

PARTICULAR SPECIFICATIONS**NAME OF WORK:- ADDITION /ALTERATION AND SPECIAL REPAIRS TO HANGARS WITH ALLIED BUILDINGS AT DAMAN****1.0 GENERAL**

- 1.1 The following specification shall be read in conjunction with the General Condition of Contracts IAFW-2249 and IAFW-1779A including Errata/Amendments thereto. If any provision in these Particular Specification is at variance with that of the aforesaid documents, the former shall be deemed to take precedence there over.
- 1.2 The work under this contract shall be carried out in accordance with Schedule 'A', the particular specifications, drgs and other provisions in MES Schedules read in conjunction with each other.
- 1.3 The term 'General Specifications' referred to in clause 1.1 hereinbefore as well as referred to in IAFW –2249, General Conditions of Contract shall mean the specifications contained in MES Standard Schedule of Rates 2009 Part I and 2020 Part II including errata and amendments.
- 1.4 General Rules, specifications, special conditions and all preambles in the MES Schedule shall be deemed to apply to the works under this contract. Unless mentioned otherwise in these tender documents, the provision in these tender documents shall take precedence over the aforesaid provisions 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.
- 1.5 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.
- 1.6 Rate quoted for a particular item quoted by the tenderer shall be deemed to include for any 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.

2.0 SCOPE OF WORK

- 2.1 The scope of work of this contract is for full, final and entire completion of all items of works in BoQ in connection with "**ADDITION /ALTERATION AND SPECIAL REPAIRS TO HANGARS WITH ALLIED BUILDINGS AT DAMAN.**"

3.0 SITE CLEARANCE

- 3.1 After completion of the work and before handing over any building, the area around shall be cleared as directed to the entire satisfaction of the Engineer-in-Charge.

PARTICULAR SPECIFICATIONS**4.0 DEMOLITION/DISMANTLING**

- 4.1 Demolition/dismantling/taking down work shall be carried out all as specified in SSR Part I Section 21. Proper precaution shall be taken while demolition and any damage made by the contractor through negligence shall be made good at his own cost.
- 4.2 All materials other than items mentioned in the Schedule of Credit having salvage value shall be handed over to department at MES store yard i.e. place of issue of Sch 'B' stores. However the demolished materials which have no salvage value as decided by the EIC and rubbish shall be filled in low lying areas or disposed off at the site as directed by EIC.
- 4.3 All dismantled materials as listed in Schedule of Credit shall become the property of contractor. The materials will be removed from the site only after the recovery has been made from the contractor and after obtaining written instructions from EIC.
- 4.4 Demolished surfaces shall be made good by using cement mortar 1:4 as directed by the Engineer in Charge.
- 4.5 All demolished and disposable materials which are not in reusable condition, as mentioned in Schedule 'A' shall be removed, spread and levelled at places at a distance mentioned under Sch 'A' item and all as directed by the Engineer-in-Charge. Debris shall be cleared from the site from time to time as directed by and to the satisfaction of Engineer-in-Charge, failing which the cost of the debris removal as worked out by the Engineer-in-Charge shall be withheld from the next RAR payment due to the contractor. The decision of Engineer-in-Charge on the value of withheld amount shall be final and binding.

5.0 EXCAVATION IN TRENCHES/OVER AREAS

- 5.1 Excavation in trenches/over areas shall be carried out in type of soil mentioned in the BOQ. Bailing and pumping of water, if required, will be done as described in para 3.17 of MES Schedule Part I. No extra payment shall be admissible for the above mentioned operation. If however an inflow of water into excavation is caused by powerful springs, tidal or river, seepage, broken water mains or drains and the like (other than those broken through the contractor's negligence), the contractor shall immediately inform the GE. If in the opinion of the GE the inflow is due to any of these causes, he shall issue instructions, in writing as to the method to be employed for clearing the water from excavation and additional payment shall be allowed as a Deviation Order.
- 5.2 In case timbering to excavation is required the same shall be specifically ordered by the GE in writing and shall be paid as deviation.

5.3 FILLING IN TRENCHES/FLOORS

- 5.3.1 The approved earth from excavation in foundations shall be used for filling in trenches/floors and any other situations after removing big stones, grass, roots and vegetations and other organic matters. Earth mixed with small stones/ pebbles is permitted to use in filling if approved by GE. The filling around pipes, after the pipes are laid and tested shall, however be with earth free from pebbles/stones.
- 5.3.2 Filling under floors/sides of trenches shall be in layers not exceeding 250mm and each layer shall be watered, compacted and well rammed as approved by Engineer-in-Charge.
- 5.3.3 Surplus soil shall be removed and spread at places as directed by the Engr-in-Charge, at a distance as specified in schedule 'A'.

PARTICULAR SPECIFICATIONS**6.0 CONCRETE WORK****6.1 CEMENT****6.2 SPECIFICATIONS FOR CEMENT TO BE PROCURED BY THE CONTRACTOR**

6.2.1 General: 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, SSR, IS Specification as amended and particular specifications given hereinafter.

6.2.2 Irrespective of what is indicated in drawings, type of cement for the subject work shall be OPC 43/53 grade/PPC. The OPC cement shall conform to specifications as per IS 269-1989, IS 8112-1989 and 12269-1987 and the PPC cement shall conform to specifications as per IS 1489 (Part-I)-1991. However, mixing of OPC and PPC shall not be permitted in the entire project till completion.

6.3 Sources of Procurement

6.3.1 Cement shall be procured by the contractor directly from any of the main producers as stated below :-

(i) ACC (ii) Ultra Tech Cement Ltd (iii) The India Cement Ltd (iv) Dalmia Cement (Bharat) Ltd (v) Century cements (vi) Saurashtra Cement (vii) The Ramco Cements Ltd (viii) Mangalam cement Ltd (ix) Birla Corpn Ltd (Cement division) (x) Orient cement (xi) Nuvoco Vistas Corporation Ltd. (xii) Shree cement (xiii) JK cement (xiv) Jaypee Rewa cement (xv) Ambuja Cement (xvi) J K Lakshmi cement Ltd (xvii) My Home Industries Ltd. (xviii) Chettinad Cement Corporation Ltd. (xix) Wonder cement Ltd. (xx) M/s Sagar Cement Ltd (xxi) Ambuja Cement Ltd

Note:- Any manufacturer not included above but already approved by E-n-C Branch and also approved during execution shall be deemed to be included without any price adjustment.

6.3.2 The Contractor shall furnish the particulars of the manufacturer/supplier of cement along with the date of manufacture to the Garrison Engineer for every lot of cement separately. The cement so brought shall be fresh and in no case older than 60 days from the date of manufacture. The documents in support of the purchases of cement shall be verified by the Garrison Engineer. Before placing the order for supply of cement by the contractor, he shall obtain written approval from the GE regarding name of manufacturer, quantity of cement etc. Cement shall be procured for minimum requirement of one month and not exceeding the requirement of the same for more than two months at a time. 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 clause 10.2.1.1 and Annexure 'B' of IS – 1489 of 1991 part I.

6.3.3 Testing of Cement

6.3.4 The contractor shall submit the manufacturer's test certificate in original alongwith test sheets giving the results of each physical test as stipulated in accordance with relevant IS provision and the chemical composition of cement or authenticated copy thereof duly signed by the manufacturer with each consignment, as per the following IS provision :-

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- (a) Method of sampling hydraulic cement as per IS-3535-1986.
- (b) Methods of physical test for hydraulic cements as per IS-4031.
- (c) Method of chemical analysis of hydraulic cement as per IS-4032-1985.

The test certificate and test sheet shall be furnished with each batch by 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 contractors as given in the format hereinafter for verification.

- 6.3.5 The contractor shall however, organize setting time and a compressive strength test of cement through designated 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 of 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 day 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.
- 6.3.6 The GE shall carry out independent testing as per the tests mentioned in the 'CEMENT SUPPLY / ACCEPTANCE FORM' of random samples of cement drawn from various lots. The testing shall be carried out through national test house, SEMT wing of CME, Regional Research Laboratories, Govt approved Laboratories, command Laboratories as per IS-3535-1986 (method of sampling hydraulic cement) and IS-4031 (method of physical test for hydraulic cement) and IS-4032-1985 (method of chemical analysis of hydraulic cement) referred to above. The cement shall be tested both for physical and chemical properties as per relevant IS codes. In case the cement is not of requisite standard despite manufacturer's test certificate, the contractor shall remove the total consignment from the site at his own cost after written rejection order of the consignment by the GE. The cost of sample transportation and test shall be borne by the contractor irrespective of the results of testing.
- 6.3.7 The random samples as per relevant IS shall be selected by GE in accordance with IS 3535-1986 for independent or additional tests before carrying out testing. The cement shall be tested within one week on supply but before in-corporation of the same in works. Cost of testing transportation and materials used in testing etc shall be borne by the contractor and no extra claim whatsoever will 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.
- 6.3.8 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. Testing of cement shall be carried out in Govt approved and accepted only on satisfactory test results of the tests. All the expenditure for the testing of cement in Govt approved laboratory shall be borne by the contractor. Since all the facilities for testing of cement as per IS-4031-1985 are not available in command Lab the test results of testing of cement carried out in command Lab shall not be considered as final criteria for acceptance and these results may be considered for comparison of values only if required. In case testing is done command Laboratory, the recovery shall be made as per Appendix 'D' attached.
- 6.3.9 The contractor shall be required to set up adequate testing facilities at site to the entire satisfaction of Garrison Engineer for conducting the tests as per IS codes referred to hereinbefore for the samples collected from the lot brought at site. These tests shall be carried out within 7 days of receipt of cement at site. The tests can alternatively be carried out at the command /Project laboratory, or any other recognized laboratory so designated by GE at Contractor's expense.

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6.3.10 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 along with the relevant documents to ensure the requirements as mentioned here in before, before acceptance. The original purchase vouchers and the test certificates 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 JE (Civil), Engineer-in-Charge, GE and the contractor. The contractor shall maintain schedule of supply of cement for each consignment.

6.3.11 The Accepting Officer may order a board of officers at different stage of work (6 stagefixed by GE) for conducting random check of cement and verification of connected documents during the currency of contract. The cost of samples, transportation and tests, if any, shall be borne by the contractor.

6.4 Storage/Accounting/Preservation of Cement.

6.4.1 Cement shall be stored in covered go down over dry platform at least 20 cm 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 20 cm away from floors and walls. 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 engineering 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 tested and untested consignment 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.

6.4.2 Stacking of cement shall be done as per relevant IS and as under :-

(a) Each cement consignment shall be stacked separately and removal shall be made on the basis of 'First in First out'.

(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 cross wise so as to tie the piles together and avoid danger of topping over.

(d) Adequate space shall be kept between two stacks.

(e) Tested and untested cement are segregated and stored with distinct identification.

6.4.3 Cement go down 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 authorized agent at site of works so that cement is removed from the go down only according to 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 reason, the same shall be removed from the cement go down on written orders of the GE and suitable replacement for the cement bag(s) so removed shall be made and no claim, whatsoever, shall be admissible on this account.

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- 6.4.4 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.
- 6.4.5 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.
- 6.4.6 PPC cement should meet the strength criteria of 43 grade OPC as laid down in IS 8112 - 1989. However, stripping time shall not be less than 14 days at any location. The contractor shall not claim anything extra whatsoever on account of use of PPC.
- 6.4.7 Mixing of OPC and PPC shall not be allowed in this work
- 6.4.8 PPC cement should meet the following requirements are to be ensured and certificate to this effect is to be obtained for each batch from the manufacturer.
- (a) The quantity of fly ash is strictly as per IS 14989 (Part I) 2002
 - (b) Fly ash is inter-ground with clinker not mixed with clinker.
 - (c) Dry fly ash is transported in closed containers and stored in silos. Only pneumatic pumping should be used.
 - (d) The fly ash used is received from thermal power plants using high temperature combustion above 1000 °C should be used
- 6.5 **SCHEDULE OF SUPPLY-** The GE in consultation with the contractor will work out the schedule of procurement in accordance with agreed CPM chart and ensure that it is adhered to. This schedule shall be vetted by the CE's office from time to time. The contractor shall procure the cement timely. 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.
- 6.6 **Measurements and Payment of Cement.**
- 6.6.1 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 duly checked by GE.
- 6.6.2 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. Cement shall be paid as material lying at site as per condition 64 of IAFW-2249. Rate of cement given in SSR shall be applicable for cement irrespective of grade of cement specified for use in the work.
- 6.7 **FINE AGGREGATE:** Fine aggregate shall be conforming to material specification and grading within the limits of grading Zone I to III as specified in Clause 4.4.1 to 4.4.7 of SSR Part I. Fine aggregate shall be natural river sand and shall be obtained from any source as approved by GE. Sand shall be free from admixture of clay, loam, silt, organic matters etc and the sand shall be washed before use. The percentage of deleterious materials shall not exceed the permissible limits laid down in IS 2386- A[Part I] . In the alternative manufactured **sand/manufactured fine aggregate** conforming to grading and other characteristics Zone I to III and other requirement in all respect as per IS 383-2016& IS 2430 may also be used without any price adjustment. The Manufactured sand shall be from clean hard stone / aggregate to required grading and shall be free from all deleterious materials. Sand obtained from quarry dust by washing and screening method shall not be used.

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- 6.8 **COARSE AGGREGATE:** Coarse aggregate for all concrete work ie PCC/RCC shall be crushed or broken stone (granite) aggregate and shall be as specified in Clause 4.4.1 to 4.4.7 of SSR Part I. The same shall be obtained from approved quarries.
- 6.9 **GRADING OF COARSE AGGREGATE:** Graded aggregate of nominal sizes given hereunder, shall be used, unless specified otherwise.
- (a) Reinforced cement concrete
- (i) For structural elements of depth/thickness more than and including 100mm-20mm
 - (ii) For structural elements of depth/thickness less than 100mm-12.5mm
- Note:** However, in no case the nominal size of Aggregate shall be greater than one fourth the minimum size of the member.
- (b) Plain concrete
- (i) Under 30mm thickness : 12.5mm
 - (ii) 30 to 80mm thickness : 20mm
 - (iii) Exceeding 80mm thickness : 40mm
- 6.10 **WATER:** Water shall conform to the requirements stipulated in IS-456-2000 and as per clause 4.9 of MES Schedule.
- 6.11 **CURING :** The contractor shall take necessary arrangement to maintain an environment of high humidity around the freshly placed concrete till it attains reasonably good strength and proper curing. Contractor shall follow any of the following method of curing while execution of work based on the site conditions :-
- Ponding or immersion of water
 - Fogging or spraying of water
 - Moist fabric covers
 - Covering by plastic sheets
- 6.11.1 Recovery @ 0.25 % of total cost of concrete at contract rate shall be recovered as penalty in case of improper curing and cracks if any are noticed by GE or by the Dept official at any stage.
- 6.12 **IMPORTANT REQUIREMENT OF CEMENT CONCRETE: -**
- 6.12.1 The cement plain concrete shall be mixed in mechanical mixer of Hopper type. The mixing shall be continued until there is a uniform distribution of the materials and the mass is uniform in colour and consistency. If there is segregation after unloading from the mixer, the concrete shall be re-mixed. The mixing time may be taken as 1-1/2 to 2 minutes. For smaller quantity up to 2 cum of concrete per day i.e. for concreting to cills, bed blocks etc hand mixing may be carried out with written permission from GE. The mixing of concrete shall be as per clause 10.3 of IS 456 2000". Where 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 colour and consistency.
- 6.13 **PRECAST CONCRETE ARTICLES :** – shall be of the grade or mix as indicated in the schedule and cast in forms or moulds as per clause 4.20 of SSR Part I.
- 6.15 **INTEGRAL WATER PROOFING COMPOUND:** Wherever integral water proofing admixture is specified or indicated to be mixed to concrete/mortar, plaster etc. The percentage of integral water proofing compound to be added shall be as per manufactures instructions. Integral water proofing compound shall conform to IS-2645:2003 and shall be ISI marked and shall either be powder or in liquid form.
- 6.16 **TESTING OF BUILDING MATERIALS :** Test for building materials shall be conducted as per IS requirement as directed by the GE. The Contractor shall provide necessary samples; make adequate arrangement for transportation and testing of the same. Testing charges

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shall be paid by the Contractor. Recovery on account of testing charges shall be made from the Contractor for various tests conducted in MES project lab as per Appx 'E' enclosed. The test for which the facility is not available in MES lab shall be got done by contractor in approved lab outside MES and the testing charges as charged by the concerned authorities shall be borne by the contractor as provided in condition 10A of IAFW-2249, General Conditions of contracts and no claims, whatsoever, shall be entertained on this accounts.

7.0 BRICK WORK

7.1 Bricks shall be kiln burnt locally available best quality, and as per samples kept in GE's office. Bricks shall be without frog unless specified otherwise in Schedule 'A' Notes or drawings, bricks shall have minimum crushing strength of 35 Kg/Sqcm. Water absorption of bricks shall not exceed 20% when tested in accordance with IS-3495 of 1966. Sampling and testing of bricks shall be carried out as per IS-5454 (1978) and IS- 3495 (1966). The size of brick shall be 220 x 105 x 65mm with a tolerance of $\pm 8\%$.

7.2 CEMENT: Refer clause 6.1 to 6.6 hereinbefore.

7.3 SAND:- Sand for mortar shall be as specified in clause 5.4 of Section 5 of MES Schedule Part I and shall be obtained from sources as mentioned in clause No 6.7 hereinbefore. Crushed stone sand shall not be used for plastering.

7.4 WORKMANSHIP

7.4.1 Unless otherwise specified hereinafter and/or shown in drawings, brick work in various situation shall be built in cement mortar as under:-

(i) Brick work in half brick thick or less and brick work below ground level including foundation. - Cement and sand mortar (1:4)

(ii) Brick work in all other locations - Cement and sand mortar (1:6)

7.4.2 Half brick thick wall shall be constructed from top of sub-base in ground floor and from top of RCC slab in upper floors. Half brick thick wall of height more than 90 cm shall be reinforced with two 6mm dia MS bars horizontally at every fourth course starting from 2nd course and anchored in walls at junctions. The anchor age length provided shall be not less than 100mm. RCC band of size full width of half brick wall x100mm with four Nos 6mm MS bars as longitudinal reinforcements and 6mm dia MS bars stirrups at 150mm centers, unless otherwise shown in drawing shall be provided a lintel level or opening height level.

7.4.3 In the event of deviations, brick work all as specified above, shall be priced at the applicable rates in MES Schedule(Part II) for materials and labour with sub class'B' bricks, subject to Contractor's percentage, as applicable and no adjustment in rate shall be made for use of bricks with crushing strength of more than 35 kg/sqcm.

7.4.4 Width of concrete lintels, beams, cills, columns and the like coming in conjunction with brick walls/pillars shall be kept to the actual width of brick of that place unless offsets have been specially shown, in which case the width as shown on drawings shall be maintained. Centre line dimensions of rooms, verandha etc shown in drawing shall be maintained. Internal and overall dimensions, if at variance from whatever shown in drawings, shall be deemed to have been amended accordingly. The dimensions for various height shall be maintained as shown on the drawings.

7.4.5 Mortar bed joints shall be such that four courses of brick work and there joints taken consecutively shall measure 3 cm to 4 cm in addition to the combined height of bricks

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themselves. The provision regarding above made in Para 5.26 of MES schedule shall be deemed to be modified accordingly and no price adjustment shall be done on this account. The vertical joints shall also be of the same thickness of bed joints.

7.5 CURING. Masonry work shall be kept constantly moist for a minimum period of 7 days.

8.0 FORM WORK

8.1 Form work shall comply with requirements of clause 4.11.6.1 to 4.11.6.5 and 7.15.1 to 7.15.10 of MES Schedule (Part I).

8.2 Form work shall be of steel only. It shall be of adequate strength. However, timber may be used by the contractor for lintel, edging etc. In case of any deviation involving form work, the pricing shall be done at the rates of timber form work rough finish. Nothing extra shall be paid for used of steel or ply wood form work.

9.0 JOINERY

9.1 TIMBER: Timber for all wood work shall be second class hard wood unless otherwise specifically mentioned.

9.1.1 Timber for all joinery and wood work shall be as per specifications given in clause 7.3 of the MES Schedule part I and shall be within the permissible limits of defects defined in clauses 7.4 and 7.5 of the MES Schedule Part I. Second class hard wood shall be any of the approved species available at Jamnagar as approved by GE.

9.1.2 Timber shall be well seasoned (whether air or kiln dried) at the discretion of the contractor but without any price adjustments. The moisture content of timber shall not exceed the limits laid down vide clause 7.7 of the MES Schedule Part I.

9.2 PRESERVATION OF TIMBER

9.2.1 Preservation/antitermite treatment shall be carried out to all wood work and joinery fabricated by the contractor at site. Factory made ply/boards are not to be treated with any chemical. The timber used for fabricating wood work/joinery shall be pressure treated.

9.2.2 Chemical used for antitermite treatment to wood work and joinery shall be copper NAPHTHENATE or any other chemical specified in IS : 401-1982 applied in any one of the manners specified in ibid IS.

9.3 Species of Timber: The species of timber and prefabricated wood products (ie plywood, wooden particle boards etc) shall be as specified below:-

- (i) Paneled/wire gauzed door shutter - Factory made shutter 2nd Class Hard Wood.
- (ii) Wooden frame for doors, windows cupboards, glazed shutters of windows ventilators etc where indicated of wood. -2nd class hard wood(Conforming to IS)
- (iii) Any other wood work not specified elsewhere -2nd Class Hard wood (Conforming to IS)

9.4 Skeleton shutters: Second class hard wood skeleton door / window shutter shall be Factory made, well seasoned and all as specified here in before.

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9.5.1 Flush door shutter shall be solid core types with block core or particle board core, as specified in the BoQ and shall conform to IS 2202 (Part I) - 1999, Specification for wooden flush door shutters (solid core type) Part I plywood face panels; except with regard to the sizes of shutters which shall be as indicated/ directed at site. Flush door shutters shall be non- decorative (commercial) type; or decorative type where indicated.

9.5.2 Tolerance on nominal thickness shall + 1.2 mm. Thickness of shutter shall be uniform throughout with the variation not exceeding + 0.8 mm when measured at any two points.

9.6 FIXING OF SHUTTERS

9.6.1 Shutters shall be fixed to the frames all as specified in Clause 8.26 of MES Sch Part I.

9.7 PVC DOOR FRAMES/ SHUTTERS

9.7.1 PVC door frames and shutters shall be provided as specified in the BoQ and as per manufacturer's instructions and as specified in the MES Schedules.

9.8 UPVC DOORS/ WINDOWS/VENTILATORS

9.8.1 All windows/ doors/ ventilators frame and shutters shall be made up of UPVC extruded hollow profiles. White UPVC extruded hollow profiles used in the work shall conform EN 12608-1:2016 and surface covered UPVC extruded hollow profiles shall conform to BS 7722.

9.8.2 Fabrication and fixing shall be done as per standards mentioned in UWDMA guidelines.

9.8.3 OPTIMA series of UPVC sections shall be used for window/ door/ ventilators upto size of 1200mm x 1200mm and INVENTA series of UPVC sections shall be used of size above 1200 x 1200mm.

9.8.4 Appropriate hardware fittings, locking arrangements, handles and hinges shall be provided as per manufacturer's instructions and as directed by Engineer-in-charge.

9.8.5 The glass panel shall be all as specified in the BoQ. Ground/ figured glass shall be provided to the windows/ ventilators of toilet/ bath/ WC.

10.0 BUILDER'S HARDWARE

10.1 All articles of builders hardware shall bear ISI marking. In case ISI marked particular item is not manufactures, it shall conform to the relevant IS and specifications given in MES Schedule.

10.2 Screws used for fixing items of builders' hardware shall be steel chromium plate screws.

10.3 Articles of builders' hardware shall be provided as specified in the BoQ and as specified above.

10.4 MORTICE LOCK

10.4.1 Mortice lock shall conform to IS 2209-1976 and all as specified in Clause 9.9.2 of MES Schedule Part I and as specified in Schedule 'A'.

10.5 HYDRAULIC DOOR CLOSER

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10.5.1 Hydraulic door closer shall be as specified in Clause No. 9.16 of SSR Part I and shall conform to IS: 3564-1995. Door closer body shall be of aluminium (die cast) and as specified in Schedule 'A'.

10.6 FLOOR SPRINGS

10.6.1 Floor springs shall comply with IS 6315-1992, Specification for floor springs (Hydraulically regulated) and as specified clause 9.17 of SSR Part I in for heavy doors suitable for doors weighting up to 125 Kg. These shall be single action or double action type as specified in Schedule 'A'. Foundation box, main body and half cover shall be of minimum 1.25 mm thick mild steel sheet or aluminium alloy sheet or brass sheet as indicated. The floor springs shall operate smoothly and easily without undue delay during opening and closing operation. The floor springs shall be free from all mechanical defects, sharp edges, and any other visible surface defects. Mild steel parts shall be given phosphating treatment and thereafter two coats of enamel paint.

11.0 STEEL AND IRON WORK

11.1 General :- All items of steel which are required for the work under this contract shall be procured supplied and incorporated in the work by the contractor under his own arrangement.

11.2 GRADES AND QUALITY

11.2.1 Steel supplied by the contractor shall conform to the following grades and quality.

Sl. No	Purpose	Grade/ Quality
(a)	High strength deformed steel bars produced by Thermo Mechanical treatment process (In short called as TMT bars) for reinforcement.	Of grade Fe 500 / Fe 500D / Fe 550 /Fe 550D and meeting all other requirement of IS 1786-1985 (Reaffirmed) 1990. (Different grade of steel shall not be used in same building)
(b)	High strength deformed CRS bars produced by Thermo Mechanical treatment process (In short called as CRS TMT bars) for reinforcement.	Corrosion resistant steel TMT bars of grade Fe 500 / Fe 500D / Fe 550 /Fe 550D and meeting all other requirement of IS 1786-1985 (Reaffirmed) 1990. (Different grade of steel shall not be used in same building).
(c)	Mild steel for miscellaneous works	Shall conform to IS-432(Part-I). Grade wherever not shown/ indicated otherwise shall be of Grade I.
(d)	Structural steel (Refer Clause 10.4 Of MES Schedule Part-I (2009))	Steel for general Structural purpose shall be Grade Fe-410 W Quality A ISI marked (IS-2062) for all type of steel Structures including those subject to dynamic loading. Structural steel ordinary quality shall confirm to IS-1977
(e)	Galvanised steel sheets (Plain & corrugated)	Conforming to IS-277.
(f)	Fabric reinforcement for concrete	Conforming to IS-1566

11.2.2 For pricing deviations involving TMT bars the rates given in SSR part-II (subject to contractor's percentage) shall be applied irrespective of the grade of TMT bars.

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11.2.3 For pricing deviations involving steel for general structural purpose Gde Fe-410WA, the rate shall be applicable as per Gde Fe-410-W given in SSR Part II adjusted by applicable percentage for respective parts of Schedule 'A'.

11.2.2 For pricing deviations involving TMT bars the rates given in SSR part-II (subject to contractor's percentage) shall be applied irrespective of the grade of TMT bars.

11.2.3 For pricing deviations involving steel for general structural purpose Gde Fe-410WA, the rate shall be applicable as per Gde Fe-410-W given in SSR Part II adjusted by applicable percentage for respective parts of Schedule 'A'.

11.3 SOURCE OF PROCUREMENT

11.3.1 **REINFORCEMENTSTEEL AND STRUCTURAL STEEL**: All steel reinforcement and structural steel shall be procured directly from any of the primary producers mentioned below:

(i)	Rashtriya Ispat Nigam Limited(RINL)	:	For all types of TMT bars & structural steel
(ii)	Tata Iron & Steel Company(TISCO, or Tata Steel)	:	For all types of TMT bars & structural steel
(iii)	Steel Authority of India Ltd(SAIL)	:	For all types of TMT bars & structural steel
(iv)	M/s Gallantt Ispat Ltd, Gujarat (Gallant TMX)	:	For TMT bars of Gde Fe 500, Fe 500D & CRS only (Size 8-32mm)
(v)	M/s Rashmi Metaliks Ltd, W.B (Rashmi TMT)	:	For TMT bars of Gde Fe 500 & Fe 600D (Size 8-32mm), & Fe500D CRS (Size 8-20mm) & Fe 550D CRS (Size 25 -32 mm) only
(vi)	M/s Bajrang Power & Ispat Ltd, Raipur (GOEL TMT)	:	For TMT bars of Gde Fe 500, Fe-500D & Fe 550D, (Size 8-32mm) & Fe-500D CRS (Size 10-25mm) only
(vii)	M/s Real Ispat & Power Ltd, Chattishgarh (G K TMT)	:	For TMT bars of Gde Fe 500D only
(viii)	M/S Steel Exchange India Ltd, (AP) (SIMHADRI TMT)	:	For TMT bars of Gde Fe 500, Fe 500D HSCRS only
(ix)	M/s Super Smelters Ltd, Kolkata (Super Shakti)	:	For TMT bars of Gde Fe 500D & Fe 550 (Size 8-32mm) only
(x)	M/s Shyam steel Industries Ltd (WB). (SHYAM)	:	For TMT bars of Gde Fe 500D & CRS only
(xi)	M/s Jai Balaji Industries Ltd, (WB).(BALAJI SHAKTI)	:	For TMT bars of Gde Fe 500D & Fe-500D CRS (Size 8-32 mm) only
(xii)	M/s MSP Steel & power Ltd, Chhattisgarh (MSP TMT 500D)	:	For TMT bars of Gde Fe 500D (Size 8-32mm) only
(xiii)	M/s SPS Steels Rolling Mills Ltd, (WB), (ELEGANT TMT)	:	For TMT bars of Gde Fe 500D only
(xiv)	M/s Sugna Metals Ltd, Hyderabad (SUGNA TMT)	:	For TMT bars of Gde Fe 500D (Size 8-32mm) only
(xv)	M/s Shyam Metalics & Energy Ltd (SEL TIGER)	:	For TMT bars of Gde Fe 550D (Size 8-32mm) only
(xvi)	MS Jindal Steels and Power Ltd, Haryana (JINDAL PANTHAR)	:	For TMT bars of Gde Fe 500, Fe 500D, Fe 550, Fe 550D & CRS (Size 8-40mm) only
(xvii)	MS Jindal Steels and Power Ltd, (JINDAL)	:	For Structural steel only

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Note: - Any primary producer not included above but already approved by E-n-C Branch and also approved during execution shall be deemed to be included without any price adjustment.

11.3.2 In case of non availability of structural steel with primary producer manufactures, the same can be procured from approved producers / secondary producers approved by E-in-C's branch New Delhi (till the date of receipt of tender) with minus price adjustment with prior approval of accepting officer. The minus price adjustment shall be done @ 5% of accepted rates i.e. SSR Rate enhanced by deviation percentage / contractor's percentage as applicable as mentioned in the contract. In case any section is not being rolled / manufactured by primary producer, there shall not be any price adjustment on account of procurement of this section from approved secondary producers. List of approved secondary producers for structural steel is given below :

- (i) KL Steel Pvt Ltd, Post Box No 61, Lal Kuan, Bulandshahar Rd, Ghaziabad (UP)
- (ii) Shree Badrinarayan Alloys & Steels Ltd, 95, Stephen house, 4 BBD Bag, Kolkata-1
- (iii) Pushpak Steel Industries Pvt Ltd, Gate No -119, Anandi Market Rd, Dhanore, Tah Khed Pune
- (iv) Amba Shakti Ispat Ltd, Plot No 6, Phase II Industrial Area, Kala Amb, Dist-Sirmour-173030 (HP)
- (v) Shree Parashnath Re-Rolling Mills Ltd, Durgapur, 4C Maharshi Devendre Rd, 3rd floor, Kolkata – 7 (Phone- 033-2274 0045 / 4475)
- (vi) Tata Steel Structura, Tata Steel –Tube Division, 1st floor, 5 Sansad Marg, Delhi-1
- (vii) KL Concast Pvt Ltd, Z-18, Naraina, New Delhi
- (viii) Karam Steel Corp, Nasrali Rd, PO Box No 56, Mandi Gobind Garh – 147 301

11.3.3 Galvanised Steel sheet & Fabric Reinforcement for concrete: These shall be ISI Marked and shall be procured directly from Main manufacturers as approved by E-in-C's Branch.

11.3.4 The contractor shall within 15 days of placing of work order indicate the source for procurement of steel to GE in writing.

11.3.5 Steel sections for railing, gates, fencing, guard bars, grills, steel chowkhat, holdfasts etc., which do not constitute structural members, can be procured from main / primary /secondary producers/BIS marked manufacturers or their authorised dealers at the option of Contractor without any minus price adjustment. Test will not be insisted upon for such steel sections

11.3.6 The contractor should place their demand/requisition of steel with the producers with adequate lead time.

11.3.7 Steel, when procured from primary producers/approved secondary producers/authorized conversion agents of main/ primary producers (stipulated in above paras) shall have to be procured directly from the storage depots of the main / primary producers/approved secondary producers/authorized conversion agents and not from their authorized agents/dealers.

11.3.8 The particulars of the manufacturer/supplier of steel shall be submitted by the contractor to the Garrison Engineer prior to procurement for every lot of steel separately. The original documents in support of purchase of steel shall be verified by the site staff and Garrison Engineer and certified true copy of the result shall be retained in GE's office. The form given here in after will be used for this purpose.

PARTICULAR SPECIFICATIONS**11.4 TESTING OF STEEL**

- 11.4.1 The contractor shall submit the manufacturer's test certificate in original along with the Test Sheet giving the result of each mechanical test as applicable and the chemical composition of the steel or authenticated copy thereof duly signed by the manufacturer with each consignment. The Engineer-in-Charge shall record these details in Steel Acceptance Register (as per proforma given hereinafter) after due verification and send a certified true copy of test sheet to GE for his records. Any particular size of bar/steel section of any consignment, not meeting the requirement shall be rejected and the same shall be removed from the site by the contractor at his own cost and the contractor shall have no claim on this account.
- 11.4.2 Independent testing of steel by the GE shall be optional at the discretion of the GE in case of procurement of steel from main producers and testing charges shall be borne in accordance with Condition 10A of IAFW 2249 i.e. testing charges shall be borne by the Deptt if the test results are found in order otherwise these shall be borne by the Contractor.
- 11.4.3 Independent testing of structural steel by the GE shall be mandatory in case of procurement from secondary producers and testing charges shall be borne by the Contractor irrespective of the outcome of test results.
- 11.4.4 In both the cases at Para 12.8.2 and 12.8.3 above, the contractor at his cost shall provide all facilities required for the testing and cost of materials consumed in tests shall also be borne by the contractor.

11.5 FREQUENCY FOR TESTS ON STEEL

- 11.5.1 Reinforcement Steel: Nominal mass test, Tensile test, Bend and Rebound test shall be carried out as per minimum frequency given below: -

Sl No	Nominal Size of Bars	Frequency
(a)	Bar size less than 10 mm	One sample (3 specimens) for each test for every 25 tonnes or part thereof.
(b)	Bar size 10 mm to 16 mm	One sample (3 specimens) for each test for every 35 tonnes or part thereof.
(c)	Bar size over 16 mm	One sample (3 specimens) for each test for every 45 tonnes or part thereof.

- 11.5.2 Structural Steel: The tests shall be carried out as per the frequency mentioned below:-

Sl No	Test	Frequency
(a)	Tensile Test	One test for every 25 tonnes of steel or part thereof.
(b)	Bend Test	One test for every 25 tonnes of steel or part thereof.

- 11.5.3 Bend test and tensile test for structural steel shall be carried as per IS-226 of 1975. For high strength deformed bar tensile, bend test and rebend test shall be done as per IS-1786 of 1985. For MS bars tensile and bend test shall be carried out as per IS 432 of 1982.
- 11.5.4 GE has the right to get one more sample (3 specimen) tested if he is not satisfied with test result of the consignment.

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11.5.5 If the test results as per manufacturer's test certificate or of independent testing of random samples are not as per criteria laid down in the relevant BIS provisions, the entire consignment which is represented by the samples shall be rejected. Such rejected materials shall be removed and replaced by the contractor at his own cost forthwith.

11.5.6 Cost of transportation of samples to the approved laboratory/test house and all testing charges shall be borne by the contractor.

1.6 STORAGE

11.6.1 Steel supplied by the contractor shall be stored in accordance with the requirement of ISS. Each grade and quality of steel shall be stored separately and have identification tags indicating the source, quality and grade.

11.7 PRESERVATION AND MAINTENANCE OF STEEL

11.7.1 The steel brought by the contractor shall be preserved to ensure that no rusting takes place till it is incorporated in the works.

11.8 SCHEDULE OF SUPPLY

11.8.1 The contractor shall procure the steel sections, timely as required in accordance with CPM Chart, agreed between GE and contractor. The contractor will forego his right to demand extension of time if the supply of steel got delayed due to his failure in placing order in time to the manufacturer/supplier.

11.9 PAYMENT

11.9.1 Running Account Receipt of payment of steel shall be governed by in accordance with Condition 64 of IAFW-2249. Payment shall be allowed after production of test certificate and original paid/purchase vouchers by the contractor.

11.10 MEASUREMENT:

11.10.1 The entire quantity of steel brought to site shall be recorded in measurement book as "NOT TO BE ABSTRACTED" indicating the reference to manufacturers, source of supply voucher number and test certificate before incorporation in the work and shall be signed both by the Engineer-in-Charge and the contractor. Proper documentation/ record shall be maintained as per the instructions on the subject.

11.10.2 Weight of steel supplied by the contractor shall be calculated at unit weights given in Appendix A' of MES Sch Part II. For section not listed in MES Sch, the ISI conversion table shall be followed or manufacturer's certificate if the weights are not available in MES Sch/ISI table.

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

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

11.10.5 Bending and fixing of bars for concrete reinforcement including mild steel wire for binding shall be carried out all as specified in MES Sch.

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11.10.6 Hooks shall be provided only for mild steel bars. In case of cold twisted/deformed steel CRS, ends shall be bent instead of hooks.

11.10.7 Binding wire for reinforcement shall be mild steel wire (annealed) of size not less than 0.9mm.

11.11 STEEL SUPPLY/ ACCEPTANCE FORM

11.11.1 For each consignment of steel supply/acceptance form will be filled in and jointly signed by the department Rep (JE/AGE) and contractor and accepted/rejected by GE before incorporation in the works.

11.12 STEEL REINFORCEMENT

11.12.1 Reinforcement shall be fabricated, placed in position all as shown on drgs and specified in clause 10.17 to 10.22 of MES Schedule (Part I) without application of heat.

11.13 WELDING

11.13.1 Welding wherever required shall be by metal arc process in accordance with 1816 (1967) and IS-823 (1964). All welding shall be fillet welding 6mm unless otherwise indicated in drg or in this specification.

11.14 Hold Fast/Lugs: Flat iron hold fast/lugs shall be provided by welding as and where shown on drawings except those, to be provided to wooden chowkats, which shall be fixed with screws as per details shown on drawings. Hold fasts/lugs shall be embedded in PCC(1:3:6) bed blocks of size 220x220x75mm in one brick thick walls and 105mmx220mmx75mm in half brick thick walls.

11.15 PRESSED STEEL FRAMES FOR DOORS

11.15.1 Steel frames for door shutters shall be pressed out of cold rolled mild steel sheets of thickness 1.60 mm as indicated and shall comply with the requirements of IS-4351-2003, specification for steel door frames. Cold rolled mild steel sheet shall conform to IS-513. The size, type (profile), single or double rebated etc shall be all as per drawing. Tolerance in the size of frames shall not vary by more than ± 2 mm. The tolerance over the profile size shall be ± 1 mm. The pressed steel frames shall be from any one of the makes as approved by GE from the list of makes mentioned here in after.

11.15.2 Hollow portion of pressed steel frame shall be filled with PCC 1:3:6, type C0 which shall be measured and paid separately.

11.16 ALUMINIUM DOORS/WINDOWS/ VENTILATORS

11.16.1 The aluminium sections shall Conform to IS-737-1986 and specified in clause No 10.37 of SSR Part I. Frames/ shutter frames of aluminium doors/windows/ventilators shall be as specified in the schedule.

11.16.2 The shutters shall be made out of specially extruded tubular sections where provision for weather stripping made in the vertical jambs.

11.16.3 The cleats for mechanical horizontal(vertical joins) of the fixed frame and shutters shall be of specially extruded aluminium sections so as to avoid any ply between jointed members.

11.16.4 Single action door shall be fixed by plated brass pivots at top and bottom.

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PARTICULAR SPECIFICATIONS

11.16.5 Single action doors shall be provided with over head door closers. Double action doors shall be provided with floor springs.

11.16.6 Inactive leaf shall be provided with concealed sheet bolt.

11.16.7 The active leaf shall have unity lock. The active leaf shall also have been concealed sheet bolt which can be operated from inside.

11.16.8 Shutters shall be provided with PVC/Neoprene weather stripping.

11.16.9 Neoprene/PVC gasket shall be used in the glazing beads for shutters before fixing glazing, the glass shall be encased in PVC Channel so as to avoid metal to glass contact.

11.16.10 The aluminium sections shall be anodized/powder coated finish as indicated in the schedule. The thickness of powder coating shall be minimum 50 micron. Colour of powder coating shall be as decided by GE.

11.16.11 The glazing beads both on shutters as well as fixed glazing shall be of screw less type.

11.16.12 The glass panel shall be all as specified in IS-1948. Glazing shall be with high quality float glass of thickness as specified in the BoQ.

11.17 **Aluminium Deco Grill** : Aluminium grill shall be as specified in the BoQ of Decogrill or equivalent make as per the manufacturer specification and as approved by GE. The aluminium grills shall be fixed to frames with 'F' channel of suitable size with adequate number of screws.

12.0 **FLOORING**

12.1 **General**

12.1.1 Provisions contained in clause 13.25, 13.32, 13.38 & 13.39 of MES Schedule (Part I) are to be adopted for laying floors and pavements.

12.1.2 Floors shall be laid to levels or to falls as shown on drawings and as directed by the Engineer-in-Charge.

12.1.3 Floor finish shall be extended over dwarf walls, doors and other openings.

12.1.4 Floor topping of cast-in-situ cement concrete shall be finished even and smooth using extra cement as specified in clause 13.32.8 of MES Schedule Part I.

12.1.5 Pozzolana or pozzolana slag cement shall not be used for floor topping.

12.1.6 Floor finish over RCC slabs shall be laid all as specified in clause 13.32.5 of MES Schedule Part I.

12.1.7 Sub floor may not be laid in panels. The thickness of sub base concrete and hard core in the ground floor shall be as indicated in schedule of drawings. In case not indicated in drawings, it shall be 75mm thick PCC (1:4:8) over hard core of 100mm thick over rammed earth.

12.1.8 Under layer and topping layer of cast-in-situ cement floors shall be laid in panels conforming to pattern indicated in drawings. Length to width ratio not exceeding 1.5 times not more than 3 dividing strips meeting at any joint. Dividing strips shall be of PVC 38mm wide and 4mm nominal thickness. Top of dividing strips shall be finished smooth with the top surface of floor. Dividing strips shall not be provided in sub floors/sub base and floor more than 40mm thick.

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12.1.9 Floors shall be laid to level and/or to falls as shown on drawings and as directed by Engr-in-Charge.

12.1.10 Floors shall be carried out through all opening in walls at floor levels, unless otherwise shown on drawings. In the case of different type of floor finish the dividing shall be the inner edges of the rebate of the doors unless otherwise shown on drawings.

12.1.11 The dividing line between the floors of different types wherever they so meet between adjoining rooms, shall be determined on the basis of the finish visible when the doors are closed and the applicable finish shall accordingly be provided.

12.2 CEMENT CONCRETE FLOORS: - PCC floors shall be provided as indicated in the Schedule/BOQ and as specified in SSR Part I.

15.3 NON SKID CERAMIC TILES

15.3.1 Non skid ceramic tiles shall be of size and thickness as specified in the BoQ. It shall be of premium quality and Grade B I conforming to IS: 13712-2006. The tiles shall be jointed and pointed with white or coloured cement to match with the colour of tiles. Non skid ceramic tiles of same size, cut to required size shall be used for skirting. The tiles shall be laid over cement mortar screed/ backing as specified in the BOQ.

15.5 GLAZED CERAMIC WALL TILES

15.5.1 The glazed ceramic wall tiles shall be of size and thickness as specified in the BOQ and shall be premium quality and Grade B IIa conforming to IS: 13753-1993 for walls and IS: 13755-1993 for floors and Clause 13.14 of MES Schedule Part I. The tiles shall be jointed and pointed with white or coloured cement to match with the colour of tiles. The tiles shall be laid over cement mortar screed/ backing as specified in the BOQ.

12.4 VITRIFIED DOUBLE CHARGED TILES FLOORING

12.4.1 Vitrified double charged tiles shall be of size and thickness as specified in the BOQ and with approved pattern/design as per Grade B-I conforming to IS – 15622-2006, set in neat cement slurry and jointed with white or coloured cement to match the shade of the tile, over cement screed as specified. The screed shall be treated with a coat of neat cement slurry @ 2.5 Kg / Sqm. The tiles shall be coloured / printed as directed by the Garrison Engineer.

15.8 GRANITE FLOORING/SKIRTING

15.8.1 It shall be all as described in the BoQ. Granite slab/ tile shall be machine cut, pre-polished, set in cement mortar including pointing in white cement mortar (1:2) using marble dust with admixture of pigment to match the shade of granite slab. The edges of Granite slab shall be bull nosed.

15.8 ACID RESISTANT TILES FLOORING

15.8.1 Acid resistant tiles shall conform to IS 4457-1982, Specification for ceramic unglazed vitreous acid-resistant tiles and Clause 13.14 of MES Schedule Part I. Size of tiles shall be as specified in Schedule A. The tiles shall be laid as specified in Clause 13.46 of MES Schedule Part I.

PARTICULAR SPECIFICATIONS**16.0 PLASTERING****16.1 GENERAL**

16.1.1 Cement: Refer clause herein before.

16.1.2 Sand: Refer clause herein before.

16.1.3 Particular attention of the contractor is invited to take note of local practices and the local availability of materials like bricks form work etc and cater for any extra quantities of mortar required for rendering smooth for extra dubbing required for touching up properly and for smooth and even surfaces. This shall be deemed to have been included in the lump sum.

16.1.4 Plaster and skirting/dado shall be returned in jambs, soffits of lintels and windows cills etc.

16.1.5 Where plaster on concrete surface shown to match the adjacent brick surfaces, the mix of plaster shall be as for the brick surfaces.

16.1.6 All plastered surface shall be trowel led to a smooth and even surfaces, without using extra cement.

16.1.7 Thickness of cement plaster mentioned hereinafter shall be finished thickness exclusive of dubbing. Dubbing may however be done in one operation with plaster.

16.1.8 Plaster on external surface shall be carried out upto 15cm below ground level except where Plinth protection/ramp etcare provided.

16.1.9 All corners, angles, junctions and riser shall be truly vertical or horizontal as the case may be and shall be carefully finished. Corners around jabs of openings and junction of walls shall be finished straight and square. 12mmwide groove at the junction of wall and RCC slabs to the entire thickness of wall plaster shall be provided. Also trowel groove shall be provided at junction of walls and RCC columns or any other dissimilar material e.g. wooden chowkhats etc.

16.1.10Plastering shall be carried out all as specified in the BoQ and MES Sch Part I.

16.2 READY MIX PLASTER : Ready mix plaster shall be carried out all as specified in the BoQ and as per manufacturer's instructions.

17.0 INTERIOR/EXTERIOR WALL/CEILING FINISHES**17.1 WHITE (LIME) WASH**

17.1.1 White washing shall be carried out all as specified in MES Schedule 2009 Part I Clause 15.12.1 to 15.12.3 and 15.12.5.

17.1.2 White (Lime) washing shall be composed of freshly burnt fat lime of good quality, free from unburnt stone and other matter and containing minimum 85% of calcium and magnesium oxide content. Slacking should be done at site with excess of water and the lime should be allowed to remain under water for two days.

17.1.3 Fresh water shall be added to bring it to consistency of cream. The quantities of gum to be used shall be at the rate of 4 Kg per Cum.

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17.1.4 Sufficient quantity of blue shall be added to the mixture of white wash to make it look bright. For white washing on ceiling, adequate quantity of zinc oxide shall be added to lime wash for achieving egg white shade.

17.2 DISTEMPER ACRYLIC EMULSION

17.2.1 Distemper of required colour and shade shall be obtained ready mixed conforming to IS 428-200. The material shall be in the form of a homogeneous paste free from odour of putrefaction as such and when mixed with water. Acrylic emulsion distempering shall be provided as per BOQ and all as specified in clause 15.14 of SSR Part I.

17.3 EXTERIOR EMULSION/ ANTI FUNGAL PAINT

17.3.1 Exterior emulsion/ Anti fungal paint shall be provided as specified in the BoQ and as per manufacturer's instructions. Preparation of surfaces and application shall be done all as per manufacturer's instructions and shall be approved by GE.

17.3.2 The contractor, authorized applicator and the paint manufacturer shall give five years guarantee for exterior emulsion paint as per Appendix attached here-in-after. The contractor shall furnish a security deposit towards the guarantee of exterior emulsion paint for a period of 05 years. This amount shall be calculated @ 2.5% of the amount of exterior emulsion paint carried out at contract rates. The contractor may furnish fixed deposits in the name of GE from any banks and this FDR will be released only after successful completion of guarantee period.

17.3.3 Necessary guarantee shall be obtained from the manufacturer applicator on non judicial stamp paper giving five years guarantee from the certified date of completion of contract to keep the building free from fading, peeling off paint during guarantee period. The guarantee does not however, absolve the contractor from his responsibility in respect of this specialized work as per contract conditions. The contractor shall be responsible to ensure that the buildings are kept free from fading or peeling off the acrylic paint during guarantee period.

17.4 WALL CARE PUTTY: White cement based putty 3mm thick shall be provided on wall/ ceiling surfaces as per manufacturer's instructions and surfaces shall be finished properly before application of primer/emulsion.

17.5 FRENCH POLISHING

17.5.1 French polishing shall be carried out as specified in Clause No. 17.7.4 of MES Schedule Part I and as per IS 348-1981.

18.0 GLAZING

18.1 Glazing shall be with glass of ordinary quality. Glass shall be free from all defects viz bubbles, waviness etc and shall be homogeneous thickness.

18.2 All sheet/ glass for glazing shall conform to IS 2835-1977 'B' quality or ordinary quality (OQ). Figured glass shall conform to IS 5437-1969.

19.0 SYNTHETIC ENAMEL PAINTING

19.1. **PAINTING AND ALLIED MATERIALS:** - Painting and allied materials compatibility of paints etc shall be specified in clause 17.2.1 to 17.2.5 of MES Schedule Part I.

PARTICULAR SPECIFICATIONS

19.1.2 **PAINTING GENERALLY:** - In addition to the General condition given in clause 17.3 MES Schedule Part I the following stipulations shall be applicable. Contractor shall execute painting under the guidance of the manufacturer's representative if so ordered by GE.

19.1.3 Member specified to be painted shall first be passed by the Engineer-in-Charge and marked as such before commencement of painting work. If the under coat of paint is not extended within six months after applying the priming coat of paint the primer shall be redone by the contractor at no extra cost to the Government. The exact time shall be decided by the GE. Surface which are inaccessible for painting after execution shall be painted before execution.

19.2 PAINTING TO WOODEN WORK

19.2.1 All wood work required to be painted shall be smoothened sized and knotted and then applied with priming coat. Stopping and filling (filler coat) shall be done after priming coat and surface rubbed down to a level and smooth surface and thereafter under coat and finishing coat applied, all as specified in clause 17.6 of SSR Part I. Where painting to wood work is specified prepare surface and apply one priming coat of pink primer, one under coat and one finishing coat of synthetic enamel paint all as specified in MES Schedule.

19.2.2 All surface of timber exposed to view and for which no type of finished specifically catered for either on drgs or in these particular specification shall be treated with 3 coats of paint as specified herein before.

19.2.3 Synthetic enamel paint and primer shall be of the following manufacturers: -

- | | | |
|-----|----------|--------------------|
| (a) | LUXOL | - BERGER |
| (b) | BROLAC | -Jenson & Nicolson |
| (c) | APCOLITE | -ASIAN |
| (d) | SUPERLAC | -SHALIMAR |
| (e) | NEROLAC | -NEROLAC |

19.3 PAINTING TO STEEL WORK

19.3.1 Where painting to steel and iron work is indicated in schedule. Prepare surfaces and apply one priming coat of Red oxide, one under coat and finishing coat of synthetic enamel paint all as specified in clause 17.8 of SSR Part I.

20.0 MS TUBES IN TRUSS

20.1 Steel tubes for truss shall be of ERW conforming to IS: 1161, Gde St-240 and or induction butt welded tubes.

21.0 GALVALUME SHEET

21.1 Galvalume sheet for roofing shall be provided as specified in clause 11.3 of SSR Part I.

21.2 These shall be pre-painted high tensile steel sheets having 550 MPa yield strength and corrosion resistant aluminium-zinc alloy coating (aluminium 55% and zinc 45%) applied by a continuous hot dipping process. Galvalume sheet shall be of 0.50 mm thick having minimum alloy coating thickness of 0.025 mm on each side. Total minimum coating mass for both surface = 150 gm/sqm). Total thickness of the colour coated sheet shall not be less than 0.50mm.

21.3 The thickness and profile of the sheet shall be approved by GE. The sheets shall have brand marking of the manufacturer, the standard applicable, the base steel thickness and coating at the back at every one metre spacing for cross checking the genuinity of the material supplied. Fasteners and other components parts shall be equivalently corrosion resistant.

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PARTICULAR SPECIFICATIONS

21.4 The contractor shall submit 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) etc. The cost of testing, transportation of materials etc shall be borne by the contractor irrespective of the results of testing.

22.0 PLYWOOD

22.1 Plywood shall be of grade BWR type conforming to IS 303-1989 with decorative finish on one side and shade as approved and balancing white on other side or as specified in schedule A. Adhesive used for bonding purposes shall be as specified. It shall be provided as specified and as directed by Engineer-in-Charge.

20.0 WATER SUPPLY, PLUMBING DRAINS AND SANTIARY APPLIANCES

20.1 PVC (SWR) PIPE & FITTINGS: PVC (SWR) pipe shall be ISI marked. It shall be fixed with MS clamps all as specified in MES Sch Part I. PVC (SWR) pipes shall conform to IS 4985. Rubber rings for the pipes and fittings shall conform to IS 5382. PVC (SWR) fittings shall be used as per recommendation of the manufacturer of the pipes. In case if there is no IS Code for the fittings, these shall generally conform to the requirement of BS 4515 DIN 19531 and DIN 19534. PVC (SWR) pipes and fittings shall be strong, dimensionally stable and shall be free from defects.

20.2 CHLORINATED POLYVINYL CHLORIDE (CPVC) PIPE AND FITTINGS: CPVC pipes shall conform to IS: 15778. The Standard Dimensional ratio to be used shall be SDR 11 or SDR 13.5 as specified in Sch A. CPVC fittings up to 50 mm shall be of SDR 11, above 50mm shall be as per ASTM F 441 in Schedule 80 & Schedule 40 and above 50mm of Schedule 80 only. Plain CPVC fittings shall mean fittings which do not have any metal component and is jointed with CPVC solvent cement only (Elbow, Tee, Socket, Reducer, Bushing, Step over bends, End cap, End Plugs etc). Special fittings shall include CPVC Brass fittings (Brass elbow, Brass Tee, Male threaded brass adaptor, Female threaded brass adaptor etc), Unions, Ball valves, Flange and tank adaptor.

20.3 BASIN MIXER/WALL MIXER, BIB TAPS, PILLAR TAPS AND STOP/ANGLE COCKS/HEALTH FAUCETS/SHOWER ROSE/TPH ETC. Basin Mixer/Wall Mixer, Bib Taps, Pillar Taps and stop/angle cocks/Health faucets/Shower rose/TPH etc shall be as specified in the schedule of approved make conforming to relevant IS.

20.4 VITREOUS CHINA SANITARY APPLIANCES:-All Sanitary fittings (except flushing cistern) shall be of vitreous china, first quality conforming to IS 2556 (Part I)-1994 and shall be ISI marked. The samples of sanitary fittings, fixing accessories shall be approved by the GE before procurement for incorporation in the work. Sanitary fittings shall be of one of the manufacturers as specified in List of Manufacturer, conforming to the catalogue numbers where referred to in these tender documents. ISI marked fittings of these brands shall be provided instead of those without ISI marking.

20.4.1 The contractor shall employ qualified & licensed plumber for supervision of installation & testing of the sanitary fitting & plumbing.

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- 20.5 **EUROPEAN TYPE WATER CLOSET AND CISTERN** : European type water closets shall be of shape and size as per with P or S trap (as required at site) of makes mentioned in List of Manufacturer These shall be complete with the following : -
(a) White PVC low level flushing cistern 10 liters capacity of any approved makes mentioned in List of Manufacturer given here-in-after, complete with 15mm brass ball valve ISI marked including polythene float, overflow with mosquito proof coupling 40mm dia CP flush bend, cup and all washers and rubber bed etc. complete including fixing accessories.
(b) Flexible PVC connection with nuts and washers.
(c) Plastic solid type seat and cover ISI marked type IA (IS-2548-1983) with CP brass hinges of make mentioned in List of Manufacturer here-in-below of white colour.
- 20.6 **FLUSHING CISTERN**: Low level flushing cistern 10 liters capacity shall be of make mentioned in List of Manufacturer here-in-below, complete with 15mm brass ball valve ISI marked including polythene float, overflow with mosquito proof coupling 40mm dia CP flush bend, cup and all washers and rubber bed etc. complete including fixing accessories.
- 20.7 **WASH HAND BASIN**: Wash hand basin shall be vitreous china first quality, off white and shall be of approved makes.
- 20.8 **HDPE WATER TANK**: HDPE tanks with three layer body, ISI marked, of capacity as indicated in the BoQ shall be provided. HDPE tanks shall have provision for inlet, outlet, overflow and washout pipes. All pipe connections such as inlet, outlet, washout, overflow and ball valves shall be measured and paid under relevant items of water supply.
- 20.9 **STAINLESS STEEL SINK**: Stainless steel sink/ Stainless steel sink with drain board shall be as specified in the BoQ and of make as listed in list of manufacturers. All stainless steel shall be Salem steel, 304 grade.
- 21.0 **STRUCTURAL REHABILITATION WORKS/ FLOORING REPAIRS TO HANGAR**
- 21.1 Structural Rehabilitation works/ flooring repairs to hangar shall be carried out all as specified in the BoQ as per manufacturer's instructions and as directed at site by GE/ Engineer-in-Charge. The specialized work of structural rehabilitation work/ repairs to hangar flooring where specific chemical materials of specified manufacturers are given in BOQ shall be got executed through authorized applicator of the manufacturers. The approval of authorized applicator shall be obtained from GE by submitting all necessary documents.
- 21.2 The authorized applicator shall also render a certificate of execution after completion of work.
- 21.3 The rate quoted by the bidder for these items is deemed to be inclusive of the application methodology specified in the tender including scaffolding and nothing extra shall be paid on this account. Proper precaution shall be taken and any damage made by the contractor through negligence shall be made good at his own cost
- 22.0 **AUTOMATION OF HANGAR DOOR**

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- 22.1 Steel doors shall be taken down from existing locations, repaired, re-aligned, modified to suit the automation works, erected, re-fixed in the location as directed and tested on completion of erection all as described in Sch 'A'/ BOQ.
- 22.2 Extra precaution shall be taken while removing the existing doors such that the rest of hangar structure and flooring shall be intact and safe. Any damage/ deformity occurring in hangar structure and flooring shall be contractor's liability and shall be made good by the contractor using either the same specification or superior specification to the satisfaction of the Engr-in-Charge/GE. Suitable support, scaffolding, safety nets, barricading, warning signs etc as directed shall be provided during the work till final testing and completion.
- 22.3 The quoted unit rate for hangar doors shall be deemed to include for all materials and labour involved in repairs of steel sliding doors, transportation, if any, erection & fixing with supporting structure/foundation in the required location including painting to the steel doors, complete all as directed by the Engineer-in-Charge. The quoted rate shall include all door leaves moving on the entire length of the tracks, travelling within the sturdy outriggers /extended door frame on both sides of hangar.
- 22.4 Structural steel work welded, bolted or riveted shall be carried out as described in IS: 800-984, Code of Practice for use of structural steel in general building construction.
- 22.5 Straightening and bending, cutting and machining, drilling of holes, assembly of members/components, riveting, bolting or welding, welding procedure, approval and testing of welders, quality of welds and correction, safety and health and erection shall be carried out all as described in clause 10.9 to 10.16 of the MES Schedule Part-I.
- 22.6 Reference is invited to clause 10.15.13 of the MES Schedule Part-I on Welding Procedure. Welding shall be carried out only by fully trained and experienced welders as tested and approved by the EIC. Qualification tests for welders as well as tests for approval of electrodes will be carried out as per IS: 823. The nature of test for performance qualification for welders shall commensurate with the quality of welding required on the work as judged by the EIC. Welding Procedures and tests for welders shall be conducted as per IS: 9595 and approved by the EIC.
- 22.7 Door leaves and tracks shall be designed to withstand the maximum forces for wind load, as per seismic zone, cyclone intensity and local wind pressures.
- 22.8 The brief details of the door shall be as under:
- 22.8.1 Safety Devices:
- a) Mechanical spring loaded stopper along the track to prevent hard impact to the hangar sides.
 - b) Each drive leaf is to be fitted on the inside face with an audible and a visual alarm (Warning light). The alarms are to operate for a short period before a drive leaf starts to move. Interlock switches are to be fitted to any access covers for drive units and electrical control panel doors, to prevent their drive leaf being used while these are open.

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- 22.8.2 Door Locking: Door locking arrangement to be provided for each leaf separately.
- 22.8.3 Operational Reliability: Power supply shall be provided through movable cable of suitable size, supported on wire and rollers and spring loaded spool system along with other required accessories/components to make the system complete and workable including safe operation of the hanger door.
- 22.8.4 Manual Operations: Manual override to operate the door shall be part of motorized system. The door leaf should be easily pushed by 2 people with a force not exceeding 50 Kg force at the height of 1.6m from FFL.
- 22.8.5 Shop Drawings: The contractor shall submit all the shop drawings required for precise fabrication and construction of the structure before execution. Drawings and specifications of complete electrical, mechanical system to motorize the movement of doors shall also be part of shop drawing and should be submitted before execution.
- 22.8.6 Buffers: Heavy duty energy absorbing buffer stops are to be fitted at the extremities of the bottom tracks to prevent leaves over-running the ends of their tracks during towing / manual mode operation. These are to be designed to eliminate any trip hazard that might otherwise occur. At the end of Top tracks mechanical stoppers are to be provided.
- 22.8.7 Operating Units: For the purposes of power operation, respective drive door leaf shall be fitted with its own Operating unit or as per OEM. 3-Phase Electric Motor of suitable rating shall drive respective drive leaf depending on site requirement with IEC classification IP55 or above. The drive transmission between the motor and the drive wheel shall be through a chain-sprocket assembly (gear chain assembly of suitable size). Drive units should comprise a squirrel cage motor with integral magnetic brake and a high efficiency helical-bevel or helical-worm reducing gearbox, driving the bottom wheels through a roller chain.
- 22.8.8 Enclosure to Operating unit: Each Operating unit shall be fully enclosed in a removable casing (Trap Door) which is easily accessible from the inside of the hangar via hinged or removable access covers. Operating unit access covers shall be interlocked so that the leaf cannot be driven under power unless all are closed.
- 22.8.9 Door Control System: The sliding door control systems are to be provided to comply with EN 12453: 2001, "Industrial, commercial and garage doors and gates – Safety in use of power operated doors – Requirements". The main electrical control equipment for respective drive leaf shall be housed in a standard steel electrical cabinet to IEC classification IP55 as defined in EN 60529:1992. The cabinet shall be mounted on either side of hanger door opening respective drive leaf is to be fitted with a pendant push button.
- 22.9 The electromechanical systems to be provided for the door shall be as under:
- 22.9.1 The work shall include electrically driven mechanism for operating motorised gate door including all its components electric motor, gear and chain power transmission unit, door wheels, control panel, safety devices, cables etc and complete all as specified and per the details as following.
- a) Electric motor: Electric motor shall be of capacity suitable to operate hanger door of size and specification as specified in BoQ. Electric geared Motor unit to be mounted within the width of gate leaf using suitable size of angle, nut & bolts etc or any fabrication work required and should be covered by a door for safety and maintenance.
 - b) Power transmission unit/ Operating Unit: Mechanical power to be transmitted between the motor and the drive wheel should be through gear chain assembly of suitable size, type, durability, easy and low maintenance, low noise, and high efficiency to achieve the desired speed. Speed reduction box should have helical-bevel gears or helical worm gears to reduce speed.

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- c) Bottom Wheel: Wheels shall be provided so as to fit the bottom rail. Wheel shall be as specified in BoQ. Thread must be machine concentric with the bearing seats. Wheel bearings should be internal tapered roller type so that horizontal and vertical loads shall be transferred to the rail through only the bearing. Bearings must be equipped with dust seal and high pressure grease pins. Wheel shall be removable from the housing without removing the door.
 - d) Control panel Sliding door control system to be designed to comply with EN 12453:2001. The control unit should be housed in a standard cabinet inside the door leaf at a suitable height and should be IP 55.
 - e) Power supply: Incoming power supply to be provided from the existing LT Panel to Sliding door should be 3 phase, neutral & earth using suitable size of MCCB & cables of reputed make. Power shall be provided through movable cable of suitable size, supported wire and rollers and spring loaded spool system along with all other required accessories/components to make the system complete and workable including safe operation of the hanger door. All conduits should be non-explosion proof.
 - f) Emergency operation: Door shall be equipped with so that can be operated by tractors / tug from ground level/ manually by applying pull/push force. In case of power failure, operator must be capable of being disconnected and operated manually without damage to motor and gearbox.
 - g) All materials used shall be of reputed makes and shall be approved alongwith the shop drawings.
- 22.10 Test for Operation: After erection/installation of the gate, tests shall be carried out by the contractor in presence of representative of department to be nominated by the Accepting Officer to check the following and results of all tests shall be maintained duly authenticated:-
- (a) The satisfactory operation of gate operating devices and safety devices installed on it.
 - (b) The correctness of all circuits and interlocks sequence of operation.
 - (c) The satisfactory operation of all protective devices.
 - (d) The compliance of the Gate with specified performance requirement.
 - (e) The satisfactory operation of motion of the gate viz working of automatic programming of speed and time.
- If any of the gate automation devices and safety features does not work, the contractor will rectify the defect/replace the defective component and the gate will be re-tested to the entire satisfaction of the GE.
- 22.11 TRAINING OF PERSONNEL RESPONSIBLE FOR OPERATION OF THE GATE: - The contractor shall be responsible for training departmental personnel / user's personnel for safe operation and maintenance requirement of the installation during testing of the gate for a period of 2 weeks after the installation is handed over to the department. The item rate quoted in BOQ shall include all charges thereof.
- 22.12 Automated hangar door shall be maintained for a period for 24 months from the date of completion of work (defect liability period of the contract). The contractor shall supply all required spares, parts, labour etc required for maintaining and ensuring smooth functioning of the automated door during the maintenance period. Quoted rate shall be deemed to be inclusive of cost of same.

PARTICULAR SPECIFICATIONS**23.0 ELECTRICAL WORKS****23.1 General**

- 23.1.1 All electrical fittings and wiring must run clear of door, windows and openings No diagonal run shall be allowed. These must always be parallel or perpendicular to the ground.
- 23.1.2 The specification and general rules/conditions laid down in the MES Schedule Part I and II including errata and amendments as applicable will be generally applicable to the whole work unless otherwise specified hereinafter.
- 23.1.3 The work shall be carried out in strict compliance with the latest edition of Indian Electricity Act the Indian Electricity Rules and IEE Regulations and the latest edition of IS732. It shall be of high standard and approved construction used in a modern electrical work both as regards design and workmanship. Complete work shall be suitable in every respect of type of voltage specified and shall be to the satisfaction of Engineer-in-Charge.

23.2 WORKMANSHIP

- 23.2.1 The work shall be carried out only by licensed wireman under the supervision of a qualified Electrical Engineer. The contractor shall produce (for inspection) license of electrician/wireman if ordered by the Engineer-in-Charge.
- 23.2.2 Protection of wiring from mechanical damage shall be as per clause 19.119 of MES Schedule Part I.
- 23.2.3 Passing of cables through walls, floors etc shall be protected as specified in clause 19.120 and 19.121 of MES Sch Part I.

23.3 SAMPLES

- 23.3.1 Before starting the work, the contractor shall produce samples of all materials including accessories and approved by the GE. Samples that are approved will be retained by GE until the work is completed and accepted. The contractor will not be allowed to commence the work before the samples are produced and approved. The contractor shall ensure that the materials used in the work are identical with approved samples and are uniform throughout. All materials shall be accordance with latest edition of the IS/BS specification and shall be of the best indigenous make approved by the GE.

- 23.4 **MATERIALS** All materials shall be accordance with latest edition of the relevant IS/BS specification and shall be of indigenous make approved by the GE.

- 23.5 **CABLES**; Cables shall be single core PVC insulated and PVC sheathed/unsheathed(all as described in Sch'A' with multistranded copper conductor conforming to specifications laid down in clause 19.25 (a) (ii) and 19.25(b) (ii) of MES Schedule Part I. All cables shall be 1100 volts grade for point wiring and shall be of such size as to be capable to carrying the maximum current which will normally flow through them without the respective rating being exceeded as laid down in IEE Regulations. Cables shall be delivered a site in maker's wrappers etc, with the seal intact and shall not be installed unless approved by the Engineer-in-charge. If cables of size as specified in Sch'A' as per relevant IS are not available, cables of equivalent size with identical current carrying capacity and with multi-stands shall be got approved from accepting office before incorporation works without extra cost to Govt.

PARTICULAR SPECIFICATIONS**23.6 MODULAR GI FLUSH BOX**

23.6.1 Modular GI Flush box shall be made out of 2mm thick GI Sheet of suitable size. The boxes shall be embedded in the walls with cement mortar (1:2) clear depth of the box shall be not less than 60mm and this shall be increased suitably to accommodate mounting of fan regulators.

23.7 MODULAR SWITCH/ SOCKET/ BELL PUSH/ REGULATOR/ COVER PLATE ETC

23.7.1 Modular switch/ socket/ Bell push/Regulator/ cover plate etc shall be of modules as described in BoQ and shall be of any of the approved makes as specified here-in-after.

23.8 LAMINATED SHEET

23.8.1 Laminated sheet shall be 3mm thick fixed in MS pressed steel terminal boxes by cadmium plated iron screws. Make of laminated sheet shall be 'HYLAM' or equivalent.

23.9 CONDUIT AND CONDUIT ACCESSORIES: All conduits, conduit fittings and accessories shall be rigid PVC conduit and fittings conforming to IS-9537 Part III of 1983 of (Medium grade).

23.10 CEILING ROSES: Ceiling roses shall be flush type all as specified in Clause 19.32 of MES Schedule Part I and shall comply with IS: 371-1979. Ceiling roses shall be provided with means for gripping flexible cord which shall not damage the insulation and/or sheath of the cord and shall be such that the load on the cord is not transmitted to the terminals.

23.11 LED LIGHTS AND FITTINGS : These shall be as specified in the BoQ and conforming to relevant IS.

23.14 MINIATURE CIRCUIT BREAKERS

23.14.1 MCB shall be of approved make and shall be obtained from any one of the manufacturers listed here-in-after.

23.14.2 MCBs shall be provided as indicated in Schedule 'A' and shall comply with the requirement of IS: 8828-1996 and Clause No 19.46 of MES Schedule Part I. The MCBs shall have rupturing capacity as specified. 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.

23.15 DISTRIBUTION BOARDS

23.15.1 Distribution boards shall conform to IS : 8623 and shall be provided as specified in Clause No 19.46.1 of MES Schedule Part I. Bus bars shall be electroplating copper tin plated and rated as directed. Exposed faces of sheet steel enclosures shall be painted with epoxy polyester powder coating at factory. Neutral shall have 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 coded suitable for both flush and surface mounting. The unused portion of DBs shall be covered using the blank pieces.

PARTICULAR SPECIFICATIONS**23.16 MOULDED CASE CIRCUIT BREAKERS**

23.16.1 Moulded case circuit breakers shall conform to IS: 13947 -1, 2 (1993). They shall be of single break type and shall be trip free from all positions and temperature compensated for thermal type only. Suitable discrimination shall be provided between upstream and downstream breakers. All moulded case circuit breakers will have front operated extended rotary handle offering IP54 protection. They shall have minimum watt loss per pole. The closed, minimum trip position and open positions must be clearly indicated as per clause in IS part-I of the IS standard. MCCB cover and case shall be made of high strength heat resistant and flame resistant thermosetting insulating material, operating handle shall be quick make, quick break type. Front operating handle shall have a common operating handle for simultaneous operations and tripping of all three phases. All MCCB's shall have indication light for ON.

23.16.2 MCCB shall be extra current limiting type and contractor shall furnish let through energy curves. All capacities taken are service breaking short circuit capacity. The MCCB shall be suitable for aluminium terminations without any link or component heated up. All the MCCB's shall have variable trip setting facility which could be adjusted easily from front at site. It shall have clear TRIP position marked in front. Electrical life of the MCCB shall be as follows :

- upto 100 amps - 6000 operations
- upto 250 amps - 3500 operations
- upto 400 amps - 3000 operations

23.16.3 MCCB shall have provision of adding in future accessories like under voltage trip, shunt trip, alarm switch, auxiliary switches, earth fault and earth leakage for fitting if required. Whenever interlocking is required, suitable selection shall be made. The MCCB shall have extended links with phase barriers and temp. of links shall not reach beyond the limits as specified in IS.

23.17 SYSTEM OF WIRING

23.17.1 Wiring shall be carried out with PVC insulated cable and shall run as far as possible on walls, ceilings so as to be easily accessible and capable of being inspected. Power wiring shall be kept apart at minimum distance of 2mm unless they are enclosed in earthed metal conduit suitably marked to indicate the risk of dangerous shock due to voltage in the conductor.

23.18.2 Concealed wiring: Concealed wiring shall be provided as described in BoQ. PVC conduit shall be rigid PVC conforming to relevant IS. The make of PVC conduit shall be as specified in the list of makes. PVC conduit shall be of adequate size to draw required No for cables.

23.19 EARTHING

23.19.1 Earthing shall be carried out as specified in the BoQ and electrical plate No 3 of MES Schedule Part I. Earthing shall be with earth plate electrode as mentioned in BoQ buried directly in ground (earth pit) not less than 2.25m deep below ground level connected to GI strip of size 25 x 4 mm/32x6mm/4mm dia GI wires with top edge of the plate not less than 1.5m below ground level connected to earth wire as mentioned in BoQ by means of bolt nut and washers of galvanised iron or steel, and protected by GI pipe light grade of suitable size. Excavation and earth work shall be in hard/dense soil. All surplus soil shall be removed to a distance not exceeding 50m. Cement concrete for PCC chamber shall be in PCC 1:3:6 type C1 and chamber cover shall be RCC 1:2:4 type B1 50mm thick, reinforcement shall be with 8mm dia CTD Bar @ 100mm centre to centre both ways including necessary form work etc. The unit rate of relevant item of Schedule 'A' include the cost of earth work, PCC Chamber, RCC cover, testing etc complete.

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23.20 CEILING FAN AND REGULATOR: Ceiling fan and regulator shall be as specified in the schedule. Fixing of fan regulator and hanging ceiling fans shall be all as specified in clause 19.115.4 of MES Sch Part I. All ceiling fans and regulators shall be earthed effectively by means of earth wire.

23.21 EXHAUST FAN: Exhaust fan shall be as specified in the schedule. Exhaust fans shall be erected at the places indicated by the Engineer-in-Charge. For fixing an exhaust fan hole shall be provided in the wall to suit the size of the frame which shall be fixed by means of rag bolts embedded in the wall. The hole shall be neatly plastered to the original finish of the wall. The exhaust fan shall be connected to exhaust fan point which shall be wired as near to the hole as possible by means of a flexible cord, care being taken that the blades rotate in the proper direction.

23.22 AIR CIRCULATOR FAN: Air circulator fan shall be as specified in the schedule. It shall be erected at the places indicated by the Engineer-in-Charge. The air circulator fan shall be connected to the electric point which shall be wired as near to fan. All fan points shall be earthed effectively by means of earth wire.

23.23 APPLICABILITY OF RULES, REGULATIONS AND CODE OF PRACTICE

23.23.1 The entire electrical installation under this contract shall comply with the requirements of Indian Electricity Rules, Acts and other regulations such as those made under factories act. Fire Insurance Act may be applicable from time to time

23.24 RECORD OF MATERIALS

23.24.1 Original voucher/invoices of materials as mentioned in special conditions here-in-before shall be produced by the contractor before claiming RAR payment. The vouchers/invoices shall be from the manufacturers and/or from their authorised dealers for full quantity of respective items required for the work under this contract. These vouchers shall be enclosed, dated and initialed by the Engineer-in-Charge giving the contract number and certified true copy of each such vouchers signed both by Engineer-in-Charge and contractor and shall also be kept on MES record

23.25 TESTING

23.25.1 On completion of the work, the entire electrical installation shall be tested by the contractor for the following tests which shall be carried out in accordance with clause 19.146 of SSR Part I in the presence of and to the satisfaction of the Engineer-in-Charge:-

- (a) Continuity
- (b) Insulation resistance
- (c) Any other test prescribed by the GE.

23.25.2 All testing equipment/apparatus, material, labour etc required for above tests shall be provided by the contractor at his own expenses through his sources, works for which test results do not conform to standard will be redone by the contractor at his own expenses.

23.26 RECORD DRAWINGS: On completion of work, wiring diagram showing the internal electrification (including high frequency supply) and layout of the buildings shall be prepared by the contractor in conformity with clause 19.146 of MES Schedule Part I and submitted to Engineer-in-Charge in triplicate.

PARTICULAR SPECIFICATIONS**24.0 EXTERNAL ELECTRIC SUPPLY**

24.1 Excavation, earthwork, Earthing, GI pipe, bricks and sand shall be all as described in the BoQ and as specified here-in-before.

24.2 STANDARD

24.2.1 All materials incorporated in this work shall be of the make specified in Schedule 'A' or this particular specification.

24.2.2 All materials to be incorporated shall conform to relevant Indian Standards or if they are not existing, other relevant International Standards. Copies of test certificates shall have to be produced and got accepted by the GE before the materials are brought to site. The workmanship shall be of the highest order and standard and shall conform to all the provisions of relevant IE rules and other statutory requirements. All electrical works shall be executed by properly skilled and trained electricians under the supervision of qualified Supervisors. Contractor is required to produce evidence of such qualifications on demand by GE.

24.3 APPLICABILITY OF RULES, REGULATIONS AND CODE OF PRACTICE:-

The entire electrical installation under this contract shall comply with the requirements of Indian Electricity Rules, Acts and other regulations such as those made under factories act. Fire Insurance Act may be applicable from time to time.

24.4 PAINTING AND PROTECTION OF EQUIPMENTS, FITTINGS ETC.,

24.4.1 Each item of equipment, fittings etc shall be painted or protected as detailed hereinafter. It is essential that before any coat of paint is applied either in the shops or at the site, the surface shall be clean and free from all dirt and shall be completely dry. The manufacturers guarantee that, each coat of paint is compatible with the previous and subsequent coats so that oiling, flaking or other faults do not occur.

24.4.2 Steel fabrication shall be thoroughly scrapped to remove mill scales, rust, dirt etc and wire brushed; One coat of red oxide primer shall then be applied. After erection at the site, the steel work shall be painted with one under coat followed by one finishing coat of oil paint.

24.4.3 The colour of all paints above floor level shall be light grey or any other shade as approved by the GE.

24.4.4 Where it is usual practice of the manufacturer or special items such as switch gear, control cabinets etc to apply a high standard of protective enamel paint in the shop before despatch, this will be acceptable provided any damage to the said paint which occur during transit or erection is made good by applying same tint and type of finishing paint by the contractor at his cost before the equipment.

24.5 INSPECTION AND TESTING

24.5.1 Test result and test certificate shall be submitted to the GE by the contractor before any payment is made to such equipments/ plants etc and a copy of these test certificates enclosed along with the final bill. These will include the following:

24.5.2 After erection at site and before being connected to the power supply all items of electrical equipment and all circuits shall be fully tested to prove correct connections, insulation resistance, continuity effective earthing etc. The installation shall be tested by an authorized Electrical inspector in addition to the test as specified herein, any defects pointed out shall be rectified immediately by repairing or replacing the defective parts of equipments at no extra cost. Installations shall be taken over by the department after successful commissioning.

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- 24.5.3 If owing to storage or other causes, the electrical insulation resistance has deteriorated, the equipment, cable etc shall be thoroughly dried out replaced/ or other steps taken to restore proper insulation resistance before connecting the same to the power supply. After connecting the power supply, the whole of the equipment shall be tested to demonstrate its stability to operate satisfactorily.
- 24.5.4 All instruments and appliances, oil or other materials necessary for the complete testing shall be provided by the contractor at no extra cost.
- 24.5.5 Approval by the department for materials, workmanship, etc during manufacture or approval at the site will not relieve the contractor from his obligation to comply with all the requirements of the contract.

24.6 UNDERGROUND CABLES

- 24.6.1 Underground XLPE cables shall be all as specified in the BoQ& shall conform to IS 7098 Part II including amendments. The cables shall be laid, jointed and tested all as specified in clauses 19.74 to 19.94 of MES Schedule Part I
- 24.6.2 The quantity of cable given in the schedule 'A' is only approximate. The contractor is instructed to visit the site before taking action for procurement of the cable.
- 24.6.3 The rate quoted for cable also includes connecting the cable terminals to the LT panels and control switches etc with suitable size of cable lugs, bolts nuts and washers.No straight through joints permitted on cables of length upto 400 mtrs and maximum straight through joints permitted for length of cable more than 400 mtrs is strictly repatriated to two.All length of cable shall be tested before laying and after laying and the satisfactory test results are to be signed by the contractor and the GE
- 24.6.4 Before accepting the lot of cable for incorporation in the work, acceptance tests of XLPE cable as stipulated in clause 18.2.1 of IS -7098 (Part-II) shall be made by the contractor to ensure the quality of cable. Testing charges including transportation of material shall be borne by the contractor without extra cost to the Govt.

24.7 LT PANEL:

- 24.7.1 Main LT Panel will be free standing, front operated, cubical in construction having multi-tier arrangement of the incomers and feeders as per details given in the schedule of Quantities. The panel will have cable entry and cable exit (as per site condition).

(a)Selection of the components :All the electrical components selected for constructing the various modules of boards must have sufficient ratings to perform the duty they will be required to do consistently without any deterioration in their normal life and safety of the other equipment including the safety of the operators. However these ratings will not be less than the ones specified in Schedule 'A'.

(b)General arrangement and layout :Each vertical section of the panel will contain 5 to 6 modules only for 125 Amps and above and will be limited to 7 modules for all modules current rating lower than 125 Amps . Minimum size of bigger module should not be less than 400 mm (height) * 450 mm (width). The height of the panel should be limited to 2400 mm. Operating levers handle etc. of the highest unit shall be at a height less than 1800mm and should not be less than 250mm of the lowest unit. All the cables incoming to the main L.T panels will be entering from the top. For this purpose a removable gland plate will be provided at the bottom. A minimum distance of 250 mm will be provided between the gland plate and the nearest terminal for proper dressing and termination of the cable. All the

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PARTICULAR SPECIFICATIONS

components of a module will be mounted on a component plate using machine screws and taped holes (excepting the components mounted on the door). These component plates should be fixed with bolts for easy replacement. Standardisation will be adopted while making these plates so that the component plates of same size modules can be changed from one module to other. No air circuit breaker will be placed in top compartment in one vertical section having only one air circuit breaker. Not more than two circuit breakers will be placed in any vertical cubical and in no circumstances three air circuit breakers will be placed in one vertical cubical

(c) Fabrication : The Main LT Panel will be metal clad, cubical in construction, free standing, floor mounted, indoor duty sheet metal enclosure. It shall be totally dust and vermin proof. All the cubicles will be equipped with front located, outward opening, lockable doors having hidden hinge and a bolted back cover both using non-deteriorating neoprene rubber gaskets to provide IP 52 protection and necessary louvers shall be provided. The board will have structural frame as well as all sides, partitions and enclosures made out of shaped CRCA sheet of minimum thickness 2 mm. In case of panels of lengths more than 2.4 meters the fabrication of any single section will be limited to a maximum length of 2.4 meters for the purpose of shipping and shifting at the site. These sections will be assembled at the location of installation with the help of nuts and bolts on a supplied common frame. While making general arrangement, consideration will be given to the place of sectionalisation to select the location where the minimum electrical connections are transferred from one section to the other section. These connections will be required to be terminated on a connector terminal block (stud type) and the connections will be numbered and marked for joining at the site.

All nuts, bolts, handles, meters, knobs etc. appearing on outside of the panels should be located in symmetry so as to give a neat appearance. All knibling work shall be carried out by automatic machines. For rigidity the panel will be provided with a base frame made out of MS channel of size not less than 100 mm and the same will be bolted to the panel. All the hardware used in the assembly will be electroplated for protection and appearance. Each part of the fabricated panel will be subjected to seven tank treatment in the order as below:

- De-greasing.
- De-rusting
- Rinsing.
- Phosphating.
- Drying.
- Primer Spraying.
- Oven drying and baking

Powder coating paint of minimum 65 microns shall be applied after primer and shade of the colour will be decided by Engineer-in-charge. Paint thickness & paint adhesion test will be carried out & witnessed.

(d) Bus bar and Connections : The main bus bars of the panel will be shaped out of high conductivity, electrolytic conductor Al91E grade, and shall be liberal sized. The conductivity of aluminium shall be minimum 58% and shall be ascertained with the help of conductivity meter. To maintain the extension capability at both ends of the panel the horizontal main bus bar will run from left end of the panel to the right end of the panel without any taper or

reduction in the size. The bus bars will be covered with the coloured, heat shrinking, PVC sleeve throughout (Except at joints). The three phases will be identified with red, yellow and blue colour bands provide on both side of a joint. The size of bus bar calculations must be approved by GE for rated fault level keeping in view the overall temp rise to 85°C. The distance between two SMC supports shall be placed to suit the rated fault level. In any case the distance between SMC supports shall not exceed 450 mm. These SMC distance calculations also must be approved by GE prior to any fabrication work and factor of safety shall be considered as two for thermal stress calculations.

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PARTICULAR SPECIFICATIONS

A minimum derating factor of safety of .66 on account of temperature rise and enclosure shall be taken and exact calculations shall be done as per site condition subjected to a minimum of 0.66 derating. While doing calculations exact rating chart of manufacturer shall be attached along with the calculations.

The bus bars will run in a separate bus bar chamber using bus insulators made of non-deteriorating, vermin proof, non hygroscopic materials such as SMC.

To limit the temperature rise in the bus bar chamber a set of louver can be provided at strategic places considering the air circulation. The louvers provided will have a brass wire mesh covering from inside with minimum 100 openings per sq inch. The overall temperature of bus bars shall not exceed 85°C. Each vertical section of modules will be given power supply by using a set of completely enclosed vertical bus bars tapping off from the main bus bars. These vertical bus bars will be of adequate size and rating to carry the full load current of all the modules and will not be less than 220 square mm in cross section. The electro-galvanised high tensile steel nuts, bolts, plain washers and spring washers of suitable size will be used in connecting the various sections of the bus bars. A minimum of 1.6 times the width of bus bar will be the lapping length of each joint.

(e)The Control wiring: The control wiring of all the panels will be done with PVC single core flexible copper wires of cross section 1.5 sq mm. and 2.5 sq mm. All the wiring involving current transformers and DC circuits will be wired with minimum 2.5 mm cross section wire and the others with 1.5 sq mm. The control wiring will be done by properly dressing all the wires in a laminar manner either in PVC duct of liberal size or bunched together by PVC strapping tapes at a distance not exceeding 150 mm. Each wire will terminate with a copper ferule crimped to the wire. The PVC ferules will be used to identify each wire of the circuit and the same numbers will be marked on the drawing for the corresponding wire. Only Elmex type clip on style connectors with suitable rails will be used for ending the control wiring. The decision will ensure that only one out going wire will be connected to one connector. When the control wiring is crossing from fixed parts to moving parts such as doors etc. the wire will be run in PVC sleeve of suitable size and the same will be mechanically clamped at both the ends ie. one end to the fixed part and the other on the moving part.

Under no circumstances the wiring should be under any kind of stress for which sufficient length of control wiring in the PVC sleeve should be provided. The colour code for the wiring will be as follows:

- For +ve of DC circuits RED
- For -ve of DC circuits BLUE
- For CT and PT circuits RED/YELLOW/BLUE following the phase codes
- For remaining BLACK
- For earthing GREEN

24.8 FLAME PROOF FITTINGS

- 24.8.1 Flameproof fittings shall be designed using materials like aluminium alloy LM-6 and shall have high IP ratings as specified. These shall be designed to prevent an internal explosion from igniting surrounding atmosphere.

25.0 FIRE FIGTING

- 25.1 Fire alarm system shall be installed as specified in Clause No. 27.8 to 27.8.10 of SSR Part I. After completion of fire alarm work, testing and commissioning shall be carried out as specified in Clause No. 27.9 of SSR Part I.

PARTICULAR SPECIFICATIONS

25.2 A system schematic wiring diagram shall be obtained from the fire alarm specialist supplier and submitted to the Engineer-in charge prior to commencement of work.

25.3 GENERAL REQUIREMENTS

- a) All materials shall be of the best quality conforming to the specifications and subject to the approval of the GE.
- b) Pipes and fittings shall be fixed truly vertical, horizontal or in slopes as required in a neat workman like manner.
- c) Pipes shall be fixed in a manner as to provide easy accessibility for repair and maintenance and shall not cause obstruction in shafts, passages etc.
- d) Pipes shall be securely fixed to walls, and ceilings by suitable clamps at intervals approved by GE and only approved type of anchor fasteners shall be used for RCC ceilings and walls.
- e) Valves and other apparatus shall be so located that they are easily accessible for operations, repairs and maintenance.

25.4 SMOKE DETECTORS: Smoke detectors shall be as specified in clause No.27.6 to 27.6.5.3 of SSR Part – I and as specified in Sch 'A'

25.5 MANUAL CALL POINT: Manual call points shall be of addressable type as specified in Schedule 'A' Manual call points shall be provided conforming to specifications covered under clause No.27.7 of SSR Part – I

25.6 FIRE ALARM PANEL: Fire alarm panel shall be provided at locations as directed by Engineer-in-Charge. The panel board shall be provided all as specified in Schedule 'A' and as specified in clause No. 27.5.1 and its sub clauses of SSR Part – I.

25.7 FIRE HOSE REEL: Standard fire hose reels(first aid hose reel) with 20mm dia high pressure dunlop rubber hose conforming to IS: 444, 30.0m long with gunmetal nozzle with 5mm bore, and control valve, connected and all mounted on circular hose reel of heavy duty mild steel construction and C.I. brackets shall be provided. Hose reel shall conform to IS:884-1969. The hose reel shall be connected directly to the M.S. pipe riser through an independent connection. 02 nos. of 63 mm dia 15m long non percolating flexible fire fighting hose conforming to IS 636 with male and female coupling shall be housed in the hose cabinet to connect with fire hydrant landing valve. Hoses, hose reel and hose boxes shall be provided all as specified in Schedule 'A' and as specified in clause No. 27.3.10.3 to 27.3.10.7 of SSR Part – I.

25.8 PRESSURE GAUGE: Pressure gauge shall be provided alongwith isolation cock at every hydrant station. This shall be fixed permanently to the riser through an independent socket and the gauge should have a pressure range from 0 to 10 kg/cm². It shall be provided all as specified in Schedule 'A' and as specified in clause No. 27.3.11.1 of SSR Part – I

PARTICULAR SPECIFICATIONS

25.9 Pressure switch and Flow Switch shall be provided as specified in Clause No. 27.3.11.2 and 27.3.11.3 and its sub clauses of SSR Part – I.

25.10 VALVES

25.10.1 All valves of sizes shall be as specified in Schedule 'A'.

25.10.2 Check valves shall be as specified in Schedule 'A'.

25.10.3 Hydrant valves shall be of approved make and with IS mark. It shall be provided as specified in Clause No 27.3.10.1 of SSR Part I.

25.10.4 Butterfly valves: Valves shall be cast iron butterfly valve to be used or isolation and/or flow regulation. The valves shall be bubble tight, resilient seated suitable for flow in either direction and seal in both directions. Butterfly valve shall be of best quality conforming to IS: 13095.

26.0 List of Manufactures

26.1 The makes/ manufacturers of various items of materials is attached as Appx 'G'. The contractors shall ensure that the items of makes given in the above Appx are only incorporated in the work unless otherwise mentioned in the respective items of BOQ.

Signature of Contractor
Date: _____

AAD (Contracts)
for Accepting officer

PARTICULAR SPECIFICATIONS**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) Manufacture (b) Brand (c) Grade
4. Quantity of Cement & Lot No./Week No. (in bags): Qty (b) Lt No./Week No.
5. Manufacturer's Test Certificate No.
6. Random Test Details (a) Physical test Report from Vide their letter No. (Name of approval Lab/Engg College)
- (c) Chemical test report fromvide their letter No. (Name of approval Lab/Engg College)
7. Details of Physical & Chemical properties.

	Physical Requirement (As per IS 4031)										Chemical Requirements (As per IS 4032)							
	Specific Surface Area (M ² /kg)	Soundness by Le Chatelier	Soundness by Auto Clave	Initial Setting Time (Minutes)	Final Setting Time (Minutes)	Compressive Strengths (Mpa)			Temp during testing °C	Standard Consistency (%)	Lime Saturation Factor (Ratio)	Alumina Iron Ratio (Ratio)	Insoluble Residue (%)	Magnesium (%)	Sulphuric Anhydride (%)	Loss on ignition (%)	Alkalies (%)	Chlorides (%)
						03 Days	07 Days	28 Days										
As per relevant IS																		
As per manufacturer's 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**

PARTICULAR SPECIFICATIONS**Appendix 'B'****STEEL SUPPLY AND ACCEPTANCE REGISTER**

1. Name of Work:
2. CA No.....
3. Name of manufacturer TC No.
4. Manufacturer:
5. Random test details;
 - (a) Physical test report from..... vide their letter No
(Name of NABL approved lab/Govt Engg College)
 - (b) Chemical test report from..... vide their letter No
Name of NABL approved lab/Govt Engg College)
6. Types of Steel, dia & quantity:
 - (a) Type : TMT / CRS
 - (b) Dia : mm
 - (c) Actual weight : MT
 - (d) Conversion weight : MT

	Chemical Test							Mechanical Test						
	Carbon (%)	Sulphur (%)	Phosphorus (%)	Sulphur + Phosphorus (%)	Manganese (%)	Silicon (%)	Corrosion resistant element	Weight per metre	Yield Stress (N/Sq mm)	Tensile strength (N/Sqmm)	% Elongation (Minimum 18%)	Bend test	Rebend test	Remarks
As per IS 1786-2008														
As per manufacturer ' test certificate														
As per independent test														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Remarks with signature

Accepted/Rejected

Contractor Junior Engineer

Engineer-in-Charge

Garrison Engineer

Remarks of BOO/Inspecting Officer/CWE

PARTICULAR SPECIFICATIONS**Appendix 'C'****(On Stamp Paper of value for Rs 100/-)**
FORM OF GUARANTEE CERTIFICATE

CA No :
Name of Work :
Date of commencement :
Date of completion :

We, the M/S _____ do here by undertake that the exterior emulsion paint carried out to the buildings included in the above Contract is guaranteed for a period of **FIVE years** from the certified date of completion of the work. If during this guarantee period **of FIVE years**, any defect is noticed in the work carried out by us, the same will be rectified by us without any extra cost to the department to the entire satisfaction of the **Garrison Engineer Daman** at our own risk and cost.

Date : _____

M/s _____

PARTICULAR SPECIFICATIONS**MAKES / NAMES OF FIRMS FOR PRODUCTS TO BE INCORPORATED IN WORK****Appendix 'D'**

SL No.	ITEMS	MAKES
CONCRETE		
1	Ready Mix Concrete(RMC)	Lafarge (Nuvoco), Ultra Tech, ACC, Prism RMC, RDC Concrete, Ramco, India Cement Ltd, JK Lakshmi Cement Ltd, Godraj & Boyce mfg Co, Nuvoco RMC, Sun-X Concrete
2	Ready mix plaster	Accoplast, Ultra techcement Ltd 'Birla level plast', Ascolite Birla, Birla Aerocon, Ascolite
3	Ready mix joint mortar	Acco Plast, Birla Aerocon, Ascolite, Renaatus Procon Pvt Ltd 'Renaplast'
JOINERY AND HARDWARE		
1.	Factory made wooden shutter/ Flush doors/Frames	Century Doors, Century Ply Industries, Greenlam (Brand : Mikasa Door Frames) Jain Doors, A-1 Teak Products Pvt Ltd
2.	Panel doors/Skelton door shutters	Pioneer Timbers, A-1 Teak Products Pvt Ltd, Goyal Industries, Doorking Industries, M/s MP Wood Products, Jain Wood Industries "Jain Brand" Indian Timber Product
3.	Flush Doors	Archid Ply, Duro Doord, Bhutton tuf, Swastik, Durian
4.	Factory made PVC / FRP door frames and shutter	Qute Extrusions Pvt Ltd (Brand Qute), OM Industries, Duroplast Extrusion, Sintex Industries Ltd, Rajshree Plastiwood Ltd, Fenesta, Durian Sarvesh Multi Plast India Ltd
5.	UPVC Doors, Windows, Kitchen cabinets and Ventilators, Ceiling, Wall Paneling and duct cover	Fenesta, Qute Extrusions Pvt Ltd (Brand- Qute), Madhu Industries, H2O Solutions, Prominance, NCL Veka Limited (KPT), ALUPLAST, Rehau India Pvt Ltd, Astral Limited, Sarvesh Multi Plast India Ltd, Yashashri Polyextrusion LTD, Duroplast Extrusion, Astrapia, Aparna Enterprises Ltd 'Aparna Ventster', OKOTECH, SMP Impex Brand 'SMP-Magma'
6.	Wood Plastic Composite (WPC) Doors & Frames	Kalinga, Ecoste, Hardyplast, Qute Extrusions Pvt Ltd (Brand Qute), Duroplast, Sarvesh Multi Plast India Ltd, Alstone Industries Pvt Ltd, SMP Impex 'SMP-Magma'
7.	Steel windows, Ventilators, Door frames, Shutters (Z/Box type)	M/s Godrej & Boyce Steel Mfg Mumbai, Madhu Industries, Ashwani & Sons Gaziabad, Multiwyn Industrial Corporation Kolkata, Agew steel Ahmedabad, Shiv Mullar Ahmedabad, Steel man Industries Jammu, Sen Harvic Mumbai, Aaccess Tough doors
8.	Wood based partitions	Novapan, Bhutan board, Green Ply, Mangalore, Mysore & Chipboard, Century Ply board India Pvt. Ltd, Kit Ply, Yamuna Interiors Pvt Ltd, Alexia Panels (ALEX)
9.	Dash tru-hold Expansion fasteners	Dash fasteners Pvt Ltd., C-16, South Extension Part II, New Delhi M/s Mon Traders, C-16, Tardeo, Air conditioned Market, Bombay - 34
10.	Steel Rolling shutters & collapsible gates	Welroll, Gandhi Automation Pvt. Ltd, Swastik rolling shutters Mumbai Metal King, Indian Entrance Automation, Indian Rolling Shutters Bangalore, New Karanataka Rolling Shutter Bangalore, New Dynamic Rolling Shutter Chennai, Akash Rolling Shutter Hyderabad, Access Automation Hyderabad, Shri Krishna Associates Panchakula, Eshwar Industries Meerut, Steel man Industries Jalandhar
11.	Mortice locks	Harrison, Godrej & Boyce Co Ltd., Dorset India, Spider Metal products Ltd, ENOX, Jainson
12.	Hydraulic door Closers	Godrej Hafele, Ozone Door Set, Spider, IPSA door closer
13.	Sheet Glass- Plain/Frosted	Modiguard, Saint Gobain, Atul Glass Industries, Garware, Gold plus glass Industries Ltd
14.	Heat absorbing glass & Reflective solar control film	Modiguard, Saint Gobain, Atul Glass Industries, Garware

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PARTICULAR SPECIFICATIONS

SL No.	ITEMS	MAKES
15.	Rough cast/Pin headed wired glass	Modiguard, Saint Gobain, Atul Glass Industries
16	Oil Putty	Gold Mohar, Shalimar Hardware, M/s Atul Dyes and Chemicals, UK Paint Industries Gurgaon, Jenson & Nicholson, MYK Arment, Berger
17.	Aluminium Sections of shutters/frames for door/Windows/Ventilators	Jindal , Hindalco, Associated Group (Elesar Focci Nivrav Commercial Ltd), Maan Aluminium, Century Extrusions, Banco Alluminum Ltd, Sterlite, Ajit India
18.	Drapery rod	Vista Levolor, MAC-DÉCOR, Deco- Window, Jayesh Metal Corpn (JMC)
19.	Blank	
20	Aluminium Tower Bolt/Aldrops/Door Handle/ Butt Hinges / Towel Rails	Jindal, ESSESS, Aluminium Udyog (Brand GLOBAL)
21	Fencing (Chain link, Concertina coil, Weldmesh, Electric, Gabions, Honeycomb, Razor wire, Razor blade tape, UNICO Weldmesh system, 358 Anti climb weldmesh system, Tree guard, Barbed wire, Anti climb and security gates	A-1 Fence Products Company Pvt Ltd, Shankar weldmesh Pvt Ltd, Tata steel Global wires, Secure fencing Delhi, Eco Netting Nagpur, OM wires and wire products Kolkatta, Just fence Hyderabad, Rajesh Industrial Corporation Chennai, Zeetmaull Janichandlaal Madras Pvt Ltd, Oswal wiremesh Co Bangalore, Mysore wires netting Co Pvt Ltd Bangalore, Asian Fence Wire Products Hyderabad.
22	Aluminium & brassmongery	Argent Industries, Crown Industries, Mech India, Nu-lite Industries, Perfect Fabricators, Classic, Aluminium udyog
23	Gypsum Based ceiling	Gypsum board, Arm strong, Ramco, Bison
24	Aluminium section for false ceiling	Jindal, Indal, Hindalco
25	Venetian Blinds	Aerolux, MAC, VISTA Levolor
26	Laminated sheets	Formica, Sun Gloss, Sunmica, Backlyte Hylum.
27	Particle board and Pre laminated particle board	Green Ply (Greenlam MFC Board), Kitlam, Anchorlam, Century Plywood/Sharon
28	Perforated Particle Board/tiles for insulation and acoustic	Anchor ceiling Tiles, Armsrong, Anutone, Aerolite ceiling system, Kitply ceiling ties, Knauf
29	Plywood/Block Boards	Anchor, Century Ply wood, Mysore Chip Board Mysore, Green Ply, Archid Ply, BhutanTuff India
30	False ceiling	Anutone, Armstrong, Aerolite ceiling system, Saint Gobain Gyproc, Diamond ceilings, Ramco Hilux
31	False ceiling members (Perimeter, Ceiling Section, Intermediates, Angles etc)	Armstrong, Aerolite ceiling system, Saint Gobain Gyproc, Gridsquare, Ramco Hilux
32	Particle Board/fiber board cement bonded	NCL Industries Ltd (Bison Panel), Everest Industries Ltd (Everest), Hyderabad Industries Ltd (HIL)
33	Thermal /Acoustic Insulation (Nitrile Rubber) & Insulation covering system/Acoustics panels	Armacell India Pvt Ltd (ARMAFLEX), Lloyd Insulation, Rock wool India Pvt Ltd, Insulation India Engineering, Himalayan Accoustics
34	Adhesives	Pidilite, Fevicol, Vamicol
35	Veneered Particle Board	Greenply, Kitply, Associate Particle Board, Century, Sharon
36	Aluminium Composite Panels	Aluco Bond, Alstone, Alstrong, Viva, Aludecor, Reynobond India Pvt Ltd

PARTICULAR SPECIFICATIONS

SL No.	ITEMS	MAKES
37	Pre moulded nonbituminous jointfiller board	Elcon, Duran Board HD-100
38	Pre moulded bituminous joint filler board	STP Ltd., Tikitar Industries Ltd, Capital Steel and Chemicals Ltd., Garlex Joint Filler by M/s Garlick & Co Pvt Ltd, Roof Rites Delhi, SN Industries, Delhi
39	Mangalore Tiles	Charminar, Raja, RECHO, Prajapat, Kerala tile Works Thrissur
40	Cool roof tiles	Johnson tiles, Somany, Nitco, Asian, Kajaria
41	Pre painted Galvalume/Galvanized corrugated steel sheets	JSW Colouron+, Tata Bluscope steel, Lloyd insulation, Tata steel BSL, Kirby Building Solutions (I) Ltd
42	Cold rolled Cold annealed (CRCA) steel sheets	JSW MI, JSW Steel, Tata steel, Nezone
43	Non Asbestos Fibre reinforced (Polypropylene), 6mm cement corrugated sheets	Charminar, Ramco, Everest Industries Ltd (EVEREST)
44	AC rain water pipes	Everest, Rajasthan asbestos Cement, Hyderabad Asbestos Cement, India Asbestos Products, Rohtas, Sabarmangala Manufacture Co., Hyderabad Charminar
45	Rolled Formed GI Section Prepainted / Colour Coated Windows (Box type)	NCL Seccolar, Tata Pravesh
KITCHEN / BATH / SANITARY FITTINGS		
01	Kitchen chimneys	Bajaj, Sunflower, Butterfly, Glen, Sunflame
02	Stainless steel sink/plate racks(ss) ISI marked	Nirali, Prayag Polymers, JAYNA, Parryware, Shakti, Pheonix, Jaquar (Bathing), Flora Steels Pt Ltd
03	EWC, IWC, Wash Hand Basin, Urinal and other vitreous china sanitaryware	Johnson, Kohler, Parryware, Cera, Jaquar, Neycer, HINDWARE
04	Towel Rails/Brackets and toilet paper holder	Johnson, Kohler, Parryware, Cera, Jaquar, HINDWARE
05	Flushing cistern - PVC Low level incl flush valves and fittings for WC and urinals	Johnson, Kohler, Parryware, Cera, Jaquar(Bathing), Commander, Prayag Polymers, Shankti, Hindware Ltd
06	Plastic Seat and covers for EWC/ Bathroom cabinets	Commander, Parryware, Cera, Neycer, PRAYAG Polymers, Jaquar(Bathing), Kohler, Hindware Ltd
07	CP or Copper/Brass alloy, Pillar tap, Bib tap, Wall mixer, Shower, Diverters, Waste coupling, Bottle trap, Health faucet, Angle cock, Stop cock, and other related accessories	Jaquar & Co Pvt Ltd, Somany, Kohler, Grohe, Hindware Ltd, Flora Steels Pt Ltd
08	PVC toilet cabinet	Commander, Jasmine, Cipla Plast, Rotamax, Polytuff
09	Hot & cold water supply fittings	M/s Jaquar, M/s L&K, Goldline, M/s Crabtree
10	Mirror	Atul, Kohinoor, Swastik, Saint Gobain, Modiguard, Asahi (AIS) Glass
11	PTMT Bathroom and Hardware fittings	Prayag Polymers, Vectus, Flora Steels Pt Ltd

PARTICULAR SPECIFICATIONS

SL No.	ITEMS	MAKES
12	Shower rose	Jaquar (Bathing), Kohler, ESS-ESS, Soma, Crabtree
13	CI/Brass/SS Ball cocks	Leader, Zoloto, Prayag Polymers,
14	Wall mouted cloth drying stand	Bathla Aluminium, Homewell
CHEMICALS / WATER PROOFING COMPOUNDS		
01	Chemical for anti-termite treatment for structures (Chloropyrifos)(20EC), Imidacloprid(30.5 SC)	Montari Industries Ltd., 78, Nehru Place, New Delhi -110019 4-H, Clubs (india), 487 A, Gandhi Nagar, Jammu-04, TRISHUL bearing ISI Mark conforming to IS specifications, M/s Dara Chemicals Industries Ltd. D-3, Lajat Nagar-01, New delhi-24' DURSBN' manufactured by DENOCIL marketed at Mumbai by DE-NOCIL Corporation Pretection Ltd, 1st& 2nd Floor, Priojshah Nagar, Eastern Express Highway, Vikroli (East) Mumbai – 79 ,M/s Kanonia chemicals & Industries, PO Renukoot-231217, Dist-Sonebhada (UP) M/s India Pesticides Ltd., E-17 to 23, UOSIDS Industrial Area, Deva Road, Chinal Lucknow (UP)-227105, M/s Pest Control (Rajastan) GuruhariNiwas D-232 Marg Bani Park Jaipur, Firm having membership of IPCA and holding Valid license
02	Water proofing compound	Pidilite Industries Ltd, taloja, raigad District, super Aquacem (India) Ltd., New delhi M/s Krishna Conchem Products Pvt Ltd , STP LTD, SICO NO 1 ,IMERMO ,EXCOT, SCOT NO 1 FOSROC, M/s Bauchemimic (India)
FLOORING/TILING		
01	Mosaic/Cement flooring tiles/Terrazzo tiles	Nitco, Hindustan Tiles, Ultra Tiles, Duracrete
02	Glazed wall tiles / Non skid ceramic tiles	Johnson Tiles, Somany, Euro Tiles, Kajaria, AGL Tiles, Aparna Enterprises Ltd 'Vitero', Simero Industries Pvt Ltd., Nitco
03	Vitrified Tiles	Johnson, Somany, Nitco Tiles, Kajaria, Orient, Bell, Euro Tiles, AGL tiles, Aparna Enterprises Ltd 'Vitero', Simero Industries Pvt Ltd
04	Acid resistant Tiles	M/S Johnson Mumbai, Somany, Kajaria, M/S Burn Standard Co. Jabalpur, M/s Parshuram Pottery Works Rajkot Morvi
05	Cement concrete Inter locking paver blocks/tiles/ precast chequered tiles	M/s Ultra Tiles, NITCO, Topaz Tiles, Godrej Boyce Mfg Co Ltd
06	PVC sheet and tile flooring	Krishna vinyl Tiles, Armstrong, M/s Marblax Tiles, Polyfin Tiles, Square Foot, Jain Irrigation System, SMP Impex 'SMP-Magma'
07	Laminated Wooden Flooring	Action Tesa, Armstrong & Bruce, Pergo, M/s Greenply Industries Ltd (Green Floormax), A1 Teak product Pvt Ltd
08	AAC Blocks	Ultra Tech, Birla Aerocon, Ascolite, Siporex, Magicrete, Godrej & Boyce Mfg Co, Renaatus Procon Pvt Ltd 'Renocon'

PARTICULAR SPECIFICATIONS

SL No.	ITEMS	MAKES
	PAINTS/FINISHES	
1	Primer	Asian paints, Nerolac, Shalimar, J&N, Berger Synthetic Enamel
2	Synthetic enamel paint	Berger Paints (Luxol), Nerolac (Synthetic Enamel Hi-Gloss), Asian Paints (Apolite Premium Gloss), Jehnson & Nicholson, Akzo Nobel Dulux (Super Gloss), MYK Arment, Nippon 'Bodelac'
3	Anti corrosive paint on structural steel	Asian Paints, Nerolac, Berger, Dulux, Shalimar, Johnson Nicholson
4	Cement Base Paint	Super Snowcem (Snowcem paints), Durocem, Aquacem, Shalimar, Berger, JK Maxx
5	Interior Emulsion paints	Berger Paints (Rangoli Acrylic emulsion), Asian Paints (Premium emulsion), Nerolac Paints (Beauty Gold acrylic emulsion), Shalimar Paints, Snowcem Paints, MYK Arment, Nippon 'Maxx Breeze', JK Maxx
6	Exterior Emulsion paints	Asian Paint (Apex Ultima), Berger Paint (Weather coat all guard), Dulux (Whether shield max), Kansai Nerolac (Excel Top Guard), Snowcem Paints, MYK Arment, Nippon, JK Maxx
6a	Interior Plastic emulsion paints	Asian Paints (Apolite premium Emulsion), Nerolac (Beauty Gold), Berger (Rangoli Total Care)
7	Acrylic Washable distemper and primer	Asian Paints (Tractor Uno), Kansai Nerolac (Beauty), Berger Paints (Jadoo), Shalimar Paints, Jenson & Nicholson, MYK Arment, Nippon Paint, JK Maxx
8	Colour anodizing for Aluminium sections	Conpaptex, Vadodara, Krishna Metal industries, Mumbai. Mansi chemical, ahemdabad, Anand tech Process, Bengaluru
9	Cement Putty	Ultratech Cement Ltd 'Birla wall care putty', J K Maxx, Golden Mohar, Asian paints, Snowcem Paints, MYK Arment, Nippon 'silky wall putty', Reynobond India Brand Reynocon wall putty
10	Hot applied thermo plastic road marking paint (As per Clause 803.4 of MORTH)	M/s Shivalik Primo India Pvt Ltd. New delhi, Asian Paints Ltd, SHALIMAR, STP Ltd, SAI Thermoplastic Paints Ltd..
	PLUMBING	
1	Gun metal Globe/Gate valve/Angle valve	Leader, Zoloto, Bir, Kirloskar
2	PVC water tanks/Polythylene (ISI marked)	Sintex, Polycon, Jaipur, Rolex, Infra, Astral Limited, Supreme Industries Ltd
3	PVC Float Valves and accessories	Prayag polymers, GMP, Neta, Zolota, Symet, Jaquar (Bathing), Symet
4	Loft Tanks	Sintex, Polycon, Plasto, Ganga
	MISCELLANEOUS	
1	APP membrane	Asian Paints Ltd, STP, IWL, Torchstar, Tiki Tar, Shivam Tar Products, Bengal Bitumen
2	Protective Coating to Reinforcement Bars	PSL Ltd, Zary Causeway, KAchigam, Daman (UT) or equivalent, Pidilite, Zinga (Calcutta),
3	Bituminous Sealing Compound	STP Ltd, SN Industries, Tikitar

PARTICULAR SPECIFICATIONS

S.No	ITEMS	MAKES
	ELECTRICAL ITEMS	
01	Transformers 66/11KV, 33/11KV, 33/0.433 KV, 22KV/11KV, 22/0.433KV, 11/0.433KV copper wound oil/ dry type cast resin of all capacity incl and above 500 KVA	ABB, Siemens, Bharat Bijlee, Crompton Greaves, Alstom (GEC), BHEL, Indian Transformer and Electricals Pvt. Ltd.
02	Transformers 66/11KV, 33/11KV, 33/0.433 KV, 22KV/11KV, 22/0.433KV, 11/0.433KV copper wound oil/dry type cast resin of all capacity incl and below 500 KVA	Voltamp, Indian Transformer & Electricals Pvt Ltd (ITEL), Esennar Transformer (P) Ltd, PACTIL, Andrew Yule
03	Isolation Transformer	Vinitek Electronic(Volina), Indian Transformer & Electricals Pvt Ltd
04	Air Break Switch (Gang Operated Device),33/11 KV	Pactil Mumbai, Jaipuria Brothers, Mysore Electrical Industries (Mei), Yamuna Power Infrastructure, BHEL
05	Air Break Switch (Isolators)	Mysore Electrical Industries (Mei), Yamuna Power Infrastructure, Southern Switchgear, Andrew Yule, Crompton Greaves
06	HT 11 KV, 3Ph Automatic Switch fuse unit	ABB Ltd Bangalore, ALSTOM, Crompton Greaves Mumbai, Schneider New Delhi, Yamuna Power Infrastructure, Indian Transformer & Electricals Pvt Ltd, Meagawin,
07	VCB (Indoor/Outdoor)	BHEL, ABB Ltd Bangalore, SIEMENS, Crompton Greaves Mumbai, Schneider, Alstom, Indian Transformer & Electricals Pvt Ltd, Meagawin
08	HT Switch gear 66/33/22/11KV 3 Phase, Gas circuit breaker SF-6 Type	Crompton Greaves Mumbai, ABB Ltd Bangalore, Schneider New Delhi, C&S, Siemens Ltd Mumbai, ITEL, Lucy Electric
09	HT Trivector Meter	SECURE, L&T, ABB (ELSTER), SCHLUMBERGER, SIEMENS
10	HT Ring main unit, SF6, 11 KV	ABB, SIEMENS, CROMPTON GREAVES, SCHNEIDER
11	Package/unified Sub-Station	ABB, SIEMENS, CROMPTON GREAVES, SCHNEIDER
12	Cable jointing kit	RAYCHEM, M-SEAL, DENSON, BIRLA 3M, YAMUNA CABLE ACCESSORIES
13	CT & PT, 11 KV/33 KV	PRAGATI, AE, KAPPA, SCHNEIDER, L&T (AS PER HT PANEL MANUFACTURERS DESIGN), SIEMENS, ABB,
14	HT Armoured XLPE, PVC insulated cable Aluminium conductor for system upto and including 11KV grade 33	Havells, RPG, Gloster, Finolex, SBEE Cables (india) Ltd, KEI Industries
15	HT Armoured XLPE, PVC insulated cable Aluminium conductor for system upto and including 11KV grade and upto 66KV grade	Havells, RPG, Gloster, Finolex, SBEE Cables Ltd (india) (only approved for 11/33KV Cables), KEI Industries (only approved for 11/33KV Cables)
16	Insulator HT/LT Disc/ Pin/ Shackel/ Loop/ any type	BHEL, WS Insulators, Jayshree, Modern Insulator, Yamuna Power Infrastructure, Sourthen Insulators, MEI
17	HT Armoured XLPE cable 132 KV grade	Havells, Gloster, Finolex
18	HT/LT Steel tubular swaged pole	The National Tubing Company Kanpur, Singh Profile Pune, Kalinga Tubes, Bombay Tubes, India Tube And Co, India Electric Poles Mfg. Co Maharashtra
19	Pre stressed concrete Poles	Cement Fabric India Jodhpur, Concrete Udyog Jhansi, Sankla Udyog Jhansi, Hindustan Pre stressed Concrete Faridabad, Indian PCC Poles

PARTICULAR SPECIFICATIONS

S No	ITEMS	MAKES
20	Bus Bar Trunking	L&T, SIEMENS, SCHNEIDER, ABB, GE, LEGRAND, C&S
21	Lightning Arrestor LT/HT	Oblum, ELPRO, Alstom, Crompton Greaves, BHEL, Yamuna Power Infrastructure
22	LT Panels	Siemens, Crompton Greaves, L&T, ABB, HPL India Ltd, Dolar, EPLEC, Legrand, Standard The make shall be as per approval from CPRI and meet all quality standards
23	HT PANEL	L&T, SIEMENS, SCHNEIDER, ABB, GE, EPLEC LEGRAND, C&S
24	Microprocessor based MCCB/RCCB LT 415 Volts	Legrand, Siemens, L&T, Schneider, ABB, Havells, C&S Limited, Indo Asian, Luker Electric, BCH
25	ACB LT 1100 VOLTS	GEC, SIEMENS, Larsen & Turbo, ABB, Crompton Greaves, BCH
26	Contactor	SIEMENS, ABB, L&T, GE, SCHNEIDER, BCH, C&S, LEGRAND
27	MCB/ RCBO/ RCCB/ DB/ Isolators	L&T (HEGAR), LEGRAND (LEXIC), SIEMENS (BETAGUARD), SCHNEIDER (MG-MULTI-9), ABB, GE, HAVELLS, HPL, CGS, C&S, MDS
28	DBs/ MCB/ MCCB/RCCB	L&T, Legrand, ABB, Siemens, Schneider, Havells, Polycab, C&S Limited, Indo Asian, Luker Electric, Orient Electric, Gold Medal Electrical Pvt Ltd., BCH
29	Voltmeter/Ammeter/ Frequency meter/ Power factor Meter	Automatic Electric, IMP, L&T, HAVELLS, MECO
30	Digital meters with built in Selector switches for Voltmeter/ Ammeter/Frequency / Energy, KW, Power Analyser	L&T, Automatic Electric, Secure Meter, Havells, C&S Limited
31	SCADA including PLC (Programmable Logic Controller)	L&T, Schneider, Siemens, Rockwell Automation, Honeywell, ABB
32	Selector Switch	SIEMENS, KAYCEE, C&S. L&T, LEGRAND, AUTOMATIC ELECTRIC, SECURE METER, HAVELLS
33	Street light timers	L&T, LEGRAND, GE, BAJAJ, SIEMENS, ABB, BCH,
34	LT Cables, XLPE, PVC insulated Copper/ Aluminium wires & cable 650/1100 Volts of all types	RPG, UNIVERSAL CABLES, KEI Industries, FINOLEX, POLYCAB, HAVELLS, RR KEBLES, UNIFLEX, PLAZA, ANCHOR, NICCO, SBEE Cables(India) Ltd
35	Change over Switch/ Starter/ Contactor DOL / Star Delta/ Synchronous/ Single phase preventor	L&T, Siemens, Crompton Greaves, GE, Havells, BCH, C&S Ltd, ABB
36	Main switch Iron clad	L&T, Siemens, Crompton, Havells, Indo Asian
37	Tamper proof electronic meter	SECURE, L&T, ACCURATE METERS, HAVELLS, HPL
38	Automatic Voltage Stabilizers/ Servo controlled Voltage Stabilizer	Automatic electric, Vintec, Indian Transformer and Electricals, Emerson, Andrew Yule, APLAB, V Guard, Volina
39	(b) Voltage Stabilizers up to 4 KVA	VINTEC, SINETRAC, MICROTECH, POWER WARE, APLAB, V GUARD, AE, VOLINA
40	(c) Voltage Stabilizers above 25 KVA (Servo Controlled)	ANDREW YULE (BRENTFORD), AE, APLAB
41	UPS	TATA LIEBERT, APLAB, LUMINOUS, MICROTECH, SUKAM, APC

PARTICULAR SPECIFICATIONS

Sl. No	ITEMS	MAKES
42	DG SETS (Engine)	Cummins, Kirloskar, Ashok Leyland, Greaves Cotton, Caterpillar
43	DG SET (Alternator)	Kirloskar, Crompton Greaves, Jyoti, Stamford, Alstom, Bharat Bijlee
44	DG Sets assembled with sound proof canopy	Kirloskar, Jackson, Sudhir, Greaves Cotton, Cummins India.
45	Induction Motors	Crompton Greaves, Kirloskar Electric, Bharat Bijlee, Seimens, Ngef, ABB.
46	Precast concrete cable covers	Mehtab, Sukhi Enterprises
47	Compact Sub-station	Sudhir, Kirloskar, ABB, C&S, Indian Transformer and Electricals (ITEL), Megawin
48	Power factor improvement Capacitor Banks	Siemens, L&T, ABB, Epcos, GE,
49	APFC Panels	L&T, GEC, SIEMENS, ABB, Epcos, Indian Transformers & Electricals Pvt Ltd
50	BLANK	
51	MS Conduit & accessories	AKG, BEC Industries, Bharat, Kalinga, Jindal
52	PVC casing capping & accessories	Presto Plast, Precision, Modi, Plaza
53	PVC Conduits (Rigid or flexible) and fittings	Precision, Anchor, Modi, Presfit, Avon, Astral Limited, Gold Medal Electrical Pvt Ltd
54	Electric Accessories Piano Switches, Ceiling rose, Call bells, Buzzers, Lamp holders/ Socket outlet etc	Legrand, Leader, Anchor, Crabtree, Gold Medal Electrical Pvt Ltd
55	Modular Switches/ sockets	Anchor (Roma), Legrand, Crabtree, Indo Asian, C&S Limited, Gold Medal Electrical Pvt Ltd, Havells
56	PVC Insulating tape	Anchor, 3M, AKG, Steelgrip
57	Street light luminaries HPSV/Metal Halide	PHILIPS, CROMPTON GREAVES, BAJAJ, WIPRO, C&S, HALONIX, HAVELLS, SHAKTI
58	LED Lamps/Tube lights/High Bay light/ Flood /Street /Façade / Bollard/ Post top/ Step/ Aviation/ Down/ Search/ Commercial lights/ Landscape/ Industrial/ Area/Panel lightings/ High bay Fittings	Bajaj Electrical Ltd, Philips, Wipro, Crompton, Havells, Haloxix Technologies Pvt Ltd, Crompton Greaves (Consumer Electricals Ltd), Jaguar (Lightening Solutions), Luker electric, Orient Electric, FortuneArtr, Syska LED lights, Surya Roshini Ltd, Gold Medal Electrical Pvt Ltd, SHAKTI
59	Ceiling fan/Wall fan	Crompton, Havells, Khaitan, Bajaj Electrical Ltd, Orient Electric, Luker Electric, Haloxix Technologies Pvt Ltd, Crompton Greaves (Consumer Electrical Ltd), Gold Medal Electrical Pvt Ltd
60	Exhaust fan/Air circulators	Crompton, Havells, Usha, Bajaj Electrical Ltd, Almonard, Orient Electric, Luker Electric, Haloxix Technologies Pvt Ltd, Crompton Greaves (Consumer Electrical Ltd), Gold Medal Electrical Pvt Ltd
61	Smart/BLDC Energy Efficient ceiling, wall, Pedestal and Exhaust fans	Crompton, Polar, Khaitan, Bajaj Electrical Ltd, Orient Electric, Luker Electric, Atomberg, Havells, Gold Medal Electrical Pvt Ltd
62	Fan Regulator	Crompton, Anchor, Khaitan, Bajaj, Havells, Usha, Orient Electric, Gold Medal Electrical Pvt Ltd
63	Geyser/Water Heater	Bajaj Electrical Ltd, AO Smith, Usha, Venus, Orient Electric, Crompton, Havells, Luker Electric
64	PVC Pole Boxes	SINTEX, FINOLEX, UNIVERSAL
65	Flame Proof light Fittings (LED/CFL) /Fan/Well glass/Bulk head incl accessories	Baliga, Sudhir, Flexpro Electricals Nasik, Bajaj, Crompton, Shyam Switchgears
66	Electronic/ Photoelectric switch for auto Op of street lights	L&T, GE, Siemens, Bajaj, Legrand, Indo Asian

Contd/--

PARTICULAR SPECIFICATIONS

Sl. No	ITEMS	MAKES
67	ACSR Conductor	All-Ind, ICC Ujala, NICCO, Bharat Conductors, Indian Aluminium Co
68	Laminated Sheet Cover	HYLAM, FORMICA, GREEN LAMINATED BOARDS, ANCHOR, BAKELITE
69	Aviation Obstruction Light	BAJAJ, CROMPTON GREAVES, WIPRO, PHILIPS
70	Thimbles/Studs/Lugs	DOWELLS, JAIPURIA BROTHERS, AXIS, INDIRA
71	Heavy duty EOT/HOT cranes any type	MUKUND, JESSOP, CRANEX, Aaccess Equipments (upto 30Ton cap)
72	LT Change over Switch	L&T, SCHNEIDER, HAVELLS, STANDARDS, C&S, LEGRAND, ABB, GE
73	Battery Charger	VOLTSTART, AE, BCH
	WATER SUPPLY	
01	GI Pipes & fittings	Jindal, Tata, Swastik, Zenith, Prakash, APL Apollo Tubes Ltd
02	HDPE Pipe & FITTINGS	Finolex, Supreme Industries Ltd, Jain Irrigation System, APL Apollo Tubes Ltd, Prince, Astral Limited
03	CI Pipes & fittings	Electrosteel, Kesoram, Kejriwal, NECO
04	DI Pipes & fittings	Electrosteel Casting, Jindal, Tata Metaliks, SAW PIPES
05	CPVC Pipes & fittings	Finolex, Astral Limited, Supreme Industries Ltd, Prayag Polymers, APL Apollo Tubes Ltd, Fusion Industries Ltd
06	PVC Soil waste, rainwater (SWR) & Drainage pipes	Jain Irrigation System, Prince, Kisan, Finolex, Infra, Astral Limited
07	PPR Pipes & fittings	Supreme Industries Ltd, Prince, Finolex, APL Apollo Tubes Ltd, Fusion Industries Ltd, SMFC.
08	PVC pipes & fittings/PVC-O & Fittings	Prince, Finolex, Supreme Industries Ltd, Astral, Jain irrigation System, Ashirwad, APL Apollo Tubes Ltd, Fusion Industries Ltd
09	MS/ERW Pipes & fittings	Tata, Jindal, Zenith
10	UPVC Pipes & Fittings	Supreme Industries Ltd, Prince, Finolex, Astral Limited, Jain irrigation System, Prayag Polymers, APL Apollo Tubes Ltd, Fusion Industries Ltd
10a	UPVC Pipes & Fittings for SWR	Prince, Finolex, Jain irrigation System
11	Polyethylene/Aluminium/ Polyethylene composite pressure pipes	Prince, Finolex
12	Plastic Pipe (for non pressure Drainage & Sewarage)	Prince, Finolex
13	CI-Soil waste rainwater (SWR) & Drainage pipes	NECO Nagpur, Kesoram, Electro Steel
14	AC-Soil waste rainwater (SWR) & Drainage pipes	M/S Everest Asbestos Hyderabad, Vishakha Ind Ltd, M/s Hyderabad Asbestos Cement (Charminar), M/s Ramco
15	RCC Pipes, Drain pipes	Indian Hume Pipes, Everest, Himalaya, Thluluvaranikal pipes
16	Sluice Valves	Kirloskar, L&T, AUDCO, Leader, Upadhyay, Bir
17	Reflex Valves/Non Return Valve/Check valves	Kirloskar, Leader, Upadhyay, AUDCO, L&T, Sant
17a	Water Closet- Vitreous China (European/ Indian)/ squatting pan Orissa pattern	CERA, Parryware, Jaguar(Bathing), Hindware, Johnson, Kohler
18	Pump Sets-Mono Block	KIRLOSKAR, CROMPTON GREAVES, BEST & CROMPTON (BEACON), MATHER & PLATT, GROUND FOSS, BEACON, KSB, JYOTHI

PARTICULAR SPECIFICATIONS

Sl. No	ITEMS	MAKES
19	Centrifugal/monoblock Pumps	Kirloskar, Crompton Greaves, Beacon, Mather & Platt, Groundfos Pumps India Pvt Ltd, Ksb, Jyoti, Cri Pumps
20	Submersible Pumps/ Open well pumps	KSB, Kirloskar, Groundfos Pumps India Pvt Ltd, Mather & Platt, Jyoti, Cri Pumps, Suguna Pumps
21	Vertical turbine pumps/Horizantal split case pump set	KSB, Kirloskar, CRI Pumps,
22	Non clog sewage submersible and VT pumps/Dewatering submersible pump sets	KSB, Kirloskar, Groundfos Pumps India Pvt Ltd, Mather & Platt, CRI Pumps,
23	Pumps for fire fighting	Kirloskar, Crompton Greaves, Mather & Platt, Bharat Bijlee
24	Submersible Cable	Finolex, Nicco, Havells, Plaza
25	Motor Starter	L&T, Bch, Schneider, Siemens, Ge
26	Electric Motors	Bharat Bijlee, Kirloskar Electric, Crompton Greaves, Abb, Siemens
27	Single Phase Preventer/ Phase Sequence corrector	L&T, Siemens, Minilec, Sinetrac
28	Silver Ionization Plant	Siemens, Bhel, Bharti Waters, Jyoti Waters, Pious Waters
29	Dual Ionization Plant	Siemens, Bhel, Bharti Waters, Jyoti Waters, Pious Waters
30	Air Release Valve	Kirloskar, Leader, BIR, AUDCO, L&T, Upadhyay, Sant
31	Float valve(Brass)	Kirloskar, Leader, AUDCO, Upadhyay, Sant, Prayag Polymers
32	Butterfly Valves/Disc Valves	L&T , AUDCO, Kirloskar, Upadhyay
33	Battery	Exide, Amco, Amron, Tata Green
34	Water Meter	Capston, Dashmesh, Kaycee, Capital, Kirloskar
35	Gate Valves	Zoloto, Leader, Gem, SEICO, Sant
AIR CONDITIONING		
01	Central Air Conditioning system any type	Blue Star, Voltas, Daikin, Leel Electricals Ltd (Lloyd)
02	Air Handling Unit	Blue Star, Voltas, Daikin, National, Zeco
03	Air curtains	Almonard, Air Con, Crompton Greaves
04	Cooling Tower	Mihir, Paharpur, Delta
05	Chillers/Condenser	VOLTAS/ BLUE STAR/ CARRIER
06	Compressors	Danfoss/ Kirloskar, Blue Star, Voltas, Carrier.
07	Pumps (Chillers & Condensers)	Kirloskar/Groundfoss/Mather & Platt/Best & Crompton (Beacon)
08	Motors	Siemens/ ABB/ Crompton Greaves/ Kirloskar Electric/ Bharat Bijlee/ NGEF
09	Pot/Y-Strainer	Emerald/Rapid Cool/Danfoss/Sparlan
10	MS Piping	Tata/BST/Jindal
11	(a) Butterfly Valve	Audco/Sant/ Normax/Leader
12	(b) Check Valve/ Non Return Valve	Audco/Sant/ BIR/ Kirloskar/Leader

PARTICULAR SPECIFICATIONS

Sl. No	ITEMS	MAKES
13	(c) Gate Valve	LEADER/ AUDCO/ITT BELL & GOSSETT/ HM/ZOLOTO
14	Balancing Valve	AUDCO/DANFOSS/FLOWCON
15	Pressure Gauge	FIEBIG/ BAKER MERCER/DANFOSS/L&T
16	Dial Type Thermometers	FIEBIG/ TEDDINGTON/DANFOSS
17	Insulation	
	(i) Glass wool	OWENS CORNING/UP TWIGA/LLOYD
	(ii) Insulation (Expand Polystyrene)	CAPRICORN/BEARDSELL/PENGUIN/LLOYD
	(iii) Insulation (Cross Polyethylene Foam)	SUPREME/TROCELLANE/PARAMOUNT/LLOYD
18	(a) Controls (3 Way Valves Actuator & Motor)	SIEMENS/HONEYWELL/JOHNSON/ANERGY
	(b) Thermostats	ENERGY/ SIEMENS/ HONEYWELL/ JOHNSON/ ANERGY
19	Extruded Aluminum Grills Diffusers	DYNA CRAFT/ RAVISTAR/ MAPRO/ CARRYAIRE/ COSMOS
20	(a) Control Cable	NICCO/ASIAN CABLES/UNIVERSAL/FINOLEX/POLYCAB
21	(b) Power Cable	GLOSTER, ASIAN, UNIVERSAL, ELEKTRON
22	Contactors/Starters	L&T/SIEMENS/ABB/BCH
23	LT Relay numerical static	SIEMENS, ABB, SCHNEIDER, L&T, EPCOS
24	Time Delay Device	L&T/SIEMENS/SCHNEIDER/BCH
25	Single Phasing Preventer	L&T, SIEMEN, MINILEC, SCHNEIDER
26	GSS Sheets	SAIL/TATA/JINDAL
27	AIR CURTAIN	SAN PRODUCTS,EURONICS,CRISIL
28	DEHUMIDIFIER	BRYAIR,OSTER BIONAIRE, NOVITA
29	Fire Dampers/ Grill/Diffuser	DYNA/RAVISTAR/MAPRO/CARYAIRE/ATE
30	Expansion Valve	DANFOSS/SPORLAN/RANCO
31	Switchgears MCCBs/ ACBs/ MCBs	LEGRAND/L&T/SCHNEIDER (MERLIN GERIN)/ GE/ SIEMENS/ BCH/ C&S
32	LT Control Panel	FACTORY FABRICATED CONTROL PANEL WITH CPRI TEST CERTIFICATE
33	Current & Potential transformers (CT & PT) 11KV and above range	Siemens, BHEL, Schneider, Crompton Greaves, L&T
34	Current & Potential transformers (CT & PT) below 11KV range	Automatic Electric Ltd (AE), Pragati Electricals Pvt Ltd, HPL, C&S
35	HP/LP/Op Cut Out	PENN/INDOFOSS/RANCO/DANFOSS/JOHNSON
36	Digital/Analog AC Static Watt hour Meters (Postpaid& Pre paid)	L&T, Jaipuria Meters, Havells, Secure Meters, Zenmeter Solutions Pvt Ltd
37	Centrifugal Fans (for AHU's)	NICOTRA/KRUGER/COMBIFREE/OEM'S MAKE
38	Strip Heaters	RACOLD/DASSPASS/UE
39	Humidistat	PENN, DANFOSS, HONEY WELL, JOHNSON, INDOFOSS
40	Filter	JOHN FOWLER/THERMODYNE/TENACITY/PUROLOTER
41	Factory Built Duct	ROLASTAR/TECHNO AIR/CAM DUCT
42	Selector Switch	L & T, LEGRAND, C&S, OMEGA, KAYCEE

Sl.	ITEMS	MAKES
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PARTICULAR SPECIFICATIONS

No		
43	Indicating light	SIEMEN, CONCORD, C&S, LEGRAND
44	Digital Voltmeter/ Amp meter	AE, EMERCON, SECURE, L&T,C&S
45	Current Transformer	AE, KAPPA, SCHENIDER
46	Flexible Connector	CORI ENGINEER, RESISTO FLEX
47	Hot Water Generator	RAPID COOL/ROSS THERMAL SYSTEM PVT LTD/ REYNOLD/ RAPID CONTROL
48	Air Washer	BREEZE AIR/THERMODYNE/CHEMPAC/KLENZOID
49	Non Chemical Type Electrostatic Scale Preventer	SCALEOFF (MFD BY M/S WELDON), SCALEX (MFD BY M/S TBI SYSTEM), HYDROCON
50	Window type AC	Blue Star, Voltas, Daikin, Carrier, O-general, Hitachi
51	Split type AC	Blue Star, Voltas, Daikin, Carrier, Hitachi, Lloyd
52	Smoke Detector	APPOLO, EDWARD, MARLAY SYSTEMS, SAFEX, SENSOR
53	Manual Call Point	MINIMAX, APPOLO, VIJAY, SAFTEX, HARDIK ENGGS HONEYWELL
54	Fire Hydrant Valves	MINIMAX, VIJOY, SAFEX, CEASE FIRE
55	Fire Hose Pipe/ Reel	MINIMAX, SAFEX, VIJAY, DUNLOP
56	Fire Extinguishers	MINIMAX, SAFEX, VIJAY, SAFEZONE, CEASE FIRE, MONARC ENGINEERINGS
57	Branch Pipe Nozzle and Couplings	MINIMAX, SAFEX, VIJAY, SAIFEZONE, CEASE FIRE, MONARC ENGINEERINGS
58	Control Panels	CEASE FIRE, VIJAY FIRE PROTECTION SYSTEMS, EX- FLAME. HONEYWELL
59	AIR WASHER	BREEZE AIR, THERMODYNE,CHEMPAC,KLENZOID
60	Fiberglass (FRP/GRP) lighting pole, cable tray, enclosure, Safety ladder, cable tray	SUMIP, Ercon
	MISC	
01	SODIUM HYDROCHLORIDE	AQAFID, ALTOCH DECLIBAC, BIROJING
02	BLEACHING POWDER	KANORIA CHEMICALS, SREERAM BENGAL CHEMICALS, KASHYAP INDUSTRIES
03	ALUM	SREERAM BENGAL CHEMICALS, JYOTI, INDIAN ABRASIVE IMPEX INDIA, DANEC INTERNATIONAL
04	GLAND PACKING	CHAMPION, COMMANDER, NAVEEN ENGINEERING
05	WATER GASKET	CHAMPOIN, CHARMINAR, COMMANDER
06	FLOAT VALVE	PRAYAG, SATYAM, TECHNO, GOLDLINE
07	Fire alarm Control Panel	GE Edwards, Notifier, Siemens Simplex, HONEYWELL
08	Manual Call Point	GE Edwards, Notifier, Siemens, HONEYWELL

PARTICULAR SPECIFICATIONS

Sl. No	ITEMS	MAKES
FIRE FIGHTING		
1.	Pipes and pipe fittings (C.I)	Electrosteel Castings/Mather & Platt (India) Ltd/Shivdurga Iron works Pvt. Ltd/Spun pipe plant/Kesoram
2.	Fire hose reel	Minimax/NITIN/Firex/Mahavir
3.	Stand post type hydrant	Minimax/Firex/ Safety/ Newage/ Vijay/ Safeguard
4.	RRL hose Pipe	Newage, Dunlop, Cosmos
5	C.I Non Return Valve (As per IS5312)	Supra/ Inter valve/prime/castle
6	Butterfly valves (As per IS 13095)	AUDCO / C & R/ Inter valve/Prime/Castle
7.	Air release valve	Leader/Sant/Atom or Equivalent approved make
8.	Gunmetal valves	Leader/Sant/ Kirloskar
9.	20mm dia rubber pipe	Jyoti Type-III, Dunlop, Cosmos
10	Perforated hose	New age or Equivalent approved make.
11	Gunmetal branch pipe	Arihant or Equivalent approved make
12	Hydrant valve	Arihant/ Winco or Equivalent approved make
13	Fire brigade connection	Kailash / Safety/ Newage/ Vijay/ Safeguard
14	Addressable manuel call points	Carmel/Ravel/Agni
15	Audio alarm hooters	Carmal/Ravel
16	Motor/ Pumps	Kirloskar/ Jyoti/ Crompton
17	Fire alarm and fire fighting system	Nitin, Agni, Notofire Pvt. Ltd.

Signature of Contractor
Date: _____

AAD (Contracts)
for Accepting officer

PARTICULAR SPECIFICATIONS (Contd...)

Appendix 'E'

RECOVERY RATES OF TESTING CHARGES

Sl no	Materials	Test	Method of testing	Frequency of Tests			Level of test	Rate per Test Rs. P	Remarks
1	2	3	4	5			6	7	8
1.	Bricks	(i) Compressive strength	IS-3595	AS per IS-5454 a given under			'A'	330/-	Checks for visual and dimensional characteristics shall also be carried out
			(Part-II)						
		(ii) Water absorption	- do -	Lot size	Sample Size	Permissible No of defective bricks	'A'	330/-	As per IS-5454
		(iii) Efflorescence	- do -	1001 to 10000	5	0	'A'	330/-	
			(Part I)	10001 to 35000	10	0			
				35001 to 50000	15	1			
2.	Coarse aggregates	(i) Sieve analysis	IS-2386	One test for every 15cum of aggregates or part thereof brought to site			'A'	660/-	
			(Part-I)						
			- do -	- do -			'A'	250/-	
		(ii) Flakiness Index		One test for every 100cum of aggregates or part thereof			'A'	600/-	
		(iii) Estimation of deleterious materials	IS-2386						
			(Part-I)						
		(iv) Organic impurities	- do -	One test per source of supply			'B'	275/-	

PARTICULAR SPECIFICATIONS (Contd...)

APPENDIX-E (Contd..)

RECOVERY RATES OF TESTING CHARGES (CONTD...)

1	2	3	4	5	6	7	8
		(v) Moisture content	- do - (Part - II)	Regularly as required	'A'	330/-	
		(vi) Specific gravity	- do -	One test for each source of supply	'B'	330/-	-
3.	Fine aggregate	(i) Sieve analysis	IS-2386 (Part-I)	One test for every 15CUM of FA or part when brought to site.	'A'	660/-	-
		(ii) Test for clay, silt and impurities	- do - (Part-I)	- do -	'A'	500/-	-
		(iii) Specific gravity	- do - (Part-I)	One for each source of supply	'B'	330/-	-
		(iv) Moisture content	- do - (Part - II)	Regularly as required subject to 2tests/day when being used	'A'	330/-	-
		(v) Test for organic impurities	- do - (Part - II)	One test for each source of supply	'B'	275/-	-
4.	Structural Concrete (M-30 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/-	Random sampling shall be carried to cover all mix units
		(ii) Compressive strength	IS-516	Qty of concrete _____ In the work _____ No of samples _____	'A'	900/-	-

PARTICULAR SPECIFICATIONS (Contd...)

APPENDIX-E (Contd..)

RECOVERY RATES OF TESTING CHARGES (CONTD...)

1	2	3	4	5	6	7	8
				(Cubic Meter) 1---5 1 6---15 2 16---30 3 31---50 4 51 and above 4+1 for each Addl 50m or part thereof			
5.	(a) PCC Block for walling (Hollow Block)	(i) Compressive strength	IS-2156 – 1984 (Appx- `B')	08 Blocks out of 20	`A'	900/-	Sample: 20blocks from consignment of every 5000blocks or part thereof
		(ii) Water absorption	- do - (Appx-`B')	03 Blocks out of 20	`B'	330/-	-
		(iii) Density	- do - (Appx-`A')	03 Blocks out of 20	`B'	330/-	-
	(b) PCC solid Block for walling	(i) Compressive strength	IS-2185	08 Blocks out of 20	`A'	900/-	Sample: 20blocks from consignment of every 5000 blocks or part thereof

PARTICULAR SPECIFICATIONS (Contd...)

APPENDIX-E (Contd..)

RECOVERY RATES OF TESTING CHARGES (CONTD...)

1	2	3	4	5	6	7	8
		(ii) Water absorption	- do -	03 Blocks out of 20	'B'	330/-	These blocks to be checked for dimension and weight
		(iii) Density	- do -	03 Blocks out of 20	'B'	330/-	-
6.	Cement Flooring Tiles / Terrazzo Tiles	(i) Water absorption	IS-1237 (Appx-'D')	06 tiles out of 18	'B'	330/-	Sample of 18tiles from each source of supply selected at random
		(ii) Wet transverse strength	- do - (Appx-'E')	- do -	'B'	660/-	-
7.	Cement	(i). Setting time			'B'	500/-	
		(ii). Soundness			'B'	550/-	
		(iii). Compressive Strength			'B'	550/-	
		(iv). Fineness			'B'	275/-	

PARTICULAR SPECIFICATIONS (Contd...)

APPENDIX-E (Contd..)

RECOVERY RATES OF TESTING CHARGES (CONTD...)

1	2	3	4	5	6	7	8
8.	Reinforcement Steel	(i). Physical tests up to 16mm dia (normal mass, tensile elongation, bend and rebend) (ii). More than 16mm dia			'B' 'B'	2500/- 2750/-	
9.	Timber	(i) Specific gravity and weight (ii) Moisture content	IS-1708-1960 - do -	Minimum '3' samples from a lot of 4 Cum or 250pieces of seasoned timber. -	'B' 'A'	120/- 120/-	- -
10.	Water for construction purpose	(i) Test for Acidity	IS-456 & 3015	Once at the stage of approval of source of water	'B'	240/-	Also refer clause 4.3 of IS-456 and its subsequent sub clauses regarding suitability of water
		(ii) Test for Alkalinity	- do -	-	'B'	240/-	
		Test for solid content	- do -	-	'C'	300/-	

PARTICULAR SPECIFICATIONS (Contd...)

APPENDIX-E (Contd..)

RECOVERY RATES OF TESTING CHARGES (CONTD...)

1	2	3	4	5	6	7	8
11.	Welding of steel work	Visual inspection test	IS-822-1970 Clause 7.1	100% by visual inspection	Work site	360/-	Specialized tests their method and frequency to be decided on consideration of their importance by the Accepting Officer
12.	Timber paneled and glazed Door/ Window & shutters (Including factory made shutters)	(a) Dimensions, sizes, workmanship and finish	IS-1003-1977 (Part I)	Frequency of sampling from each lot shall be as under: Lot size Sample size 26 to 50 5 51 to 100 8 101 to 150 13 151 to 300 20 301 to 500 32 501 to 1000 50 1001 and above 80	'A'	180/-	-
		(b) Strength test	IS-1303-1990	Form the each lot 5% of the factory made shutters shall be manufacturer tested for strength tests	-	-	-
		(i) Slamming			-	-	-
		(ii) Impact indentation	- do -	-	-	-	-
		(iii) Shock resistance	- do -	-	-	-	-
		(iv) Edge loading	- do -	-	-	-	-

PARTICULAR SPECIFICATIONS (Contd...)

APPENDIX-E (Contd..)

RECOVERY RATES OF TESTING CHARGES (CONTD...)

1	2	3	4	5	6	7	8
13.	Plywood (IS-303-1989)	(a) Moisture content	IS-1734-1983 (Part-I)	Six tests pieces cut from each of the boards selected as per table shall be subjected to tests	'C'	240/-	Sampling shall be as per IS-7835-1975 Tables
14.	Wood particle board (medium density) IS-3097-1985	(a) Density	IS-2360- (Part-III)	Three test specimens from each sample (size 150mm x 75mm)	'A'	60/-	Sampling shall be as per IS-3487-83 with moisture meter
		(b) Moisture Content	- do -	- do -	'A' & 'B'	60/-	-
		(c) Water Absorption	- do - (Part 16)	- do – (Size 300mm x 300mm)	'A'	60.-	-
		(d) Swelling due to surface absorption	- do - (Part-17)	- do – (Size 125mm x 100mm)	'A'	60/-	-
		(e) Swelling in water	- do -	- do – (Size 200mm x 100mm)	'A'	60/-	-
		(f) Modulus of rupture	- do - (Part-4)	Three test specimens as per IS-2380-77	'B'	90/-	-
		(g) Screw withdrawal strength	- do - (Part-4)	- do – as per IS-2385	'C'	120/-	-

NOTE:

The rate given in Appendix- 'D' above shall be enhanced by 70%

Legend: A-Site lab, B-Zonal lab, C-National test house / SEMT wing Pune / Govt. Engineering College

Signature of Contractor
Date:

AAD (Contracts)
For Accepting Officer