mortar	1:1 1:2 1:3 1:4 1:6 1:8	CUBIC METRE	1058.83 699.05 493.03 382.33 254.20 192.70
4.	Gauged mortar (Cement lime and sand mortar)	1:1:6 1:1:8 1:2:9 1:5:10 1:7:12	CUBIC METRE	244.98 189.63 164.00 147.60 120.95
	BRICK WORK OLD SIZE BRICKS			
5.	Brick work in well burnt bricks straight on plan or to curve exc. 6m mean inner radius, built in cement mortar	1:3 1:4 1:6 1:8	CUBIC METRE	123.00 95.84 64.06 47.93
5A.	- ditto – but <u>Modular Bricks</u>	1:3 1:4 1:6 1:8	CUBIC METRE	113.30 87.90 58.40 44.30
6.	Brick work in well burnt bricks Straight on plan or to a curve exc. 6m mean inner radius built in gauged mortar using <u>old size bricks</u>	1:1:6 1:1:8 1:2:9	CUBIC METRE	60.48 47.93 40.49

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SI No.	DESCRIPTION OF ITEM	MIX BY VOLUME	UNIT	CEMENT CONSTANT IN KG.
1	2	3	4	5
6A.	- ditto – but using modular bricks	1:1:6 1:1:8 1:2:9	CUBIC METRE	56.80 43.60 37.70
	STONE MASONRY			
7.	Walling of laterite stone masonry brought upto courses well bonded and solidly hearted in cement mortar.	1:6	CUBIC METRE	58.85
7A.	Walling of random or polygonal rubble uncoursed or brought upto courses well bonded and solidly hearted in cement mortar.	1:3 1:4 1:6 1:8	CUBIC METRE	147.60 114.80 75.34 58.94
8.	(a) PCC block masonry 200mm thick	1:6	CUBIC METRE	29.00
	(b)PCC block masonry 100mm thick	1:4	CUBIC METRE	32.20
	PLASTERING			
9.	10mm thick rendering or screeding on brick or concrete surfaces in cement and sand mortar	1:2 1:3 1:4 1:6	SQUARE METRE	11.79 8.41 6.77 4.46
10.	- ditto – but using gauged mortar	1:1:8 1:2:9	SQUARE METRE	3.38 2.82
11.	10mm thick rendering or screeding on stone masonry surfaces in cement and sand mortar	1:2 1:3 1:4 1:6	SQUARE METRE	15.68 11.17 8.41 5.64
12.	- ditto – but using gauged mortar	1:1:8 1:2:9	SQUARE METRE	4.20 3.64
13.	Add or deduct from Srl.9 & 11 for each 5mm thickness in cement mortar over or under 10mm thick on concrete, brick, lathing or stone masonry surfaces	1:2 1:3 1:4 1:6	SQUARE METRE	4.77 3.38 2.51 1.69
14.	- ditto – but using gauged mortar on Srl items 10 & 12	1:1:8 1:2:9	SQUARE METRE	1.38 1.13

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SI No.	DESCRIPTION OF ITEM	MIX BY VOLUME	UNIT	CEMENT CONSTANT IN KG.
1	2	3	4	5
	POINTING			
15.	Raking out joints to a depth of 10mm and flush, keyed or struck pointing on brick work in cement mortar.	1:2 1:3 1:4	SQUARE METRE	2.51 1.69 1.38
16.	-ditto- but on random rubble masonry uncoursed or brought to courses with 20mm thick joints, in cement and sand mortar.	1:2 1:3 1:4	SQUARE METRE	5.02 3.95 2.83
17.	Struck, keyed or flush pointing to block in courses or ashlar or concrete walling in cement mortar.	1:2 1:3 1:4	SQUARE METRE	1.39 1.13 0.85
18.	Struck, keyed or flush pointing to squared rubble coursed or uncoursed walling in cement mortar.	1:2 1:3 1:4	SQUARE METRE	3.95 2.83 2.26
19.	Bastard tuck or mason's V-joints pointing to squared rubble coursed or uncoursed masonry, in cement mortar.	1:2 1:3 1:4	SQUARE METRE	5.02 3.64 2.82
20.	Bastard tuck or mason's V-joints pointing to random rubble masonry, coursed or uncoursed in cement mortar.	1:2 1:3 1:4	SQUARE METRE	6.15 4.46 3.64
	BRICK FLOORING			
21.	Hard burnt brick floors, laid flat, jointed and pointed flush in cement and sand mortar.	1:3 1:6	SQUARE METRE	11.17 5.64
22.	- Ditto – bricks laid on edges	1:3 1:6	SQUARE METRE	15.68 8.41
	SURFACE FINISHING TO CONCRETE FLOORS			
23.	Floating with wood or steel hand float as ordered, cement concrete surface to a fair and even surface using extra cement.		SQUARE METRE	1.38

PARTICULAR SPECIFICATIONS (Contd.,)

CEMENT CONSTANTS (Contd

SI No.	DESCRIPTION OF ITEM	MIX BY VOLUME	UNIT	CEMENT CONSTANT IN KG.
1	2	3	4	5

GRANOLITHIC FLOORING				
24.	30mm thick granolithic concrete floor topping spread over ordinary concrete floor etc. Including floating or trowelling to an even and fair surface.	1:1:2	SQUARE METRE	16.09
25.	10mm thick layer of terrazzo (consisting of 1 part of mixture of cement and marble powder to 1:5 parts of approved crushed stone chipping, 4 to 7mm size) laid level or to falls including cut and polished finish.	1:1:5	SQUARE METRE	8.71

3.10 **Blank**

3.11 **FINE AGGREGATE**

3.11.1 Fine aggregate for concrete work shall conform to materials specifications and grading within the limits of grading zones II to III all as specified in Clause 4.4 to 4.4.7.3 of MES Schedule Part - I. Also refer Sch 'A' Notes here-in-before.

3.12 **COARSE AGGREGATE**

3.12.1 Coarse aggregate for all cement concrete work shall be graded crushed/broken hard granite stone obtained from approved quarries all as specified in Clause 4.4 to 4.4.7.3 of MES Schedule Part - I. Mixture of two types shall however, not be used.

3.13 **GRADING OF COARSE AGGREGATE**

3.13.1 Graded aggregate of nominal sizes given here under, shall be used, unless specified otherwise, in the specifications here in after :-

(a) **All reinforced cement concrete** :- Unless otherwise shown on drawing, the size of aggregate shall be as per IS-456 (upto amendment No. 5 of Jul 2019), but in no case more than 20mm graded aggregate.

(b) **Plain cement concrete** :-

- | | | | |
|-------|--|---|----------|
| (i) | Upto and incl 30 mm thicknesses | : | 12.5 mm. |
| (ii) | Over 30 and upto and incl 75mm thickness | : | 20 mm. |
| (iii) | Exceeding 75mm thickness | : | 40 mm. |

3.14 **Water** : Water shall conform to the requirement stipulated in IS 456 (upto amendment No. 5 of Jul 2019) and as per Clause 4.9 to 4.9.2 of MES Schedule Part - I.

PARTICULAR SPECIFICATIONS (Contd.,)

3.15 **Mix of concrete** : Unless otherwise specified, mix of cement concrete in various situations shall be as under :-

<u>Sl.No</u>	<u>SITUATIONS</u>	<u>TYPE OF CONCRETE</u>
(a)	All RCC under Sch 'A' Part I.	RCC minimum grade M-25 design Mix) mixed at site in automatic concrete weigh batching plant as per IS 456-2000 (upto amendment No. 5 of Jul 2019) and IS 10262-2009 & SP 23 latest edition.
(b)	Cement concrete in any other situations not mentioned above.	PCC M-15, (Nominal Mix)

3.16 **IMPORTANT REQUIREMENT OF REINFORCED CEMENT CONCRETE/PLAIN CEMENT CONCRETE**

3.16.1 (i) All the materials, workmanship inspection and testing for the cement concrete shall be as per requirements given in IS-456-2000 (upto amendment No. 5 of Jul 2019).

(ii) The contractor shall provide all facilities for casting, curing and conveyance of test cubes of cement concrete to authorised laboratory as approved by the GE for testing as laid down in IS-456-2000 (upto amendment No. 5 of Jul 2019) at no extra cost to Government.

(iii) Engineer-in-Charge shall maintain a record of actual consumption of cement in proper register (other than the cement register mentioned in special condition) for all design mix and initial the entry for every change in quality of cement bag.

3.16.2 All plain cement concrete shall be mixed in mechanical mixer of Hopper type. However, in case of small quantity (i.e) the quantity of concrete required being less than one batch of mix, the contractor may, after obtaining written permission of the Engineer-in-charge, be allowed hand mixing without any price adjustment. Where hand mixing is permitted, it shall be carried out on a water tight platform and care shall be taken to ensure that mixing is continued until the concrete is uniform in colour and consistency. However, all design mix concrete shall be weigh batched and volumetric conversion will not be permitted.

3.17 **COMPACTION**

3.17.1 Concrete should be thoroughly compacted and fully worked around the reinforcement, embedded fixtures and into corner of the form work. Internal vibrators (needle vibrator) shall be used for compaction of RCC beams, columns and the slabs of thickness more than 150mm. For slab of thickness upto 150mm, screed vibrator (surface vibrator) shall be used for effective compaction.

3.18 **BATCHING AND MIXING OF CONCRETE**

3.18.1 **BATCHING**

(a) The mixing of cement and aggregate for cement concrete for all grades and type of RCC work shall be done by weigh batching. Calibration certificate of weigh batcher including that of water measuring device shall be submitted by contractor. Contractor to arrange for periodic calibration through approved agencies as directed by GE.

(b) The batching shall be as per clause 10.2 of IS 456: 2000 (upto amendment

PARTICULAR SPECIFICATIONS (Contd.,)

No. 5 of Jul 2019) and clause 4.11.3 (Excluding provision vide sub clause 4.11.3.1) of MES SSR Part –I

(c) CONCRETE WEIGH BATCHING PLANT

The concrete will be mixed in mini concrete weigh batching plant. The plant will have adequate capacity to complete the work in time with auto feeding system of cement and aggregate. It will have handle for manual ejection in case of power failure. Mini plant manufactured by any reputed company capable of giving rated output will be acceptable. Batching plant shall have provision for printing batch sheets of mix produced.

3.19 WATER SUPPLY SYSTEM FOR CONCRETE MIXER

3.19.1 Mixing of water to prepare PCC/RCC shall be done by the contractor by following the method described here-in-after :-

(i) Contractor to use duly calibrated water measuring/dispensing device for preparation of Design mix concrete.

(ii) However where hand mixing is allowed by Engr-in-Charge, the method of mixing of water shall be all as directed by Engr-in-Charge.

3.19.2 All concrete for RCC work shall be consolidated / compacted by mechanical vibrators of approved type (plate type for slabs and needle type in other locations). Plain cement concrete may however, be rammed and consolidated by tamping and rodding as specified in MES Schedule.

3.20 DESIGN MIX CONCRETE M-25

3.20.1 Wherever design mix concrete is specified/shown on drawing, the same shall be provided as per the following :-

(a) Design mix concrete shall have requisite workability and 28 days characteristic compressive strength not less than 25N/Sqmm and the acceptance criteria shall be all as per IS 456-2000 (upto amendment No. 5 of Jul 2019). The mix shall be designed as per recommended guide lines for concrete design mix as per IS. Adequate number of trial mixes shall be carried out at the commencement of the work to decide the proportion for the grade of the concrete and yield. Otherwise the concrete mix shall be got designed from approved lab/ any NABL accredited lab/NIT/Govt Engineering College so as to produce the grade of concrete having the required workability and characteristic strength not less than that specified. The initial mix design particulars along with all the connected documents shall be submitted to the GE for approval. The work on ground shall not be progressed until approval of design mix by the GE. However work may be commenced if the results of 7 days test are satisfactory and the contractor undertake to redo the work at "No extra cost to Government" in the event of unsatisfactory results after 28 days test. Subsequent design mix due to change in aggregate or for any other reasons shall however be approved by the GE.

3.20.2 Minimum quantity of cement shall be as per provision of IS: 456-2000 (upto amendment No. 5 of Jul 2019) meeting the requirements from durability point of view. However if extra quantity of cement is used for whatever reasons, the same shall be at no extra cost basis to Government.

3.20.3 The cement constant given in Appendix 'C' are not applicable for design mix.

3.20.4 TESTING

3.20.4.1 Tests of concrete cubes shall be carried out as laid down in IS-456-2000 (upto amendment No. 5 of Jul 2019). The cost of all materials and labour for casting and curing the requisite number of cubes, cost of testing in laboratory approved by the CWE including transportation of cubes to approved laboratory, testing fees and other expenses etc. shall be borne by the contractor.

3.21 READY MIX CONCRETE (RMC)

PARTICULAR SPECIFICATIONS (Contd.,)

3.21.1 RCC Ready Mix Concrete alternatively may be used for **RCC work** design mix concrete of grade M-25 & above with out any extra cost to GOVT as specified here in after. Specification for RMC shall be as given below and contractor's quoted rates shall be deemed to include above provisions.

(a) Supply of RMC shall be conforming to IS-4926-2003. RMC shall be manufactured by firms listed in Annexure here-in-after. The agency of 'RMC' shall be got approved prior to commencement of 'RMC' work.

(b) The agency of RMC shall be got approved from GE prior to commencement of RCC work. However the responsibility of maintaining quality and grade of concrete fully rests with contractor.

(c) RMC Plant shall be supplied with the following information by the GE :-

(i) The type of cement to be used.

(ii) Maximum size, type of aggregate and its strength determined from samples of plastic concrete taken at the place and time of delivery in accordance with the requirement of IS 456-2000(upto amendment No. 5 of Jul 2019).

(iii) The minimum acceptable compressive strength determined from sample of plastic concrete taken at the place and time of delivery in accordance with the requirement of IS-456-2000(upto amendment No. 5 of Jul 2019).

(iv)The slump or compacting factor or other requirement of consistency or workability.

(v) The ages at which the test cubes or beams are to be tested and number of tests to be made.

(vi) Any other requirement.

(vii) Use of Admixture (if any) to be used.

(d) Concrete mix design shall be carried out preferably by RMC manufacturer complying with the relevant IS specifications for all the ingredients as listed below :-

<u>Material</u>	<u>BIS Specification</u>
(i) Coarse Aggregates	IS : 383-1970
(li) Fine Aggregates	IS : 383-1970
(iii) Cement	IS : 8112-2013
(iv) Admixtures	IS : 9103-99(Rev)

Only ISI marked admixtures shall be used.

PARTICULAR SPECIFICATIONS (Contd.,)

(e) The initial mix design report properly bound in quadruplicate shall be submitted by the contractor to GE for approval. After approval of RMC mix design by GE, the contractor shall make cubes of trial mixes as per approved mix design at site laboratory for all grades of concrete in presence of Engineer-in-Charge using same ingredients as adopted for design mix, prior to commencement of concreting and get them tested in presence of Engineer-in-Charge for 7 days and 28 days. For each design mix, a set of six cubes shall be prepared and from each set, three cubes shall be tested at the age of 7 days and three cubes at the age of 28 days. The cubes shall be made, cured, transported and tested strictly as per IS requirement. The average strength of three cubes at the age of 28 days shall exceed the specified target mean strength for which design mix has been approved. The RMC incorporated in the work shall be in accordance with the approved mix design. If condition of RMC at the time of delivery at site is not acceptable to the GE, it shall be taken back/removed from the site at the cost of contractor. The decision of GE in this regard shall be final and binding. Some of the conditions under which GE can reject RMC are enumerated here-in-below :-

- (i) Initial setting of concrete due to transit delay.
- (ii) Segregation of aggregates due to excess rotation of mixer drums during transit.
- (iii) The RMC supplied does not give required slump.
- (f) In addition to above, GE may further decide the rejection of RMC on any other ground which he decides necessary. Further, the payment made by the contractor to RMC supplier is independent of the payment to be made by the Department to Contractor for carrying out the work.
- (g) A register shall be maintained at site duly signed by the competent representative of RMC manufacturer/supplier, contractor's authorized representative and Engineer-in-charge recording the following details :-

- (i) Date of delivery
- (ii) Time of mixing.
- (iii) Time of delivery at site.
- (iv) Quantity and grade of RMC.

(h) Before actual incorporation of RMC at site the contractor has to get the name of firm approved by GE from whom the contractor proposes to get the RMC. Before approving the name of the firm, the GE shall visit the manufacturer's site for inspection of the following :-

- (i) Infrastructure in terms of storage of aggregates, sand and cement.
 - (ii) Arrangements for washing of aggregates and sand.
 - (iii) Sources of supply for aggregates, sand and water.
 - (iv) Adequacy of testing facilities for water, materials, cement, concrete, alkali aggregate reaction, etc at manufacturing yard.
 - (v) Batching and weighing arrangements including arrangements for adding calculated quantity of water.
 - (vi) Mixing mechanism.
 - (vii) Quality of engineer supervision and skills of workers.
 - (viii) Record, test registers, etc being maintained.
 - (ix) Capacity of the installed plant and adherence to time schedules.
 - (x) Data showing periodic calibration of all equipment.
 - (xi) Details of batching showing quantity of input items in production of concrete.
- Only after GE himself gets satisfied on inspection of the above points he will approve the firm.

PARTICULAR SPECIFICATIONS (Contd.,)

(j) In case of rejection of supply of RMC supplied by the manufacturer at site, the contractor shall be responsible for making good the same without extra cost to the Govt. The GE/Engineer-in-Charge & other officers authorized by the Accepting Officer shall have access to check on the quality of production in RMC suppliers manufacturing yard as and when they desire so. The contractor shall make all arrangements for such inspections. Payment of RAR/deviation pertaining to RCC works involving RMC, rates given to **M-25** (Design mix) (20mm graded stone aggregate) subjected to contractor's quoted percentage for Sch 'A' Part I shall be applicable. No advance payment will be made towards payment made by contractor to RMC manufacturer and no advance on account for cement, coarse aggregate and fine aggregate stored in the yard of RMC manufacturer shall be payable. Type and quality of cement used in RMC shall be in accordance with the specifications as already specified for design mix in the contract agreement here-in-before. It will be the responsibility of the contractor to ensure that the RMC Manufacturer uses in manufacturing RMC the cement/aggregates of grade and quality as described here-in-before. He shall also be responsible to produce necessary paid vouchers and test certificate for the above materials as and when called for by GE for verification to ascertain the correctness of type and quality of materials used by the RMC manufacturer. Paid voucher of RMC shall also indicate details of make/brand of cement used besides batch No, consignment details and test certificate details of procurement of cement.

(k) Please note that if cement has been procured by contractor and given to RMC manufacturer, then original paid vouchers and test certificates of cement shall be given to GE along with paid vouchers of RMC for claiming payment. However in case of cement used in RMC has been procured directly by RMC manufacturer, in such case certified photo copy of paid vouchers and test certificate of cement purchased shall be also enclosed along with paid vouchers of RMC for claiming payment. The contractor shall be responsible to ensure that the cement used in RMC is of approved make/brand as specified in the tender.

(l) Requisite facilities for verification and check of the raw material shall be made available to GE by the RMC manufacturer. GE will have easy access to the RMC plant to check quality of concrete being produced at the plant at intervals as decided by GE. The GE shall independently carry out the following tests at random at site lab established by the contractor.

(m) Compaction factor test, flexural strength test and cube tests shall be carried out as per IS-456-2000 (upto amendment No. 5 of Jul 2019) at site from samples collected by the contractor during placing of the concrete. Cost of the collection of samples and testing shall be deemed to be included in the quoted rate. Acceptance criteria for the RMC shall be all as specified in the IS-456-2000(upto amendment No. 5 of Jul 2019). In Case RMC supplied by the approved firm fails to meet the strength requirement as per acceptance criteria laid down in IS-456-2000(upto amendment No. 5 of Jul 2019) and rejected by GE, the Contractor shall make necessary arrangement for removal of such rejected quantity of RMC and will redo the work at his own cost.

(n) Conveying equipments for concrete shall be mortar tight, well maintained and thoroughly cleaned before commencement of concrete mixing. The contractor is free to adopt either centrally mixed concrete incase the plant is installed at site or truck mixed concrete. The temperature of concrete mass on delivery shall not exceed 40°C.

(o) Concrete shall not be dropped from a height, thrown or otherwise treated so that segregation, undesirable finish, or defective structural quality results. The maximum drop shall be 1.5m unless otherwise approved by the Engineer-in-Charge.

PARTICULAR SPECIFICATIONS (Contd.,)

- (p) No extra water shall be added to the concrete after it has left the batching plant.
- (q) All equipments pump chamber, hoppers, lines and rubber noses shall be kept clean at all times. Any build up in the lines of materials from previous operations shall be cleaned out properly.
- (r) In the event of break down of the equipment causing delay not exceeding 20 minutes, which time concrete cannot be placed, the following procedure shall be adopted with approval of Engineer-in-Charge, the concrete already in place shall have the 'Wet edges' maintained by depositing small quantities of hand mixed concrete placed by hand against the 'Wet edge' and vibrated into the gaps. Where atmospheric temperature exceeds 30 degree centigrade, the receiving hopper and line shall be cleaned out and concrete contained therein discarded and immediately removed from the site. The concrete shall be discarded if initial setting of the concrete has begun in the hopper or discharge lines. All lines shall be cleaned free of concrete prior to resumption of pumping after each break down. Concrete in the lines shall be pumped at approximately 8 minutes intervals to ensure the concrete in the line is live. Whenever delivery of concrete to the pump is delayed, the pumping interval shall be reduced to 5 minutes during extra hot weather conditions. Delivery lines where exposed to hot sun shall be protected by covering with bags, wetessian or other approved means.
- (s) Due to mechanical malfunction if the concreting is required to be stopped the necessary measures and precautions shall be taken by the contractor. The cost of any additional works caused by these stoppages shall be borne by the contractor without any extra cost to the Government.
- (t) No concreting shall be commenced until the form work, reinforcement and all other preparation require for placement of concrete are inspected by the Engineer-in-Charge and approved.
- (u) Contractor shall take every precaution to strengthen the shuttering as required to withstand the additional pressure that may be created due to pumping of concrete. Workability of concrete shall be as specified in IS-456-2000(upto amendment No. 5 of Jul 2019).
- (v) If certain admixtures are required to be added to RMC either in plant or at place of delivery to improve the workability the same shall be added as per manufacturer's instructions with prior approval of Garrison Engineer. Quantity of admixture at any stage should not exceed the maximum limit as specified by manufacturer. Admixture if any to be used should be compatible with cement.
- (w) Contractor if desires to use admixture shall conduct the test for cement, admixture etc., in an independent testing lab approved by Garrison Engineer without extra cost to the Govt.
- (x) Revision of design mix due to change in aggregate proportions due to change in size and relative density/bulk density of aggregate shall be immediately brought to the notice of the Garrison Engineer and in all cases provisions contained in IS-456-2000(upto amendment No. 5 of Jul 2019) for mix considerations/acceptance criteria shall be complied with.
- (y) The time between mixing of concrete at manufacturer's yard and transportation and delivery at site shall not be more than 1 ½ hours. In case longer time is unavoidable the same can be permitted by Garrison Engineer adopting using admixtures all as permissible as per IS without any extra cost to the Govt.

PARTICULAR SPECIFICATIONS (Contd.,)

(z) One set of 6 cubes of every 50 cum of concrete production or every 50 batches whichever is greater or as per the discretion of Engineer-in-Charge shall be cast for testing 28 days and 7 days cube strength additional cubes should be cast.

(aa) Delivery ticket for truck should show cement content used by the manufacturer type of cement, admixture used and locations of concreting etc.

(ab) RMC shall be supplied as per IS 4926-2003 and concrete cube shall be casted as per IS-456-2000 (upto amendment No. 5 of Jul 2019).

(ac) Minimum quantity of cement shall be as per provision of IS: 456-2000 (upto amendment No. 5 of Jul 2019) meeting the requirements from durability point of view and the details regarding proper training and works quality control shall be in accordance with IS:456-2000(upto amendment No. 5 of Jul 2019) and IS:4926-2003. However if extra quantity of cement is used for whatever reasons, the same shall be at no extra cost basis to Government.

(ad) RMC made out of OPC without mixing flyash slag only be permitted.

3.22 FORM WORK

3.22.1 Form work shall comply with requirements of clause No 4.11.6 (4.11.6.1 to 4.11.6.5) & 7.15 (7.15.1 to 7.15.10) of MES Schedule Part-I except that the form works to be provided under this contract shall be of steel only as specified here-in-after in lieu of timber formwork. Props shall be of only steel and bottom plates and side shuttering shall also be of steel only. For supporting small heights, wooden support may be used in lieu of steel support at the discretion of GE without any price adjustment. Similarly in small locations where steel shuttering is practically not possible, plywood shuttering may be used in lieu of steel shuttering at the discretion of GE without price adjustment.

3.22.2 Deformed steel sheet shall not be permitted for use as form work. In case of any deviation involving form work to surfaces exposed to view, the pricing shall be done at the rates of timber form work for rough finish and in case of unexposed concrete surfaces; the pricing shall be done at the rates of timber work, clean sawn subject to contractor's percentage. The contractor shall have no extra claim on account of this.

3.23 EXPOSED SURFACE OF CONCRETE

3.23.1 Exposed surfaces shall be finished such as to present a fair and even surface and shall not be plastered. The surfaces shall be presentable without any further treatment. Any irregularity and protruding formwork marks shall be removed and minor honey combing made well with cement and sand mortar (1:3). Lines along formwork joint may however show.

4.0 STEEL AND IRON WORK**4.1 GENERAL**

4.1.1 All steel required for the work under the contract shall be procured, supplied and incorporated in the works by the contractor under his own arrangements. The reinforcement steel as well as the structural steel like angles, I Sections channels etc shall be of tested quality and shall comply with the requirement mentioned in the drawings, SSR and particular specifications here-in-after. The specifications mentioned in the tender documents shall be read in conjunction with the provisions laid down in SSR Part I Section 10 – Steel and Iron work. The contractor shall submit test certificate from the manufacturers.

4.2 TYPES OF STEEL

Contd.,

PARTICULAR SPECIFICATIONS (Contd.,)

4.2.1 Steel supplied by the contractor shall conform to the following grades and quality:-

(a) **STEEL FOR CONCRETE REINFORCEMENT**

(i) Reinforcement steel bars shall be high strength steel deformed bars manufactured by TMT process. Reinforcement bars shall be of Fe 500D grade confirming to IS:1786-2008. Reinforcement bars shall bear ISI mark. Minimum elongation shall be 18%. Reinforcement steel bars shall also comply with the following stipulations mentioned in IS:13920-2016 (including amendment No. 2 of Nov 2020):-

(aa) Ratio of ultimate stress to 0.2% proof stress shall not exceed 1.25.

(ab) Ratio of ultimate stress to 0.2% proof stress shall be at least 1.15.

(ac) Steel shall be only of strength grades with minimum 0.2% proof stress of 500 Mpa in addition to other requirement of IS:1786.

(ad) The actual 0.2% percent proof stress of steel bars based on tensile test must not exceed their characteristic 0.2% proof strength by more than 20%.

(ii) Mild steel bars shall conform to IS-432 (Part I) and grade I.

(iii) Fabric Reinforcement for concrete shall conform to IS: 1566.

(b) **STRUCTURAL STEEL**

(i) Definition of structural steel as given in Clause 10.4 of SSR Part I shall be applicable. Standard quality steel of grade E-250 (Fe -410 W quality A) conforming to IS: 2062 for all types of steel structures including those subject to dynamic loading shall be used.

(ii) Ordinary quality structural steel wherever mentioned shall be conforming to IS-1977 of grade E-165 (Fe-290)

(iii) Galvanised steel sheets (plain and corrugated) shall conform to IS -277. Grade of zinc coating to be used shall be the one which is given in Clause 10.29.1 of SSR Part I which is dependant on thickness of sheet. Minimum coating of zinc shall be 450 g/sqm.

4.2.2 **SOURCE OF PROCUREMENT**

(a) **TMT STEEL**

TMT Steel bars of all sizes supplied by the contractor shall be procured directly from primary manufacturers approved by E-in-C's branch as listed in Annexure II here-in-after.

PARTICULAR SPECIFICATIONS (Contd.,)

- (b) **STRUCTURAL STEEL: STRUCTURAL STEEL:** The contractor shall procure structural steel section directly from SAIL/TATA STEEL/RINL/JINDAL as per Annexure II enclosed here-in-after.

- (c) **GALVANISED IRON SHEETS AND FABRIC REINFORCEMENT FOR CONCRETE**

These shall be ISI marked and shall be procured from SAIL / RINL / TATA STEEL or BIS marked manufacturers at the option of the contractor without any minus price adjustment.

- (d) Steel section for railing, gates, fencing, guard bars, grills, steel chowkats, hold fasts etc, which do not constitute structural members, can be procured from main producers / secondary producers / BIS marked manufacturers or their authorized dealers at the option of Contractor without any minus price adjustment. Tests for such steel sections shall not be insisted by GE.

- (e) The steel will be procured from the storage depots of the main producers / approved secondary producers (as applicable) and not from their authorized agents / dealers as the authorized agents deal with the steel manufactured by more than one manufacturer. The GE will ensure that contractors place their demand / requisition of steel with adequate lead time.

- 4.3 All finished steel shall be well and clearly rolled to the dimensions, sections and weights specified. The finished material shall be reasonably free from cracks, surface flaws, laminations, rough jagged and imperfect edges and any other harmful defects and shall be finished in a proper manner. Tolerance on size and weight of reinforcement bars shall not be more than as specified in clause 10.17.4 and 10.17.5 of SSR Part I and as specified in IS-1786 and IS-2062 and as per relevant IS codes.

- 4.4 Contractor will give to GE manufacturer's test certificate (IN ORIGINAL) along with the test sheet giving result of each mechanical test and the chemical composition of steel (as per IS 1786) for reinforcement steel or authenticated copy thereof duly signed by manufacturer with each consignment. The documents such as original purchase vouchers and test certificates in support of the purchases of steel shall be produced by the contractor to the site staff & GE for verification and record.

- 4.5 **APPROVAL OF STEEL BROUGHT BY THE CONTRACTOR**

Following action shall be taken by GE before incorporating steel procured by the contractor for the work :-

- (a) Physical verification of steel received to confirm the actual quantity of steel as well as to verify aspects brought out in foregoing.

- (b) GE will obtain original machine numbered purchase vouchers of manufacturer from contractor.

- (c) Verify the documents listed in Ser (b) & foregoing given by the contractor from the manufacturer.

- (d) No consignment or part thereof will be allowed to be incorporated in the work until and unless the test results of independent testing are obtained and the consignment is passed by GE. Schedule of procurement will be prepared keeping in view the time lost for testing etc.

PARTICULAR SPECIFICATIONS (Contd.,)

(e) Three samples of pieces (3.00m long) of each section of each consignment will be retained at the project site till completion of the work. These samples will be suitably marked and properly preserved.

4.6 TESTING OF STEEL

4.6.1 (a) The manufacturers of steel are to carry out inspection and testing of steel in accordance with the relevant BIS provisions. The contractor shall submit manufacturer's test certificate in original alongwith the test sheet giving the result of each mechanical test as applicable in accordance with relevant IS provision and the chemical composition of the steel or authenticated copy thereof with each consignment duly signed by manufacturer with each consignment. The Engineer-in-Charge shall record these details in a steel acceptance register which will be signed by the Junior Engineer, Engineer-in-Charge, GE and Contractor as given in the format as **Appendix 'E'** here-in-after, after due verification and Engineer-in-Charge shall send a certified true copy of test sheet to GE for his records.

(b) For independent testing ,random samples of steel drawn from various lots and shall be got tested from a National Test House, SEMT wing CME, Regional Research Labs or NABL approved Labs, etc as per the minimum frequency given in clause 7.6.3.1(a) & (b). Samples from each lot shall be also tested for quality and elongation. The elongation shall not be less than 18%.

(c) Ultimate tensile strength elongation, bend and rebend test for reinforcement steel bars shall be carried out as per Clause 9 and test specimen shall be as per Clause 11 and delivery inspection shall be as per Clause 12 of IS-1786. Bend tests and tensile tests for structural steel shall be carried out as per IS-2062.

4.6.2 In all cases mentioned above contractor at his cost shall provide all facilities required for the testing. Cost of materials consumed in tests including transportation & testing shall also be borne by contractor. The records of such checks shall be maintained in steel test register.

4.6.3 FREQUENCY OF SAMPLING FOR INDEPENDENT TESTING BY GE

4.6.3.1 Frequency for nominal mass, tensile strength, bend and re-bend tests of steel for checking nominal mass, tensile strength, bend, re-bend test, test specimen at random shall be selected by the GE at following frequency :-

(a) STEEL FOR CONCRETE REINFORCEMENT

- (i) Bars size less than 10mm : One sample (3 specimen for each test for every 25 tonnes or part thereof)
- (ii) Bars size 10mm to 16mm : One sample (3 specimen for each test for every 35 tonnes or part thereof)
- (iii) Bars size over 16mm : One sample (3 specimen for each test for every 45 tonnes or part thereof)

(b) STRUCTURAL STEEL

- (i) Tensile test : 1 test for every 25 tonnes of steel or part thereof.
- (ii) Bend test : 1 test for every 25 tonnes of steel or part thereof.

Note: For various tests, acceptance criteria, tolerance etc, refer relevant BIS codes.

PARTICULAR SPECIFICATIONS (Contd.,)

- 4.6.3.2 The testing by GE as per above frequency is mandatory before payment is released to the contractor in case of structural steel from secondary producers. The GE may also increase the frequency and number of samples / tests for his satisfaction. The cost of these additional tests shall be governed as per condition 10 (A) of IAFW-2249. However cost of samples, transportation and other overheads shall be borne by the contractor irrespective of test results.
- 4.6.3.3 Test shall not be insisted upon for the steel required for guard bars, holdfasts, grills and such other allied items.
- 4.6.3.4 In case test results of testing pursuant to Clause **7.6.3** are not within the acceptable limits, then that consignment of steel shall stand rejected and contractor shall remove the same from site at his own cost. The rejected material shall not be incorporated in the work. The contractor shall have no claim on this account.
- 4.6.3.5 Cost of test samples as per frequency given in Clause **7.6.3** above shall be borne by the contractor irrespective of test results.

4.7 DOCUMENTATION

- 4.7.1 Original purchase vouchers from the manufacturer, and original or authenticated test certificates of the manufacturers for the total quantity of steel supplied under each consignment to be incorporated in the work shall be produced to the Engineer-in-Charge of the work by the contractor. All consignments received at the work site shall be inspected by the GE along with the relevant documents before acceptance. The original vouchers and the test certificates shall be defaced and signed by the Engineer-in-Charge and kept on record in the office of the GE duly authenticated and with cross reference to the control number recorded in the steel acceptance register. The steel acceptance register shall be signed by JE, Engineer-in-Charge, GE and contractor. The entire quantity of all consignments shall also be suitably recorded in the measurements book for record purposes as 'NOT TO BE ABSTRACTED' before incorporation in the work and shall be signed by the Engineer-in-Charge and contractor. The following provisions shall also be complied :-

(a) All original vouchers will be kept in a file serially numbered and to be kept in GE's office.

(b) Test certificates of each steel consignment will be kept in a file, serially numbered and kept in GE's office.

(c) Steel Acceptance Register as per [Appendix 'E'](#) will be maintained by the GE.

(d) In/Out Register for details of receipt, acceptance/rejection and consumption of steel will be maintained as per [Appendix 'D'](#).

(e) Register containing results of independent and additional testing by GE.

(f) Inspection registers.

- 4.7.2 CWE will check the documents personally, connected with the steel, at least once a month and record of these check will be kept in the Inspection Register (Para [7.7.1](#)(f) above).

4.8 STORAGE ACCEPTANCE/PRESERVATION OF STEEL

- 4.8.1 The steel procured by the contractor shall be stored in the site of work as directed by Engineer-in-Charge / GE neatly in separate stacks at least 15 cm above GL for various grades/quality / sizes / consignments with distinct paint marks for identification. The steel so stacked shall be removed for incorporation in the work only in the presence of departmental representative. The quantity of

Contd.,

PARTICULAR SPECIFICATIONS (Contd..)

steel of various sizes received at site and recommended for incorporation in the work shall be entered in a separate register and signed by the contractor and the Engineer-in-Charge daily.

4.8.2 Steel will be stored in a manner so as to prevent distortion and corrosion till it is consumed in the work. Any section that has deteriorated and corroded or if considered defective for any other reason, the same shall be removed from site by contractor at his cost.

4.8.3 The contractor will keep a separate stack of steel brought at site for inspection, away from the accepted stack of steel. In case, the consignment does not meet any of the requirements of the relevant IS codes, the steel will be rejected by the GE and it will be removed from the site within 24 hours at the cost of the contractor.

4.9 **CONVERSION WEIGHT OF STEEL**

4.9.1 The weight of steel shall be calculated as per the conversion factors specified in the SSR. For sections not listed in SSR, ISI conversion table shall be followed or manufacturer's certificate if the weights are not available in SSR/ISI tables.

4.9.2 Normal waste and off-cuts shall be stacked neatly which shall be the property of contractor. Contractor shall be allowed to remove such cut pieces after inspection and certification by the Engineer-in-Charge.

4.9.3 Advance on account of payment made towards these cut pieces shall be adjusted from advance on account of payment immediately falling due and before removal of such cut pieces from site.

4.10 **PAYMENT IN RAR**

4.10.1 Payment of the steel brought by the contractor should only be released by the GE after taking action on points enumerated in Para 7.7 here-in-before and after completing the documentation mentioned here-in-before in this regard.

4.10.2 Before procurement of steel, contract and structural drawing shall be read thoroughly and various grades/types of steel to be incorporated in the work shall be identified by contractor and got approved by the GE. Steel shall be procured sufficiently in advance as mentioned here-in-after under Clause 7.12.

4.11 **SAFETY OF STEEL**

4.11.1 It will be responsibility of contractor to make sure that all possible arrangement is made for safe custody of the steel. In case of any loss of steel, only contractor will be responsible and the loss will be made good by contractor without any delay or claim what so ever.

4.12 **SCHEDULE OF SUPPLY**

4.12.1 Contractor shall work out complete requirement of steel size wise and phase the same as per the activities planned to be executed in terms of CPM networking. The contractor shall procure all the steel sections in accordance with this CPM chart. Schedule of supply of steel will be finalized by GE in consultation with contractor and same will be incorporated in CPM chart so that supply of steel is monitored in a way to avoid any delay in completion of the work. The schedule of supply of steel will be vetted by Accepting Officer from time to time.

PARTICULAR SPECIFICATIONS (Contd.,)

4.13 **WELDING**

4.13.1 Welding wherever shown on drawing shall be by metal arc process in accordance with IS 816 and IS 822 unless specifically indicated otherwise on drawings.

4.14 **BINDING WIRE**

4.14.1 Binding wire for reinforcement shall be mild steel wire annealed not less than 0.9mm dia.

4.14.2 **COVER BLOCKS**

4.14.2.1 Cover blocks shall be precast factory made all as specified in clause No.10.20.1 of SSR Part - I.

PARTICULAR SPECIFICATIONS (Contd.,)

Appendix ‘D’

{Refer Clause No. 7.7.1(d)}

SI No	Date	Steel IN			Steel OUT			Qty Balance
		Qty (Tons)	Section	Control No	Qty (Tons)	Section	Reasons*	

*Note : The following reasons may be mentioned for taking out steel from storage:-

- (a) For testing purpose
- (b) For use in work
- (c) Rejected steel taken out of site

PARTICULAR SPECIFICATIONS (Contd.,)

Appendix ‘E’(Refer Clause No.7.7.1(c))

STEEL SUPPLY & ACCEPTANCE REGISTER

- 1CA No & Name of Work
- 2Control No
- 3Name of Manufacturer's T. C. No
- 4Manufacturer
- 5Random Test Details

(a) Physical test report from-----vide their letter No
(Name of NABLapproved Lab/Govt Engg College)

(b) Chemical test report from-----vide their letter No
(Name of NABLapproved Lab/Govt Engg College)

6Types of Steel, Dia & Qty (a) Type : TMTHCR/CRS (b) Dia----mm (c) Actual Wt ---- MT (d) Conversion Wt -----MT

	Chemical Test							Mechanical Test						Remarks
	Carbon %	Sulphur %	Phosphorous %	Sulphur + Phosphorous %	Manganese %	Silicon %	Corrosion Resistant Element (CRE)	Wt per meter	Yeild Stress (N/mm2)	Tensile Strength (N/mm2)	Percentage Elongation (min 18%)	Bend Test	Rebend Test	
As per IS 1786 - 2008														
As per manufacturer's test certificates														
As per independent test														

Remarks with Signature

Accepted/Rejected

Contractor

Junior Engineer

Engineer-in-Charge

Garrison Engineer (AF)

Remarks of BOO/Inspecting Officer/CWE

PARTICULAR SPECIFICATIONS (Contd.,)**4.15 HOLD FASTS/LUGS**

- 4.15.1 Flat iron hold fasts/lugs shall be provided by welding as and where shown on drawings. Hold fasts/lugs shall be embedded in PCC (1:2:4) type B1 (using 20mm graded stone aggregate) bed blocks of suitable size. Hold fasts/lugs shall be hot tarred and sanded before fixing in position.

5 GALVALUME SHEETS

- 5.1 Galvalume sheet for roofing shall be pre- painted high tensile strength steel sheets having 550 MPa yield strength and high degree of corrosion resistance aluminium – zinc alloy coating (Aluminium 55% and zinc 45%) applied by a continuous hot dipping process. Galvalume sheet shall be of 0.5 mm thick (total coated thickness) having minimum alloy coating thickness of 0.025 mm on each side (Total minimum coating mass for both surface = 150 gm /sqm). The total thickness of the colour coated sheet shall not be less than 0.50mm. The colour and profile of the galvalume sheet shall be as approved by GE. Nominal rib/crest height shall be minimum 28mm and nominal centre to centre pitch shall be maximum 200mm. The sheets shall be colour coated with 20 micron (minimum thickness) silicon modified polyester/ super durable polyester over 5 micron (minimum thickness) primer on top and 5 microns (minimum thickness) backing coat on 5 microns(minimum) primer on reverse side. The sheets shall have brand marking of the manufacturer, the standard applicable, the base steel thickness and the coating at the back of every one metre spacing for cross checking the genuinity of the material supplied. Fasteners and other components parts shall be equivalent corrosion resistance property.

5.2 WORKMANSHIP

- 5.2.1 The maximum spacing of purlins for fixing the sheets, minimum side laps & end laps of sheets etc shall be all as per manufacturer's instructions and standard Engineering practice. To preserve the surface appearance of Galvalume sheets clean and dry, gloves shall be used during handling. The fixing shall be done as per the standard practice specified by the supplier firm who profiled the steel sheets and care shall be exercised to prevent the sheets from sliding over rough surfaces or each other. The entire fixing process of galvalume sheets shall be executed through a specialist agency identified by the supplier and as approved by GE. The sheets shall be fixed using hot dip galvanized, self drilling and self tapping screws neoprene and EDPM washers. Penetrations and lap in sheet shall be sealed by using proper sealant profile. HDPE fillers shall be provided wherever required to close voids between sheets, sheet & fasteners etc. The sheet shall be stitched with each other as per manufacturer's instructions.

PARTICULAR SPECIFICATIONS (Contd.,)**5.3 TESTING**

- 5.3.1 The contractor shall submit the original manufacturer's test certificate in connection with Chemical composition of the steel, tensile / yield strength of steel sheet, corrosion resistance (salt spray) test, dimensional (thickness of both base metal and coating), coating adhesion (180 degree bend test) etc and also submit manufacturer's guarantee certificate of product conformation of the standard. GE shall also carry out independent test as per the test mentioned above from random samples through any of the IITs/IISc/SEMT wing,CME Pune. The cost of testing, transportation of materials etc shall be borne by the contractor irrespective of the results of testing and no extra claim whatsoever shall be admissible.

5.4 MAKE FOR GALVALUME SHEET

- 5.4.1 Galvalume sheet shall be of an approved make from the list given in Annexure here-in-after.
- 5.4.2 Minimum laps for Galvalume / zincalume steel sheets in roofing and wall cladding shall be :-
- (a) End laps - 200 mm.
 - (b) Side laps - One corrugation.
- 5.4.3 All steel work shall be as per IS 800. Contractor shall follow normal engineering practice ensuring structural soundness and safety of workmen during execution.
- 5.4.4 The gusset plate used shall be of mild steel plate and shall not be less than 8mm. The welding shall be continuous fillet type as indicated on drawings.

- 5.5 **FABRICATION** :- No fabrication will be allowed at site. All primary members shall be shop fabricated.

- 5.5.1 All finished steel shall be well and cleanly rolled to the dimensions, sections and weights as shown on drawings and as specified in MES Schedule.
- 5.5.2 Before execution of the work the structural steel brought to the site shall be stored in such a way that there is always a gap of atleast 15cms above the ground level. In case of long storage suitable protective measures shall be taken to prevent scaling and rusting.
- 5.5.3 The structural steel work to be welded or bolted shall be carried out as described in IS:800 code/ASTM of practice for use of structural steel work in general building construction.
- 5.5.4 All sections shall be straight and if necessary, before being worked shall be straightened and flattened by pressure unless required to be of curvilinear from and shall be free from twists. Straightening of section by hammer blows is not permitted. All bending and cuttings shall be carried out in cold condition.
- 5.5.5 Member shall be cut mechanically by saw or shear or by oxyacetylene flame. All sharp or broken edges and all edges of joints which are subjected to tensile or oscillating stresses shall be rounded by grinding. No electric metal arc cutting is permitted.

PARTICULAR SPECIFICATIONS (Contd.,)

5.5.6 Prior to assembly, cutting, tolerance shall be as per MES Schedule and as per IS or as per manufacturer's instructions.

5.5.7 All holes shall be accurately marked and drilled. Holes through more than thickness shall be preferably drilled together, after the members are assembled and tightly clamped tolerance $\pm 5\text{mm}$ per member.

5.6 **WELDING**

5.6.1 Welding shall be metal arc welding conforming to IS-814 and the electrodes shall conform to IS-816 as shown on drawings. Contractor has to submit the test certificate for welding to this effect that welding conforms to IS has been done.

5.6.2 Before welding process is commenced the assembly of structural members to be welded shall be made with proper jigs and fixtures to ensure correct positioning of members. Sharp edges, rust of cut edges, hatchels, irregularities and fissure due to fault cutting shall be chipped or ground on field over the lengths of the affected area deep enough to remove faults completely. Edge preparation of welding shall be carefully and accurately made so as to facilitate a good joint, the edges to be welded as well as adjacent areas extending members, proper care shall be taken of welding shrinkage and distrotions as the drawing dimensions cover finished dimension of the structure. The elements shall be got checked and approved by the Engineer-in-Charge before assembling / welding. After the assembly has been checked, temporary tack welding in position shall be done by electric welding keeping in view finished dimensions of the structure. The process of welding shall however be as specified in MES Schedule and as directed by the Engineer-in-Charge.

5.7 **MS BLACK BOLTS, NUTS AND WASHERS**

5.7.1 All MS black bolts and nuts to be incorporated in the subject work shall confirm to IS 1363-2002 (parts 1 & 2) and IS 1363-1992 (part 3) and round washers shall confirm to IS-5370, IS-5372 or IS-5374. Wherever specifications are not available the American standard specification to be followed.

5.7.2 Bolts, heads and nuts shall be of such length as to project and clear thread beyond the nuts when fixed in position and these shall fit in the holes without any shake. The nuts shall fit in the threaded ends of bolts properly.

5.7.3 Round washers shall be placed under the heads and nuts of permanent bolts. Maximum two washers for one nut and one for each bolt head to be used. Bolt threads shall be outside the limits of joining members and unthreaded portion of bolt shall not be outside the washer.

5.7.4 Bolts, nuts and washers shall be thoroughly cleaned and dipped in double boiled linseed oil before use. The bolts shall be tightened starting from the centre of the joint towards the edge.

5.7.5 The component parts shall be assembled in such a manner that they are neither twisted nor otherwise damaged and shall be prepared all as shown on drawing supplied by the tenderer. Assembly shall be done by assembly fixtures, jigs and stands which facilitate high quality assembly with proper safety. Misalignment and distortion of parts after assembly shall not be allowed. Only thoroughly straightened parts free form burrs, ingresses, rust etc. shall be allowed for assembly.

PARTICULAR SPECIFICATIONS (Contd.,)

- 5.7.6 In case any of the structural member is not available to the full length as shown in drawing the contractor will be allowed to provide a lengthening joint so as to provide the member of required length. However, the joints design and details shall be as decided by the Accepting Officer. Nothing extra shall be admissible on this account.

5.8 **FIXING**

- 5.8.1 Roofing sheet shall be factory cut and supplied in required length to suit drawings. Roofing sheets shall be crest fixed to purlins with hot dip galvanized self drilling fasteners with integral EPDM washers (one fastener on each crest). Also fasteners to be provided on side laps. Minimum sheet overlap at sides shall be one corrugation. Penetrations and laps in sheet shall be sealed by using proper sealant. Profiled HDPE fillers shall be provided wherever required to close voids between cappings and troughs of the sheet to provide a weather tight exterior. End laps for roof sheeting shall be 100mm.

5.9 **WIND TIES**

- 5.9.1 Wind ties shall be of flat iron treated with rust proof coating and matching colour paint or any other superior specifications available fixed with self drilling screws at crest of the corrugations.
- 5.9.2 All material shall be as per IS codes. If relevant IS code is not there, American standards shall be followed.

6 **ROOF COVERING**

(a) **GENERAL :-**

Roof covering shall be with colour coated sheet and shall be got approved from GE and further works shall be carried out all as per approval.

(b) **PANEL MATERIALS :-**

Base materials for colour coated sheet shall be Zinalume (or) galvalume substruct steel panels and shall conform to ASTM or Equivalent.

(c) **FASTENERS :-**

Standard fasteners shall be No. 14, Type A EPDM washer as approved by GE self tapping sheet metal screws with metal and neoprene washers which conform to American standards Association specifications. All screws shall have hexagonal heads and colour coated to match roof panels and shall be zinc plated steel.

6.1 **SEALER**

- 6.1.1 Sealer for side laps, end laps and self-flashing windows shall be two way self adhesive tapes 6mm wide x 5mm thick asbestos fiber filled, pressure sensitive. The sealer shall be non asphaltic non-shrinking non-drying and non-toxic and shall have superior adhesion to metals, plastics and painted surfaces at temperatures from 50 degree to 104 degree centigrade.

PARTICULAR SPECIFICATIONS (Contd.,)**6.2 INSTALLATION OF ROOF PANELS :-**

- (i) Roof panels shall be continuous from ridge to eave for buildings. End laps shall be provided as required.
- (ii) All laps of roof panels shall be sealed with a continuous ribbon of tape sealer.
- (iii) Roof panels shall be secured to intermediate framing members with No. 14 sheet metal screws at a maximum spacing of 333 mm. At end laps the maximum spacing of screws shall be 111mm. At four corners of the buildings, panel to structural fastener spacing shall not exceed 111mm.

6.3 FLASHING TRIM & CLOSURES :-

- (i) Flashing and / or trim shall be in required width and shall be made out of 0.5mm thick total coated thickness(TCT) Galvalume/Zincalume sheet and furnished at the rake, corners, eaves, formed openings and wherever necessary to provide weather tightness and finished appearance.
- (ii) Colour coated, sheet for flashing, metal closure, trim and other miscellaneous uses shall be 26 gauge of the same specifications as the roof covering material.
- (iii) A formed peak panel matching the slope and profile of adjoining panels shall be provided alongwith the building ridge.
- (iv) Solid or closed cell, pre formed E.T.P. (Ethylene poly propylene Terpolymer) closures matching the profile of the panel shall be installed along the eave, rake and other locations all as directed by GE.

7 RAIN WATER PIPE

- 7.1 Rain water pipe wherever shown on drawings shall be of UPVC pipe and fixed all as shown on drawing. Rain water pipe shall be provided with a bend at ground level as shown on drawings.

8 BIRD PROOFING

- 8.1 Provide bird proofing mesh made of 'Antibird net UV black in colour made of material polyfin all weather proof co-polymer of machine knotting using CNC machines with DSLS technology for antislip knotting, heat setting should be steam set for greater dimensional stability and knot firmness and diameter of the twinee is 1 mm and the size of mesh 25 x 25 mm (± 2 mm) and should achieve twin breaking strength of 16 kgf minimum and MBS (mesh breaking strength) 12 kgf and KBS 22 kgf minimum fixed complete all as per manufacturers instruction complete on trusses all as specified & as directed. **Make : Leo Technova India./ Srijan System Pvt Ltd.** Bird proofing arrangement shall fixed/ tied to truss members with nylon wire as per manufacturer's instructions & as per direction of Engr-in-Charge.

9.0 PAINTING GENERALLY

- 9.1 Painting to all structural members shall be all as specified in clause here-in-after. The contractor shall make his own arrangement for the supply of paints of approved manufacturer in the sealed containers. The shades shall be as directed by the GE. Painting shall be carried out before erection of members and got approved by GE .However , during erection any damage is occurred for painting , the same shall be made good without any extra cost to Govt .

PARTICULAR SPECIFICATIONS (Contd.,)

- 9.2 All painting as far as possible shall be carried out in dry weather and neatly cut in all edges. Surfaces shall be prepared and cleaned off as necessary.
- 9.3 All iron and steel work to be painted shall be scrapped free from dust, scale etc., with steel brushes and shall be cleaned before painting.
- 9.4 All surfaces to be painted shall be prepared all as specified in MES Schedule and passed by GE. Each coat of paint shall be passed by GE before next coat of paint is applied.
- 9.5 All paint unless otherwise specified shall be of quality not inferior than that of specified in the standard specification mentioned in MES Schedule.
- 9.6 Surfaces which are inaccessible for painting after erection shall be painted before erection. However any damage to the finishing shall be made good by the contractor without any extra cost to the department.
- 9.7 Lump sum rate quoted shall be deemed to include the entire cost of surface preparation, shop coat, under coat and finishing coat. Any dispute regarding this provision, the decision of Accepting Officer shall be final and binding.
- 9.8 Before surface application of paint, it shall be ensured that the surface is free from oil, grease, dirt, salts, soil and other contamination and shall be cleaned with solvent, vapour, alkali, emulsion or steam. For removal of loose rust, loose scale, scrapping, sanding and wire brushing is permitted. The surface shall be made such that the coating shall be able to bond properly to the substrata.
- 9.9 Shop primer shall be Zinc rich and shall be applied in workshop. Undercoat and finishing coat shall be applied at work site in order to minimize handling damages. For undercoat and final coat , paint system shall be such that it matches applicable paint system, serviceability,i.e., coat ability after a period of time and other desired features.
- 9.10 Surface preparation shall be done by solvent and hand tool cleaning. Shop coat shall be of Zinc rich red oxide. Under coat and finishing coat shall be acrylic only.
- 9.11 All bolts shall be hot dip galvanized (threads are spraying coated).
- 9.12 **WORKMANSHIP**
- 9.12.1 Steel and iron work shall be painted in the manner as specified in clauses 17.8 of MES Schedule.

PARTICULAR SPECIFICATIONS (Contd.,)

10. CEMENT PLASTER SKIRTING

10.1 Cement skirting shall be provided adjoining PCC floors in locations indicated in drawings. It shall be 10mm thick in backing coat in cement mortar 1:4 finished even and smooth using extra cement. Height of cement skirting where not shown on drawings shall be of 100mm. It shall be line with plastering and separated with a groove. Junction of floor and skirting shall be rounded to a minimum radius of 5mm. Cement skirting shall be provided at the portion shown on drawing.

11. PLINTH PROTECTION

11.1 Plinth protection in all situations shall be provided with 75 mm thick PCC (1:3:6) type C-1 over 75mm thick consolidated bed of hard core of broken granite aggregate not exceeding 63 mm gauge over rammed earth. The width of the plinth protection shall be all as shown on drawing. PCC shall be laid in alternate bays (not exceeding 2 Sqm) and finished even and smooth on top without using extra cement. 6mm wide joints shall be provided throughout the thickness of plinth protection, in concrete bays, at corners and turning points and also in between walling and plinth protection. All joints in plinth protection shall be filled with mastic filling comprising 1 Part of heated bitumen 85/25 grade and 3 parts of sand (all by weight). Plinth protection shall not be provided in the area which is covered by steps/ramps. Saucer drain shall be provided with plinth protection all as per the drawing. Minimum width of plinth protection shall be 100mm whatever shown on drg.

12. PRECAST CEMENT CONCRETE BLOCKS

12.1 Irrespective of what is mentioned in drawing, all masonry work shall be of PCC solid block masonry walls as detailed below.Solid blocks used in masonry shall comply with the requirements of IS: 2185 (Part I).

12.2 The solid PCC blocks wherever shown on drawings or in these specifications shall be of nominal size 400 x 200 x 200mm (for 200mm thick walls) or 400 x 100 x 200mm (for 100mm thick walls). Half blocks, if required, shall be manufactured in half lengths of 200mm. The tolerance on length of individual block shall be + 5 mm, and tolerance on height and width of block shall be + 3mm. The faces of the blocks shall be flat and rectangular, opposite faces shall be parallel and all arises shall be square. The bedding surface shall be at right angles to the faces of blocks. All blocks shall be sound and free of cracks or other defects which interfere with the proper placing of blocks.

12.3 Solid concrete block shall have solid material not less than 75% of the total volume of the block calculated from the overall dimensions.

12.4 CLASS, GRADE AND DENSITY

Type of wall	Type of block	Minimum average compressive strength after 28 days	Classification as per IS : 2185 (Part – I)	Block density
Non load bearing/ (External / Internal panel walls)	Solid	50 Kgs/ cm ²	Grade ‘C’	Not less than 1800 kgs/cum
Load bearing	Solid	50 Kgs/ cm ²	Grade ‘C’	Not less than 1800 kgs/cum

Contd.,

PARTICULAR SPECIFICATIONS (Contd.,)

- 12.4.1 The blocks may be manufactured at site by the contractor or purchased from a manufacturer. Identification mark of manufacturer and the grade of unit on the blocks is not necessary. If the blocks are purchased from a manufacturer, contractor shall submit a certificate from manufacturer that the blocks conforms to the requirements of IS : 2185 (Part I). However the contractor shall be fully responsible to remove the blocks from the site without any extra expenditure if on independent testing they are found not conforming to IS. No claim shall be entertained on this account. Independent testing of blocks as described here-in-after shall be carried out by GE.If the blocks are manufactured at site, then the cement used for manufacturing shall be from any one manufacturer from the list given here-in-before. Aggregates used shall conform to the requirements of IS:383. The grading of combined aggregates (coarse and fine) shall conform as nearly as possible to the requirements indicated in IS : 383. Fineness modulus of the combined aggregates shall preferably be between 3.6 and 4.0. Water for mixing and curing shall conform to the requirements of IS : 456.
- 12.4.2 Concrete mix used for manufacture of blocks shall not be richer than one part of cement to six parts of combined aggregates by volume before mixing. Concrete shall be prepared in a mechanical mixer and blocks shall be compacted mechanically. Hand mixing and compacting shall not be allowed.
- 12.4.3 After de-moulding, the blocks shall be protected until they are sufficiently hardened to permit handling without damage and then shall be cured in a curing water tank or in a curing yard and kept continuously moist for at least 14 days. If cured in an immersion tank, the water of the tank shall be changed at least every four days. The blocks may alternately be steam cured in accordance with requirements of pressure or non-pressure steam curing without any price adjustment. After curing the blocks shall be dried for a period of four weeks (with voids horizontal to facilitate through passage of air) to complete their initial shrinkage before being used in the work
- 12.5 **TESTING OF BLOCKS**
- 12.5.1 Sampling and testing of blocks shall be carried out in accordance with IS : 2185 (Part I). A sample of 20 blocks shall be taken at random from every consignment of 5000 blocks or part thereof of same size and batch. All 20 blocks shall be checked for dimensions and inspected for visual defects. The number of blocks with dimensions outside the tolerance limit and / or with visual defects among these shall not be more than two. Following tests shall be carried out on the 20 blocks.

PARTICULAR SPECIFICATIONS (Contd.,)

Sl No	Tests	No of blocks	Acceptance values
(a)	Block Density	3 blocks	<u>Solid blocks</u> :- Not less than 1800 Kg/cum
(b)	Compressive strength	8 blocks	<u>Solid blocks</u> :- Min average compressive strength 50 Kgs / cm ² with min strength 40 Kgs/ cm ² for individual PCC block for load bearing wall as well as for non-load bearing wall.
(c)	Water absorption	3 blocks	Not more than 10%
(d)	Drying shrinkage	3 blocks	Not more than 0.10%
(e)	Moisture movement	3 blocks of (d) above	Not more than 0.09%
(f)	Remaining 3 blocks shall be reserved for retest of drying shrinkage and moisture movement if need arises.		
12.5.2	The cost of PCC blocks for testing and testing charges shall be borne by the contractor with price adjustment of Rs. 10/- per cum for non- testing.		
12.5.3	<p>Pre cast cement concrete block masonry shall be built in CM (1:6) for full block (200 mm thick) walls and in CM (1:4) for 100mm thick partition / half block walls. Pre cast PCC block masonry wall of 100mm thick shall be constructed over PCC sub base in ground floor and from top of RCC slab with reinforcement details as shown on Note No.17 of Drg No.17-18/AJ/S-01, Sheet 1/8 for 115 thick partition wall in case of concealed beam / beam is not shown in drawings. PCC block masonry wall 100mm thick shall be built with 8mm dia bars 2 Nos in every alternate course horizontally starting from floor level and anchored in wall at junctions. The anchorage length shall not be less than 100mm. The quoted rate includes for provision of reinforcement. However reinforcement shall be measured as supply only in case of deviation. In case not shown in drawing RCC band of size full width of the wall for 100 thick PCC block wall shall be provided with depth 150mm at lintel or opening height level with 4 Nos of 10mm dia TMT bars as longitudinal reinforcement and 8mm dia TMT bar stirrups at 100mm centre to centre.</p> <p>Note: - Reinforcement shall be TMT as specified in the PS clause of steel for this work .The cost of PCC blocks for testing and testing charges shall be borne by the contractor.</p>		
12.6	<u>PRICING OF DEVIATION</u>		
12.6.1	<p>In the event of deviation, pre cast PCC block masonry (hollow / solid) shall be priced at the rates given in SSR Part II for blocks made of PCC (1:3:6) with contractor's quoted percentage as applicable without any price adjustment for variation in sizes of aggregates actually used. Also irrespective of what is stated in preamble of SSR, the above mentioned SSR rate is deemed to include the cost of all tests i.e. those covered under SSR and also those specified here-in-before and no adjustment shall be made for other tests than mentioned in SSR preamble</p>		
12.6.2	<p>The particulars of source /manufacturer of PCC solid / hollow block shall be got approved from GE in writing by the contractor before placing the order on the manufacturer.</p>		
13.	<u>WATER PROOFING TREATMENT TO NEW RCC ROOFS</u>		

Contd.,

PARTICULAR SPECIFICATIONS (Contd.,)

- 13.1 After RCC slab is cured and fully set, ponding shall be done over RCC slab by filling water, which shall be kept there for one week (in case of roof slope upto 1:20).

Note – Raw concrete surface SHALL NOT be treated with cement plaster when concrete is green. 1. No coving shall be provided after the RCC slab is cured & fully set at junction of roof and parapet. 2. No ponding test to be carried out if roof slope is more than 1:20.

- 13.2 In case the slightest indication of seepage/leakage is noticed, the same shall be rectified by injection grouting to seal all cracks or application of Polymer modified mortar FOSROC Nitobond SBR or equivalent of M/s MC Bauchemie / CIPY / SIKA / Pidilite Dr Fixit / Asian paints / Thermax / STP admixed with Integral WPC or cementitious crystalline waterproofing compound in the affected area to seal all cracks and micro cracks if any; and this shall be done by contractor at his own cost. Roof surface shall be rechecked for water tightness by Ponding Test (in case of roof slope upto 1:20); and this stage shall be passed by GE

Injection grouting: At places of dripping, injection grouting to be done using cement slurry admixed with FOSROC Cebex 100 an expansive grout additive admixed at 225gms/bag of cement or equivalent of M/s MC Bauchemie / CIPY/ SIKA / Pidilite Dr Fixit / Asian paints / Thermax / STP. The fixing and spacing of nozzles and the injection pressure shall be as per manufacturer's instructions.

Cementitious crystalline waterproofing treatment: To be done at places of dampness. Providing and applying crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC roof slabs, prepared by mixing integral crystalline slurry with water in ratio as per manufacturer's instructions and applying the same with the help of synthetic fibre brush on horizontal/sloping surfaces as required. Number of coats shall be as required at site and applied as per manufacturer's instructions. Make: FOSROC- Brushbond TGP System and equivalent of M/s MC Bauchemie / CIPY/ SIKA / Pidilite Dr Fixit / Asian paints / Thermax / STP

Note: Cementitious crystalline waterproofing compound reacts with moisture in cracks and micro-cracks to form crystals and thus result in sealing of cracks and microcracks of concrete.

- 13.3 **FOR IN-ACCESSIBLE ROOF** : Apply Polyurethane waterproofing coating on prepared concrete surface of roof slab & up to 300mm of parapets and crumple joint including junction of roof and parapet. This stage shall be passed by the GE. Roof surface shall be left without any further treatment.

Method: Cleaning the surface and applying FOSROC Nitoproof 725 (minimum 0.8mm dft) over a priming coat of Nitoproof WB Primer or equivalent product of Asian paints , M/s MC Bauchemie / CIPY / SIKA / Pidilite Dr Fixit / Thermax / STP applied as per manufacturer's instructions.

- 13.4 **FOR ACCESSIBLE ROOF:** Apply Polyurethane waterproofing coating on prepared concrete surface of roof slab & up to 300mm of parapets and crumple joint including junction of roof and parapet. This stage shall be passed by the Accepting Officer.

Method: Cleaning the surface and applying FOSROC Nitoproof 650 PU over a priming coat of FOSROC Nitoproof WB Primer or equivalent product of Asian paints , M/s MC Bauchemie / CIPY / SIKA / Pidilite Dr Fixit / Thermax / STP applied as per manufacturer's instructions.

Further, provide a polypropylene/ polyester, nonwoven geotextile fabric of 150 gsm. Followed by cement screed 15 mm in CM(1:4)in slope, over that 20mm thick Terracota burnt tiles are laid. While laying tiles, care should be taken to see that joints between tiles are kept minimum and joints are thoroughly filled with FOSROC Nitotile grout polymer based joint mortar or equivalent products of

Contd.,

PARTICULAR SPECIFICATIONS (Contd.,)

Asian Paints / M/s MC Bauchemie / CIPY/ SIKA / Pidilite Dr Fixit / Thermax / STP applied as per manufacturer's instructions.

- 13.5 The work shall be carried out complete as per manufacture's specifications and application methodology. Execution to be done with authorized trained/skilled applicator of manufacturer as per the technical guidelines laid by manufacturer. Company back guarantee to be given by contractor after completion of Water Proofing work before payment.

13.6 **WATER PROOFING TREATMENT TO CHAJJAS/ SUNSHADES**

- 13.6.1 Coving or any extra plaster (over external plaster) over chajja not to be provided.
- 13.6.2 The designated area i.e. over chajja and over the wall above chajja for a height of 900 mm and up to 600 mm on either side of chajja width shall be moist by sprinkling water.
- 13.6.3 Apply FOSROC Brushbond Roofguard minimum 3-layers or equivalent product of Asian Paints / M/s MC Bauchemie / CIPY / SIKA / Pidilite Dr Fixit / Thermax / STP as per manufacturer's instructions.
- 13.7 **WATER PROOFING TREATMENT TO SUNKEN SLAB**
- 13.7.1 All pipes passing through walls of sunken floor shall be laid before water proofing treatment is carried out. One No 50mm dia, 35cm long medium grade GI pipe with wire gauge on inside mouth shall be provided to each sunken portion.
- 13.7.2 Clear the sunken/lowered portion of RCC slab surface for full depth of sunken floor by wire brush. Chisel out any mortar sticking the surface.
- 13.7.3 Apply FOSROC Nitoproof 600PF (minimum 0.8mm dft) over a priming coat of Nitoproof WB Primer or equivalent product of Asian Paints / M/s MC Bauchemie / CIPY / SIKA / Pidilite Dr Fixit / Thermax / STP as per manufacturer's instructions to bottom and full vertical sides of sunken floors.
- 13.7.4 Fill it with water and check for dampness and seepage. In case the slightest indication of seepage/leakage is noticed, the same shall be rectified by injection grouting to seal all cracks or application of Polymer modified mortar FOSROC NitoBond SBR or equivalent of Asian Paints / M/s MC Bauchemie / CIPY / SIKA / Pidilite Dr Fixit / Thermax / STP admixed with Integral WPC or cementitious crystalline water proofing compound in the affected area to seal all cracks and micro cracks if any and this shall be done contractor at his own cost.
- 13.7.5 Apply additional coat of FOSROC Nitoproof 600PF (minimum 0.8mm dft) or equivalent product of Asian Paints / M/s MC Bauchemie / CIPY / SIKA / Pidilite Dr Fixit / Thermax / STP. 9.4.6 All junction points of side walls where CI/GI pipes are passing through shall be sealed with epoxy cement mortar

- 13.7.6 The main contractor shall stand guarantee to the Government for period of TEN YEARS from the date of taking over the completed buildings for the efficiency of the treatment carried out. The main contractor shall furnish written guarantee for the above in favour of Garrison Engineer immediately on completion of work.

- 13.7.7 The guarantee amount shall be calculated @ 2% of the total cost of water proofing treatment 'carried out at contract rates enhanced by 25%. towards the guarantee for water proofing treatment shall be retained from the RAR/final bill amount. The amount shall be released to the contractor after the satisfactory completion of TEN YEARS guarantee period. During the guarantee period if any leakage is found out same shall be got rectified by the contractor without any extra cost to the Government. The amount so withheld shall not carry any interest. The contractor

Contd.,

PARTICULAR SPECIFICATIONS (Contd.,)

may however, furnish a fixed deposit receipt in lieu, from a Schedule Bank pledged in favour of Garrison Engineer.

- 13.7.8 The Performance security referred to in Condition 19 of General Conditions of contract IAFW-2249 is independent of the Guarantee amount referred herein before. Conditions 46 and 68 of the General Condition of contract (IAFW-2249) shall be deemed to be amended to the extent mentioned above.
- 13.7.9 Should the Accepting Officer at any time, during the construction or prior to the expiry of said guarantee period of 10 years, find that the buildings have been found leaking the contractor, on demand in writing from the GE, will forthwith under take to carryout such repairs/rectification which may be necessary to render the buildings free from leakage / seepage at his own expense till expiry of the guarantee period of ten years.
- 13.7.10 In the event of Contractor's failure to comply with the Accepting Officer directions within the stipulated period, the work shall be carried out at the risk and expense in all respects of the contractor. The liability of the contractor under this condition shall not, however, be extended beyond the period of 10 years from the certified date of completion, unless the notice was served on the contractor previously to rectify such defects.
- 13.7.11 The contractor shall provide a plaster plate of requisite size in location as decided by the Engineer-in-Charge on the wall of each of the building. The plate shall be 10mm thick in cement mortar (1:4) to indicate the details such as water proofing treatment done vide CA NO, date of expiry of guarantee period and name of contractor by engraving and painting (black). The cost of plaster plates are included in the lumpsum quoted for the buildings.

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14 **INTERNAL ELECTRIFIATION**

14.1 **GENERAL**

- (a) This installation shall strictly comply with the provisions contained in the latest edition of the Indian Electricity Rules and amended IS-732-1989. Code of practice for Electrical wiring and fittings in buildings as applicable to these works except where such regulation and rule are modified by these specifications.
- (b) All electrical work shall be executed properly by skilled licensed electricians under the supervision of suitably qualified electrical supervisors. The contractor on demand by Engineer-in-Charge shall produce such evidence of qualification of his workmen, supervisors(s) either at the time of commencement of the work or at any time thereafter during the contract period.
- (c) The position of various electrical fittings and fixtures shown on the drawings may be changed by the Engineer-in-Charge at the time of execution if found necessary.
- (d) The run of conduits shall be marked on the walls and soffits of roof floors slabs for the wiring. Approval of the Engineer-in-Charge shall be obtained in writing before starting the works.
- (e) Looping back system of wiring shall invariably be used throughout the installation
- (f) All electrical fittings and wirings shall be clear of door, windows and other openings.
- (g) The main switches and controls should have the voltage of supply clearly painted on them.
- (h) The phase indication (RYB) should be provided at the main incoming switches and controls.
- (j) The name of functions of each distribution board shall be clearly and neatly painted on the distribution boards.
- (k) Colour code system for internal electrification of conduit wiring shall be followed as per IS for phase neutral and earthing. For phase RYB cable colour shall be red, yellow and blue respectively. For neutral and earthing cable shall be of black and green colour.

14.2 **MATERIALS AND SAMPLE BOARD**

- 14.2.1 All materials unless otherwise specified shall possess ISI mark or conform to relevant IS specifications or to BSS if ISS is not available. Approval of GE referred to in clause 19.2.1 and 19.2.2 of MES Schedule Part – I shall be in writing. Approval samples shall be labeled as such and signed both by the contractor and the Engineer-in-Charge.They shall remain in the custody of Engineer-in-Charge, till final completion of work.
- 14.2.2 The contractor is deemed to have included in rates, cost of making holes/chases where required through masonry or concrete work for taking in cables/conduits and conductors etc and making good the same to match with existing work under Schedule ‘A’ Part I.

14.3 **TYPE OF ELECTRIC SUPPLY**

- 14.3.1 Type of electric supply will be AC-415 volts, 3 phase and 240 volts single phase at 50 cycles.

Contd.,

PARTICULAR SPECIFICATIONS (Contd.,)**14.4 SCREWS, NAILS ETC**

- 14.4.1 All screws, nails used in the electrical works shall be of brass, unless otherwise specified. Laminated sheet cover for pressed steel boxes shall be fixed with cadmium plated iron screws.

14.5 CABLES

- 14.5.1 All cables to be used in this work shall be indigenous make with ISI mark conforming to IS-694 including amendments if any for PVC insulated and unsheathed copper conductor cables.

14.6 CONDUIT, CONDUIT ACCESSORIES AND CONDUIT WIRING

- 14.6.1 Conduit, conduit accessories for point wiring shall be all as specified in Sch 'A'. It shall conform to relevant IS and bear ISI mark. The dia of conduit shall be as specified in clause 19.125 of MES Schedule Part – I. Conduit and conduit accessories shall conform to type of conduit and as specified in Clause No. 19.29 of MES Schedule Part – I.

14.7 POINT WIRING / SUB MAIN WIRING

- 14.7.1 Cable and earthing lead for internal wiring, sub main wiring shall be as specified in Schedule 'A'. Cables and cords shall be from fresh stocks and shall be of approved make. The capacity of current per circuit shall be as specified in Clause No. 19.24.2 of MES Schedule Part – I.
- 14.7.2 Cable for internal wiring work shall be as specified in Schedule 'A'. Unless otherwise specified the cable shall be copper conductors and as specified in clause No. 19.25 of MES Schedule Part – I.

14.8 ELECTRICAL TEST

- 14.8.1 On completion of wiring, the whole installation will be tested in accordance with IS-732, clause 8 (a) (b) & (c) and test certificate as per Appendix 'B' of the above IS rendered duly signed by the contractor and Engineer-in-Charge. If the test results are not acceptable, all repairs and replacement and extra work of removal and relaying of re fixing shall be carried out by the contractor at his own expense and installation retested, until test result indicate compliance with the prescribed requirement. The contractor shall supply all necessary apparatus, lab and instruments or equipments required for testing. The quoted rates shall be deemed to include for the above provision.

14.9 RECORD DRAWING

- 14.9.1 On completion of wiring to the building the contractor shall submit three copies of the line plans of the building (Scale 1:100) indicating actual position of all controls and fittings and actual runs of all main and sub-circuit and such other information which the Engineer-in-Charge may require. All circuits shall be clearly indicated and numbered in the wiring diagram and all points shall be given the same number as the circuit to which they are electrically connected phase and neutral wires shall be shown in red and black colours respectively.

14.10 LIGHTNING PROTECTION

- 14.10.1 Installation of lightning arrestor system for protection of buildings and allied structures shall be carried out as per IS – 2309-1989. The works of lightning protection shall be executed as ordered under Sch'A' and as

Contd.,

PARTICULAR SPECIFICATIONS (Contd.,)

specified in MES Schedule Part I as applicable.

15.0 EXTERNAL ELECTRIFICATION**15.1 SCOPE OF WORK**

15.1.1 The external electrification work shall be provided all as described in Schedule 'A' including testing as specified here under.

15.2 EXCAVATION

(a) Excavation in trenches cable and laying shall be carried out all as specified in clause 19.74 to 19.76 of SSR Part-I.

(b) Measurement of excavation shall be as per elsius ed width as given in Section 3, clause 3.2.3 Para (a), (b) and (c) of MES Schedule Part-II.

(c) Please refer clauses on excavation hereinbefore.

15.3 BLANK

15.4 CABLE PROTECTION

15.4.1 Bricks used for cable protection shall be fly ash modular size bricks and laid all as directed.

15.4.2 HT cable cover for cable protection shall be all as per schedule 'A' specification

15.5 MAKING GOOD

15.5.1 Roads, footpath including side drains if any cut through for trenches shall be made good by the contractor to match the original specification as directed by the Engineer-in-Charge. When roads shave to be crossed, half the width of the road shall be dug at a time and proper warning notices, signs and lights shall be displayed and watchman posted by the contractor at his own cost.

15.6 PROTECTION OF EXISTING WORK

(a) All pipes, water mains, cables, etc., met within the course of excavation shall be carefully protected and supported without extra cost to the Government and shall be deemed to include in the rates quoted for Sch 'A'.

(b) The rates quoted by the contractor for various items in Schedule 'A' shall be deemed to include for all the contingencies referred above. No claim whatsoever will be entertained by the department on this account.

(c) In case damage of any existing cables / pipe / AF Net and signal cable, repair / replacement of the same is the responsibility of the contractor without any extra claim from the Department. However, contractor may use instrument to locate the existing cable / pipe before excavation.

15.7 CABLE LAYING AND RECORD

15.7.1 The following essential data shall be furnished by the contractor as cable record of all the buried cable installation.

(a) Size, type and make of cable.

Contd.,

PARTICULAR SPECIFICATIONS (Contd.,)

- (b) Location of cable in relation to bench marks or any other permanent structure.
- (c) Cross section showing where cables are laid in pipes or trenches giving their sizes, type and depth.
- (d) Position and type of all joints.
- (e) Position and depth of all pipes, ducts to which are met and obstructions to the cable run.
- (f) Record of accurate lengths from joints to joint and phase sequence between joints to joints to each cable run.
- (g) The contractor shall provide LT cable metal tags indicating sizes, each run joints, length of cable between sub lead centers, so that at any spot each cable can be identified easily.
- (h) While laying LT cable under the roads, paths etc, exact depth at which the cables are to be laid shall be as per SSR and as directed by the Engineer-in-Charge.
- (j) Cable shall not be bent to small radius while laying in trenches/ducts. The minimum safe bending radius shall be taken as 12 times external dia of cable.
- (k) Before laying the cable, the trenches shall be provided with a layer of sand to the thickness as directed by Engineer-in-charge, for the purpose of cushioning cable ends with exposed ends shall be provided with cable sockets. Sand cushioning for protection of underground cable in trenches shall be done as described in clause 19.75 of MES Schedule Part – I.
- (l) All jointing of cables in joint boxes, etc., shall be done strictly as per manufacturers instructions. The joints shall conform to the relevant IS. Each jointing will be inspected and passed by Engineer-in-Charge. Random checks shall be exercised by GE also and the findings recorded. The PVC cable shall be terminated through a gland, made of suitable sizes. Before making joints in cables and near the proposed building sufficient loops shall be provided for further maintenance.

15.8 TESTING

- 15.8.1 The testing shall be carried out by the contractor in presence of Engineer-in-Charge, recorded and signed by both the parties.
- 15.8.2 For cable laying, jointing, testing the relevant clauses 19.19 to 19.23 of SSR Part-I (2009) shall also be kept in view.

15.9 XLPE CABLES

- 15.9.1 [XLPE LT cables shall be procured from approved manufacturers listed here-in-after.](#)
- 15.9.2 XLPE cable shall conform to IS-7098 (Part – I) for LT and IS : 7098 (Part – 2) for HT cables. Testing shall be carried out as per Appendix ‘F’ to IS – 1255-1983 for test voltages and for other parameters as per clause 19.93 of SSR Part – I (Specifications).
- 15.9.3 Cable shall be laid in trenches all as specified in clause 19.74 to 19.76 of SSR Part-I.

15.10 TESTING OF CABLES :-

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PARTICULAR SPECIFICATIONS (Contd.,)

a) **Testing during laying.** XLPE cable shall be meggar tested by HV 2500 / 5000 V meggar before joining. After jointing is completed pressure test shall be carried out. The cable shall be tested for :-

- i) Continuity.
- ii) Absence of cross phasing,
- iii) Insulation resistance between conductors,
- iv) Insulation resistance to earth.

(b) **Testing after laying.** Immediately after the initial laying and jointing work is completed, a high voltage test shall be applied to the cables to ensure that they have not been damaged or after laying operation and that there is no flow in the jointing. The following test shall also be carried out :-

- i) Insulation resistance test sectional and over all.
- ii) Continuity test sectional and over all.
- iii) Load test.
- iv) Earth test.

14.11 **TESTS**

14.11.1 On completion of the installation, the resistance to earth of the whole installation and of each earth terminations shall be measured and the electrical continuity of all conductors, bonds and joints and their mechanical condition verified. The method of measuring resistance shall be as indicated in Appendix 'A' IS-2309. The ohmic resistance of the lightning conductor system completes with air terminations but without the earth connection shall be a fraction of Ohm and in any case it should not exceed 1 Ohm. For this purpose a continuous current of about 10 Amps shall be passed through the portion of the system under test and the resistance verified against its calculated value. Suitable precision tests for this purpose shall be used by the contractor. For this test the system may be divided into convenient sections at testing points by suitable joints.

15.11.2 A test certificate for buildings as per Appendix 'F' on IS-2309 of 1969 shall be rendered jointly signed by the contractor and the Engineer-in-Charge.

15.12 **XLPE HT CABLE**

15.12.1 HT cables shall be of three core aluminium conductors, XLPE insulated, armoured and conforming to IS 7098 (part-2). HT cables shall comply with the requirements as specified in clause 19.19.1 to 19.19.1.8 of SSR Part-I. Cables shall be procured from approved manufacturers listed here-in-after. Necessary paid voucher duly verified by Engg-in-charge and test certificate of the cables shall be kept on record before making payment.

15.13 **METHOD OF LAYING LT CABLES**

15.13.1 LT Cable shall be laid in trenches all as specified in clause 19.74 to 19.84 of SSR Part-I.

16.0 **FITTINGS , FIXTURES & MISC ITEMS**

16.1 Fittings, Fixtures & miscellaneous items shall be carried out all as specified in Schedule 'A' Part – VI.

16.2 Necessary paid voucher duly verified by Engg-in-charge for all items as covered in Sch 'A' Part – VI shall be kept on record before making payment.

16.3 **FLAME PROOF LED LIGHT FITTINGS**

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- 16.3.1 Flame proof LED light fittings & accessories shall be as specified in BOQ and shall be procured from approved manufacturers listed in Annexure here-in-after. The unit rate quoted by the tenderer shall be deemed to include for all the connected accessories and nothing extra is admissible in this regards.
- 16.4 **DISTRIBUTION BOARD AND MCBs**
- 16.4.1 Provide distribution board and MCBs as indicated in Schedule 'A' Part IV. Miniature circuit breaker shall comply to the requirement of IS-8828-1996. The MCBs shall have rupturing capacity of 10 KA. The terminals of MCBs should be brought out sufficiently to connect cable lugs directly. No adopter should be used for terminating the cables. The MCBs should have quick-break-trip free mechanism to ensure that contact cannot be closed against persistent fault. Bus bars shall be electroplating copper tin plated and rated 200 Amps. Exposed faces of sheet steel enclosures shall be painted with epoxy polyester powder coating at factory. Neutral has same number of outgoing holds as the number of MCBs. Unit rate in Schedule 'A' shall also be deemed to include for all internal connections in the distribution board and bus bar system is completely insulated and fitted in PVC channel to avoid accidental toner, bus bar available in single phase and 3 phase shall be colour coated suitable for both flush and surface mounting.
- 16.5 **EARTHING**
- 16.5.1 The earthing shall be in accordance with section 19 clause 19.137 of MES Schedule Part – I and as per electrical plate No 3 of SSR Part-I. Earthing as described in BOQ shall be executed in the presence of MES representative. Excavation for earth pit may be in any type of soil, excavation shall be passed by Engineer-in-Charge before filling in. Surplus soil if any shall be removed to a distance not exceeding 50 meters and the site left clean and tidy. Concrete in earth pit shall be 1:3:6 type C1 using 20mm graded stone aggregate.
- 16.5.2 The maximum continuity resistance from any point of the installation including the earth continuity conductor and earth lead to the earth pit shall not exceed 1 ohm.
- 16.5.3 All metal works associated with wiring system other than current carrying parts including the cable sheathed and armoured conduit, ducts and box shall be connected to the earth continuity conductor as required under Indian Electricity Rules 1965 and IEE wiring regulations. The earth terminal of socket outlet etc. shall be connected to the earth continuity conductor. The sizes of all the earth continuity shall be as specified in respective BOQ items. Testing of earthing shall be carried out as per clause No 19.146 of MES Schedule Part –I.
- 16.6 **LT PANEL BOARD**
- 16.6.1 LT panel board made out MS sheet of thickness as specified in BOQ shall be provided at locations as directed. The size of LT panel board is such that it should accommodate the accessories as specified in BOQ item. The feeder pillar box shall be of factory fabricated conforming to relevant IS. Manufacturing drawings shall be submitted by the contractor for approval of GE prior to fabrication. The accessories shall be procured from approved manufacturers as per Annexure listed here-in-after.

PARTICULAR SPECIFICATIONS (Contd.,)

- 16.6.2Necessary paid voucher duly verified by Engg-in-charge for all items as covered in this item shall be kept on record before making payment.
- 16.7LIST OF MANUFACTURERS
- 16.7.1The make of various items of materials are listed in Annexure I to III. The contractor shall ensure that the items of makes (any one) as listed in Annexure only are incorporated in work, which conforms to the relevant specification/ requirements/ stipulation in the contract. The make of items which are not covered in the list of manufacturers/ Sch'A' Annexure shall be as approved by GE in terms of Special Condition 12.5.
- 17.0MATERIALS AND TESTING
- 17.1A list of tests to be carried out for various materials and recovery rates of testing charges is given here-in-after. Adequate quality control at every stage of work is essential and the contractor shall establish site / field laboratory which shall be suitably staffed and headed by Civil Engineer with sufficient experience in conducting quality control test. The laboratory-in-charge shall work under directions of GE and Engineer-in-Charge and test shall be conducted as per their approval. Sufficient number of machines and equipments shall be installed by the contractor so that all control field tests can be performed at site.
- 17.2For contracts whose acceptance amount is more than Rs. 1 crore, contractor has to set up a full fledged laboratory at site for carrying out all types of level 'A' tests as per frequency specified in the CA. The contractor shall be responsible for such tests to be carried out and for that he shall employ competent technical staff as approved by GE (whose pay/expenditure shall be borne by the contractor). The tests shall be carried out in the presence of Engineer-in-Charge. A record to this effect shall be prepared and signed by both parties i.e., contractor and Engineer-in-Charge. The record should show material to which the test to be carried out, type of test, number of tests, interval of tests, the details of minimum requirements as per IS, the test results' and all other relevant information necessary. The materials, testing equipments etc., required for testing shall be provided by the contractor. The expenditure involved towards cost of material, tests equipment etc., shall be borne by the contractor. In case of failure of tests, the contractor shall make arrangement to remove such rejected materials from site on failure of tests. Minimum lab equipment required in site lab shall be as given below and as specified here-in-after :-

SI No.	NAME OF TEST	REFERENC E IS	APPARATUS REQUIRED
1.	Sieve analysis of coarse / fine aggregate	IS-2386 Part-I	Sieves as per IS-460-1962. Balance of sensitivity 0.1% of wt of aggregate.
2.	Flakiness / Elongation index	IS-2386	Sieves, Balance, Thickness gauge, Length gauge
3.	Aggregate impact value	IS-2386	Sieve 12.5mm, Sieve 10mm, Impact value test equipment complete.
4.	Cube/PCC Block compressive strength	IS-456-2000 IS-516-1959	Cube testing machine or UTM.
5.	All the tests to be done in the site lab	Relevant IS Code	Relevant apparatus required for the tests to be done in the site lab.

PARTICULAR SPECIFICATIONS (Contd.,)

- 17.3 If the contractor does not carryout any of the tests as specified or for any less number of tests carried out, recovery to that effect shall be made at the recovery rate as mentioned in the list. In case the contractor is unable to carryout certain tests due to break down of testing equipments/non availabilities of testing equipments, the required tests shall be got carried out in Govt Lab/College as approved by GE and cost of such shall be borne by the contractor.
- 17.4 The safety of the site laboratory from any possible damages or loss due to thefts etc (other than accepted risks) shall be contractor's responsibility and no compensation will be payable by MES to contractor in the case of any loss/damage.
- 17.5 Level 'B' tests shall be carried out in Zonal laboratory Engineering College as approved by GE and level 'C' tests in National test house/SEMT. Wing Pune/Engg College. All testing charges for carrying out the test including materials and transportation to laboratory etc. shall be borne by the contractor. The testing charges for tests carried out in Zonal lab/National testing house /SEMT wing Pune/Engineering College shall be as specified in table. The contractor may carried out level 'B' and level 'C' tests also in field laboratory by installing requisite equipments at his cost and arrangement. In case of failure of contractor to carry out any tests as listed out, recovery will be affected at the rates mentioned in the list. In such an eventuality, percentage/selected check of materials shall be got done by GE in Zonal/Govt approved laboratory and expenditure for such test shall be borne by the department.
- 17.6 For contracts whose acceptance amount is less than rupees one crore, test required to be carried out in "site lab" indicated as "A" in the Legend in the list below shall be got done from "National Test House/SEMT/Engineering College" i.e. in level "C" however recovery shall be as indicated for level 'A' test.

PARTICULAR SPECIFICATIONS (Contd.,)

SI no.	Materials	Tests	Method of testing	Frequency of tests			Level of test	Rate	Remarks
1	2	3	4	5			6	7	8
1.	Fly ash Bricks	(I) Compressive Strength	IS-3495 (Part - II)	As per IS - 5454 as given under			A	330/-	Checks for visual and dimensional characteristics shall also be carried out as per IS-5454.
		(ii) Water absorption	-do-	Lot size	Sample size	Permissible nos of defective bricks	A	330	
		(iii) Efflorescence	-do- (Part - I)	1001 to 10000	5	0	A	330	Legend A – Site lab B – CTL/Zonal lab C – Approved test Lab/Engg College
		(iv) Dimention test	IS 12894	10001 to 35000	10	0			
		(v) Drying shrinkage	IS 4139	35001 to 50000	15	1			
2.	Coarse aggregate	(i) Sieve analysis	IS-2386 (Part-I)	One test for every 15 cum of aggregates or part thereof brought to site			A	660/-	
		(ii) Flakiness index	-do-	-do-			A	250/-	
		(iii) Estimation of deleterious materials	IS-2386 (Part - I)	One test for every 100 cum of aggregate or part thereof			A	600/-	
		(iv) Organic impurities	-do-	One test per source of supply			B	275/-	
		(v) Moisture content	-do- (Part-II)	Regularly as required			A	330/-	
		(vi) Specific gravity	-do-	One test for each source of supply			B	330/-	

PARTICULAR SPECIFICATIONS (Contd.,)

1	2	3	4	5	6	7	8												
3.	Fine aggregate	(i) Sieve analysis	IS - 2386 (Part-I)	One test for every 15 cu m of fine aggregate or part when brought to site	A	660/-													
		(ii) Test for clay silt and impurities	-do- (Part – II)	-do-	A	500/-													
		(iii) Specific gravity	-do- (PART-II)	One for each source of supply	B	330/-													
		(iv) Moisture content	-do- (PART-II)	Regularly as required subject to 2 tests / day when being used	A	330/-													
		(v) Test for organic impurities	-do- (PART-II)	One test for each source of supply	B	275/-													
4.	Cement	(i) Setting time	IS-4031-63 REAFFIRMED 1980	One for each consignment or as and when required	B	500/-													
		(ii) Soundness	-do-	-do-	B	550/-													
		(iii) Compressive strength	-do-	-do-	B	550/-													
		(iv) Fineness	-do-	-do-	B	275/-													
5.	Structural concrete (M-25 Grade and above)	(i) Slump test or compacting factor test or Vee-Bee time	IS-119	The minimum frequency of sampling of concrete of each grade shall be as under :-	A	300/-	(i) Random sampling shall be carried out to cover mixing units												
		(ii) Compressive strength.	IS - 516	<table><tr><th>Qty of concrete in the work (Cu m)</th><th>No. of samples</th></tr><tr><td>1 – 5</td><td>1</td></tr><tr><td>6 – 15</td><td>2</td></tr><tr><td>16 – 30</td><td>3</td></tr><tr><td>31 – 50</td><td>4</td></tr><tr><td>51 & above</td><td>4+1 for each addl 50 Cu m or part thereof.</td></tr></table>	Qty of concrete in the work (Cu m)	No. of samples	1 – 5	1	6 – 15	2	16 – 30	3	31 – 50	4	51 & above	4+1 for each addl 50 Cu m or part thereof.	A	900/-	(ii) Refer IS 456 – 2000 Clause No. 14 for frequency of sampling.
Qty of concrete in the work (Cu m)	No. of samples																		
1 – 5	1																		
6 – 15	2																		
16 – 30	3																		
31 – 50	4																		
51 & above	4+1 for each addl 50 Cu m or part thereof.																		

PARTICULAR SPECIFICATIONS (Contd.,)

1	2	3	4	5	6	7	8
6	(a) PCC Blocks for walling (Hollow Block)	(i) Compressive strength	IS : 2156 – 1984 (Appendix 'B')	8 Blocks out of 14	A	900/-	Sample : 14 blocks from consignment of every 5000 blocks or part thereof.
		(ii) Water absorption	- do - (Appendix 'E')	3 Blocks out of 14	B	330/-	
		(iii) Density	- do - (Appendix 'A')	3 Blocks out of 14	B	330/-	
	(b) PCC solid Block for walling	(i) Compressive strength	IS : 2185	12 Blocks out of 18	A	900/-	Sample : 18 blocks from consignment of every 1000 blocks or part thereof. These blocks to be checked for dimension and weight.
		(ii) Water absorption	- do -	3 Blocks out of 18	B	330/-	
		(iii) Density	- do -	3 Blocks out of 18	B	330/-	
7.	Cement flooring tiles / Terrazzo tiles.	(i) Water absorption.	IS – 1237 (Appendix 'D')	6 tiles out of 18	B	330/-	Samples of 18 tiles from each source of supply selected at random.
		(ii) Wet transverse strength.	-d o – (Appendix 'E')	-do-	B	660/-	
		(iii) Resistance to wear	- do – (Appendix 'F')	- do -	C	1000/-	

PARTICULAR SPECIFICATIONS (Contd.,)

1	2	3	4	5	6	7	8
8	Burnt clay roofing tiles (handmade) As per IS : 2690 (Part – II).	(i) Water absorption.	IS : 3495 (Part – II)	6 tiles out of 12	B	216/-	Samples : 12 tiles from each source of supply selected at random.
	Length 150 mm to 250 mm, Width 100 mm to 200 mm, Thickness 35 mm to 50 mm.	(ii) Compressive strength.	-do – (Part – I)	- do -	A	180/-	
9.	Mangalore pattern roofing tiles.	(i) Water absorption.	IS : 654 (Appendix ‘A’)	6 tiles out of 32	B	180/-	Sample : 32 tiles from each consignment of 3000 tiles or part thereof. These tiles shall be checked for dimension.
		(ii) Breaking load.	- do – (Appendix ‘C’)	- do -	B	120/-	
10.	Timber.	(i) Specific gravity and weight.	IS : 1708	Minimum 3 samples from a lot of 4 cum or 250 pieces of seasoned timber.	B	120/-	
		(ii) Moisture content.	- do -	- do -	A	120/-	
11.	Water for construction purposes.	(i) Test for acidity.	IS : 456 & 3015	Once at the stage of approval of source of water.	B	500/-	Also refer Clause No. 4.3 of IS : 456 and its subsequent sub clauses regarding suitability of water.
		(ii) Test for alkalinity.	- do -	- do -	B	500/-	
		(iii) Test for total dissolved solids (TDS) content.	- do -	- do -	B	500/-	
11A	Reinforcement steel	(i) Physical tests up to 16mm dia (Normal mass,tensile,elongation, bend and rebend	As per PS	As per PS	B	2500/-	
		(ii) More than 16mm dia	As per PS	As per PS	B	2750/-	

PARTICULAR SPECIFICATIONS (Contd.,)

18. SCHEDULE OF FINISHES

Location	Wall	Ceiling	Floor	Shirting	Over RCC slab
Internal (Vocational lab and passage)	A-1	B-1	C-1	D-1	E-1
External (Vocational lab and passage)	A-2	B-2			

- A-1:** 15 mm thick rendering in CM 1:6 over masonry work (PCC Block) finished even and smooth without using extra cement. Provide 3 mm thick wall care Putty (in two coats) over plastered surface. Preparation of wall care putty surface and apply one coat of primer. Preparation of Primer surface and apply three coats of Oil bound distemper with sponge roller of shade as appd.
- A-2:** 10 mm thick rendering in CM 1:4 over masonry surface (PCC Block) finished even and fair. 5 mm thick rendering in CM 1:3 over 10 mm thick rendering surface including mixing of 1 % water proofing component (liquid) in mortar finished even and smooth without using extra cement. Provide 3 mm thick wall care putty (in two coats) over plastered surface. Preparation of wall care putty and apply one coat of Primer. Preparation of primer surface and applying three coat of weather exterior paint of shade as appd.
- B-1:** 5 mm rendering in CM 1:3 over RCC ceiling surface (RCC roof/ RCC shelve/ RCC Lintel soffit etc.) finished even and smooth without using extra cement. Preparation of plastered surface and apply 3 mm thick wall care putty (in two coats) finished even and smooth in line and level. Apply a coat of primer over wall care putty. Apply three coats of oil bound distemper over primer surface with sponge roller of appd shade.
- B-2:** 5 mm thick rendering in cm 1:3 over RCC ceiling surface (RCC roof/ RCC shelve/ RCC Sunshade lintel soffit etc.) finished even and smooth without using extra cement. Perforation of plastered surface and apply 3 mm thick wall care putty (in two coats) finished even and smooth in line and level. Apply three coats of weather exterior paint over primer surface with sponge roller of appd shade.
- C-1:** 150 mm thick hard cone (Stone Aggregate) over rammed earth. 75 mm thick PCC (1:3:6) over hard core surface finished fair and even without using extra cement. 40 mm thick PCC (1:2:4) over PCC (1:3:6) surface finished fair and even without using extra cement. 20-25 mm thick Kota Stone flooring of size not less than 550mm X 550mm laid over 20 mm thick cement bed in CM 1:6 laid over neat cement slurry. The joints shall be filled with readymade tile grout mixed with pigment to match the shade of stone. Cutting/grinding and polishing (mirror polish) of Kota stone flooring.
- D1:** 20-25 mm thick Kota stone skirting of 150mm height laid over 15 mm thick rendering in CM 1:4, the joints shall be filled with ready-made tile grout mixed with pigment to match the shade of stone. Cutting/grinding and polishing (Mirror polish) of Kota Stone skirting.
- E1:** RCC slab shall be casted as per structural details and grade of RCC. The slab shall have 18-20 mm thick pre-polished granite stone slab as appd of required width and length laid over 20 mm thick cement mortar screed 1:6. The edge of stone shall be full round polished molding. The front portion of RCC slab thickness, slab stone and mortar shall be covered with the same stone slab fixed with back Rendering mortar 10 mm thick in cm 1:3. The contact between

Contd.,

PARTICULAR SPECIFICATIONS (Contd..)

counter slab and its skirting shall be jointed with chemical" ARALDITE" or other appd chemical.

18.1 WEATHER PROOF EXTERIOR PAINT

18.1.1 Two coats of weather proof exterior paint over a coat of primer including mixing with antifungal chemical shall be provided alround vocational lab externally as per manufacturer's instructions. Application shhal be all as specified in clause 15.15 to 15.15.12 of MES Schedule Part I. The tint and colour of the paint shall be as directed by the Accepting Officer. The paint shall be of first quality and shall conform to relevant IS. Primer shall be of the same manufacturer/make of weather proof paint as approved by Accepting Officer.

18.1.2 Weather proof exterior paint shall be of superior quality manufactured by the standard firms listed here-in-after. This shall be of first quality.

18.1.3 Paints for priming coat, under coat and finishing coat shall be of same manufacturer.

18.2 OIL BOUND DISTEMPER

18.2.1 The tint of the paint shall be as directed by Accepting Officer.. Oil bound distemper to be applied over internal walls/ceilings of structural after preparation of wall care putty. Apply three coats of oil bound distemper of approved tint/colour over a coat of primer. The distemper shall be carried out as per manufacturer's instructions.

18.3 WALL CARE PUTTY

18.3.1 Wall care putty to be provided over plastered surface as per manufacturer's instructions. The thickness of wall care putty is 3mm (in two coats) in line and plumb. The wall care putty to be provided over external/internal plastered surface of ceiling and walls whatsoever mentioned or not mentioned in Drg.

18.4 CEMENT BASED PAINT

18.4.1 Where cement based paint is indicated on drawing/Schedule of finishes, apply two coats of water proofing cement based paint over one coat of primer as per manufacturer's instruction II as specified in clause 15.15 to 15.15.12 of MES Schedule Part I. The tint of the paint shall be as directed by the **GE**. The paint shall be of first quality and shall conform to relevant IS. Silicon based water repellent compound need not be used separately while preparing of cement based paint, in case, the same has been added by the manufacturer while manufacturing of cement based paint shall be as per manufacturer's literature. Primer shall be of the same manufacturer/make of cement base paint as approved by **Accepting Officer**.

19 **Cup board shutter and frame:** Cup board shutter and frame shall be made with 18-19 mm thick WPC pre laminated one side board as per drg and design. The Cupboard shutter shall be made as in Box type. The back sheet of box shall be 12 mm thick WPC ply/board. Each member of shutter shall be joined with glue/nails/screws as per manufacturer's instructions. The shutter hinge shall be anti-soft closing hinge type of appd make. The shutter shall have 75 thick SS handles. The cupboard shall rest on 150 mm thick PCC (1:2:4) platform finished even and smooth without using extra cement as per drg. The front and side portion of platform shall be finished with as per skirting finish of Kota stone flooring.

20 **SS sink with drain board:** SS Sink with drain board shall have 1145mm x 510mm overall size with bowl size 510mm x 404mm x 200mm size with 1mm thick rest over granite stone as per drg and design. Sink shall have all connected gratings and PVC waste pipe complete in all respect as specified.

21 LIST OF DRAWINGS

21.1 The following drawings shall form part of the tender documents. In addition, any other drawings/documents mentioned in these drawings shall also form part of contract and shall be deemed to have been referred to by the contractor in the office of GE The tenderer to note that

Contd.,

PARTICULAR SPECIFICATIONS (Contd.,)

even if date of last revision is mentioned or not mentioned inadvertently in the list of drawing, the revisions contained in the drawings forwarded shall form part of tender documents and rates quoted by the contractor is deemed to include for the same. The list of drawings indicated as reference drawings may not be referred as list of drawing for reference and the list of drawings given below shall be followed. However, the notes mentioned in List of Drawing shall be followed for all other purposes. In case of any dispute on this, the decision of the Accepting Officer shall be final and binding.

SI No	Description of drawing	Drg No.	Sheet No.	Date	Date of last Revision	Remarks
1	2	3	4	5	6	7
1	Ground Floor Plan	ATS/GE(AF)/WD/01/2024	1/3	30.09.24		
2	Plan, Front Elevations & Section	ATS/GE(AF)/WD/01/2024	2/3	30.09.24		
3	E/M Plan	ATS/GE(AF)/WD/01/2024	3/3	30.09.24		

Signature of Contractor

AGE (Contracts)
For Accepting Officer

PARTICULAR SPECIFICATIONS (Contd.,)

22.0

LIST OF MANUFACTURERS

Annexure-III

- 22.1
- Before placing the bulk supply order on any of the firms/manufactures listed below, approval of sample & make shall be got approved by GE/AGE(I).
- 22.2
- The make / manufacturer of different materials / items are given in **Annexure-III**. The makes of certain items also given in Schedule 'A'/Schedule of work (BOQ) and particular specifications. The procurement of items shall be from the makes given in Schedule 'A'/BOQ. If no make is given in Schedule 'A'/ BOQ, the same shall be procured from the make given in particular specifications/ **Annexure-III**.
- 22.3
- If no make is specified in the tender documents, the same item shall be procured of make approved by the any HQ CEs Command /ADGs /E-in-C's Branch, New Delhi for Group-I (Approved till bid closing end date).
- 22.4
- If item is not listed / approved as per note above, the same item shall be procured of ISI marked. However no ISI marked materials / items are manufactured the same shall be conforming to IS specifications

APPROVED LIST OF PRODUCTS & MAKES / BRANDS: B/R ITEMS (Annexure-III)

Sl.No	Item	Make	Remarks
1	2	3	4
1	Ready Mix Concrete (RMC)	Lafarge	
		Ultra Tech	
		ACC	
		JK LASHMI CEMENT LTD	
		Ramco	
		Godrej & Boyce Mfd C.	
2	AAC Block	GODREJ	
		Ambuja Cool Wall	
		Ultratech Xtralite	
		Birla Aerocon	
	JOINERY		
3	Factory made Wooden paneled door, shutter, wire gauged, gazed shutters	M/S Goel Brothers, Raipur	
		M/S Pioneer Timber, Chandigarh	
		M/S Goyal Industries, New Delhi	
		M/S Jain Doors Pvt Ltd, Haryana	
		M/S India Wood & Wood Products, Mangalore	
		M/S MP Wood Products, Indore	
		M/S A1 Teak Products, Indore	
4	Wooden Flush Door Shutter	KIT PLY Industries	
		Century Plywood	
		DURIAN	
		M/S jain Doors Pvt Ltd Haryana	
		A1 Teak Products Indore	
		Greenply Industries Ltd	
5	Factory made PVC, FRP Shutters and Frames	M/S Rajshri Plastiwood, Indore	
		M/S Sintex Industries Ltd	
		M/S Accura Polytech Accucel	
		M/S Dura Plast Extrusion	
		M/s Navratna Co Speciality Chemicals (GIZA)	
		M/s Madhu Industries	

PARTICULAR SPECIFICATIONS (Contd.,)

6	UPVC Doors, Windows and Ventilators	M/S Poly Windows, Pune
		Madhu Industries
		M/s Aparna Profiles Pvt Ltd (Aparna Wenstal Okotech)
		M/s Rajshri Plastiwood
		M/s Madhu Industries
7	Steel Windows, Ventilators, Door Frames, Shutters	Madhu Industries
		Chandni Industries
		Ashwani& Sons
		Trisul Industries
		Ashish Industries
8	WPC Board	M/s Rajshri Plastiwood
		M/s Navaratna Speciality chemical (GIZA)
		Greenply
		Century
9	Extruded PVC profile Doors & Frames	M/s Rajshri Plasti wood
		M/S Sintex Industries Ltd
		M/S Accura Polytech Accucel
		M/S Dura Plast Extrusion
		M/s Navratna Co Speciality Chemicals (GIZA)
10	Aluminium section of shutters/frames for door/window/ventialator	M/s Hindalco Ind Ltd
		M/s Indian A1 Company (Indal)
		Jindal
		Century Extrusion Ltd
		FENESTA
11	Steel Rolling Shutters/ Grills & Collapsible Gates	M/s Shree Lakshmi Engg Wks, Bangalore
		M/S Prakash & Co, New Delhi
		M/S Senthil Rolling Shutters & Engg Co, Chennai
		M/S Swastik Rolling Shutters, Mumbai
		M/S Jayaraj Industries, Chennai
	BUILDER'S HARDWARE	
12	Hydraulic Door Closer	M/s Everlite
		M/s Universal
		M/s Dyana
		M/s Hardwin
13	Stainless Steel Plate Rack	M/s Prayag
		M/s Nirali
		*M/s Bluestar Sanitary Industries Pvt Ltd (SILVERSHINE)
14	Aluminium Tower Bolt / Aldrops / Door handle / Butt Hinges	*M/s Argent Industries (ARGEN)
		Novapan
		Mepro
15	Towel Rails	M/s Jaguar
		M/s KICH
		M/s ESS ESS
16	Mortice Locks	Harrison
		Godrej & Boyce Co Ltd
		Jainson

PARTICULAR SPECIFICATIONS (Contd.,)

17	Drapery rod	Vista Levolor	
		MAC-DECOR	
		Deco Window	
		Jayesh Metal Corpn	
18	Venetian Blinds	Vista Levolor	
		MAC	
		Aerolux	
STEEL, ALUMINUM & IRON WORK			
19	Galvainzed Steel Chain Link Fence Fabric	Tata Steel Global Wires	
		Secure Fencing, Delhi	
		Eco Netting, Nagpur	
		Asian Fence Wire Product, Hyderabad	
		Oswall Wiremesh Co, Banglore	
20	Barbed wire (Galvanised Steel) Mechanically Woven, Double Twisted, Hexagonal Wire Mesh Gabions, Revet Mattress and Rock Fall Netting (Galvanized Steel Wire)	Tata Steel Global Wires	
		Secure Fencing, Delhi	
		Eco Netting, Nagpur	
		Asian Fence Wire Product, Hyderabad	
		Oswall Wiremesh Co, Banglore	
	ROOF COVERING		
21	Mangalore Tiles	Charminar	
		Raja	
		RECHO	
		Prajapati	
		Kerala Tile Wks, Trisur	
	CORRUGATED SHEETS		
22	Non Asbestos Fibre reinforced (poly propylene), 6mm Cement Corrugated sheets	*Everest Industries Ltd (EVEREST)	
		Charminar fortune (M/s HIL Pvt Ltd)	
		Ramco Indus Ltd	
23	Pre-Painted Galvalume / Galvanized Corrugated Steel Sheets	TATA BLUESCOPE STEEL	
		JSW	
		ESSAR	
		LLOYD INSULATION	
24	Galvanised Plain/ Corrugated Steel Sheets	TATA BLUESCOPE STEEL	
		JSW	
		ESSAR	
		LLOYD INSULATION	
25	Pre-Moulded bituminous joint filler board	STP Ltd	
		Tikitar Industries Ltd	
		Sikka	
26	AC Sheets & Ridges	Charminar	
		Everest	
		UP Asbestos	
		Ramco	
27	Water Proofing Compound	Pidilite Industries Ltd	
		FOSROC	
		Dr Fixit	

PARTICULAR SPECIFICATIONS (Contd.,)

1	2	3	4
28	APP Membrane	STP Ltd	
		Texsa India Ltd	
		IWL Ltd	
		Tiki Tech	
	CEILING AND LININGS		
29	Perforated particle Board / tiles for insulation and acoustic	Anchor Ceiling Tiles	
		Armstrong Wood Ind	
		GYP board	
		Bison Panel	
		Lagyp	
30	PVC False Ceiling, wall Lining and solid PVC Partition	Rajshri Plastiwood (Rajshri)	
		ARMSTRONG	
		Square Foot	
31	Plywood	Kitply	
		Century Plywood	
		Archid Ply	
		Green Ply	
		Anchor	
32	Particle Board Gypsum	Mangalam Timber Product	
		Gypsum Board	
		Jolly BD, Mumbai	
		Indian Gypsum product	
		Armstrong Wood Industries	
33	Laminated Sheets	Formica	
		Sun Gloss	
		Sunmica	
		Backlite Hylam	
34	Tile/Flooe Adhesives	Pidilite	
		Fevicol	
		Vermicol	
35	Pre-laminated Particle board	Navapan	
		Eco Board Industries, Pune	
		Kitply	
		Green Ply	
		Anchor Lam	
		Century Plywood	
36	Block boards and veneered particle board	Bajaj Boards	
		Nu Wood	
		A-1 Boards	
		Bhutan Board	
		Charminar	
	FLOOR FINISHES & PAVINGS		
37	Glazed Ceramic wall / Flooring tiles	Johnson Tiles	
		Kajaria	
		Somany	
		Asian Granite Ind Ltd (AGL TILES)	
		RAK Cements Ltd	
38	Non-skid Ceramic tiles	Johnson Tiles	
		Kajaria	
		Somany	
		Orient Bell Limited	

PARTICULAR SPECIFICATIONS (Contd.,)

39	Vitrified Tiles	Johnson marbonite	
		Kajaria	
		Somany	
		Asian Granito Limited (AGL Tiles)	
		RAK Ceramics Ltd	
		Orient Bell Ltd	
40	Mosaic/Cement Flooring Tiles	NITCO Mumbai	
		M/S Mehtab Tiles, Indore	
		National Tiles	
		Bharat Tiles and Engg Company, Bangalore	
		Duracrete	
		ULTRA	
		Modern Tiles and Marbles Bangalore	
41	Acid Resistant Tiles	M/S Johnson, Mumbai	
		Somany	
		Kajaria	
		M/S Burn Standard Co, Jabalpur	
		M/S Parshuram Pottery Wks, Marvi	
42	Cement Concrete Interlocking Paver Blocks / Tiles	Mehtab Tiles , Indore	
		NITCO	
		Patel Fur mart	
		M/S Ultra Tiles	
		Navya Tiles, Jodhpur	
43	PVC Sheet and tile flooring	Krishna Vinyl Tiles	
		Armstrong	
		M/S Marbles Tiles	
		Polyfin Tiles	
		Square Foot	
	WHITE WASHING, COLOURING & DISTEMPERING		
44	Distemper oil-emulsion (OBD)	Nerolac	
		Akzo nobel (Dulux)	
		Asian Paints	
		Berger Paints	
45	Plastic Emulsion Paint and Exterior Emulsion Paint	Asian Paints	
		Berger Paints	
		Nerolac	
		Akzo nobel (Dulux)	
46	Cement Base Paint	Super Snowcem	
		Duracem	
		Aquacem	
		Shalimar	
		Berger	
47	Wall care cement putty	Birla Cement	
		JK White Cement	
		Golden Mohar	
		Asian paints	
		Jenson & Nicolson	
		Shalimar Paints	

PARTICULAR SPECIFICATIONS (Contd.,)

	GLAZING		
48	SHEET GLASS FROSTED/PLAIN/HEAT ABSORBING GLASS/REFLECTIVE SOLAR CONTROL FILM/ROUGH CAST WIRE GLASS	Saint Gobin	
		Asahi works	
		Modiguard	
49	Oil Putty	Berger Paints	
		Jenson & Nicholson	
		Asian Paints	
50	Wall care putty	M/s Dalmia Magic premium skincoat bharat Ltd (Dalmia Cements)	
		JK WHITE	
		BIRLA WHITE	
		ASIAN PAINTS	
51	Mirror	Modi	
		Atul	
		Saint Gobin	
	PAINTING		
52	Synthetic Enamel Paint	Asian Paints	
		Nerolac Paints	
		Akzo nobel (Dulux)	
	Water Supply, Plumbing, Drains & Sanitary Appliances		
53	CI Pipe and fittings	Electro-Steel Casting Ltd	
		Kejriwal	
		NECO	
		Kesoram	
54	GI Pipes & Fittings	Tata	
		Jindal	
		FINOLEX	
		SURYA PRAKASH	
55	MS Pipes & Fittings	Tata	
		Jindal	
		SURYA PRAKASH	
56	DI Pipes & Fittings	Jindal Ltd, Gujrat	
		Electrosteel Castings Ltd	
		Tata Metalics, Kolkata	
		SAW Pipes	
		Srikalahasthi Pipes Ltd	
57	HDPE Pipes & Fittings	Finolex	
		Prince pipes fittings Ltd (core fit)	
		Supreme	
		Jain Irrigation System	
		Kissan Irrigation & INFRA STRUCURE Ltd	
58	CPVC pipes and fittings (Chlorinated polyvinyl chloride)	Finolex	
		Dutron	
		SFMC	
		M/s Prince pipes & Fittings smart fit)	
		Birla Aerocon HIL Ltd	

PARTICULAR SPECIFICATIONS (Contd.,)

59	PVC - Soil, waste, rainwater (SWR) & Drainage pipes	Supreme	
		Prince (ultrafit)	
		Kisan	
		Finolex	
60	PPR Pipes & Fittings	Prince Pipe fittings Ltd (Greenfit)	
		Finolex	
		Supreme	
		Savoir Faire Manufacturing Co. Pvt. Ltd (SFMC)	
61	PVC Pipes & Fittings	Prince Pipes fittings Ltd (Aquafit)	
		Finolex	
		Supreme	
		HIL Ltd Birla Aircon	
		Kissan Irrigation & INFRA STRUCURE	
62	UPVC Pipes and Fittings	Prince Pipes & fittings Ltd (Aquafit)	
		Finolex	
		Supreme	
		HIL Ltd (Birla Aircon)	
		Kissan Irrigation & INFRA STRUCURE	
63	UPVC Pipes & Fittings for SWR	Prince Pipe fittings Ltd	
		Finolex	
		Supreme	
		HIL Ltd Birla Aircon	
		Kissan Irrigation & INFRA STRUCURE	
64	Polyethylene / Aluminium / Polyethylene Composite Pressure Pipe	Prince	
		Finolex	
		Supreme	
65	Plastic Pipe (for non-pressure Drainage &Sewage)	Prince (Foam fit)	
		Finolex	
		Supreme	
66	CI - Soil, waste, rainwater (SWR) & Drainage pipes	NECO, Nagpur	
		SKF (Singhal Iron Foundry, Mathura)	
		M/S Ramco	
67	AC - Soil, waste, rainwater (SWR) & Drainage pipes	M/S Everest Asbestos Hyderabad	
		Visaka India Ltd	
		M/S Hyderabad Asbestos Cement (Charminar)	
		M/S Ramco	
68	RCC pipes, drain pipes	Indian Hume Pipes	
		Everest Asbestos Hyderabad	
		Himalaya	
		Thuluvananikal pipes	

PARTICULAR SPECIFICATIONS (Contd.,)

69	Air Release Valves	Leader	
		BIR	
		Kirloskar	
		Upadhyay	
		Sant	
		L&T	
70	Foot Valves	Upadhyay	
		Leader	
		Kirloskar	
		Sant	
71	Reflex Valves	Kirloskar	
		Leader	
		Sant	
		L&T	
72	Sluice valves	Leader	
		Zoloto	
		Kirloskar	
		Upadhyay	
		L&T	
		BIR	
73	Butterfly Valves/ Disc Valves	Upadhyay	
		L&T	
		Kirloskar	
		Zoloto	
		Sant	
		Leader	
74	BLANK		
75	Gate valves	Capstan	
		Dashmesh	
		Kaycee	
		Capital	
		Anand Asahi	
		Kirloskar	
76	PVC Water Tanks/ Polythylene	Sintex Indus	
		Polycon, Jaipur	
		Rotex	
77	C P Bib Cock, Stop cock, pillar cock and accessories	Jaquar	
		Marc	
		Cera Sanitaryware	
		Kohler	
78	Copper/ Brass Alloy Bib Tap, Pillar Tap, Angle Valve & Stop Valves and accessories	Soma	
		Leader	
		Zoloto	
		JAQUAR & CO. PVT.LTD (JAQUAR)	
79	PVC Stop Cock and Bib Cock / float valves and accessories	Jaypee	
		GMP	
		Neta	
		Zoloto	
		Prayag polymer	
		Symet	

PARTICULAR SPECIFICATIONS (Contd.,)

80	Gun-Metal Globe/ Gate Valves/ Angle Valves	Leader	
		BIR	
		Zoloto	
		Kirloskar	
81	Shower Rose	Jaquar	
		Kohler	
		Crabtree	
		Cera Sanitaryware	
82	CI / Brass Ball Cocks (Float Valves)	Leader	
		NETA	
		Zoloto	
83	Water Closet - Vitreous China (European /Indian)/ squatting pan Orissa pattern	CERA Sanitary ware	
		RAK Ceramics	
		Parryware	
		Jaquar	
		Hindware	
		Johnson	
		Kajaria Sanitary Ware(KEROVIT)	
84	Flushing Cistern - PVC Low Level incl Flush Valves and Fittings for WC and Urinals	Parryware	
		CERA Sanitary ware	
		M/S Johnson Peddar	
		RAK ceramics India Pvt Ltd	
85	Plastic Seat Covers for EWC	CERA	
		Neycer	
		Parryware	
86	Urinals - Vitreous China	CERA	
		Parryware	
		Neyveli Ceramics (Neycer)	
		Hindware	
		Jaguar & Co Pvt Ltd	
		Johnson	
		Kajaria Sanitaryware Ltd(KEROVIT)	
87	Wash Basin - Vitreous China	CERA	
		Parryware	
		Hindware	
		Neyveli Ceramics (Neycer)	
		Jaquar	
		Kajaria Sanitaryware (KEROVIT) Ltd	
		RAK ceramics Pvt Ltd	
88	Sink Steel	Nirali	
		Neelkant	
		Jayna	
		Parryware	
89	Centrifugal / Monoblock Pump	Kirloskar	
		Beacon	
		Crompton Greaves	
		KSB pumps	
		Wilo Mather & Platt	
		Jyoti	
		V Guard	
		CRI Pumps	

PARTICULAR SPECIFICATIONS (Contd.,)

90	Submersible Pump / Open well pumps	Kirloskar		
		KSB		
		Wilo Mather & Platt		
		Jyoti		
		V guard		
		CRI Pumps		
91	Vertical Turbine Pumps	Kirloskar		
		KSB		
		Wilo Mather & Platt		
		Jyoti		
92	Non Clog Sewage Submersible Pumps	KSB		
		Kirloskar		
		Wilo Mather & Platt		
93	Pumps for Fire Fighting	Kirloskar		
		Wilo Mather & Platt		
		Crompton Greaves		
		Bharat Bijlee		
	ELECTRICAL WORK			
94	Pole - Pre-stressed concrete	M/S Cement Fabric India, Jodhpur		
		M/S Hindustan Prestressed Concrete, Faridabad		
		M/S Indian PCC Poles		
		M/S Concrete Udyog Jhansi		
		M/S Sankla Udyog, Jhansi		
95	Pole - Steel tubular	India Tube and Co		
		India Electric Poles Mfg Co, Maharashtra		
		Bombay Tubes		
		National Tubing Company, Kanpur		
96	Insulators HT / LT Disc / Pin / Shackle / loop/ String Type	BHEL		
		Jayshree		
		W/S Insulators		
		Southern Insulators		
		MEI		
		Modern Insulators		
97	RMU & PSS	Lucy Electric India Pvt Ltd		
		Larsen & Toubro (L&T)		
		ABB		
98	Air Circuit Breaker (ACB) LT 1100 Volts	Larsen &Tubro (L&T)		
		Siemens		
		ABB		
		Schneider Electricals		
		Crompton Greaves		
		GEC		
		English Electric		
99	Vacuum Circuit Breaker (VCB) suitable for 36 KV, 22KV and 12 KV system incl accessories	SIEMENS		
		Crompton Greeves, Mumbai		
		ABB Ltd, Bangalore		
		Alsthom		
		BHEL		
		Larsen & Toubro (L&T)		
		Schneider Electricals		

PARTICULAR SPECIFICATIONS (Contd.,)

100	Automatic Power Factor Correction (APFC) Panel	Larsen & Toubro	
		GEC	
		Siemens	
		ABB	
		Epcos	
101	Power Factor Improvement Capacitor Banks	Larsen &Tubro	
		Siemens	
		EPCOS	
		GE	
		ABB	
102	HT Switch Gear 66 / 33 / 11KV 3 Phase, Gas Circuit Breaker circuit breaker SF-6 Type	Crompton Greaves, Mumbai	
		Schneider, Mumbai	
		ABB ltd, Bangalore	
		Siemens ltd, Mumbai	
103	HT 11 KV, 3 Ph Automatic Switch Fuse Unit	ABB ltd, Bangalore	
		ARREVA T&D India Ltd, Noida	
		Crompton Greaves, Mumbai	
		Schneider, Mumbai	
		C&S Electric Ltd	
104	Air Break Switch Gang Operated (33KV/11 KV) (Isolator)	Pacfit, Mumbai	
		Crompton Greaves	
		Jaipuria Brothers	
		HEI	
		BHEL	
105	Air-break Switch Gang (Isolators)	Mysore Electric Industries(MEI)	
		Southern Switchgear Mubai	
		Andrew Yule	
		Crompton & Greaves Mubai	
106	Arresters Lightening LT / HT	Oblum	
		BHEL	
		GEC-ELPRO	
		Crompton & Greaves Mumbai	
		AREVA T&D	
107	Change Over Switch / Starter / Contactor DOL/ Star-Delta/ Synchronous / Single phase preventer	Siemens	
		Larsen & Tubro	
		ABB	
		Crompton Greaves Mumbai	
		GE	
108	Main Switch Iron Clad / Fuse switch unit	Siemens	
		L & T	
		Crompton & Greaves	

PARTICULAR SPECIFICATIONS (Contd.,)

109	Transformers 66/11 KV, 33/11 KV, 33/0.433 KV, 22KV/11KV, 22/0.433 KV Copper Wound all rating	ABB Ltd, Bangalore	
		Siemens	
		Bharat Bijlee Ltd, Mumbai	
		Crompton Greeves, Mumbai (C&S electric)	
		Schneider Electrical	
		Alstom (GEC)	
		EMCO	
		BHEL	
		Andrew Yule	
		Kirloskar Electric	
110	Transformer 11 KV/433 V Step up/Step down, Indoor/ Outdoor type 11 KV upto 1000 KVA capacity Dry Resin Type	Schneider	
		Crompton	
		Kirloskar	
		ABB Ltd, Bangalore	
111	Transformers 33KV & 11 KV, Current & Potential	L & T	
		Siemens	
		Schneider	
		Crompton Greeves, Mumbai (C&S electric)	
112	Isolation Transformer	ITE GURGAON	
		VINTEK ELECTRONICS (VOLINA)	
		Chime Electronics Delhi (Brand-Sinetrac)	
113	Transformers 6.6KV / 433V three phase upto and including 100KVA	Indian Transformer, Gurgaon	
		Voltech Manufacturing Company Ltd (Voltech)	
		KOTSONS	
		VOLTAMP	
114	Transformers 11 or 6.6 KV / 0.433 KV Copper Wound, 500 KVA and Above	Crompton Greeves, Mumbai (C & G)	
		Bharat Bijlee Ltd, Mumbai	
		Andrew Yule	
		ABB	
		Schneider	
		Kirloskar	
		ECE	
115	Transformers 11 KV / 0.433 KV Copper Wound, 500 KVA upto 100 KVA	Voltamp Ltd, Baroda	
		M/S Indo Tech Transformers	
		Alstom (GEC)	
		ABB	
		Schneider	
		Bharat Bijlee Ltd, Mumbai	
		ESSENAR Transformer (P) Ltd	
116	Transformers 11 KV / 0.433 KV Copper Wound, Below 100 KVA	PME	
		Rajasthan Transformers	
		Everest	
		RK Industries	
		Pactil	
		Kotson	
		Hi tech Industries	
		Jaybee Ind (jaybeeti)	
		TransFab Power (I) Pvt Ltd	

PARTICULAR SPECIFICATIONS (Contd.,)

117	Cable Jointing Kit for 11 KV / 22 KV	Raychems	
		Densons	
		M-Seal	
		Birla -3M	
118	UG HT XLPE, PVC Insulated Conductor for 3.3 / 33 / 22 / 11 KV System	Cable Corporation of India, Mumbai (CCI)	
		Havells india ltd	
		Universal Cables Ltd,	
		Asian Cables	
		Gloster	
		RPG Cables Ltd, Thane	
		Finolex Cable Ltd Pune	
		KEI Ind	
		Polycab Pvt. Ltd	
		RR Cable	
		APAR Industries	
119	UG LT XLPE, PVC Insulated Conductor for 1100 Volts	Cable Corporation of India, Mumbai (CCI)	
		Finolex Cable Ltd, Pune	
		Polycab	
		Gloster	
		Universal	
120	Aluminum Conductor Steel Reinforced (ACSR)	All-Ind	
		ICC	
		Bharat Conductors	
		NICCO	
		Indian Aluminum Co	
121	Street Light fittings (MH / SV / LED)	Bajaj	
		Phillips	
		Wipro	
		Crompton	
		GE (GEC)	
		Havells India Ltd	
		Luker	
		Jaquar	
		FIEM Ind Ltd (FIEM)	
		Pyrotech Electronics Pvt Ltd	
		BENTEC Ind Ltd (BENLO)	
		Evereaday Indus Ind Ltd (Eveready)	
		Orient Electric	
		Polycab	
		Surya Roshini	
		Surya Roshnini Surya	
		Halonix Technologies Pvt Ltd (Halonix)	
		Shri Sant Krupa Appliances (SYSKA)	

PARTICULAR SPECIFICATIONS (Contd.,)

122	Solar Street light Fitting	Phillips	
		BHEL	
		Tata	
		Bajaj	
		Havells	
123	High Mast light	Bajaj	
		Phillips	
		Crompton	
124	Fluorescent tube light fittings/LED/ lamp holder	Wipro	
		Bajaj	
		Crompton	
		Phillips	
		Havells	
125	Flame Proof Light Fittings (LED) / Fan/ well glass /bulk head incl accessories.	M/S Sudhir	
		M/S Batiga	
		Flexipro Electricals, Nasik	
		M/S Shyam Switchgears, Mumbai	
		Bajaj	
		Crompton	
126	Florescent lamp Lt lamp	Phillips	
		Wipro	
		Bajaj	
		GE- Lighting GEC	
		Osram	
		Havells	
		Crompton	
127	Light fittings LED	Havells	
		Bajaj	
		Crompton	
128	LED Tube lights / bulbs	Phillips	
		Havells	
		Osram Lighting Pvt Ltd	
		Wipro	
		Bajaj	
		GE	
		Luker	
		Bentec Pvt Ltd	
		Eveready Indus Ind Ltd (EVEREADY)	
		Orient Electric	
		Polycab Pvt Ltd	
		Surya Roshini	
		Halonix Technologies Pvt Ltd (Halonix)	
		Shri Sant Krupa Appliances (SYSKA)	
		Jaquar & Company Pvt Ltd	
		Pyrotech Electronics Pvt Ltd	
		FIEM Ind Ltd	

PARTICULAR SPECIFICATIONS (Contd.,)

129	Electronic / Photoelectric Switch for Auto Op of Street Lts	Larsen & Tubro	
		GEC	
		Siemens	
		Bajaj Electricals	
		Legrand	
130	DBs/MCB(Miniature Circuit Breakers & MCCB (Moulded Case Circuit Breakers)	Larsen &Tubro	
		Legrand India Pvt Ltd	
		ABB	
		Schneider	
		Havells	
131	Microprocessor based MCCB /RCCB LT 415 Volts	Larsen &Tubro	
		Schneider	
		ABB India Ltd	
		Legrand India Ltd	
		Siemens	
		INDOASIAN	
		*C&S Electric Ltd (C&S Electric)	
132	Electrical Panel (LT)	L&T	
		Legrand India Pvt Ltd	
		Standard	
133	Electric Accessories, Piano Switches, Celling rose, call bells, Buzzers, Lamp Holders/ socket outlet, etc.	Panasonic Life Solutions (Panasonic Anchor)	
		Crabtree	
		Leader	
		Legrand India Ltd	
		Havells	
		C&S Electric Ltd (C&S Electric)	
		Panasonic Anchor	
134	Ammeter / Voltmeter / Power Factor/frequency Meters	IMP	
		Automatic Electric	
		L&T	
		Havells India Ltd	
		MECO	
135	Digital Meters with built in selector switches for Voltmeter, Ammeter, Frequency, Energy, KW, Power Analyzer	Larsen &Tubro	
		Automatic Electric	
		Enercon	
		Secure Meter	
		Havells India Ltd	
136	Modular Switches /Sockets	Legrand	
		Crabtree	
		Havells	
137	Electronic Energy Meters, Tamper Proof	Larsen &Tubro	
		Jaipuria Meters	
		Havells Electricals	
		Secure Meters India	
		Elemeasure	
		Bentec India Ltd (BENLO)	

PARTICULAR SPECIFICATIONS (Contd.,)

138	SCADA System	Schneider	
		Elemeasure	
		Forbes Marshal Pvt Ltd	
139	Ceiling Fan	Bajaj	
		Crompton	
		Khaitan	
		Havells India Ltd	
140	Exhaust fan / Air circulators	Crompton	
		Khaitan	
		Bajaj	
		Almonard	
		Havells India Ltd	
141	Fan Regulator	Anchor	
		Havells India Ltd	
		Bajaj	
		Usha	
		Khaitan	
		GEC	
		Legrand	
142	Electronic Type Fan Regulator	Legrand	
		Crompton	
		Havells India Ltd	
		Bajaj	
		Orient	
		V Guard	
		Polycab	
143	Geyser	Bajaj	
		Racold	
		Usha	
		Venus	
		Havells India Ltd	
		Jaquar	
		V Guard	
144	PVC Insulated Copper/Aluminium Cable 1100V of all types	Plaza cable	
		Finolex Cables	
		Anchor Electricals	
		Havells India Ltd	
		NICCO	
		Polycab Wres	
		RPG Cables	
		Gloster	
		RR Kabel	
		KEI Ind	

PARTICULAR SPECIFICATIONS (Contd.,)

145	PVC conduits (Rigid or flexible)/FRLS rigid PVC conduits/ fittings	Anchor	
		Modi	
		Pressfit	
		Precision	
		Astral	
		Panasonic life Solutions (Panasonic anchor)	
		POLYCAB WIRES PVT LTD (POLYCAB)	
146	PVC Tape	*GM Modular Pvt Ltd (GM)	
		Panasonic life Solutions (Panasonic anchor)	
147	MS conduit	BEC Industries	
		Kalinga	
		Jindal	
		Bharat	
		AKG Conduit Pipe	
148	Casing capping & Accessories	Precision	
		Modi	
		Presto Plast	
		Supreme	
149	Indicating Lamps Neon / LED Type	Larsen & Turbo	
		Siemens	
		ABB	
		Schneider	
		EPCOS India Pvt Ltd	
		Jaipuria	
150	DG Set (Engine)	Kirloskar	
		Cummins	
		Greaves -Cotton	
		Ashok Layland	
		Caterpillar	
		Sterling Gen	
		Mahindra	
151	DG Set (alternator)	Kirloskar	
		Stamford	
		Jyoti	
		Crompton Greaves	
		Alstom	
		AREVA	
		Bharat Bijlee	
152	DG Set Assembled with Sound Proof Canopy	Kirloskar	
		Jackson	
		Sudhir	
		Greaves -Cotton	
		Cummins India	
		Mahindra	

Signature of Contractor
Dated:

AGE (Contracts)
For Accepting Officer

PARTICULAR SPECIFICATIONS (Contd.,)**Annexure 'IV'****Notes applicable for all LED fittings**

- (i) The LED lights/luminaries supplied must meet the provision laid down in IS No.16101, 16102 Part I & II, 16103 Part I, 15885 Part II/ Sec 13, 16104, 16105, 16106, 16108:2012 and LM 70.
- (ii) All LED light products must have replacement warranty of 50,000 hours from the date of completion of the contract.
- (iii) The product will replace free of cost in the following cases:-
 - (a) Manufacturing defects.
 - (b) Failure due to mechanical and electrical impact.
 - (c) Drop in lumen (or lux at 1m) below 90% of claimed values of lumen (or lux at 1m) of the LED/Luminaries.
- (iv) The warranty will be provided on a case to case basis and shall be extended if above clause are included in contract agreement/supply order.
- (v) The firm must have all India foot print, its own R&D and should be a leading manufacturer of LED lights/luminaries.
- (vi) The contractor shall submit the following certificates from the manufacturer for LED light fittings (both light and driver)
 - (a) Surge protection certificate.
 - (b) Type test certificate LM-79, LM-80 for all luminaries along with detailed technical Catalogue duly signed and sealed by the manufacturer.
- (vii) Owing to continuous innovation and improvements in LED light fittings by manufactures the contractor shall provide latest version of LED fittings with high lumens output and system efficacy which are available in the market during execution of works.
- (viii) For any change in product or change in catalogue number etc due to technological up gradation letter has to obtain from the lighting company on their letter head signed by an official of National level only.
- (ix) All the LED fittings shall be identified by printing or fixing stickers duly mentioned the CA number and date of completion.
- (x) Sample approval must be obtained for any type of LED Light fittings before incorporating in works.

Signature of Contractor**AGE (Contracts)
For Accepting Office**

PARTICULAR SPECIFICATIONS (Contd.,)**Appendix "F"****1. DESIGN PARAMETERS**

1.1 Structural design (for vocational lab building) and structural drawings for super structure and foundations for all buildings/structures included in BOQ shall be prepared so as to comply with the provisions for design and analysis of steel/concrete structures as per latest editions relevant IS Codes.

2. MATERIAL SPECIFICATIONS**2.1 Concrete**

(i) RCC in column and its footing, plinth beam, lintel beam, RCC roof beam, RCC slab sun shade, M-25 (Design Mix) as per IS-456-2000 or higher grade if required.

3.0 DESIGN LOADS

3.1 DEAD LOAD: Self weights from all supported and supporting elements and as per provisions of IS 875 (Part-1)

3.2 LIVE LOAD: As per provisions of IS: 875 (Part-2)

3.3 WIND LOAD: As per provisions of IS: 875 (Part-3)

3.4 SEISMIC LOAD: As per provisions of IS: 1893 with Importance Factor– 1.5, Earthquake Zone-III shall be considered.

3.5 OTHER LOAD: Temperature, erection, crane loads and other loads will be considered as per relevant data provided or as per any other IS Code relevant to the design of these bldgs. Collateral Load shall not be less than 25kg/sqm.

3.6 LOAD COMBINATION: As per provisions of IS: 875 and IS: 800

3.7 Design life of structures shall be taken as 100 years.

4.0 GUIDE LINES FOR DESIGN FOR PEB BUILDING

4.1 The structure shall be designed as per IS 800, IS 456 and other relevant IS codes with wind and seismic load prevailing at location of proposed building. If IS code is not available the design shall be done/checked as per the relevant American design codes. Column footing and column, plinth beam, lintel beam, RCC roof beam, RCC roof slab, RCC roof projection, sun shade over openings shall be designed in accordance with IS standards as applicable.

4.2 Designer to ensure that substructure (Foundation) is able to physically accommodate the required anchor bolts and that the sub-structure is designed for proper transfer of loads from super structure to the foundation.

4.3 Following guidelines shall be followed in design : -

(i) Structures shall be designed for RCC framed structure.

(ii) Normal masonry foundation below GL as per IS -1904 for supporting plinth beam and for dwarf wall.

PARTICULAR SPECIFICATIONS (Contd.,)**Appendix “F”**

(iii) **SBC (Safe Bearing Capacity)** for foundation design of stanchions as per soil investigation report **(to be provided by depts.)**.

(iv) From outside of KV school wall and area, addn back filling in footing of Addn Back filling in footing of columns and under floor for vocational lab building shall be carried out with approved earth which is included in the quoted rates

5.0 Analysis and design

(a) Analysis and design of vocational lab building shall be carried out as per IS 875, IS-1904 and RCC foundation as per IS 456 and any other relevant IS codes. Structure shall be designed as per Limit state method and shall be checked for limit state of serviceability.

(b) Structural analysis and design shall be carried out using STAAD Pro connect edition latest version. Structural design shall be carried out for seismic as well as wind loads in addition to dead load and live load.

(c) Notional Horizontal Load as per IS 875 shall be applied on structure and checked.

(d) The interaction relationship for combined axial force and bending moment shall satisfy as per / relevant sections of IS.

(e) Structure shall be checked for combined shear and bending as per Section of IS.

(f) Deflection both lateral & vertical shall be within the limit as per IS.

(h) Transfer of horizontal forces due to wind and EQ to the foundation should be ensured by proper means. Uplift due to wind and EQ should be checked for beam and column foundations.

(l) Erection loads to be considered while designing for reversal of stresses.

6. The following requirement shall be met with while preparation of structural drawings :-

(a) The structural drawings shall be drawn to a scale sufficient for clear interpretation by executives.

(b) Every sketch shall be given as serial number so that it can be uniquely referred to along with sheet No e.g. “Section of Beam PB-(Drawing No 5) Sheet No 8/9 etc”. Reference number shall be taken by the consultant from client.

(c) The tenderer must familiarize himself with the general format of structural drawing followed in the office of the client and prepare his drawings accordingly.

(d) The structural drawing should give Reinforcement and dimensions of various structural elements of RCC structural members. Detailing of reinforcement bars must be given exhaustively and clearly so as to be totally unambiguous for executives.

PARTICULAR SPECIFICATIONS (Contd.,)**Appendix “F”**

- (d) Notes regarding steel structure shall be mentioned in detail. All details of all the joints at column, beam, slabs etc, details shall be shown in drg. Complete fixing detail of RCC structure with RCC columns shall also be shown.
- (g) Notes regarding various RCC details i.e. type of cement, RCC, Reinf steel, acceptance criteria of concrete, quality of water, cover to reinforcement etc shall be mentioned on drgs in details.
- (h) Cross section and details of main structural members showing cross section details and specifying the dimensions.
- (j) Marking plan showing the column and foundation (showing different segments of wall below plinth beam, plinth beam etc)
- (l) RCC Roof framing plan and details showing all the junction and cross section (different section of roof, beam & wall)
- (m) Foundation plan and its details shall be clearly shown on drawings.
- (o) General arrangement drawings for floor & roof plan, elevation and other details.
- (p) The vetting agency will be liable and answerable for any design deficiencies detected during design life of the vocational lab Bldg (Educational Building) of G+2 and may be called upon to address such issue if any.
- (q) Structural designer signing the drawings must have M.Tech (structures) with minimum 2 years experience.
- (r) Certificate as under shall be given duly signed by structural designer on each structural drawings:-

Certificate:-

“It is certified that the design/specifications included in these drawings are in accordance with the current Govt. policy, IS codal provisions, NBC guide lines and sound engineering practice and earthquake resistant design for Seismic Zone –III”

- (s) A blank certificate as under shall be printed on each drgs :

“Design is checked as for input parameters, earthquake zone, loads, grade of concrete and grade of steel.”

(Space shall be left below certificate for signature by deptt representatives)

PARTICULAR SPECIFICATIONS (Contd.,)**Appendix “F”****7. CHECKING BY CLIENT [GE (AF) Sambra] :-**

(a) Tenderer/Consultant shall firstly submit preliminary drawings showing locations of beam, column layout and sizes for architectural coordination by architect section of deptt. After Architectural coordination, structural design and drawings shall be done by consultant.

(b) Name, address, qualifications and mobile/phone No of the structural engineer shall be mentioned on the letter head of tenderer along with preliminary report.

(c) Tender/consultant shall submit draft design report for checking by client containing all the input and design data, load calculations, load combinations, STAAD input and output file along with preliminary structural drawings. Soft copy of STAAD input file (.std extension) should also be sent to this office for approval prior to vetting from designated institute. STAAD model should have Nil error on running the analysis and design.

(d) Competent qualified rep of tenderer/ structural designer shall be available during checking for necessary clarification/explanation to the client at the appointed date and time. The modifications/changes, if any, suggested by the client shall be incorporated. Checking by the client will not absolve the tenderer's responsibility from ensuring structural soundness.

8. Third party vetting/proof checking

(a) The vetting of structural design (including all design calculations) and drawings shall be got done from any NIT/IIT/IISc Bangalore. The cost of the same is deemed to be included in quoted rates and nothing extra will be admissible.

(b) The vetting of structural design and drawings shall be from the designated institute (duly signed by authorized signatory on behalf of the Institute) and not from a professor/individual of the institute in his personal capacity. The institute vetting the designs and drawings shall ensure that the designs and drawings are in compliance as per laid down IS Standards, regulations and sound engineering practices.

(c) A certificate that all details have been thoroughly checked and are in compliance to standards, codes, regulations in respect of safety and soundness shall be obtained from vetting agency by the consultant and shall be submitted to the department.

Note: If the Auth signatory of institute is not a faculty of Structural Engg, the drawings shall also be signed by Prof/faculty of Structural Engg

(d) Vetting agency will also be liable and answerable for any design deficiencies detected during design life of the structures and may be called upon to address such issues, if any.

PARTICULAR SPECIFICATIONS (Contd.,)**Appendix "F"****9. Submission of final documents**

- (a) Structural design and structural drawings shall be signed by a person having M.Tech in Structure qualification with Min 02 years experience.
- (b) Consultant shall submit the following documents duly vetted within time period as specified.

(i) Final Design Folder including all design calculations, STAAD file, Auto CADD drgs hard copy as well as soft copy in a CD. : 01 Folder & CD

Note: structural designer qualification and experience certificate to be attached in design folder

(ii) Original Tracings of all drawings. : 01 set on tracing paper
(Duly signed by structural designer and Vetted by Vetting Institute)

(iii) Printout of drawing : 06 set of each drg
(Duly signed by structural designer and Vetted by Vetting Institute)

- (c) The documents submitted by the tenderer/consultant shall be scrutinized by the dept and any observations raised and clarifications sought by the dept shall be replied/clarified by the tenderer/consultant to entire satisfaction of the dept within seven days of communication from the dept. The tenderer/consultant shall also attend the office of the GE (AF) Sambra, if so called for personal discussions and clarifications without any extra cost to the dept.

- (d) Tenderer/Consultant shall also provide any midterm review of design requirement during currency of work due to site requirement without any extra cost to the dept.

10. Liability of Contractor, Structural Consultant and Vetting Institute : The overall responsibility shall also rests with the Contractor, Structural Consultant & Vetting Institute after acceptance of tender for faulty structural design and drawings and defect/ damage detected in designed infrastructure due to faulty design during its design life.

11. Delay : The tenderer will be held accountable for delays in providing the final design and drgs.

**AGE (Contracts)
For Accepting Officer**