SECTION VII
PARTICULAR SPECIFICATION

1. GENERAL

1.1 The work under this contract shall be carried out in accordance with Schedule 'A', particular specifications, drawings forming part of this contract and other provisions in P.M DEPMC/ACDS Schedule of Rates of CPWD /MES /STATE.

The Employer may engage some other agency/ agencies to execute some work in the same site. The contractor is expected to work in close coordination with other agencies engaged by the Government including making/ allowing connection of services lines, matching/ coordinating in site grading/ road works etc.

1.2 The term "General specification" referred to in para 1.1 above as well as referred to in General Conditions of Contracts shall mean specifications contained in P.M DEPMC/ACDS Schedule including errata and amendments there to issued along with tender documents.

1.3 General Rules, Specifications, Special Conditions and all preambles in the P.M DEPMC/ACDS Schedule shall be deemed to apply to works under this contract, unless mentioned otherwise in these tender documents, in which case specifications in these tender documents shall take precedence over the aforesaid provisions in the P.M DEPMC/ACDS schedule.

1.4 The notes on the drawings (if any) to the effect that foundations are based on specified Safe Bearing Capacity of the soil are for guidance only.

1.5 All works as shown in the drawings, specifications, conditions of contract and Schedule 'A' shall be deemed to have been covered in the prices quoted and nothing extra shall be payable to the contractor for any reason whatsoever unless specifically stated otherwise in the contract.

1.6 If specification for any item of work or material are not available either in Schedule ‘A’ P.M DEPMC/ACDS schedule or in this Particular Specification, relevant IS specification or National Building Code shall be followed.

1.7 Any drawing which is mentioned/referred on a drawing forming part of the contract but not specifically mentioned in the list of drawings shall be deemed to be forming part of the contract. The tenderer shall see such drawings/details in the office of PM, DEPMC/ Accepting Officer

1.8 All works shall be carried out as per Modern Project Management Practice, IS Codes, IE rules and P.M DEPMC/ACDS MES/CPWD ,any other state govt ssr.

1.9 **SAMPLES OF MATERIALS**

1.9.1 All materials to be provided shall be ISI marked. In cases where ISI marked materials are not available, materials superior or conforming to BIS standards and approved by the Project Manager shall be used. Materials for which manufacturers names have been mentioned in contract, makes as approved from list of manufacturers mentioned in contract shall be provided. The manufacturer’s having ISI marked material shall be preferred.

1.9.2 Approval of samples of all materials which shall be used in the project is mandatory. No order for

materials shall be placed by the contractor prior to approval of samples. The contractor shall produce the samples of all the materials / equipment and obtain approval in writing from the PM before he places bulk orders for the materials / equipment for incorporation in the work. In respect of materials for which samples are not kept or detailed specifications are not given hereinafter, the materials / equipment shall comply with relevant IS specifications. However, prior approval from the Project Manager shall be taken before finalizing the make. The contractor shall supply General Specifications, original test certificates from the manufacturers whose equipment are proposed to be incorporated in the work under this contract. Original test certificate will be retained by the department and bills will be returned after defacing.

1.9.3 A consolidated list of approved makes of various materials are appended in this document. The tenderer shall quote his rates on the basis of the price of best quality of the make stipulated in the item of works as described in specification as well as in the list of approved makes and as approved by the PM.

1.10 MAKING GOOD

The contractor shall cut, leave or form holes, recesses, chases etc. in concrete, brick work, walls, ceilings, floors and in any other situations as required or as directed by the Project Manager and make good in cement and sand mortar (1 :3)/PCC (1 :3:6) as directed by Project Manager and Finish to match the adjoining surfaces and the cost of same is deemed to be included in the lump sum cost of respective items.

1.11 SHOP DRAWINGS

1.11.1 Shop/fabrication drawings shall be prepared by the contractor for all specialist items of work as indicated in the specifications before starting manufacturing of the equipment. These shall be carefully prepared in accordance with the specifications and drawings and best trade practices and shall contain all the relevant information required.

1.11.2 Unless otherwise mentioned, the Contractor shall submit the shop drawings atleast 6 weeks before the commencement of works for the prior approval of the PM. Before submission, the Contractor shall check the shop drawings and ensure that these are correct and complete and drawn in required scale and fully coordinated with all relevant disciplines.

1.11.3 The Contractor shall also ensure that any amendments to drawings and other information are made in accordance with comments of the PM, and shall re- submit these drawings and other information for formal approval by the PM. The Contractor shall submit three sets of the finally approved shop drawings to the PM. The shop drawings are to be updated / revised if there is any change in the scope of work as instructed by the PM. Any manufacturing done prior to the approval of drawing from the PM in writing shall be rectified in accordance with the approved drawings by the Contractor at his own cost and equipment shall be supplied within the stipulated period.

1.11.4 Care shall be taken to ensure that all subsequent works are carried out as per the approved shop drawings only.

1.11.5 Shop drawing shall be prepared by the contractor for the following works unless specified otherwise: -

(i) Structural steel works

(ii) Internal and External Plumbing Works.
(iii) Internal Electrical Works.
(iv) Tile works

1.12 **SOIL INVESTIGATION REPORT**
"Enclosed"

2. SCOPE OF WORK
The contract includes for the full, final and entire completion of the items of work described in **Schedule 'A'** catered for in General summary all as shown in drawings including notes thereon and/or as specified in these particular specifications.

3. BUILDING WORKS (EARTHWORK)

3.1.1 **LEVELLING OF SITE AROUND BUILDINGS AND FOR BUILDINGS**
The site around 3 meters from the edge of plinth protection of the building shall be dressed and levelled as directed by the PM. However, where distance around plinth protection is less than 3 meters, no price adjustment shall be made on this account. Lumpsum amount quoted by the contractor for the buildings against Section-1 shall be deemed to include for the same.

3.1.2 The site is fairly levelled, however ground levels will be taken and average ground level for each Block shall be considered for deciding plinth level as approved by PM.

3.2 **EXCAVATION AND EARTHWORK**

3.2.1 Unit rates for buildings in Section-I shall be deemed to include for excavation and earthwork in any type of soil (i.e. loose/soft/hard/dense). However, in the event of any deviations involving building works of Sch 'A', Part-I, the pricing for any type of soil shall be based on the mean rate in Schedule of Rates of CPWD /MES /STATE for 'Soft / loose' and 'Hard / Dense" soil subject to contractor's percentage applicable as mentioned elsewhere in this contract as for Schedule "A" Section-I. If rock (soft/disintegrated/hard) is met with at the site, it shall be excavated by chisel cutting or by use of mechanical plant or by any other suitable method/techniques which have been evaluated by contractor as ordered, in lieu of blasting by a prior written approval of PM. Blasting of hard rock by using explosives shall not be permitted. Payment shall however, be made as per respective items of SSR, subject to the percentage to be applicable as mentioned elsewhere in the document. Excavation in any type of soil/rock shall be carried out to the exact dimensions shown in drawings or as ordered. Any extra excavation done by the contractor on his own shall be made good with PCC (1:5:10) using stone aggregate at the bottom without any extra cost to the owner.

3.2.2 Loose pockets of Disintegrated rock/ soil if encountered shall be completely removed and backfilled with lean concrete (1:5:10) type E-2 using stone aggregate as per the direction of the P.M.

3.2.3 (a) In the event of any deviation involving excavation in soft/disintegrated/hard rock the same shall be paid as deviation at the applicable rates of CPWD/ MES/ STATE Schedule for soft/disintegrated/hard rock subject to the percentage to be applicable as mentioned elsewhere in the document.

(b) Hard rock met with during excavation shall be taken out and stacked and accounted and credited

as described here-in-after. Soft / Disintegrated rock shall also remain Govt. property and shall be disposed off/ removed in filling as and when permitted by the PM. The contractor may use the Hard rock obtained from excavation in the work for building stone, hard core, soling, WBM if approved by PM in writing.

3.2.4 **METHOD OF MEASUREMENTS OF EXCAVATION**

(i) Where soft/loose soil, hard/dense soil, soil/disintegrated rock and hard rock are mixed, the measurement for the total quantity shall be made by taking levels of the ground as directed by PM and the total quantity of excavation shall be computed from these levels. The soft disintegrated rock and the hard rock excavated shall then be stacked separately and measured in stacks. The quantity of soft/disintegrated rock and hard rock so measured shall be reduced by 50% to allow for voids. These reduced quantities of soft/disintegrated rock and hard rock shall be admissible for payment under item of excavation of soft/disintegrated rock and hard rock respectively. From the total quantity of the mixture the quantity of soft/disintegrated rock and hard rock excavated thus arrived at shall be deducted to work out the quantity of soil (i.e. soft/loose/hard dense soil) excavated.

(ii) Where only soft disintegrated rock and hard rock are mixed, the measurement for the total quantity shall be made by taking levels of the grounds as directed by PM and the total quantity of the excavation shall be computed from these levels. The hard rock excavated shall then be stacked and measured in stacks. The quantity of hard rock so measured shall be reduced by 50% to allow for voids. This reduced quantity of hard rock shall only be admissible for payment under item of excavation of hard rock. From the total quantity of the mixture, the quantity of hard rock excavated thus arrived at, shall be deducted to work out the quantity of soft/integrated rock excavated.

(iii) All excavation shall be measured in successive stages of 1.5 metres depth starting from the commencing level. In case of excavation in rocks, if the depth of successive stage slightly exceeds 1.5 metres the levels shall betaken at that stage but excavated rock though obtained from the deeper depth, shall be measured in the previous successive stage only.

(iv) Hard rock obtained from excavations shall become property of the contractor for which he will be charged at the rate of Rs. 439.44 per cum for the quantity of hard rock admissible for excavation payment. The method of measurements shall be as laid down in clause 3.1 on page 16 & 17 of SSR-2004 Part-II. The measurement shall be properly recorded in MB and signed by the Project Manager and Contractor. Nothing extra shall be paid for stacking and removal of Hard Rock from the site of work.

3.2.5 In case timbering for excavation is required and specially ordered by the PM in writing this shall be paid as a deviation as per clause 53C of ACDS General Conditions of Contract.

3.2.6 The contractor's lumpsum price shall include for dewatering / pumping / bailing out water, if met with during excavation due to high water table and no extra payment shall be admissible to the contractor on any such account.

3.3 **EARTH FILLING**

3.3.1 Earth obtained from excavation and approved by PM shall be used for filling around foundations, under floors and other situations to make up levels and shall be watered and well rammed in

layers not exceeding 25 cm thick. Use of vegetable soil/turf/peat in filling is prohibited.

3.3.2 Earth obtained from surface excavations / surface dressing shall not be used for filling purpose for works under this Contract and shall be removed from the site filled in low lying areas or at location directed by PM without any extra cost.

3.3.3 Contractor's tendered lump sum against Schedule 'A' Part-I shall include for the following: -

(a) Contractor shall quote his lump sum taking into consideration that entire quantity of earth obtained

from excavation excluding the soil obtained from surface excavation & surface dressing shall be utilized for filling purposes like returning filling in trenches etc to achieve plinth height as shown on drawing including removal of surplus soil and bringing in approved earth to make up shortage, from out side MoD land without any extra cost to Govt if any.

(b) The excavated soil obtained can be used as refill below floors if found suitable and approved by the Project Manager. Grass, roots, leaves or any other organic matter obtained in excavation shall not be used for refill below floors, the surplus soil & unusable soil shall be removed and deposited at a distance exceeding 250 metres and not exceeding 500 metres when directed at a level not exceeding 1.5metres above the ground level. This disposed soil shall be spread and levelled and compacted as directed by the PM. The cost of excavation and its disposal as mentioned above is included in the lump sum cost quoted by the Contractor for Schedule A Part I and nothing extra is admissible on this account.

(c) In case of excavation for foundation in black cotton soil for blocks as mentioned in Schedule A Part I, the complete excavated soil shall not be reused for filling under floors and shall be disposed off as mentioned below. The balance soil within the floor of the building and upto a distance of 3.0 Metre beyond the external fall of the wall shall be excavated to depth of 1.5 Metre from ground level.

(d) The complete excavated soil as mentioned in Clause 3.3.3(c) above shall be removed to a distance exceeding 500 Metre and not exceeding 1.5 Km where directed at a level not exceeding 1.5 Metre above the ground level. The disposed soil shall be spread, levelled and compacted as directed by the Project Manager. Approved earth/moorum from outside MoD Land shall be brought by the Contractor for refilling under floors and excavated area outside the building as mentioned in Clause 3.3.3(c) above Filling under floors and foundation trenches shall be carried out as per Clause 3.19 of Standard Schedule of Rates of CPWD /MES /STATE . The cost of excavation, disposal of soil and excavation in borrow pits for approved soil/moorum, its transportation and filling under floors, foundation trenches etc. as mentioned in Clause 3.3.3(c) above is included in the lump sum cost quoted by the Contractor for Schedule A Part I

3.4 REMOVAL OF SPOIL

The surplus spoil(loose/soft/ hard/dense soil, soft/disintegrated rocks) obtained from excavation in normal soil in respect of Schedule A Part I shall be removed and disposed off at a distance exceeding 250 mt & not exceeding 500 mt at a level not exceeding 1.5 mt above ground level as directed by PM. The disposed soil shall be spread, levelled & compacted as directed by the PM. The cost of removal & disposal as mentioned shall be deemed to be included in the cost of lump sum quoted by the Contractor for Schedule A Part I. In case of black cotton soil, the disposal of soil is as mentioned in Clause 3.3.3.(c), (d) above

3.5 **HARD CORE**

Hard core where shown on drawings shall be broken hard stone (trap/basalt/Granite) of gauze not exceeding 63mm all as specified under para 3;27 on serial page 47 of SSR Part-I. Consolidation shall be done by well ramming and watering. The thickness of hard core shown in the drawings shall be the consolidated thickness.

3.6 **CONCRETE FILLING / CINDER FILLING**

Concrete filling/cinder filling in sunken areas, if shown on drawings or specified elsewhere, shall be PCC (1:5:10) type E2 with brick aggregate not exceeding 40mm gauze. Brick aggregate shall be well graded so that after consolidation, it provides dense and compact sub base.

3.7 **ANTI-TERMITE TREATMENT TO FOUNDATIONS AND GROUND FLOOR**

3.7.1 Anti-termite treatment shall be carried out in strict compliance with IS 6313 (Part II) of 1981 for pre-construction treatment using chemical CHLOROPYRIOPHOS EC20 and LINDANE EC20 emulsifiable concentrate.

3.7.2 The scope of work pertaining to Anti-termite treatment shall be restricted to the provision i para 6.2.1, 6.2.2, 6.2.3, 6.4, 6.5 and 6.6 of IS : 6313 (Part II). The provisions of chemical in other paragraphs of the said IS shall also apply to the extent they are applicable to the items of works, specified in various para of IS mentioned above. The rate of application for different locations shall be as given in respective paras of IS.

3.7.3 A record of chemicals obtained in sealed containers shall be maintained in the measurement book duly signed by Project Manager and the contractor.

3.7.4 The work of anti-termite treatment shall be got executed by the contractor through an approved agency (as approved by PM) who is a member of IPCA holding valid license as per clause 12 of Insecticides Act 1968 and persons employed to do the Anti-termite treatment shall be qualified as per rule 1991. The cost of anti-termite treatment is also deemed to be included in the unit rate quoted for buildings under Sch-'A' section I.

3.7.5 With reference to paras 6.2.2 and 6.3 of the IS : 6313 (part-II) the contractor shall note that earth filling to be done by him shall be carried out in layers not exceeding 25 cms each, watered and rammed as specified.

3.7.6 To check validity of guarantee, the following information will be inscribed on each building on a plate of 450 mm x 300 mm size prepared by plastering the brick surface with 20 mm thick in cement and sand mortar (1:4) at such a place and in such a manner as approved by the PM. Date of expiry of guarantee shall be calculated or computed from the physical date of completion of the buildings as certified by the PM.

Anti-termite treatment carried out during _____

Chemical used _____

Agency who executed the work _____

Guarantee expires on _____

The guarantee shall be given in Proforma at Appendix 'A"

3.7.7 The unit rates quoted for buildings in Sch 'A' Sec I shall deemed to be inclusive of this provision.

4. CONCRETE

I. COARSE AGGREGATE

Coarse aggregate shall be broken / crushed stone with the specifications given in clause 4.4 on pages 52 to 54 of MES Schedule Part I/CPWD/STATE . However, in case of controlled quality concrete the provisions made in IS-456 shall be applicable.

II. Grading of coarse aggregate unless otherwise specified shall be as follows:

(a)	For all reinforced cement concrete of thickness not less than 80 mm	-	20 mm graded as specified in para 4.4.7.1 on page No. 53 of MES Sch (Part-I) /CPWD/STATE
(b)	For all reinforced cement concrete of thickness less than 80 mm	-	12.5 mm graded as specified in para 4.4.7.1 on page 53 of MES Sch (Part-I) /CPWD/STATE
(c)	For plain cement concrete 65 mm thick and over	-	40 mm graded as specified in para 4.4.7.1 on page No. 53 of MES Sch (Part-I) /CPWD/STATE
(d)	For plain cement concrete less than 65 mm thick.	-	20 mm graded in concrete 40 mm thick and above (but less than 65 mm thick) and 12.5 mm graded stone aggregate in concrete below 40 mm thick, both as specified in para 4.4.7 on page No. 53 of MES Sch (Part-I) /CPWD/STATE
(e)	Where due to less thickness of concrete the use of 20 mm graded aggregate is not possible, the aggregate shall be of 12.5 mm grading as specified in para 4.4.7.1 on page 53 of MES Sch (Part-I) /CPWD/STATE Fwithout any price adjustment.		

4.1 CEMENT

(a) The flowing types of cement can be used in structural/ Non structural works of ACDS .

(i) Ordinary Portland Cement Grade 43 (IS:8112-1989)

(II) Ordinary Portland Cement Grade 53 (IS:12269-1987)

(III) Portland Pozzolana Cement (IS:1489-1991 Part-I) with fly ash content of grade 43 and 53)

(b) (i) **Structural work**:- Only one type of cement will be used in one building. Mixing of various type of cement will be not allowed in one building. However, different type of cement can be used in different buildings.

(ii) **Non Structural works:-** As far as possible only one type of cement will be used in one building for structural and Non structural work. However in exceptional cases different types of cement can be used in same building for non structural work such as plaster, flooring, PCC etc, with prior permission of PM (ACDS)

(c) **Use of PPC:-** While using PPC, the following conditions will generally be met:-

(i) Strength criteria for PPC cement will be as per IS:8112-1989.

(ii) Stripping time shll be minimum 14 days.

(iii) Para 4.1 (b) (i) & (ii) shall be enforced.

(iv) Mandatory certificates of testing and quality assurance will continue to submitted with fly as content as per IS: 1489-1991, part-I

4.1.2 **PROCUREMENT**

Cement shall be procured by the contractor from the main producers of cement enumerated as per list of approved makes / agencies.

The particulars of the manufacturer/supplier of cement along with the date of manufacture shall be produced by the contractor for every lot of cement separately. The original documents in support of the purchases of cement shall be produced before the Project Manager for verification.

4.1.3 **TESTING**

The contractor shall submit the manufacturer's test certificate in original along with the Test Sheet giving the result of each physical test as applicable and the chemical composition of the cement or authenticated copy thereof, duly signed by the manufacturer with each consignment clearly bringing out lot No. The Project Manager shall record these details in the cement acceptance register (Appx 'B') after due verification. The Project Manager shall also organize independent testing of random samples of cement drawn from various lots from the National Test House, SEMT, Regional Research Laboratories, Government approved laboratories as per IS: 3535 - 1986 (Method of sampling Hydraulic cement), IS: 4031 (Method of Physical test for Hydraulic Cement) and IS: 4032-1985 (Method of chemical analysis of Hydraulic cement).

Following mandatory tests shall be carried out for cement procured by the contractor:
(i) Initial and final setting time.
(ii) Soundness test.
(iii) Compressive strength test at 3, 7 & 28 days as specified in relevant IS code.

The cement shall conform to chemical requirements and physical requirements as specified in relevant IS. The test carried out as per provisions of IS codes specified herein before shall be the criteria for acceptance of cement by Project Manager. If samples from a lot/lots are not within the acceptance limits of Indian Standard the lot/lots shall be rejected without any claims or compensation to the contractor for the lot/lots purchased. The contractor shall replace the lot/lots with the fresh one, which shall be tested again for acceptance. The cost of all tests carried out on cement before acceptance for incorporation in the work shall be borne by the Contractor whether the results are acceptable or not.

4.1.4 STORAGE

(a) Refer clause 4.3.1 on page-51 of SSR Part-I
(b) Cement shall be stored 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 rooms, the stock should be at least 20 cm above from floors and away from walls. Inspections shall be carried out once a day by the DEProject Manager consultant and every week by the Project Manager. It shall be ensured by the Project Manager that tested and untested cement are segregated and stored separately with distinct identification. The cement godown shall be provided with two locks on each door. The key of one lock at each door shall remain with the Project Manager or his representative and that of the other lock with the contractor's authorized representative at site of works so that cement is removed from the godown only according to daily requirements with the knowledge of both the parties
(c) OPC grade 43 and PPC (Fly ash based) shall be stored in different storage rooms for structural and non structural work. A record shall be kept showing the location and type of

cement used. Different type of cement shall not be mixed together

(d) Maximum period of storage of cement for structural work shall be two months and for all other works three months

4.1.5 DOCUMENTATION

The Contractor shall submit original vouchers from the manufacturer 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 PM and documents verified before acceptance. The original vouchers and Test Certificates shall be defaced by PM, signed by Contractor and kept on record in the office of PM duly authenticated and with cross reference to the Control Number recorded in the Cement Acceptance Register. This Register will be signed by JE, DEPMC representative, PM and Contractor. The Accepting Officer may order a Board of Officers for random check of cement and verification of connected documents. The entire quantity of cement shall also be suitably recorded in the Measurement Book (not to be abstracted) for record purposes before incorporation in the work and shall be signed by the DEPMC, Project Manager and the Contractor. These documents shall be produced to the all visiting officers from ACDS .

4.1.6 SCHEDULE OF SUPPLY

Schedule of procurement of cement shall be finalized by the contractor with “Project Manager & DEPMC or his authorized representative” and shall be incorporated in the CPM chart so that procurement is in accordance with the progress contemplated in the CPM chart. The complete requirement of cement shall be worked out before making any RAR payment and procurement of cement by the contractor shall be completed sufficiently in advance of the execution of work.

4.2 FINE AGGREGATE (SAND)

Fine aggregate for all concrete work shall be best available river sand conforming to samples, complying with the requirement as specified in para 4.4.7.2 for grading zone I / zone-III on page 53 of MES schedule-2009 (Part I)/CPWD/STATE schedule..

4.3 All mixes of concrete except design mix concrete and mortar mentioned in this tender document shall be by volume except design mix concrete confirming to IS: 456 of 2000 for which all the ingredients shall be proportioned and mixed by weight.

4.4 MIX OF CEMENT CONCRETE

4.4.1 Cement concrete wherever shown on drawings or specified shall be of the following mix unless otherwise mentioned in these tender documents:

(a)	PCC lean concrete in foundations column footing, brick walls, brick pillars under brick steps and lean concrete not mentioned in (b) below.	-	PCC (1:4:8) type D2 (by volume)
(b)	Sub base of floors except as mentioned.	-	PCC (1:5:10) type E-2 (by volume)
(c)	Lean concrete under floors for cycle shed & ramp	-	PCC (1:5:10) type E-2 (by volume)

(d)	PCC in Damp proof course	-	PCC (1:2:4) type B0 (by volume)
(e)	PCC blocks for hold fasts, PCC cills, PCC kerbs, coping, benching and any other PCC item not specifically mentioned elsewhere.	-	PCC (1:2:4) type B-1 (by volume)

4.4.2 Unless otherwise mentioned elsewhere, all RCC work in buildings covered under schedule 'A' Section-I shall be M-25 (Design mix).

4.5 MIXING AND CONSOLIDATION OF CONCRETE

4.5.1 All cement concrete work e.g. in footing, walls, column, beams, slabs, etc. shall be with ready mix concrete (RMC) from approved RMC manufacturer or from automatic batching plant installed at site with tested and calibrated water meter, control panel and of capacity 10-30 Cum per hrs. The mixing procedure supplying, conveying, placing, etc. shall comply with the specification mentioned under para 4.11 here in after. For smaller quantity i.e. for concreting to lintels, chajjas, shelves, etc., mechanical mixer and weigh batcher shall be used with approval of the PM and mixing of concrete shall be as per clause 10.3 of IS: 456-2000.

4.5.2 Mechanical vibrators shall be used for consolidation/ compaction to consolidate all reinforced cement concrete. Consolidation by tamping may be resorted to with prior permission of PM in writing in locations where it is not practicable in the opinion of the PM to operate the vibrator. Care shall be taken to ensure that concrete is not over vibrated so as to cause segregation/ bleeding.

4.6 CASTING OF CONCRETE

PCC cills, RCC lintels (except those with chajjas), RCC shelves and fins may be cast-in-situ or precast at the discretion of the contractor without any extra cost. In the event of any deviation with regard to these items, pricing shall be done at applicable rates in MES/CPWD/STATE Schedule for cast-in-situ concrete.

4.7 DESIGN MIX CONCRETE

4.7.1 Where concrete is specified by grade that is M-25 & M-30 the same shall be of design mix all as per clause 9.2 of IS-456 - 2000, IS-10262-1982, SP-23 (S&T) 1982 and as specified herein after.

4.7.2 As soon as possible, after receiving the order to commence the work, the contractor shall procure sufficient quantities of the aggregate and cement and submit samples to any approved laboratory for testing and mix design. Also RMC plant be identified and design mix got approved from PM.

4.7.3 The optimum mix to achieve the Target mean strength shall be determined in the laboratory conditions. The concrete shall conform to IS specifications:

4.7.4 MIXING BY VOLUME / WEIGHT

For controlled quality concrete of mix M-25 & M-30 only weigh batching will be adopted. No volume batching will be allowed for mix M-25 & M-30 grade of concrete.

4.7.5 MINIMUM CEMENT CONTENT

Minimum Cement, whichever is more for M-25 & M-30 grade of concrete shall be as per mix design or 340 Kg/cum & 380 Kg/cum respectively. The minimum cement content as mentioned above shall be provided even if the laboratory mix design gives lesser quantity of cement. If actual quantity of cement used as per mix design is more than the above minimum required, no price adjustment shall be made.

4.8 BATCHING

4.8.1 In proportioning concrete, the quantity of both cement and aggregate shall be determined by mass and in accordance with clause 10.2 and sub clauses of IS-456: 2000.

4.8.2 TRIAL MIXES

The actual mix proportion will be arrived at by means of a number of trial mixes by changing the water cement ratio proportions of fine and coarse aggregate, fineness module of aggregate by changing their grading and preparations etc. Attempts shall be made to make the mix design as economical as possible.

4.9 SAMPLING

The sampling procedure and the frequency of sampling shall be as per clause 15.2 of 1S:456-2000.

4.9.1 TEST SPECIMEN

All test specimen shall be 150mm cubes. For each sample, six cubes shall be cast out of which three cubes each shall be tested for 7 days and 28 days compressive strength respectively. The specimen shall be tested as described in IS: 516-1959.

4.9.2 ACCEPTANCE CRITERIA

The acceptance criteria of the test results shall be as laid down in clause 16 of 1S:456-2000.

4.9.3 WORKABILITY

The workability of the concrete shall be checked frequently as per IS: 1199: 1959 (Methods of sampling and analysis of concrete).

4.9.4 CHANGE OF MIX DESIGN

During the progress of work, mix design will have to be changed if quality of the ingredients of the concrete changes due to any reason.

4.9.5 PACKING AND TRANSPORTATION OF SAMPLES

The contractor must, at his own expenses, properly, pack the samples. The contractor shall bear the cost of transportation of the samples required to be tested, from site of work to the laboratory as directed by PM.

4.9.6 SITE LABORATORY

A state of the art Testing Laboratory shall be established at the site by the contractor at his own expense, which shall include the following minimum machinery and testing apparatus. Contractor shall establish separate laboratories for each and every station

(a) Concrete Cube Testing Machine of minimum capacity 100 Tons
(a) Cube Moulds: 15cm x 15cm x 15cm –12Nos.
70.6mm x 70.6 mm x 70.6mm-9 Nos.
(c) Slump Cone, Tamping rod
(d) Vicat's Apparatus
(e) Slandered Sand
(f) Moisture Meter
(g) Digital Balance (With Battery Backup)- 10 kg to 0.001 gm accuracy
(h) Digital Balance- 50kg to 0.001 kg accuracy
(i) Core cutter.
(j) Hot Air Oven – Temperature range 500 C to 3000 C
(k) Measuring Cylinder- 2000ml, 1000ml, 500ml, 100ml
(l) Sieves Coarse: 30cm Dia
(25mm,20mm, 16mm, 12.5m, 10mm, 6.3mm, 4.75mm, Pan & lid)
Fine: 20cm Dia
(4.75mm, 2.36mm, 1.18mm, 600mic, 150mic, Pan & lid)
(m) Thermometer- 00 C to 1000 C with accuracy of 10 C
(n) Megger and earth resistance tester
(o) Pumps and pressure gauges for hydraulic testing
(p) Curing Tank (Min. 2000 Lit. Capacity)
(q) Miscellaneous Sand Scoop, Spatula, Straight Edge Gauged Trowel, Steel foot rules, Scale, Mortar Pans, Spade, Shovels, Filter Paper and Wax
(r) Other equipment for site test as outlined in BIS
Test in addition to above shall be carried out at recognized test centres as catered in Appendix 'C' and / or desired by PM without any extra cost to Govt.

4.10 CONCRETE MIX PROPORTIONING

The mi x proportion shall be selected to ensure the mix workability of the fresh concrete is suitable for the conditions of handling and placing so that after compaction it surrounds all reinforcements and completely fills the formwork. When concrete is hardened, it shall have the required strength, durability and surface finish as per relevant clauses of IS: 456-2000. The compaction of concrete in RCC roof and floor slabs shall be done with plate vibrators.

4.11 READY MIX CONCRETE

4.11.1 Ready mix concrete (RMC) shall conform to IS:4926. For RMC, the contractor shall submit the following to PM and obtain approval of RMC Plant.

(i) Mix design including names of suppliers from whom raw materials are to be procured.
(ii) Technical details of batching plant.
(iii) Location of batching plant and details of transportation of concrete by transit mixers. .
(iv) Brief ,details of projects where RMC. have been used from the proposed manufacturer.

Mixing: - Thorough mixing is essential for production of uniform concrete. Equipment and methods used shall be capable of effectively mixing concrete materials to produce uniform mixes of the lowest slump practical for the work.

Mixers both stationary and truck mounted shall be so charged that there is a preblending of the ingredients as the stream flows into the mixer.

Water shall enter the mixer first, but must continue to flow while other ingredients are entering the mixer. Water charging pipes shall be of proper design and of adequate size so that water enters at a point well inside the mixer. Water charging shall be complete within the first 25% of the mixing time.

Cement shall be charged along with other materials, but it shall be ensured that cement enters the stream after approximately 10% of the aggregate is in the mixer. When it is necessary to charge cement into truck mixers separately, additional mixing time shall be allowed to obtain desired uniformity to mix.

Admixtures shall be charged to the mixer at the same time in the mixing sequence for every batch. Liquid admixtures shall be charged with the water. Powdered admixtures shall be sprinkled into the mixer with other dry ingredients. When more than one admixture is used, they shall be batched separately and they shall not be premixed before entering the mixer.

Mixer performance checks shall be made at regular intervals to ensure uniformity of the concrete. Visual examination of the concrete shall be one of the aids for maintaining and checking mixer performance.

Results of tests on air content, slump unit weight of air free mortar shall be guide lines on mixer performance.

Mixing time shall be measured from the time all ingredients are in the mixer.

Mixing time shall be established from mixer performance tests conducted at frequent intervals throughout the period of the works. However, as an initial guide, mixer manufacturer's recommendation may be followed. Other guide line being 1.33 min. for 1 cum capacity of mixer and 0.33 min for every additional 1 cum of mixer capacity.

Mixer shall be designed to have audible indicators and combination inter locks which prevent mixer discharge prior to completion of a preset mixing time. Mixer shall also be designed to start and stop operation with full load.

Provided that design water - cement ratio is not exceeded, small increments of retempering water may be added to mixed batches to obtain the desired slump.

Addition of water in excess of designed water - cement ratio to compensate for slump loss resulting from delays in delivery or placing of concrete shall not be permitted.

Batch to batch uniformity of concrete with regard to slump, water requirement and air content is dependant on temperature of concrete. It shall, therefore, be ensured that the maximum and minimum temperatures of concrete throughout all seasons of the year do not vary beyond the limits given below:

Maximum: 30°C
Minimum: 20°C

Necessary measures shall be taken to lower or raise the temperature of water to maintain the mixed concrete between the specified temperature limits.

Mixer shall be capable of and handled properly so that concrete of lowest desired slump can be effectively discharged without causing segregation.

Ready - Mix concrete may be :
- mixed in a central plant and transported to the job in agitating or non-agitating truck bodies.
- mixed entirely in transit.
- mixed entirely after reaching the job site.
- mixed partially in a central plant and completed in transit or after reaching the job site (shrink mixing).

In ready mix concrete, special attention shall be given to the addition of mixing water quantity, which if incorrect, shall result in reduction of concrete quality.

Concrete consistency (Slump) is also affected by amount and rate of mixing, length of haul, time period for unloading and temperature conditions.

In cool weather or short haul and with prompt delivery, concrete quality may not be significantly affected. But with reverse conditions, quality of concrete may be significantly affected.

Addition of water to compensate for slump loss shall not exceed that quanitity necessary to compensate for a maximum 25mm slump loss. However, by this additional quantity of water, the design water cement ratio shall not be exceeded.

Loss in workability in warm weather shall be minimised by expediting delivery and placement, and by controlling the concrete temperature.

If it becomes necessary to use retarders to prolong the time the concrete will respond to vibrations after placement, prior approval shall be obtained from PM for their use.

In hot weather conditions or delays in delivery/placement, use may be made of the procedure of withholding some of the mixing water till the mixer arrives at the job site. In such cases, after addition of the balance (withheld) quantity of water, an additional 30 revolutions of mixer at mixing speed shall be given to adequately incorporate the additional water into the mix.

When loss of slump or workability cannot be controlled by measures stated above, complete mixing shall be done at the job site using centrally dry batched ingredients.

4.11.2 **Supply and placing of ready-mix concrete(RMC)**

Responsibility of in-place quality of ready-mix concrete shall be shared by the manufacturer/ supplier of ready mix concrete and the placing contractor. They shall work in close coordination. The placing crew shall be in direct radio/telecommunication contact with the batching plant to ensure:

Avoidance of delay in dispatching concrete from batching plant:- inform batching plant delays to formwork, reinforcement work, handling or placing units.

The placement contractor shall give in writing his requirement of a particular batch of concrete to the supplier.

The ready-mix concrete manufacturer/supplier shall, along with each batch of concrete delivered to the placement contractor, give him a concrete delivery ticket. The supplier shall give copies of all such delivery tickets to the PM for his record and also shall get duplicate copies of all such delivery tickets duly received and signed from the placement contrator.

Ready mixed concrete as supplied by the manufacturer and as placed by the contractor shall in no way be different from the specifications of concrete as approved by the PM.

Fresh concrete can be transported to the placement area by a variety of methods. Common among them are :-Mixer trucks.

Stationary truck bodies with or without agitators:- Buckets hauled by trucks. Conveyor belts. Hose or pipe line by pumping. Each type of transportation has specific advantages and limitations depending on the condition of use, mix, accessibility and location of placing.

Transportation by mixer trucks

These are essentially revolving drums mounted on truck chasis. Truck mixers used in the job shall be labeled permanently to indicate the manufacture specifications for mixing like:

- Capacity of drum.
- Total number of drum revolutions required for complete mixing.
- Mixing speed
- Maximum time limit before completion of discharge and after cement has entered the drum.
- Reduction in time period of discharge.
- Due to warm weather or other variables.
- All above information shall only form guidelines for the manufacture/producer of concrete.

Fulfillment of the stipulated number of revolutions or elapsed time shall not be acceptable criterion. As long as the mixing water limit is not exceeded and the concrete has satisfactory plastic physical properties and is of satisfactory consistency and homogeneity for satisfactory placement and consolidation and is without initial set, the concrete shall be acceptable.

When the concrete is totally mixed in transporting trucks or in case of shrink-mix concrete, volume of concrete being transported shall not exceed 63% of the rated capacity of the drum. In case the concrete is totally mixed in the central batching plant, the transporting truck may be loaded upto 80% of the rated capacity of the drum. In this case the drum shall be rotated at charging speed during loading and reduced to agitating speed after loading is complete.
When transporting concrete by truck mixers, delivery time shall be restricted to 1.50 hours from the time cement has entered the mixer to completion of discharge.

Transporting by agitating/non-agitating trucks

Transporting ready mix concrete by this method shall consist of truck chasis mounted with open

top bodies. The metal body shall be smooth and streamlined for easy discharge. Discharge may be from the rear when the body is mechanically tilted. Body of the truck shall have a provision of discharge gate. Mechanical vibrators shall be installed at the discharge gate for control of discharge flow.

Agitators, if mounted, also aid in the discharging of concrete from the truck in addition to keeping the concrete alive.
Water shall not be added to concrete in transport in this system.
Bodies of trucks shall be provided with protective covers during period of inclement weather.

Delivery period, when adopting this system of transporting, concrete shall be restricted to 30 minutes from the moment all ingredients including cement and water enters in mixer to completion of discharge.

Transporting by buckets

This method of transportation is very common for transportation of centrally mixed concrete. Buckets of suitable capacities may be fitted with concrete which is totally mixed in central plant and hauled to the job site. Buckets then may be conveyed to the actual point of placement either with the help of crane/ hoist or they may be carted.

As in the case of open truck transportation, water shall not be added to concrete transported in buckets. Concrete shall be protected from inclement weather by necessary covering arrangements. Also, maximum delivery period for this system of transportation from the time cement is introduced into the mixer to completion of discharge shall not exceed 30 minutes.

Before loading concrete in either truck mixer, open bodied trucks or buckets, the containers shall be thoroughly cleaned, washed and dried, so that there is no water or moisture in the container which may effect the designed water content of the concrete.

Other methods of transportation

Transportation of concrete either by belt conveyors or by pumping is envisaged in this work.

If, however, producer/manufacturer/purchaser of ready mix concrete desires to use such methods of transportation, they may do so provided their scheme and complete specifications are submitted to the **PM** for his record and approval.

Method of transportation used shall ensure
Efficient delivery of concrete.
- No significant alteration of properties with regard to water cement ratio, slump, air content and homogeneity.

All variables in transportation, considering type and accessibility of placement locations, distance, time interval etc. shall be carefully studied before arriving at the method used.

4.11.3 Placing Concrete by Pumping Methods

Concrete conveyed by pressure through either rigid pipes or flexible hoses and discharged directly into the desired area is termed as pumped concrete. The method of conveying the concrete

through pipe lines is dealt with in these specifications.

Method of applying pressure to concrete is by pumps. Pumps to be used shall be either of the two types as mentioned below:

(a) Piston type pumps
(b) Squeeze pressure type pumps.

Piston pump to be used in the works shall consist of a receiving hopper for mixed concrete, an inlet valve, an outlet valve, and the pump shall be a twin - piston pump. The two pistons shall be so arranged that one piston retracts when the other is moving forward and pushing concrete into the pipe line to maintain a reasonably steady flow of concrete. Single piston pumps shall not be acceptable.
Inlet and outlet valves shall be anyone of the following types :
Rotating plug type Sliding plate type Guided plunger type Swing type Flapper type or any combination of the above.

The pistons shall be mechanically driven using a crank or chain or hydraulically driven using oil or water.

The receiving hopper shall have a minimum capacity of 1.0 cum and the hopper shall be fitted with remixing rotating blades capable of maintaining consistency and uniformity of concrete. The primary power for pumps may be supplied by gasoline, diesel, or electric motors. The primary power unit and the pump unit may be truck, trailer or skid mounted.

Squeeze pressure pumps shall consist of a receiving hopper fitted with re-mixing blades. Re-mixing blades shall be such that these can push the concrete into the flexible hose connected at the bottom of the hopper.

The flexible hose shall pass through a metal drum around the inside periphery of the drum and come out through the top part of the drum.

The drum shall be maintained under a very high degree of a vacuum during operation. The drum shall be so fitted with hydraulically operation metal rollers, which when rotating, create a squeeze pressure on the flexible hose carrying concrete and forces the concrete out into the pipe line.

Effective range of pumps to be used in the work shall be decided by the contractors after studying the site conditions. However, the minimum horizontal range shall not be less than 150 metres and minimum vertical range shall not be less than 50 metres.

Selection of pumps based on discharge capacity shall be decided by the contractors after studying the requirements for the project. Discharge capacity shall be worked out by the contractors and approval obtained from the PM. As a guide line figure the contractors may assume a discharge capacity of 15 cubic metre/hour/pump.

4.11.4 **Pipe Lines**

All concrete carrying pipe lines shall generally be rigid pipe lines. Flexible pipe lines may only be used at bend curves in lines or at discharge ends if required. Placements of flexible units shall be done judiciously and connected to the pipe lines only when it meets the approval of the PM.

Rigid Line/Hard Line/ Slick Line: Such Lines shall be made either of steel or plastic. Aluminium alloy pipes shall not be used.
Minimum pipeline diameter shall be 100 millimeters and shall have normal maximum length of 3 metre in each section connected through couplers.
Flexible Pipe Line: Flexible lines shall be made out of rubber or spiral wound flexible metal or plastic. The pipe shall again be such that they are in Sections of 3 metre length each and connected through couplers. These pipes shall be such that they are interchangeable with rigid lines. While installing flexible units, care shall be taken that there are no links in the pipeline, which is a normal tendency with these pipes having diameters 10mm and above
Couplers to be used for connecting pipeline sections (either hard or flexible) shall have adequate strength to withstand stresses due to handling, misalignments poor support to pipe lines etc.

For horizontal runs of pipes and for vertical runs up to 30-metre height the couplers shall be rated for a minimum pressure of 35 kg/cm square. Couplers used for rising runs between 30 metre and 50 metre heights shall have a minimum pressure rating of 50 kg/cm square. Couplers shall be designed to allow for replacement of any pipe section without displacing other sections. These shall provide for the full internal cross section with no constructions or service, which may disrupt the smooth flow of concrete. For pipleines of size 150mm and above, double logged type coupler with a thick rubber gasket and secondary wedge-takeup is recommended. Types of couplers that may be used shall be any of the following:

- Grooved end coupler
- One piece extended lever swing type couplers
- And full flow oil line type couplers.

Other Accessories

Other accessories which shall be catered for, are as under: -

- Rigid and flexible pipes of varying lengths
- Curved sections of rigid pipes
- Swivel joints and rotary distributors
- Pin and gate valves to prevent back flow in pipelines
- Switch values to direct the flow into another pipeline
- Connection devices to fill forms from the bottom up
- Splints, rollers, and other devices for protection of conduit over rock concrete Reinforcing steel and form and to provide lifting and lashing points in the pipe line. '
- Transitions for connecting different sizes of pipe sections Air vents for downward pumping.
- Clean out equipment.

For concreting of columns, walls and scattered small placements, recommendation is made for special cranes or power controlled booms carrying pipelines with a pendant type concrete delivery hose.

Lubricating of Pipe Line

Before pumping concrete into the pipeline, the line shall be lubricated with a properly designed mortar/grout lubricant. This shall be ensured by starting the pumping operation with a properly designed mortar, or with a batch of regular concrete with the coarse aggregate omitted. The quantity of mortar required as lubricant is dependent on the smoothness and cleanliness of the pipelines. As a guide line, for a 100mm diameter pipe line of 100metre length, 0.08 cum to 0.10 cum of mortar should normally be adequate, but this shall not be taken as specified, and the contractor shall establish his requirement.

The quantity of mortar that comes out of the delivery end of the pipline shall not be used in place of the concrete work. However, with the approval of PM, this mortar may be used as bedding mortar against construction joints. The rest of the mortar shall be wasted.
Lubrication shall be maintained as long as the pumping of concrete continues.

Proper planning of concrete supply, pump locations, line layout, placing sequence and the entire pumping operation will result in savings of time and expense.

The pump shall be placed as near the placement area as practicable. The surrounding area of the pump shall be free of obstructions to allow for movement of concrete delivery trucks. The surface must be strong enough to withstand the loaded trucks operating on it. If the surface is a suspended slab, the truck route shall be adequately supported in consultation with the PM.

Pipe lines from the pump to the placing area shall be laid with minimum number of bends. For large placement areas, alternate lines shall be installed for rapid connection when required. A flexible pipe at the discharge end will permit placing over a large area directly without re-handling of pipelines. The pipeline shall firmly supported.

If more than one size of pipe must be used, the smaller diameter pipe shall be placed at the pump end and the larger diameter at the discharge end.

When pumping downwards, an air release valve shall be provided at the middle of the top bend to prevent vacuum or air buildup. Similarly, while pumping upwards, a no-return valve shall be provided near the pump to prevent the reverse flow of concrete during the fitting of clean up equipments or when working on the pump.

It is essential that direct radio/telecommunication be maintained between the pump operator and the concrete placing crew. Good communication between the pump operator and the batching-plant is also essential. The placing rate shall be estimated by the pump operator so that concrete can be ordered at an appropriate delivery rate.

The pump shall be started for a check run and operated without concrete to ensure that all moving parts are in operation properly. Before placing concrete, the pump shall be run with some grout/l mortar for lubricating the line.

When concrete is received in the hopper, the pump shall be run slowly until the lines are completely full and the concrete is steadily moving. A continuous pumping must be ensured, because, if the pump is stopped, concrete in the line may be difficult to move again.

When a delay occurs because of concrete delivery or some form repair works or for any other reason, the pump shall be slowed down to maintain some movement of concrete in the pipeline. For long en delays, concrete in the receiving hopper shall be made to last as possible by moving the concrete in the lines occasionally with intermittent strokes of the pump. It is sometimes essential to run a return line back to the j pump so that concrete can be re-circulated during long delays.
If after a long delay, concrete cannot be moved in the line, it may be necessary to clean out the entire line. However, quite often only a small section of pipeline may be plugged and required cleaning. The pump operator who know such details as the length of line, age of concrete in the line etc., should be, dependent upon to aid in deciding the appropriate section to be cleaned.

When the form is nearly full, and there is enough concrete in the line to complete the placement, the pump shall be stopped and a "go-devil" inserted at the appropriate time so that concrete ahead of the go-devil shall be forced completion of the work. The go-devil shall be forced through the pipeline to clean it out. Use of water pressure is a safer method. The go-devil shall be stopped at the -discharge end to ensure that water does not spill on the placement area. If air pressure is used, extreme care shall be taken and the pressure must be carefully regulated. A trap shall be installed at the end of the line to prevent the go-devil being ejected as a dangerous projectile. An air release valve shall also be installed in the line to prevent air pressure build up.

It is essential to clean the line after concrete placing operation is complete. Cleaning shall be done in the reverse direction from the form work end to the pump-end where the concrete in the line can be dumped in a bucket. After removal of all concrete, all pipe lines and other equipments shall be cleaned thoroughly and made ready for the next use.

4.12 CONCRETE SURFACING

4.12.1 Exposed surfaces of all RCC work such as soffit of roof/floor slab, slabs & bottom of beams, lintels, seismic bands, shelves & RCC railing / parapets etc. unless otherwise specified hereinafter in particular specification shall be provided with a coat of 5mm thick plaster in cement and sand mortar (1 :3) finished even and smooth. In case this thickness of plaster exceeds 5mm at places due to local unevenness, no extra payment is admissible. The exposed surfaces of columns, beams, lintels and the like coming in conjunction with plastered surfaces shall be plastered as specified in plastering section. Sand for plaster shall be as specified. The term exposed surfaces does not include the surfaces hidden under earth filling etc. and in such cases irregularities, protruding form work marks shall be removed and air holes, if any, shall be stopped with cement and sand mortar (1: 3). Cost of above provisions shall be deemed to be included in the contractors quoted rates.

4.12.2 Drip course of 20mmx10mm size on outer edge of bottom of RCC/PCC cill projection etc. shall be provided irrespective of whether shown on drawings or not.

4.13 STONE CILL

Polished Kota stone sills shall be provided in all window even if not shown on drawings. The thickness of Kota stone shall be 25mm and shall be in one piece with 200mm bearing on either side.

4.14 PLINTH PROTECTION

4.14.1 Plinth protection shall be 75mm thick in cement concrete (1 :3:6) type C-2 over 75mm thick hard core of 40mm graded stone aggregate and well compacted over rammed earth and shall be finished even and fair with steel trowel without using extra cement. Plinth protection shall be laid to a slope of 1 in 24 in alternate bays system., Each bay shall not exceed 3 metre in length. 12mm wide and 7.5 cms deep joint shall be formed between the bays which shall be filled with mastic filling to full depth, comprising a mixture of one part of heated hot blown bitumen 85/25 Penetration and two parts of heated coarse sand (by volume). The width of plinth protection irrespective of what is shown on drawings shall be 1500 mm. The toe of plinth protection of size 75mm deep and 75mm wide shall also be of PCC 1: 3:6 type C-2 and shall be provided in buildings irrespective of whether shown on drawings or not. Plinth protection shall be provided to all buildings irrespective

of whether shown on drawings or not.

4.15 CONSTRUCTION JOINTS/ EXPANSION JOINTS

All construction joints/ expansion joints shall be as per clause 13.4 of 1S:456-2000 and 1S:11817. Concreting shall be carried out continuously upto the construction joint and prior to start of concreting written approval shall have to be obtained from the PM.

"At the construction joints, the concrete surface shall be cleaned properly and a coat of Nitobond (FOSROC) shall be applied before placing fresh concrete. The rate of application shall be as per manufacturer's instruction. For slabs & beams of one Qtr, the concreting shall be done continuously till completion. No construction joints shall be permitted."

4.16 WORK IN EXTREME WEATHER CONDITIONS

Work in extreme weather condition (hot or cold) shall be carried out as per clause 14.2 of IS:456 - 2000.

4.17 DAMP PROOF COURSE

The damp proof course shall consist of a layer of 40mm thick PCC (1 :2:4) type B0 and shall be mixed with water proofing compound conforming to IS:2645 liquid grade as per manufacturer specification and laid as specified in para 5.42 on page 101 of MES Schedule (Part I) or CPWD/ STATE schedules. Water proofing compound shall conform to IS2645. It shall be mixed with concrete in the proportion and in the manner as given in manufacturers instructions. Deviations if any shall be priced on the basis of water proofing compound actually incorporated in the work.

Damp proof course shall be provided on all brick walls, PCC walls and brick pillars for their full length and width at the ground floor. Damp proof course shall also be provided under openings/door opening at depressed level including vertical faces of depressed level and including vertical faces of depressed portion of opening as per requirement of clause 5.8.1.3 of IS - 2212. However, damp proof course shall not be provided over dwarf walls/RCC columns.

"Damp proof course shall be provided on masonry walls at floor level wherever plinth beams are not provided.

4.18 BLANK

4.19 PCC BENCHING

PCC Benching shall be provided at the junction of parapet wall and roof even if not shown in the drawing. The radius of PCC benching shall be 75mm and shall be cast in PCC 1:2:4. The entire surface of benching shall be plastered in CM 1:4 15mm thick.

4.20 FORM WORK

4.20.1 Formwork shall be as per clause 11 of of IS-456-2000 & IS: 14687. The level of forms shall be adjusted to keep the difference in thickness of the flooring of Kota stone and ceramic tile floors.

4.20.2 Formwork shall be of minimum 12mm water proof plywood or steel of adequate strength. However, the form work to be used for surfaces specified in these specifications to be plastered shall be such that after application of the specified thickness, fair finished surface is achieved as specified herein. Wall thickness shall not be made use of as formwork. Wall shall be built after the columns are casted. In the event of deviation, rates in MES schedule/CPWD/STATE schedule for clean sawn formwork will be applicable. **In** this connection also refer to para 14.14.3 on page 314 of SSR Part - I. steel tubular scaffolding telescopic type shall only be used. Form work shall be preferably of steel.

4.20.3 The contractor shall excavate for the RCC footings, walls to their exact size after accounting for formwork to sides. If the excavation is more than required size extra excavation shall be made good as mentioned in clause 3.13.4 on page 39 and sub clause 3.15.5 on serial page No. 39 of SSR Part - I. However, form work shall be provided to vertical sides of column pedestals as necessary and as directed by Project Manager. Slopped portion and RCC column footing if any, under masonry work shall be filled with PCC (1 :5:10) type E-2 to maintain continuity and level of masonry work and lumpsum quoted by the contractor shall be deemed to include for the same.

4.20.4 The form work for Soffits of suspended slabs such as roof slabs, floor slabs, landings and similar work, shall be of steel and vertical supports shall be of adjustable type steel props. Wooden bullies shall not be used.

4.20.5 Shuttering of RCC 'cantilever canopy / chajja shall not be removed unless counter balancing load have been imposed.

4.21 MIX OF LEAN CONCRETE

Wherever lean concrete has been specified /shown on drawings except as mentioned in clause 4.4.1 hereinbefore it shall be PCC (1 :5: 1 0) type E-2.

4.22 CURING

Curing of RCC / PCC shall be as per clause 13.5 of IS:456-2000.

1.23 BLANK
1.24 BLANK

4.25 Design Mix Concrete - Pricing of deviation

For the purpose of pricing deviation in M-25, M-30 Grade design mix concrete the rates in SSR Part –II subject to contractor percentage shall be applicable.

5. BRICK WORK

5.1 MATERIALS

5.1.1 Bricks to be used in the Building work shall be best available kiln burnt clay bricks of size 230 x 115 x 75 mm with frog size 100x40x10-20mm having minimum compressive strength of 75 Kgs per sqcm and shall comply with the requirements of Sub Class ‘B’ as specified in IS-1077. All bricks in any of the work coming below ground level shall also be best available kiln burnt clay

bricks. Bricks to be used in other sections under this contract shall be best available kiln burnt clay bricks of size 230 x 115 x 75 mm with frog size 100x40x10-20mm having minimum compressive strength of 75 Kgs per sqcm and shall comply with the requirements of Sub Class 'B' as specified in IS-1077.

5.1.2 Common burnt clay building bricks shall conform to the requirements laid down in IS 1077-1992. Bricks shall have minimum compressive strength of 75 Kg/Cm^2 (Class designation 75). The brick shall have smooth rectangular faces with sharp corner & slight round edges, and shall be well burnt, uniform in colour, free from cracks, flaws, nodules of lime and emit clear ringing sound when struck.

5.1.3 **Sampling and tests**. Samples of bricks shall be subjected to the following tests.

a) Dimensional tolerance.

b) Water absorption.

c) Efflorescence.

d) Compressive strength.

5.1.4 Sampling for carrying out the above tests, shall be done as per IS: 5454 at random according to the size of lot given in Table below. The sample thus taken shall be stored in a dry place until tests are made.

5.1.5 Samples shall be taken as per details given below:-

Sampling from a stack. The brick stack, shall be divided in to a number of real or imaginary sections and the required number of bricks drawn from each section. Sampling from trucks shall be as per IS: 5454.Scale of sampling and criteria for conformity for visual and dimensional characteristics: -

No. of bricks in a lot	For characteristics specified for individual bricks		No. of bricks to be selected for dimensional characteristics
	No. of bricks to be selected	Permissible no. of defective bricks in the sample	
2001-10000	20	1	40
10001-35000	32	2	60
35001-50000	50	3	80

b) **Visual characteristics**. The number of bricks to be selected from a lot and shall be in accordance of col. 1 & 2 of Table for visual characteristics in all cases and dimensional characteristics if specified for individual bricks. All the bricks selected above in accordance with col. 1 & 2 of Table shall be examined for visual characteristics as specified in col 2. If the number of defective bricks found in the sample is less than or equal to the corresponding number as specified in col. 3 of table , the lot shall be considered as satisfying the requirements of visual characteristics, otherwise the lot shall be deemed as not having met the visual requirements.

c) **Dimensional characteristics**. The number of bricks to be selected for inspecting the dimensions and tolerance shall be in accordance with col. 1 & 4 of Table 1. These bricks

will be divided into groups of 20 bricks thus formed will be tested as per IS: 1077 for all the dimensions and tolerance as given below

i) Type of bricks – Non modular bricks

ii) Nominal size _ 230X114X75mm

iii) Actual size – 230X111X70 mm

iv) Dimension for group of 20 bricks

Length 442 to 478 cm (460 ± 18 cm)

Width 213 to 231 cm (222 ± 9 cm)

Height 134 to 146 cm (140 ± 6 cm)

A lot shall be considered having found meeting the requirements of dimensions and tolerance if none of groups of bricks inspected fails to meet the specified requirements.

)d Scale of sampling and criteria for physical characteristics shall be as per IS: 5454.

The Lot, which has been found satisfactory in respect of visual and dimensional requirements, shall be next tested for physical characteristics like compressive strength, water absorption, and efflorescence.

5.1.6 The physical requirements of the bricks shall be tested as per IS: 3498 (Part I to IV)

The bricks shall have physical characteristics as specified here under:-

a) Water absorption - 20% Max

b) Compressive strength - 75 Kg/sq cm

c) efflorescence - Nil to Slight sign of efflorescence i.e. 0-10% of surface area of the brick should show a thin deposit of salt

To eliminate the efflorescence the bricks are required to be soaked in water mixed with chemical for 24 hours before use on the work & no extra payments shall be made for this.

5.1.7 A lot shall be considered having satisfied the requirements of physical characteristics if the condition stipulated herein are all satisfied:

a) The average compressive strength shall satisfy the requirements specified in Para 5.1.6 (b) above.

b) The compressive strength of any individual brick tested in sample shall not fall below the minimum average compressive strength specified for the corresponding class of brick by more than 20 %

c) Average water absorption shall be as specified in Para 5.1.6 (a) above.

d) The Number of bricks failing to satisfy the requirements of the efflorescence specified in Para 5.1.6 (c) should not be more than the permissible in IS: 5454

5.1.8 Handling and storage of bricks shall be as per Cl 5.6.9 of SSR Part-1

5.1.9 The general quality of brick shall be as per Cl. 5.6.5 of SSR Part-I.

5.1.10 Construction of manholes & underground structure shall invariably be done by using burnt clay bricks class B with compressive strength 75 Kg/cm^2 & water absorption lesser than 15%.

5.1.11 **FLY ASH CEMENT BRICKS (optional where industries are available)**

Fly ash cement bricks used in the work shall be of size 230x115x75mm with frog size 100x40x1-20mm having minimum compressive strength 75 Kg/cm$^{2.}$, and shall comply with the requirements as specified in IS: 12894: 2002 for all aspect expect that the work 'Line' shall be replaced with the work cement in the above code.

Fly ash to be used in the manufacturer of fly ash cement bricks shall conform to Grade 1 or 3 of IS:3812-2003.

Minimum percentage of fly ash to be used in the fly ash cement bricks shall not be less than 25%. Manufacturers and test certificate and independent testing conforming chemical and physical requirement / characteristics and proportion of fly ash shall be produced by the contractor to the PM for approval. Fly ash shall be procured from coal/ lignite based terminal power plants.

Water absorption for the fly ash bricks shall not be more than 20% of weight.

Efflorescence when tested according to IS: 3495 (Part-III) 1976 shall have the rating of efflorescence not more than 12.5%

Testing of fly ash cement bricks shall be carried out in accordance with procedures listed in IS: 13757-1993. Frequency of test shall be as per IS: 1077and IS: 5454.

5.2 WORKMANSHIP

5.2.1 All brick work unless mentioned otherwise in particular specifications shall be built in CM (1:6) except half brick walls, brick on edge walls, brick pillars (isolated), brick steps, brick fins which shall be built in cement and sand mortar (1:4).

5.2.2 Unless otherwise shown on drawings all brick work in half brick walls shall be built from sub floor level in ground floor and from RCC slabs in subsequent floors shal be reinforced with 2 Nos. 8mm dia for steel at every fourth course starting from 20 cm above DPC / floor slab. These bars shall be extednded into the junctions with adjoining walls / columns for a minimum length of 75mm. Laps shall be 300 mm

5.2.2.1. For half brick walls, continous RCC bands shall be provided at cill evel, lintel level, and roof level whether shown in the drawing or not. The size of band shall be 115(width)x75mm

(depth) and shall be reinforced with 2/8 dia TMT bars and 8mm dia TMT links @150clc. Grade of concrete shall be M-25.Wherever doors and window openings are there, separate lintel has to be provided as per drawings and specification.

5.2.3 Nominal width of brick shall be considered 230mm for one brick wall & 115 mm for half brick wall.

5.2.4 For half brick walls more than 3000 mm in length vertical RCC bands of size 115mm x thickness of the wall shall be provided at maximum 3000 mm c/c spacing. The vertical bands shall be reinforced with 4 Nos 8mm TOR reinforcement bars with 8 mm TOR links at 100 mm/cc. No foundation shall be provided for these vertical bands. The vertical 8 mm for bar shall, however, be anchored into the slabs / beams / lintels both at the top and at the bottom. The anchorage length shall be 200 mm minimum..

5.2.5 2 Nos. 12 mm TMT bars shall be provided longitudinally in RCC floor slabs where half brick walls are supported on them directly.

5.2.6 Bearings of all slabs on masonry walls shall be for the full thickness of wall.

5.3 THICKNESS OF BRICK WALL/PILLAR & CONCRETE MEMBERS

5.3.1 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 work unless off sets have been specifically shown, in which case width as shown on drawings shall be maintained.

5.3.2 The walls shall be laid out strictly as per drawings. Before carrying out the Brick work the layout shall be done and got approved by the PM and changes instructed incorporated.

5.3.3 Mortar bed joints shall be such that four courses of Brick work and three joints taken consecutively shall measure 3 to 4cm in addition to the combined height of the Brick. Accordingly, the provision under clause 5.26 on page 95 of SSR (Part I) shall not be made applicable to this contract and no price adjustment shall be done on this account. However, in the case of half Brick walls where reinforcement has been specified herein above such four courses will be selected between the horizontal joints having the reinforcement.

5.3.4 Thickness of Brick walls/pillars shown on drawings as 115mm, 230mm and 345mm for half Brick wall, one Brick wall and one and half Brick wall respectively, shall be deemed to have been amended to the thickness obtainable with the use of Bricks as specified herein before without adjustment in prices.

5.3.5 Centre line dimensions of rooms, Verandah etc as shown in drawings shall be maintained. Internal and overall dimensions if at variance, then too, centre line dimensions shall be adhered to and drawings shall be deemed to have been amended accordingly.

5.3.6 All scaffolding for brick work shall be of double legged steel (Independent staging)

6. WOOD WORK (CARPENTERS WORK)

6.1 The timber to be used in various situations (except flush shutters, veneered particle boards, block boards and timber for formwork) unless otherwise specified elsewhere in particular specifications shall be as under:

(a) Wooden frame /chowkhats for door, Cup boards : class 1 Hard wood Hollock / Bonsum /Mirantee (BEN TEAK)

(b) Cleats, chock stops, fillets, battens etc. :IInd class Hard wood Hollock / Bonsum /Mirantee (BEN TEAK)

(b) Edging Beading to particle board / block :1st class Hard wood teak board etc.

6.1.1 Maximum permissible moisture content in timber used for various purposes is 12%. The contractor shall get the timber (except that required for temporary use such as formwork etc.) klin seasoned to ensure that permissible moisture content is not exceeded.

6.1.2 No price adjustment will be made either to the unit rates quoted for the buildings in Schedule 'A' Section I while pricing any deviation on account of klin seasoning as specified hereinbefore, as this element is deemed to be included in the rates.

6.2 SURFACE FINISH

Exposed faces of carpenters work shall be wrought except surfaces buried or in contact with concrete/brick work etc. which shall be left clean sawn.

6.3 TOLERANCE

Tolerance upto 1.5mm for each wrought face for carpenter work shall be allowed except for fillets, beads and wooden shutters, which should be of specified thickness/size.

6.4 PLY WOOD:-

Ply wood shall comply with IS-303 and shall be BWP superior grade and shall be as specified or shown on drawings. The bonding shall be done with phenol formaldehyde synthetic resin.

6.5 VENEERED PARTICLE BOARD

Veneered particle board where on drawings shall be of exterior grade, solid core three layered flat pressed particle board with commercial or decorative veneer facing and bonded with BWP type phenol formaldehyde synthetic resin and shall conform to IS: 3097. Unless otherwise specified or shown on drawings, board shall be provided with decorative veneers on one face and commercial veneer on other face.

Thickness of veneered particle board shall be 18mm thickness unless otherwise shown on drawings. Edges of all boards shall be sealed with lapping / beading as directed by PM.

7. JOINERY

7.1 TIMBER FOR JOINERY

7.1.1 Wherever shown on drawings, paneled shutters for wooden doors (except glazed/gauzed shutters) shall be provided. All shutters shall be factory made and shall be 35mm thick as specified herein after. All painting work including priming coat shall be applied after obtaining approval of unfinished shutter procured from factory and brought at site.

7.1.2 All other timber required for joiners work not mentioned above or elsewhere in particular specifications shall be Ist Class Hard wood (Well seasoned (Teak wood).

7.1.3 For seasoning of timber for Joiners work refer Clause 6.1.1 and 6.1.2 here in before.

7.1.4 Provisions of clause 6.1.1 and 6.1.2 regarding moisture content shall equally apply to timber for factory made shutters mentioned under clause 7.2 & 7.3 here-in-after.

7.2 GAUZED SHUTTER

7.2.1 Wire gauzed shutter shll be made out of angle iron 35x35x5mm and 1.5mm thick MS sheet as shown on drawing.. the frame for shutter shll be of pressed steel as shown on drawing. MS section shall be painted with two coat of synthetic enamel paint over a coat of red oxide primer including preparation of surfaces.

7.2.2 The wire gauzd shutter shall be provided with 10mm Sq bars grill complete all as specified and shown on drawing. The shutter shall also be provided with fly proof wire mesh having 0.63mm nominal dia wire and 1.4mm average with of aperture complete all as specified here in after.

7.3 FLUSH DOOR SHUTTER

Flush door shutter shall be 35mm thick, solid core, non-decorative, factory made shutter with **non flammable ,water & termite proof** made as per IS: 2202 (Part I- 1999) and shall be ISI marked. Styles & rails shall be without any joint and be made of non coniferous timber hard wood (hollock / mirantee/BONSUM/ BEN TEAK) with moisture contents not more than 12% and dimension as given in IS code. The face panel comprising of plywood or crossband and face veneers shall be glued by hot pressed process. Over all finished thickness of face panel shall not be less than 3mm while the thickness of face veneer shall not be less than 0.6mm. Block board core shall fully confirm to the requirement specified in the IS code. All timber used shall be well seasoned and chemically treated. Adhesive shall be phenol formaldehyde synthetic resin BWP type specified in IS: 848- 2006. All dimensions shall be finished dimension & manufactures test certificate for test specified in IS: 2202 (PartI) shall be rendered.

The Contractor shall submit machine numbered paid vouchers from the Authorized Dealer/ Manufacturer for the total quantity of the flush door shutters supplied under each consignment. At the time of delivery of flush doors at site, delivery challan along with invoices shall be submitted by the Contractor to the PM, DEPMCEach consignment received at the site shall be inspected by the P. M. The original invoice shall be defaced by the P. M. and kept on record at the site office.

The Excise duty gate pass shall be submitted by the contractor to the PM for each consignment of flush door shutter dispatched by the factory holding valid BIS certification and brought at site for incorporation in the work.

On receipt of the shutters at site, the samples of door shutters shall be tested in any approved laboratory as instructed by the PM, DEPMCFrom each lot of approximately 700 shutters, one shutter shall be selected at random by the PM, DEPMCThe cost of replacement of the door shutters selected as samples, their transportation to the laboratory and the cost of testing by the laboratory shall be borne by the contractor and shall be deemed to be included in the lump sum rates quoted in Schedule 'A' Section-I

Flush doors to be provided with teakwood beading as per drawings including all fixtures and threshold and painted to match the door. Bottom of the flush door be painted with two coats of synthetic enameled paint before installation.

7.4 TREATMENT WITH CHLOROPYRIOPHOS

7.4.1 All woodwork and joinery except plywood, block board, flush shutters, veneered particle boards and timber formwork shall be given treatment with Chloropyriophos. The quantity of Chloropyriophos to be used and method of application shall be as given in clause 7.4.2 and 7.4.3 herein after. The coat of Chloropyriophos treatment specified in the clause shall be deemed to be included in the unit rates of buildings in Schedule 'A' Section I.

7.4.2 The components of joinery and wood work as mentioned in clause 7.4.1 above before their assembling, shall be dipped completely in solution of Chloropyriophos and Kerosene oil in the proportion as mentioned in the relevant IS for at least one hour.

7.4.3 After the operation as specified in clause 7.4.2 above the components of the aforesaid joinery and wood work shall be assembled as required and planning and sand papering done if required, at any portion of the surface. A coat of the solution mentioned in 7.4.2 above shall be properly applied with brush on the assembly surfaces of joinery and wood work.

7.5 PVC PANELLED DOOR SHUTTER

Providing and fixing of solid PVC profile door shutter of 28mm thick & 71mm wide rails & stiles made of Solid PVC foam Profile with a fine homogeneous cellular structure having smooth surface 3.3mm thick (2.8mm PVC foam sheet is laminated on both side with 0.25mm Ridig PVC sheet) PVC sheet is used as panel. Welded & primered MS frame of size 40mmx20mm is provided for extra strength. PVC panel, stiles, rails & decorative beading of size 12mmx12mm are joined together using solvent cement adhesive. All corners of PVC profile are first mitre cut and then welded complete as per direction of PM/Engineer-in-Charge & manufacturer’s specification.

Rigidlam PVC Doorframe:

Providing & Fixing factory made Rigidlam PVC Door Frame of size 60mm x 50mm with a wall thickness of 5mm made out of extruded 5mm Rigid PVC Foam sheet (4.75mm thick PVC Foam Sheet laminated with 0.25mm thick Rigid PVC Sheet) mitre cut at two corners & joined with two numbers 150mm long brackets of 15mm x 15mm primered MS square tube. The two vertical frame members and one horizontal frame member are reinforced with 40mm x 20mm primered MS tube of 19 gauge through out the frame. The door frame to be fixed to the wall using MS screws of size 65/100mm complete as per manufacturer’s specification and direction of Engineering-in-Chief.

8. BUILDERS HARDWARE FITTINGS

8.1 Ironmongery (hardware fittings) shall conform to the samples or shall be of approved make and as specified hereinafter. All ironmongery and hardware fittings (except hinges and other than those required for steel windows / vents) shall be of Aluminium alloy anodized. All fittings shall be ISI marked and as approved by PM. All screws shall be of cadmium plated steel, unless otherwise specified.

8.2 Hinges shall be as described below:

8.2.1 Butt hinges shall be brass, medium weight 100 mm long for Doors shutter ISI marked (IS: 1341) and as specified in SSR Part-I 2009 clause 9.7.2 on page 181 and approved by PM.

8.2.2 300 mm dia single action ordinary rat tail rod pattern springs including roller & roller plate as per SSR 2009 Part-I, Clause-9.7.8 on page-182 or CPWD specificationsand shall be provided to wire gauge shutters..

8.2.3 Hinges shall be fixed to wood and wood based members with CP steel screws. Hinges shall be welded to mild steel frames irrespective of what is shown on drawings.

8.3 Aluminum anodized sliding door bolts (type 3) 250 mm long with hasps and staple (bolttype) and fixing clips of sheet and bolt of extruded section of aluminum alloy, 16mm dia and shall be provided one each to all wood door shutter in all type of dwelling units. These shall be complied with IS 2681-1993 and with fixing bolts.

8.4 Aluminum anodized Tower bolt 200 mm long & 150 mm long shall be provided in all types of dwelling units. The barrel and the bolts shall be of extruded section of aluminum alloy. The aluminum tower bolt shall comply with IS 204 (Part-2) - 1992. However, the diameter of the bolts shall be 12mm.

8.5 The tie hanger in cupboards shall be of aluminium anodised pipe of 10mm internal diameter, 300mm long with standard aluminium anosized brackets as approved by PM. Wall thickness of aluminium pipe should be more than 1mm.

Note: 1. All aluminium anodized fittings shall conform to relevant IS and approved by the PM.

2. The rates given in the MES/ CPWD / State schedule shall apply to ironmongery (Hardware fittings) specified above even though these may not conform to specifications given in MES/ CPWD / State schedule.

8.6 19 mm (+1) dia Stainless steel pipe of thickness 1.6mm thick with appropriate socket for cupboard shall be provided as shown on the drawings..

8.7 Cupboard knobs where shown on drawings shall be of 40 mm diameter of brass fixed with brass nuts, screws and washer of mild steel bright finished.

8.8 Aluminium alloy (anodized) locking bolts (10 mm dia 100 mm size) shall be ISI marked (IS 2681) and be provided to each shutter (one each)

8.9 Aluminum rubber stopper double legged shall be fixed to bottom rail of door shutter, wooden door stopper one number 50mm size butt hinge shall be provided.

8.10 Aluminium Magnetic catcher of heavy duty of standard make shll be provided in all type of Dwelling Units.

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8.11 Aluminium anodized hasp & staples safety type confirming to IS-363-1993 in cupboard shall be provided in all type of dwelling units.

8.12 Hook and eye shall be of aluminium anodized and matching with window and of size as shown on drawings

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8.13 Magic eye shall be provided to each entrance door (one per DU) as per locations shown on drawings and shall be as per sample approved by the PM. It shall be of brass body, with both sides lenses, and of approved make.

8.14 Mortice lock shall be provided on the entry door of each dwelling units and shll be of brass vertical type, of size 100mm 4 levers of approv ved make as per samble approvd by th PM. The same shall be conforming to IS: 5930-1970 and all as specified as per clause 9.8.3 of P.M DEPMC/ACDS SSR Part-I on page 183.

8.15 Locks for cupboard shall be of Grade -2, size 50 mm 4 levers unless otherwise specified and wherever shown in drawings shall be of brass all as specified in clause 9.9.4 of P.M DEPMC/ACDS SSR Part-I on page 184.

8.16 Piano hinges shall be MS bright finish electro galvanized, 30 mm width of flaps (when opened) fixed to cupboard and kitchen cabinet. The continuous hinges shall be conforming to IS: 3818-1992. The hinge pin shall be of mild steel.

8.17 Extruded aluminum alloy handles, fabricated type anodized 150 mm size shall be provided in all type of dwelling units. Handle shall be ISI marked conforming to IS: 208-1996.

8.18 Pegs wherever shown on drawings shall be of aluminium anodized, cast integral with base plate fixed on a wooden well finished plate.

8.19 Drapery Rod wherever shown on drawing shll be of high strength aluminium rod powder coated thickness 40-60 micron outer dia 19/20 mm & inner dia 16 mm with plastic rings made of ABS plastics for other than main rooms, whereas for Main rooms the rod shall be of outer dia 28 mm *inner dia 24.5 mm. the brackets shall be of galvanized steel 1.6 mm thick. For main rooms the drapery rod shallbe of make MAC-sleek line type-II Vista Leveler Soffio-II and for other than main rooms -sleek line type _ I / Vista leveler Soffio-I.

8.20 **FLY PROOF WIRE MESH**

Wire mesh shall be of galvanized mild steel hot dipped wire having 0.63 mm nominal diameter wire and 1.4mm average width of aperture irrespective of what is shown on drawings. The edges of wire gauge (in the case of wooden shutters) shall be bent over wooden beads and the beads pressed well into the angle of the rebate to hold the gauge on two faces. The wooden beads shall be fixed to the wooden members of the shutters with steel panel pins.

8.21 In case of Aluminium windows/ CSWs/UPVC, the edges of wire gauge shall be bent over Aluminium beads and the beads pressed well into the angle of Aluminium section to hold the gauge on two faces as shown on drawings.

9.0 STEEL, IRON AND ALUMINIUM WORK.

9.1 Following types of steel shall be used in all works: -

(a) **Reinforcement steel**. High strength deformed steel bars produced by Thermo Mechanical Treatment Process (TMT) Steel bar of grades Fe 500 meeting all other requirements of IS: 1786-1985.

(b) **Structural Steel**.
   (i) Standard Quality – Conforming to IS: 2062.
   (ii) Ordinary Quality – Conforming to IS: 1977.

(c) **Galvanized Steel Sheets**. (Plain & Corrugated) confirming to IS: 277.

(d) **Fabric Reinforcement for Concrete**. Conforming to IS: 1566.

9.2 **Procurement**. All Steel shall be contractor's supply. Following checks shall be carried out by PM before the steel supplied by the contractor is accepted and is approved for incorporation in the works: -

(a) The structural steel supplied by the contractor shall be procured from main producers like SAIL, Rashtriya Ispat Nigam Ltd., IISCO, TISCO or secondary producers who manufacture structural steel out of ISI marked billets and are having BIS certification of ISI marking on their products and approved by ACDS.

(b) The steel sections for railing, gates, fencing, guards bars, grills, steel chowkhat, hold fasts etc, which do not constitute structural members, can be procured from main producers / secondary producers / BIS marked manufacturers or their authorized dealers without any minus price adjustment.

(c) The Galvanized Steel Sheets and fabric reinforcement for concrete to be supplied by the contractors shall be ISI marked and shall be procured from main producers.

(d) **TMT Steel**.

(i) TMT steel supplied by the contractor will be procured from main producers only like **SAIL, Rashtriya Ispat Nigam Ltd., IISCO, TISCO**. The documents in support of the purchase of steel shall be verified by the PM. The particulars of the manufacturer / supplier of steel shall be obtained from the contractor for every lot of steel separately. The form given at Appendix 'D' will be used for this purpose.

(ii) The Contractor shall place their demand /requisition of steel with adequate lead time. The demand shall be placed to the main producers of steel by 20th of preceding month and in case the supply of steel is not done by 30th of the next month the same shall be consider as non availability certificate from main producers while as approving procurement of steel from secondary producers by the accepting officer. The steel should be purchased from the storage depots of the main producers / and not from their authorized agents / dealers as the authorized agents deal with the steel manufactured by more than one manufacturers.

Testing of Steel. The manufacturer is to carry out inspection and testing of steel in accordance with the relevant BIS provisions. The contractor shall submit the manufacturer's test Certificate in original alongwith the Test sheet giving the results of each mechanical test as applicable and the chemical composition of the steel or authorized copy thereof, duly signed by the manufacturer with

each consignment. The Engineer-in-Charge / PM shall record these details in Steel Acceptance Register, as given at Appendix 'D' after due verification. The PM shall also organize independent testing of random samples of steel drawn from various lots from a National Test House, SEMT CME, Regional Research Labs, Government approved Labs, Zonal Labs etc as per the recommended minimum frequency shown in Table at Appendix D1 Independent testing of steel by Project Managers shall be mandatory as covered under Note 2 of Appendix D1. Samples from each lot should be tested for quality and elongation. The elongation shall not be less than 16%. In order to undertake Departmental testing, requisite facilities shall be organized by the contractor. Cost of samples, transportation and cost of testing shall be borne by the contractor.

9.3 **Documentation**. The contractor shall submit original purchase vouchers from the manufacturer for the total quantity of steel supplied under each consignment to be incorporated in the work. All Consignment received at the work site shall be inspected by the Project Manager alongwith the relevant documents before acceptance. The original vouchers and Test Certificates shall be defaced by the Engineer-in-Charge and kept on record in the site office of the PM duly authenticated and with cross reference to the control number record in the Steel Acceptance Register. The Steel Acceptance Register will be signed by JE, PM and contractor. The Station Commander / Accepting Officer may order a Board of Officers for random check of steel and verification of connected document. The entire quantity of all steel items shall also be suitably recorded in the Measurement Book for record purpose as not to be abstracted, before incorporation in the work and shall be signed by the Engineer-in-Charge and the Contractor.

9.4 **STEEL IN COILS ETC.**

Any bar of any dia for reinforcement may be procured in round bundles or coils and the cost of straightening the same shall be borne by the contractor. When bars are procured in bundles, the length of each bundle shall be worked out on the basis of unit weight predetermined by the PM by getting suitable length (not less than 3 metres) out of each consignment received, getting it straightened, length measured and weighed in presence of contractor's accredited representative. The said length and the weight shall be recorded from which unit weight (weight per unit length) shall be calculated. The length of bars worked out on the basis of unit weight determined as above shall form the basis for the purpose of calculating quantity of steel used/to be used in work and making payment of materials lying at site. However, if the unit weight works out more than the unit weight given in SSR, then unit weight given in SSR shall be followed for computing weight of steel for the purpose of making payment of steel lying at site.

9.4.1 Size, type and grade of steel shall be as shown on drawings. However, if grade and type of steel are not shown on drawings, the same shall be high strength deformed bars Grade – Fe-500 for reinforcement and Fe-410 W / Fe-290 for structural purpose. Various types of steel are given as under:

i) **Reinforcement Steel**

a) High strength deformed bars Grade TMT grade Fe 500 conforming to IS-1786-1985 (Re-affirmed 1990) as specified or indicated on drawings.

b) Mild steel Grade I conforming to IS-432 (pt I) 1982.

c) Fabric reinforcement of concrete shall be conforming to IS-1566 of 1982.

ii) **Structural Steel**

a) E-250 (Fe-410 W Quality B) for all types of steel structures including those subject to dynamic loading shall be used.
b) E-165 (Fe-290) shall be used for doors, windows guard bars, grills, steel gates, handrails, fencing post etc.

iii) Galvanised steel sheets (Plain and corrugated) shall be conforming to IS: 277 of 2003 with medium coating of zinc nominal 450 g/square metre.

9.4.2 STORAGE

Steel of different sizes shall be stacked separately. For each classification of steel, separate areas shall be earmarked. Steel shall be marked with distinct painting marks for each identification. All steel shall be so stored that it is always at least 15cm above the GL. Steel shall be stored in a manner so as to prevent distortion and corrosion. Any section, that has deteriorated and corroded or if considered defective by Project Manager, shall not be used in the work and shall be removed by the contractor without any extra cost. It will be the responsibility of the contractor to make sure that all possible arrangements are made for the safe custody of the steel. In case of any loss of steel only contractor will be responsible and the loss will/shall be made good without any delay or claim whatsoever.

9.4.3 SCHEDULING AND SUPPLY

Schedule of supply of steel shall be finalized by contractor with PM and shall be incorporated in CPM chart so that supply of steel is monitored in a way to avoid any delay in completion of the work. The complete requirement of steel of various sizes will be worked out before making any RAR payment and procurement of steel by the contractor will be completed sufficiently in advance of the date of completion,

9.5 WELDING

Welding where specified or shown on drawings shall be gas or arc electric welding which shall be at the contractor's option and as per IS: 816 and IS: 1323 as applicable.

9.6 HOLD FASTS

Holdfasts for doors shall be as shown in the drawings. Holdfasts for doors irrespective of what is shown in the drawings shall be embedded in PCC 1 :2:4 (type B-1) blocks built in brick work. The size of the blocks for walls, one brick thick and over shall be 23 cm x 23 cm x 15 cm. Lugs of steel windows shall also be embedded in PCC 1 :2:4 (Type B-1) blocks of size as specified above for holdfasts. The size of holdfasts shall be as indicated in the drawings. However, PM may allow to use adequate number of approved DASH TRUE fasteners bolts in case of steel windows/doors to be fixed with RCC columns without any price adjustment. The section of steel shall be FI 25 x 3mm for holdfasts unless otherwise shown on drawings.

9.7 MS GRILLS / GUARD BARS (FOR SERVANT QUARTER)

Irrespective of whether shown in drawings or not, provide Grill/Guard bars shall be provided to all windows with 12mm sq bars. All steel work shall be painted with 2 coats of synthetic enamel paint

over a coat of red oxide primer.

9.8 EXPANDED METAL

Where shown on drawings expanded metal shall be 12.5mm (SWM) x 40mm (LWM) with strands of 3.25mm width and 1.60mm thickness weighing not less than 5.037 kg. Per square metre conforming to IS: 412.

9.9 UPVC WINDOWS :

All openable and fixed window system shall have minimum 3 hollow chambers from front to back. The sliding system frames shall have minimum 3 chambers from front to back.
All sections of the frame and sash shall be reinforced in accordance with the system supplier's recommendations using galvanized mild steel in a single continuous length.

GENERAL REQUIREMENTS- Profile

The profile is to be extruded from a compound that has been blended to ensure quality and consistency. The material shall be white or of approved shade, high impact modified window grade UPVC and shall be colorfast and conform to BS EN 12608:2003 as below:

Description of Material	Required Value
Flexural modulus of Elasticity	Shall not be less than 2200 N/mm2
Resistance to impact by falling mass at – 10 °C for Class II (falling mass 1000g ; falling height 1500mm - as per BS EN 12608:2003)	not more than 1 test specimen shall show rupture in wall
Mean Breaking Stress for welded corners	Shall not be less than 35N/mm2 for compression bending test or 25N/ mm2 for tensile bending test

The profile shall be a hollow 3-chamber (across depth) profile with an outer wall thickness not less than 2.4 mm. The profile shall be of first grade/quality uniform and free from foreign bodies, cracks or marks.

Fabrication of window

a) The window units shall be designed with all corner joints, transom joints and mullion joints being mitered and fusion welded.

i) All excess material is to be neatly trimmed and neatly feature grooved/raised nib finish at corners, transom joints and mullion joints.
ii) There will be no mechanical joining of the profile.
iii) No polishing flush of any joints will be permitted.
iv) The window units shall be designed so that the route of drainage is prevented from passing through the reinforcement chamber.
v) The finished product shall be free from all sharp edges, burrs and the like that may be hazardous to the user.
vi) The dimensional tolerances on the finished outer frame height and width shall be + 3mm. Frame assemblies shall be such that they can be installed square within a
vii) maximum difference in the diagonals of 4mm. Minimum overlap of sash on frame shall be

8mm

viii) In all window units, adequate drainage should be provided to permit the escape of water from platforms or horizontal members beneath each sealed unit. The drainage slots shall not penetrate into the reinforcement chambers. Rain water Stop to be provided wherever necessary to provide barrier to excess rain water.

Reinforcement

a) Reinforcement shall be made from galvanised mild steel of not less than 2.2mm thickness as per strength requirement unless otherwise approved by Engineer in Charge
b) Steel reinforcement shall conform to IS 277:2003 or equivalent -Base material of steel shall conform to IS 513:2008 – Drawing Grade
c) The reinforcement shall be installed in accordance with the recommended actions. The reinforcement shall conform to the wind load requirements of IS875: Part 3. The reinforcement shall be in one continuous length and should beinstalled minimum 5mm and maximum 10mm from the face of the profile to be welded.
d) The reinforcement shall be secured to the profile so that it does not move or rattle and it maintains the structural integrity of the frame and satisfactory thermal separation. Reinforcement is to be fixed at a maximum of 100mm from the ends and then at a maximum of 300mm centers.

Glazing and Weather seals- GLAZING

Window shall be such that glazing or re-glazing on site is possible without the need to remove the outer frames from the structure of the building.

All glazing is to be packed in accordance with the system supplier’s recommendations to prevent any kind of damage during handling.

All beads will be cut at the correct degree recommended by the manufacturer. Glass retention clips shall be fitted in accordance with the Systems supplier’s recommendations.

WEATHER SEALS

The weather seals shall be EPDM/ Silicone seals. ASTM- D412 and ASTM- D2240 are standard specifying test methods for Tensile strength and Hardness of the gasket whereas the required value shall be specified

Ultimate tensile strength min >7.5 N/mm2

The weather seals are to be fitted in continuous lengths and grooves. The joints in the vent weather seal are to be positioned at the bottom and in the outer frames at the top.

Security and Safety

Fasteners shall be designed so that they cannot be released from the outside by the insertion of a thin blade. No opening light shall be openable or removable from the outside, when it is fastened in

the closed position, except by use of special tools or breaking part of the window.

QUALITY CONTROL AND TESTING OF MATERIALS

Raw Material

The material from which the profiles are made shall consist substantially from white polyvinyl chloride as per BS EN 12608:20003. Only those additives and pigments may be used that are needed for the manufacture of the compound and its subsequent conversion into sound,durable extrusions of good surface finish and mechanical strength, as assessed by the requirements of this specification.

Profile Properties- Appearance and Finish

The color of the profile shall be uniform and the color of all profiles in a system shall be uniform. The profile shall be free from foreign bodies, cracks or sink marks when viewed by normal corrected vision at 90o to the surface and at a distance of 1 meter in normal diffused north light.

Dimensions and Weights

The profiles shall be straight such that the longitudinal axis of the profile, as measured on the face surfaces, may deviate from the straight line by no more than 1mm per meter.

The cross section of the profile shall conform in shape and dimensions and may deviate by no more than + 0.5mm; glazing channels and seal grooves may deviate by not more than + 0.3mm.

The weight of the profile per meter shall not be more than 5% below the nominal value.

Window properties: All load bearing members shall be adequately reinforced so as to resist the wind load requirements of IS 875: Part 3. Calculations shall be submitted for all window designs.

Air Tightness: The air infiltration for windows shall not exceed 1 litres/ second m2 @ 75 Pa for both positive and negative pressures (certified for use in air conditioned buildings)

Water Tightness: The water penetration for windows shall be minimum 15 minutes @ 150 Pa as per AS 4420.5

Installation of Frame

i. Before installation the Installation Team is to make sure that the opening has been prepared and finished. Allow a 5mm gap between the frame and the opening. The new window shall be set in the prepared opening. Allow for suitable packing blocks.

ii. The window shall be fixed into the aperture, by drilling and fixing through the outer frame, to the existing structure using ‘Fischer’ fixings, F8S type bolts.

iii. The fixings shall be no less than 150mm from corners or transoms/mullions and at no more than 600mm centers.

iv. When the frame is securely fixed in position then fit glass and glazing beads. Allow for any necessary glazing blocks and glass lock devices.

v. Check windows for correct operation before proceeding with making good.

vi. No fixings are to penetrate the drainage channels.

vii. The windows shall be first treated with Polyurethane Foam (PU Foam) to enhance insulation against heat and Noise. The gap between masonry and the frame is to be filled with Neutral Cure Silicon (exposed to sun surface) and/or Acrylic Sealant (only for the internal surface).

viii. The silicone joints should be covered with Architraves/trims as per direction of Engineer-in-charge.

Making Good

i. Making good to the external surface of the window frame and finish with a compatible approved low modular silicone sealant to BS5889. All trims and quadrants are to be approved by the Engineer- in- Charge prior to fixing.

ii. Allow for making good any disturbed plaster, brickwork and decorations internally and externally including color wash to brickwork.

iii. Clean off excess material and check fittings and gearing.

iv. Leave installation clean and in good working order.

GENERAL ITEMS

i. This specification is to be read in conjunction with any other relevant documents and drawings.

ii. Sizes are not to be scaled from any drawings or sketches but should be measured on site prior to manufacture.

Window Accessories

i. Window should be designed and reinforced such that it can withstand the wind load requirements by providing suitable strengthening accessories.

ii. The window shall meet the requirements of water tightness.

iii. Trims:- Shall be used to cover the window to masonry joints.

Window Hardware

i. All slider door/windows are to be provided with multi point locking arrangement with/without key locking facility as per the requirement. The hardware to be of G-U or ROTO or equivalent make. The slider locking mechanism handles are of projected/flush type.

ii. Casement window friction stays are to be of G-U or Securistyle or equivalent make of

appropriate size and weight bearing capacity, made of SS304. The stack height of friction stay is to be 16 + 0.5mm.

iii. The casement windows are to be provided with multi point locking mechanism of GU/ Avocet / ROTOor equivalent make and handle to suite the same.

iv. Measurement- Area of window shall be measured for payment correct to a centimetre from outer edge of the window frames.

9.10 STEEL WINDOWS & VENTS –

9.10.1 **-BLANK-**

9.11 PRESSED STEEL CHOWKHATS FOR DOORS & CUPBOARDS

9.11.1 **-BLANK-**

9.12 **FAN HOOKS WITH BOXES**

Fan hooks of, cast iron or MS boxes with hooks shall be provided to each room as per details shown on drawings. The boxes shall be such that the canopy above the fan selected fully cover the box and nothing other than the fan and canopy is visible. The cost of the CI or MS boxes with hooks shall be deemed to be included in the lump sum cost of building in Sch 'A', Section-I.

9.13 **STEEL RAILING**

9.13.1 Steel railing where shown on drawings shall be provided as per design and detail shown on drawings. Mild steel work shall be painted with two coats of synthetic enamel paint. Over a coat of primer unless otherwise shown hand rail shall be of 50 mm dia MS Pipe medium grade confirming to IS- 1239and shall be fixed to MS balluster in such a manner that 2/3rd of the pipe remains free.

9.14 **BLANK**

9.15 **MS GARAGE DOOR**

MS door shutter to be provided in garage, shall be made with angle iron frame 35 x 35 x 1.5 mm 0.63mm thick PGI sheet as shown on drawings. The frame for door shall be of angel iron 50 x 50 x6mm as shown on drawings. Ms section shall conform to the relevant IS code as mentioned in SSR Pt-I the door frame shall be painted with two coats of synthetic enamel paint over a coat of red oxide primer including preparation of surfaces.

10. WATER PROOFING TREATEMENT

10.1 **Roof and Floor Slabs**

All roof/floor slabs shall be flat type RCC slabs on beams / columns / portal/walls as shown on drawings. Roof slabs shall have 1:40 slope or as shown in the drawing having minimum height of ceiling as on other floors.

10.1.1 After RCC roof slab including plastering on top is cured and finally set, water shall be ponded over the roof slab up to height of 5cm to 7.5 cm for 48 hours by providing temporary bunds all round and blocking water spouts/openings. The location of seepage/leakage if any shall be identified and marked. Grouting will be carried out in portion of roof slab observed with seepage at Contractor's expenses as under :-

Draw up a 1m x 1m matrix on the affected portion of roof slab and 1m beyond on all sides. Fix 12mm dia grouting nozzles at each cardinal point of the matrix in the affected portion of slab. The nozzle should penetrate upto 40mm below slab or upto top reinforcement in roof slab. After cleaning the roof slab, Grout the roof slab by grouting method with a pressure of 0.5 Kg/CM² to 1.00 Kg/ Cm^2using a grout of cement slurry with 20 parts of water and 1 part of cement by volume till rejection. After grouting is over, the nozzles shall be sealed off with cement mortar and washed with fresh water and allowed to dry. All nozzle protruding above shall be cut.

10. 2 **WATER PROOFING TREATEMENT TO RCC ROOF SLABS.**

10.2.1 For garage, terrace, the water proofing shall be done by providing 15 mm plaster in CM (1:4)in specified slope with water proofing compound as per manufacturer instructions while concrete is green and 550 x 550 mm size polished kota stone flooring of 20-25 mm thick shall be laid in slope over 20 mm screed in CM (1:6). Grinding shall be carried out as specified in Clause 13.47.4 on page 309 of SSR 1991 (Part-1).

For Garage (Individual) terrace: The water proofing shall be done by providing 15mm thick in CM (1:4) on sloped roof with water proofing compound while concrete in green.

10.2.2 Water Proofing treatment to RCC roof slab shall be carried out as specified below.

(a) Clean the RCC slab surfaces including sides up to 300mm high by wire brush raking & cleaning of construction joints, if any.

(b) Apply a coat of neat cement slurry admixed with approved integral liquid water proofing compound confirming to IS 2645 as per manufacturers recommendation over the RCC slab and sides upto 300mm high.

(c) Lay 20mm thick layer of cement mortar of mix 1:4 (1 cement :4 coarse sand) admixed with approve liquid water proofing compound confirming to IS 2645 and treating similarly the adjoining walls upto 300mm height including rounding of junctions of wall and slabs.

(d) Lay a layer of broken bricks/brick bats (coba) 25mm to 80mm size with 50% cement mortar 1:4 (1 Cement : 4 coarse sand) admixed with approved integral liquid water proofing compound conforming to IS 2645 to required slope.

(e) Coving in the radius of 80mm cement concrete 1:2:4 admixed with integral liquid water proofing compound and finished with cement mortar 1:4(1 cement : 4 coarse sand) admixed with approved integral liquid water proofing compound conforming to IS 2645 is to be provided at the junction of horizontal surface & side walls.

(f) After 2 days of curing apply second coat of cement slurry admixed with approved integral water proofing conforming to IS 2645.

(g) Finish the surface with 20mm thick jointless cement plaster 1:4 (1 cement : 4 coarse sand) admixed with approved integral liquid water proofing compound conforming to IS 2645 including over the coving upto 300mm height on sides wall and finishing the surface with trowel with neat cement marking with 300x300mm false square

(h) Average thickness of the above treatment shall be 125mm and minimum thickness at khurras shall be 65mm.

(i) Khuhrras shall be provided to all inlet points of rainwater pipes 450x450mm with a minimum thickness of 65mm in brick bat coba described herein before in para (a to g) including rounding the edges & making finishing the outlet complete.

(j) The proportion of approved integral liquid water proofing compound conforming to IS 2645 to be used in respect of cement shall be laid down by the manufacturer of the particular water proofing compound.

(k) The whole treated portion shall be flooded with water for 2 weeks for curing. In case any leakage /seepage is Letterd then the affected area shall be rectified & retested to the satisfaction of the Project Manager.

10.2.3 ----------Blank----------

10.2.4 **PONDING TEST FOR COMPLETED WATER PROOFING TREATMENT**

After completion of WPT all as specified, the entire work shall be pond tested for a period of 48 hrs by ponding with water 5 to 7.5 cm in height in the presence of DEPMC/PM. The PM should certify completion of WPT only after success of test & redoing & selecting of affected area if “ponding test” fails. Process shall be repeated till test is successful without any extra cost to Govt.

10.2.5 **WATER PROOFING TREATMENT TO SUNKEN FLOOR**

(a) All pipes passing through the walls of sunken floors shall be laid before the water proofing treatment is carried out. One number 50mm dia, 35cm long medium grade GI pipe spout with wire gauze on in side mouth shall be provided to each sunken portion irrespective of what is shown in drawings at the time of casting of the sunken RCC slab/ beam.

(b) Clear the sunken/ lowered portion of RCC slab surface (including vertical total depth plus skirting height) of floors by wire brush. Chisel out any mortar sticking to the surface there after rendering of uneven surfaces with 6mm thick cement mortar with 1:4 (1 cement : 4 coarse sand) mixed with integral water proofing compound to make it even.

(c) All junctions’ point of side walls where CI/GI pipes are passing through shall be sealed with epoxy putty.

(d) After drying putty wash the slab and sides of sunken portion with water and make it clear

and clean.

(e) Apply three coats of polymer modified cementicious water proof coating as per manufacturer specifications to bottom and vertical sides up to skirting height of the floors. The proportion and application of the water proofing treatment shall be as per the recommendations of the manufacturer or the specialist agency carrying out the water proofing treatment.

(f) Test the water proofed area by filling water for at least 7 days. In case any leakage/ seepage is Letterd the water proofing treatment shall be redone as per Paras (B) to (E) above and retested to satisfaction of the Project Manager.

(g) Plaster the bottom and sides up to bottom of the skirting with minimum 20mm thick cement mortar 1:4 mixed with integral water proofing compound as per manufacturer's specifications including rounding of corners and junctions sloping towards spout.

(h) All pipes laid in sunken portion shall be covered with 50mm thick PCC 1:3:6 all round after painting with anticorrosive paint (Black Japan).

(i) Provide filling with PCC 1:5:10 (1 cement : 5 coarse sand : 10 graded brick aggregate 40 mm nominal size) as specified.

(j) Provide floor finish and under layer of floor finish as specified.

10.3 **GUARANTEE FOR WATER PROOFING TREATMENT**

Contractor shall stand guarantee for 10 years against leakage/ seepages, of treated floors/slabs. Guarantee shall be given in proforma at Appx 'F'.

10.4 **TREATMENT FOR UGT & OHT**

10.4.1 Under ground sump, fire fighting and domestic water sump and over head RCC water tank shall be provided with 20 mm thick cement plaster in cement mortar (1:4) mixed with brick bat coba 25mm to 80mm size with 50% cement mortor 1:4 admixed with approved water proofing conforming to IS 2645 to required slope as per manufacturer's instruction at bottom, sides on all internal & external walls and at roof slab top complete

10.5 **Rain Water Pipes**

10.5.1 Irrespective of what is shown on drawings, rain water pipes and fittings shall be 110 mm outer dia UPVC pipe. The pipes and fittings shall be ISI marked (IS-13592) and 6 KGF/Sqcm pressure rating, procured from any of the manufacturers as per the approved list of makes/ agencies.

10.5.2 Pipe shall be fixed as shown on drawings. Where the pipes are shown to be fixed on walls, these shall be fixed with suitable PVC holder bat clamp and shall be embedded in PCC 1:3:6 block of size 150 x 150 x 150 mm and as directed by PM.

10.5.3 For all rain water pipe inlet 450mm x 450mm Khurrah shall be provided as per detail shown on drawing

11. FLOORING

11.1 General

11.1.1 Floors of various types shall be provided as specified here in after and as shown in drawings.

11.1.2 Floors shall be laid to levels or to falls as shown on drawings / directed by Project Manager. Floors shall be sunk below the general floor level to the required depth where shown in drawings, by suitably sinking the slabs at the time of casting them.

11.1.3 Floor finish shall be carried over all openings and dwarf walls.

11.1.4 Surface of concrete floors unless otherwise specified shall be finished even and smooth using extra cement with steel trowels.

11.1.5 Ramp shall have cement concrete flooring over sub base as specified hereinafter.

11.1.6 Where the floor finish is to be laid over RCC slab, the top surface of slabs shall be cleaned with hard wire brushes and given a coat of neat cement slurry using 3 kg. of cement per square meter just before laying the floor finish.

11.1.7 The dividing line between the floors of different type wherever they so meet between adjoining rooms shall be unless otherwise shown at the centre line of the door shutter in closed position and the applicable finish shall accordingly be provided. Exposed edges of floors shall be finished to match with top surface finish.

11.1.8 Cement concrete sub base or sub base floor and wearing coat shall be laid separately and not monolithically.

11.1.9 PCC floor topping shall be laid in square or rectangular panels with each side not exceeding 1.2 metres.

11.1.10 If any extra thickness of concrete is required to provide slope in the floor as directed by the Project Manager, the same shall be provided by the contractor at no price adjustment.

11.1.11 Unless otherwise shown in drawings / specified, the height of skirting & Dado shall be as under: -

(a) Skirting - 100 mm

(b) Dado - 2100 mm

11.2 Cement Concrete Floors

11.2.1 PCC floors where indicated in drawings / schedule of finishes shall be of the following composition:

40 mm thick PCC (1: 2:4) type B-1, finish even & smooth using extra cement, glass dividing strips shall be provided over 75 mm thick PCC (1: 4:8) type D2 over rammed earth filling.

11.2.1. 1 Floor in case of ramp / garage and parking area/ stilt area shall be of 100 mm thick 1:2:4 type B2 & concrete finished with spiked rolled with grooves.

11.2.1.2 Sub base of ramp / Garage and Parking Area / Stilt shall be 100 mm thick PCC (1:4:8) Type D2 over rammed earth.

11.2.1.3 Uses of all temporary fillets, side forms etc. shall be dispensed with where glass dividing strips occur. No price adjustment shall be made on account of non-use of temporary fillets, side forms etc.

11.2.2 Surface of concrete floors, PCC skirting / dado shall be treated with sodium silicate all as specified in Para 13.35 on serial page 301 of SSR 2009 (part-I).

11.3 SCREED FOR SKIRTING /DADO & FLOOR TILES

11.3.1 Unless otherwise specified, the wall surface shall be covered with 10 mm thick screed of cement sand mortar 1:3 (1 Cement: 3 Coarse sand) and shall be laid as described in Para 13:39.4 & 13: 40.2 on page 305 & 306 of SSR 2009 (Part-I) respectively.

11.3.2 Unless otherwise specified / Shown on drawings, the screed for ceramic tiles in floors shall be as under: -

(a)	Toilet / Bath / Kitchen	-	30 mm thick in CM (1:3)
(b)	Other locations	-	20 mm thick in CM (1:3)
(c)	Skirting/ dado	-	10 mm thick in CM 1:2

11.4 Interlocking Pre-cast tiles flooring.

75 mm thick tiles shall be provided over 25 mm thick fine sand over 80 mm thick PCC 1:5:10 type E2 in the location between road and ramp of the building as shown on drg. The same will be measured and paid under Sch 'A' Sec-IV Roads & paths. The interlocking paving tile shall be factory made of makes as specified in Appendix 'E'. The size, Shapes and pattern shall be as approved by PM. The compressive strength shall not be less than 30N/ Sqmm and same shall be checked from reputed laboratory from each lot and shall be kept on record.

11.5 Vitrified Tiles

11.5.1 SPECIFICATION OF VITRIFIED TILES IN FLOORING

The Vitrified tiles wherever shown on drgs / schedule of finishes shall be polished / satin matt finished of sizes 595 x 595 mm not less than 9 mm thick, jointed in neat white cement and pointed in white cement with pigment to match and provided in Drawing & dining. The colour / shade of the same shall be as approved by PM nearly matching with colour / shade if specified in drawings. Tiles shall be of first quality of Group B1a confirming to IS: 13006/EN 176 Group B1a. The tiles shall be laid on 10 mm thick cement mortar (1:3) over 20mm thick PCC (1:2:4) type B0 over neat cement slurry @ 3 kg / sq.m over RCC slab in first and subsequent floors. In the ground floor, the tiles shall be laid on 10 mm thick cement mortar (1:3) over 20mm thick PCC (1:2:4) type B0 over 75 mm thick PCC (1:4:8) type D-2 over rammed earth.

11.5.2 **VITRIFIED TILES IN SKIRTING**

Where shown on drawings/Schedule of finishes provide skirting of glazed vitrified tiles of specified size (or nearest available size) & specified thickness and height with shade matching with floor or as approved by PM. The tiles shall be laid over 10mm thick screed of cement mortar (1:3) set and jointed in neat cement slurry and pointed in white cement with pigment to match. Tiles shall be of first quality. The workmanship and laying of tiles shall be all as specified in clause 13.41 of P.M DEPMC/ACDS Sch 2009 Part-I on page 306.

11.5.3 **SPECIFICATION FOR MATT GLAZED CERAMIC RECTIFIED TILES FOR ROOM, VERANDAH, LOBBY & BALCONY ETC**

Polished / Satin Matt Glazed finished ceramic tiles Rectified in size 400 x 400 mm as manufactured by approved vendors specified in appendix 'D' conforming to IS: 15622 – 2006 / ISO 13006 (Group B-III) shall be laid on 10 mm thick cement mortar (1:3) over 20 mm thick PCC (1:2:4) type B0 over 75 mm thick PCC (1:4:8) type D2 over rammed earth in ground floor. The tiles at remaining floors shall be laid on 10 mm thick cement mortar(1:3) over 20 mm thick PCC (1:2:4) type B0 over neat cement slurry @ 3 kg/sqm over RCC slab.

11.5.4 **SPECIFICATION FOR WALL TILES IN KITCHEN AND TOILETS**

Glazed Ceramic wall tiles in size 300 x 200 mm as manufactured by approved vendors specified in appendix 'D' conforming to IS 15622: 2006 / ISO 13006 (Group B III) shall be laid over 10 mm cement screed in CM (1:3). The height of dado shall be upto door height in toilets and in Kitchen.

11.5.5 **SPECIFICATION FOR FLOOR TILES FOR MAIN ROOMS**

Polished / Matt satin finished Ceramic Floor tiles in size 595 x 595 mm and minimum thickness shall not be less than 9mm as manufactured by approved vendors specified in appendix 'D' conforming to ISO 13006 EN 176 (Group B1a) shall be laid on 10 mm thick cement mortar (1:3) over 20 mm thick PCC (1:2:4) type B0 over neat cement slurry @ 3 kg / sqm over RCC slab in first & subsequent floors. In the ground floor, the tiles shall be laid on 10 mm thick cement mortar (1:3) over 20 mm thick PCC (1:2:4) type B0 over 75 mm PCC (1:4:8) type D2 over rammed earth.

No	**Property**	International Std. ISO 13006 / EN176 Group B1a	**Method of Testing**
1.	Deviation in length	+/- 0.6%	EN 98
2.	Deviation in thickness	+/- 5%	EN 98
3.	Mohs hardness	>6	EN 101
4.	Water absorption	< 0.50%	EN 99
5.	Flexural Strength	>27 N / mm2	EN 100
6.	Abrasion resistance	< 204 mm3	EN 102
7.	Stain resistance	Resistant	ISO 10545-14
8.	Chemical resistance	No Damage	EN 106
9.	Breaking strength	1113 N	ASTMC-648

10	Glossiness	Min 80% reflection	Glossmeter

11.5.6 **SPECIFICATION FOR FLOOR TILES-POLISHED MAT FINISHED CERAMIC TILES (NON SKID) SIZE 300X300 (FOR KITCHEN FLOORING).**

Matt Glazed Ceramic Floor tiles in size 300 x 300 mm (Non-skid) as manufactured by approved vendors specified in appendix 'D' conforming to IS 15622: 2006 / ISO 13006 EN 177 (Group B III) shall be laid on 10 mm thick cement mortar (1:3) over 20 mm thick PCC (1:2:4) type B0 over neat cement slurry @ 3 kg / sqm over RCC slab in first & subsequent floors. In the ground floor, the tiles shall be laid on 10 mm thick cement mortar (1:3) over 20 mm thick PCC (1:2:4) type B0 over 75 mm PCC (1:4:8) type D2 over rammed earth.

11.5.7 **SPECIFICATION FOR FLOOR TILES (SAND PAPER FINISH) FOR THIRD TOILET OF OFFRS DU TILES AND 2ND TOILET ROUGH FINISHED TILES (SAND PAPER FINISH).**

Matt Glazed Ceramic Floor tiles (sand paper finish) in size 300 x 300 mm as manufactured by approved vendors specified in appendix 'D' conforming to IS 15622: 2006 / ISO 13006 EN 177 (Group B IIa) and screwed and sub base as described in clause 11.5.6 here-in-before.

No.	Property	European std EN-177 BIIa / ISO 13006 and IS: 15622:2006	Method of Testing
1.	Deviation in length	+/- 0.5%	EN 98 / IS: 13630 (Part-I)
2.	Deviation in thickness	+/- 5%	- do -
3.	Wedging warpage	+/- 0.5%	- do -
4.	Squareness	+/- 0.6%	- do -
5.	Water absorption	3 – 6 %	EN-99 / IS: 13630 (Part-II)
6.	Scratch Resistance (Moh's scale)	Min 5	EN-101 / IS: 13630 (Par-13)
7.	Abrasion resistance	As per the Abrasion class indicated by the manufacturer	EN-154/IS: 13630 (Part-11)
8.	Crazing Resistance	In conformity with the norms	EN-105 / IS: 13630 (Part-9)
9.	Chemical resistance	Resistant to all acids and alkalies (except hydraulic acid and its compounds).	EN-1221 / IS: 13630 (Part-8)
10.	Bending Strength	≥ 220 kgs / cm2	EN-100 / IS: 13630 (Part-6)
11.	Thermal shock	Resistant to 10 cycles	EN-104 / IS: 13630 (Part-5)

11.5.8 **CERAMIC TILES SKIRTING**

Ceramic tile skirting with same finish to match with approved colour Glazed ceramic tiles floor finish. Height of skirting shall be 100 mm and fixed over 10 mm thick screed in CM 1:3.

11.5.9 **GLAZED CERAMIC TILE DADO**

Glazed ceramic tiles shall be provided to toilets, bath, WC, wash, kitchen to the height as shown on drgs. The shade & size shall be matching with floor tiles as approved by PM and thickness not less than 6.5 mm of approved make. The joints shall be pointed with white cement mixed colour to match and laid over 10 mm thick screed in CM 1:3.

11.5.9 (a) No outsourced Vitrified / Ceramic Tiles shall be supplied by the manufacturers. Only Vitrified / Ceramic Tiles manufactured at Company's own manufacturing plant shall be supplied

11.5.10 **Kota Stone Flooring for servant qtrs and approachable terraces.**

550 x 550mm size machine cut polished Kota stone flooring of 20-25 mm thick with 20 mm screed in cement mortar 1:6 shall be carried out all as specified in clause 13.47 on page 309 of SSR 2009 (part-I). But in case of Ground floor the above flooring and screed shall be provided over sub-base of 75 mm thick PCC (1 : 4 : 8) type D-2 over compacted earth filling. Grinding of kota stone floor shall be done by machine fitted with fine grade blocks (No. 120). The final grinding shall be carried out with the finest grade grit blocks (No. 320) with machine & where grinding by machine is not feasible because of restricted space, grinding by hand machine or hand may be permitted by the PM without any price variation and with the following carborandum stones.

1st Grinding	-	Medium Grade Stone (No.80)
2nd Grinding	-	Fine Grade Blocks (No. 120)
Final Grinding	-	Finest Grade Grit Blocks (No 320)

The polishing process shall be all complete as per clause 13.47.4 on page 309 & 310 of SSR 2009 (part-I). Plain cement concrete 1: 2:4 (1 cement 2 coarse sand: 4 graded stone aggregate) shall be used where required to achieve the desired slope/level of adjacent floors and the cost is deemed to be included in the price quoted.

11.5.11 **KOTA STONE SKIRTING**

Kota stone slab 20-25mm thick in skirting shall be laid over cement screed of CM(1:3) 10mm thick and jointed with grey cement slurry mixed with pigment to match the shade of slab including rubbing and polishing etc.

11.5.12 **GRANITE STONE COOKING / PREPARATION PLATFORM**

PANTRY

18 mm thick granite stone topping and down facia including rounding shall be provided on cooking / preparing shelf over 20 mm thick screed in CM (1:4) laid over RCC platform..

11.6 **CEMENT SKIRTING**

11.6.1 Cement skirting where PCC floor are provided shall be 5mm thick in cement and sand mortar (1:2) over 10 mm thk cement and sand mortar (1:4) screed trowelled even and smooth. Height of

skirting shall be as indicated on drawings .Height of skirting where not shown on drawings shall be 100 mm. Skirting shall be returned in jambs, openings, and exposed edges etc.

12. PLASTERING AND POINTING

12.1 General

12.1.1 External finish shall be taken 15 cms below the ground level except where plinth protection / ramp and the like is provided, in which case it shall be taken upto the bottom of the plinth protection / ramp etc.

12.1.2 Plaster / pointing, skirting / dado shall be returned to in jambs reveals and soffits of lintels / window cills etc.

12.1.3 All plastered / rendered surfaces shall be trowelled to smooth and even surface with steel trowel (without using extra cement).

12.1.4 To avoid cracks at junction of RCC and brick walls, 150 mm wide GI chicken wire mesh of 0.9 mm dia, 12 mm mesh shall be nailed on the joints before plastering. Grooves between junction of RCC & masonry shall be formed wherever directed by the PM. The GI chicken wire mesh shall be provided on both faces (external and internal) at all the junctions of RCC column, beam, lintels with masonry

12.1.5 Thickness of plaster does not include thickness of dubbing out.

12.2 Plastering and Pointing

12.2.1 Cement plaster on internal surfaces above skirting / dado shall be done in cement and sand mortar (1: 6) in one coat and shall be 12 mm thick at the proudest part, unless specified otherwise elsewhere in particular specifications or shown on drawings. Mortar for dubbing out and rendering shall be of same type and mix. Dubbing out may be executed as separate coat or along with the rendering coat.

External Washed grit plaster shall be provided on external surfaces in two layers with following specifications:-

(i) Under layer shall be 15 mm thick (average) plaster of cement mortar 1:4 (1 cement : 4 coarse sand) and shall be brought to true level and plumb by using wooden float after thoroughly wetting the surface. The surface shall be further roughened by furrowing with a scratching tool. The surface shall be kept wet till top layer is applied. Irrespective of what is shown on drawings, GI chicken wire mesh 24 gauge and 20 mm mesh shall be fixed all along RCC and brick work joints in a width of 300 mm with cement slurry and nails before providing under layer of plaster as aforesaid.

(ii) Grooves of size 20x15 mm or as specified shall be provided as directed by the DEPMC and Project Manager to form a design pattern on the external façade as shown on drawing. Tapered wooden battens to match the size and shape of the grooves shall be fixed over the under coat with

nails before the application of the top coat. It shall be ensured that top panels are not damaged, but if damaged, the same shall be made good by the Contractor.

(iii) All white or coloured marble stone chipping to be washed in clean water before use.

(iv) Top layer shall be 15 mm thick comprising of mixed white & grey cement (using approximately 35% white cement and 65% grey cement) with reflectance 50±1% or Silver Cement of Companies like M/S Shriram Cement Works with reflectance 50±1%, marble powder and white/approved coloured marble chips in proportion of 1:0.5:2 (1 mixed white & grey cement or Silver cement : 0.5 marble powder and 2 marble chipping of 12 mm and down size including 15% pattern using white cement with pigments as approved by DEPMC and Project Manager. Before application of top coat, the surface of the under coat shall be cleaned and a coat of grey cement slurry @ 2 Kg. of cement per Sqm, shall be applied. The top layer shall be applied in uniform thickness and sufficiently pressed with wooden float for proper bonding with the under coat and finished to a true and plumb surface. Finished surface of top coat after the mix has taken the initial set shall be scrubbed and washed with suitable brushes and water mixed with H2 So4 @ 5% Scrubbing and washing shall continue till the stone chipping are sufficiently exposed to its natural colour.

(v) Marble stone chipping of size 12 mm and down size of approved colours, marble powder of approved quality and pigment of approved colour shall be used.

(vi) Suitable scaffolding to be used shall have sound and strong supporters tied together with horizontal pieces over which scaffolding planks shall rest to ensure that for horizontal supports no holes are made in the wall.

(vii) The wooden battens shall be removed very carefully by a special tool so that the edges of grit wash are not damaged.

(viii) Before application of under coat of plaster, the surfaces shall be prepared by raking out joints properly and brushing out the dust and loose mortar and washed thoroughly with water and kept wet.

(ix) Grooves shall be finished with cement slurry mixed with approved water proofing compound.

A sample be got approved by the Contractor prior to start the work from the DEPMC and Project Manager

12.2.2 All exposed surfaces of beams, columns, lintels, cills and the like coming in conjunction with plastered surfaces shall be plastered/finished as per adjoining surfaces and to the thickness required to bring them in the same plane as that of adjoining plaster/ finish.

12.2.3 Extra work over plastering (externally) as shown on drawing shall be done in isolated width or in raised bands.

13. PAINTING/ DISTEMPER/ WHITE WASHING/ COLOUR WASHING

13.1 WHITE WASHING / COLOUR WASHING

White wash / colour wash shall be provided where shown on drawings. All lime wash shall be done in 3 coats. The colour wash shall consist of 2 coats of colour wash (off white shade No. 3.033 or

NO. 4.05 as per IS: 1650) over one coat of white lime wash. Where the finish on plastered surfaces is not indicated in schedule of finishes it shall be (colour wash as specified above). However, soffit of rooms shall be provided 3 coats of white (lime) wash. Lime wash shall be carried out all as specified in 15.2 & 15.11 & 15.12 on serial page No. 321 & 322 of SSR Part-I. To achieve better finish of white wash zinc oxide shall be mixed with lime wash at the rate of 2 percent of slacked lime. In final coat of white wash fevicol DDL shall be mixed as per manufacturers instructions No ultramarine blue shall be mixed in any coat. However, sodium chloride, as specified in clause 15.12.3 on page 323 of SSR part I shall be mixed in first and second coats. Irrespective of what is shown on drawings, plastered surfaces inside the cupboards shall be given 2 coats of oil bound distemper white shade, after preparation of surfaces.

13.2 OIL BOUND DISTEMPER (WASHABLE DISTEMPER)

13.2.1 Oil bound distemper acrylic to all internal walls and ceilings, shall be provided with two coats of oil bound distemper acrylic over one coat of putty Birla white or equivalent and two coats of cement primer (one coat over newly plastered surface and one coat over putty).manufactured by reputed firms as mentioned in the list of approved makes/ agencies conforming to I S: 428 -2000 & shall be provided over prepared surface as specified in clause 15.14 on serial page 325 & 326 of SSR Part-I, DDL (Fevicol) synthetic resin in the preparation as recommended by the manufacturers .shall also be added in Distemper solution. The thickness of the wall putty shall not be less than 1 mm thick including making the surface smooth by sand papering etc. to the entire satisfaction of the PM.

13.3 DRY DISTEMPERS

13.3.1 Dry Distempers to all internal walls of not specified otherwise shall be provided with two coats of Dry Distempers over a coat of white wash and preparation of surfaces etc as specified in clause 15.13 on srl page 324 & 325 of SSR Part –I (2009).

13.4 Irrespective of what ever shown on drg or specified else where, fire retardant paint shall be applied on all surfaces of refuge area, meter room and fire escape staircase.

13.5 SYNTHETIC ENAMEL PAINT

13.5.1 The tint of the paint shall be as described in the schedule of finishes or as approved by PM and shall be approved brand / make. Wooden surfaces will be treated with 2 coats of synthetic enameled paint over one coat of pink primer except otherwise described.

13.5.2 The contractor shall use fresh and first quality paint. The contractor's rates shall also be deemed to include for the preparation of surfaces and application of primer. The contractor shall obtain the permission of PM in writing well in advance for the makes/brands of paint that he will use in the work. He shall also submit samples thereof. The synthetic enamel paint shall be from any of the makes as per list of approved makes/ agencies.

13.5.3 The Contractor shall, if so required by the PM, produce certificate from the manufacturers or their representative to establish that the brands of paints used by him are of the approved make. Paints shall be brought at the site in manufacturer's drums with seal intact.

13.5.4 Paints used in priming coat, under coat and finishing coat shall be of the same manufacturer. The paint shall be applied first using vertical strokes until the surfaces are covered and then brushed

cross wise for complete coverage with light strokes so as to smooth out laps and brush marks and finally laid off with vertical strokes. The above shall constitute a single coat of paint.

13.5.5 Surfaces specified / shown on drawings to be oil painted / painted shall be passed by the PM and marked as such before each coat is applied. Each coat shall be of slightly varying shade (not applicable to white shade) and shall be passed by the PM before next coat is applied.

13.5.6 Unless specified to be treated otherwise in specifications hereinafter, all wood based surfaces shall be given the priming coat of pink primer, one under coat and one finishing coat of synthetic enamel paint. The priming coat of paint shall be applied before fixing.

13.5.7 Unless specified to be treated otherwise in these particular specifications hereinafter, all surfaces of iron and steel shall be given one priming coat of red oxide one under coat and one finishing coat of synthetic enamel paint. Iron and steelwork in reinforcement, galvanized iron or tinned ironwork shall, however, not to be painted.

13.5.8 All exposed cast iron soil/waste/vents/anti syphonage pipes and fittings there to shall also be painted with synthetic enamel paint (one under and one finished coat) externally matching in colour with the adjoining surfaces.

13.5.9 All exposed surfaces for which no type of finish is specifically stipulated either in drawings or in these particular specifications shall be painted with synthetic enamel paint of two coats over one coat of primer as specified hereinbefore.

13.5.10 If the under coat of the paint is not executed within six months after applying the priming coat of paint, the priming coat shall be done again by the contractor at no extra cost.

13.6 **TARRING**

13.6.1 Surfaces of timber and steel items in contact with or embedded in concrete / masonry work, etc., shall be treated with two coats of tar.

13.6.2 Back of steel chowkhats / frame and portion of iron and steel members in contact with or embedded in concrete / masonry works shall be treated with two coats of tar / black bituminous paint conforming to IS specifications.

13.7 **FRENCH POLISH**

French polish for wood work shall conform to IS-348 and shall be provided as shown on drawings. It shall be done as per P.M DEPMC/ACDS specification Part I, 2009.

13.8 **CEMENT BASED PAINT**:

Cement based paint shall be provided where shown on drawing /specified .It shall be cement paint and shall comprise of base coat of water proofing cement paint and two coats of cement paint of approved tint and applied as specified in Para 15.7 on page 321 & para 15-15 on pages of 326 & 327 of P.M DEPMC/ACDS schedule (Part I).First quality brand of the makes as per the list approved makes/agencies shall be used as approved by the PM.

14. GLAZING

14.1 The glazing shall be done with selected quality flat glass conforming to IS-2835, unless otherwise specified in particular specifications hereinafter. All float glass shall be of good quality, free from specks, bubbles, smoke wanes, air holes and other defects.

14.2 Unless specified otherwise hereinafter, all glazing shall be with 4mm thick float glass for panes upto 0.5sqm and 5mm thick for panes exceeding 0.5 square metre.

14.3 Glass shall be fixed to aluminium windows/vents with aluminium snap beading alongwith PVC / neoprene gasket complete all as specified. Glass in steel window shall be fixed with metal beads and glazing pins as shown on drawing size of MS beading shall be 10mm square bead of thickness not less than 1 mm if not otherwise shown on drawings.

14.4 Pinheaded glass 4mm thick shall be provided in windows/vents coming in toilets and in the locations as indicated in drawings. However, thickness of glass in the louvered windows shall be as shown on drawings.

14.5 The glass shall be fixed to wooden shutters with wooden beads as shown on drawings and as specified in clause 16.9 on page 331 of P.M DEPMC/ACDS Schedule (Part I). Wooden beads shall be of 1st class hard wood teak of size shown on drawings.

14.6 The contractor shall produce vouchers / certificates from suppliers/manufacturers to the PM as a proof that the putty conforms to IS-419.

15. PLUMBING, DRAINS AND SANITARY FITTINGS

15.1 Materials / Fittings / Fixing Accessories

15.1.1 All Sanitary ware (except flushing cistern) shall be of white vitreous china best quality ISI marked. The samples of sanitary fittings, fixing accessories shall be approved by the PM before bulk procurement for incorporation in the work. Sanitary ware shall be of makes as mentioned in the list of approved makes/ agencies 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 marked.

15.1.2 The unit rates of buildings included in Sch 'A' section I shall include for the entire and complete sanitary installation, internal plumbing and drainage which comprise inter-alia the provision of all sanitary and toilet accessories, fittings, fixtures, floor trap, gully traps, fittings and fixing accessories, soil, waste, vent, anti-syphonage pipes and specials, ducks foot bends, etc. All the specials viz single and double branch pieces, bends, ducks foot bends, etc., shall be provided with access door fitted with 3mm rubber washer screwed with set screws. The outlet of 'P' trap of WC shall be jointed with connecting pipe/branch piece.

15.1.3 The contractor shall employ qualified and licensed plumber for supervision of installation and testing of the sanitary fitting and plumbing. The connection shall be provided as indicated in drawings. The layout of soil, waste, vent and anti syphonage pipes shall be marked on the walls in coloured chalk and approved by the PM before execution of work. The unit rates of buildings given in Sch 'A' Sec-I also include inter-alia the provision of the following:

(a) All sanitary ware, fittings, fixtures, accessories, etc., of first quality ISI marked.

(b) Plumbing and sanitation complete upto 3 mtr beyond the outer faces of walls of the building. Waste pipe shall be provided upto and including Gully Trap and 100 mm dia (internal dia) SGSW Pipe from Gully trap, to first manholes, anti-syphonage pipes and vent pipes including all manholes falling within 3 mtr from the bldg face.

(c) All waste pipes up to and including provision of gully traps embedded in concrete below ground level. Waste pipe from gully traps to first manhole shall be 100mm dia.

(d) Vent pipes and anti syphonage pipes.

(e) All plumbing pipes / fittings shall be of UPVC type B with rubber ring joints and antisyphonage pipes & vent pipes shall be type 'A' marked ISI 13592..

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15.1.4 **Water closet (Pedestal Pattern)**

European type (Pedestal pattern) water closet shall be 40 cm high, wash down pattern with concealed "P" or "S" trap as directed including plastic hinge and lid solid type with rubber buffers confirming to IS: 2548 Part-I – 1996 complete, flushing cistern shall be PVC cistern of 3/6 liters dual capacity ISI marked confirming to IS: 7231 with 32 mm bore polythene flush pipe of sufficient length internal fittings (valve less symphonic) brass handle and pair of painted cast iron brackets. Water closets shall be fixed with brass screws of appropriate size. Jointing of flush pipe to water closet flushing run shall be done with red lead cement. The WC shall be fitted with health faucet, chromium plated rising spray with wall brackets with 1.5 m long metallic flexible tube, Gem Cat No. 350083 or approved equivalent .

15.1.5 **Water Closet Anglo Indian Type**

Water closet Anglo Indian Type shall be provided where shown on drawings. Water closet (Anglo Indian type) shall be vitreous china UNIVERSAL with 'S' trap of make HINDWARE Cat No. 20012 or equivalent from the make as per the list of approved makes/agencies and as approved by the PM. WC with 'S' trap shall be screwed to hard wood plug embedded/fixed to floor. Low level flushing cistern PVC 3/6 litre dual flush, feather touch operated bearing IS-7231 with plastic seat cover bearing number IS-2548 (Part I) 1996. Seat shall be screwed to WC and shall be of solid PVC/ fibre. Low level flushing cistern shall be of make as per the list of approved list of makes/agencies and as approved by the PM. Cisterns shall be fixed to walls by means of suitable size screws and wooden plugs.

15.1.5.1 Seat cover for both water closet European type and Anglo Indian type shall also be of the same make as that for European type or Anglo Indian type respectively.

15.1.6 **WASH HAND BASINS:**

(a) All rectangular wash hand basins shall be of size 550 x 400 mm wall mounting type of shape as per Hindustan Sanitary ware Cat No. 10001 or equivalent of other makes as specified in Appendix 'E'. All oval wash basins shall be as per Hindustan Sanitary Ware Cat No. 10016 of size 560 x 410 or equivalent of other makes as specified in Appx E list of approved makes including all necessary arrangements. Each Wash Hand Basin shall consist of following: -

(i) CP brass waste fitting 32 mm dia.

(ii) CP brass bottle trap 32 mm with CP brass pipe to wall with CP brass cast wall flange.
(iii) CP brass pillar taps 15 mm. however, where geysers are to be provided, single lever type CP brass central hole basin mixer conforming to IS 8931 – 1993 shall be provided.
(iv) CP brass mixer shall be provided with hot and cold water.
(v) GI Waste pipe 32 mm dia (medium grade)
(vi) The brackets shall be embedded in walls in cement concrete (1:2:4) type B1 block of size 10 cm x 10 cm x 23 cm. Necessary counter shall be provided where shown on drawing.
(vii) Mirror.
(viii) PVC connection 15 x 450 mm
(ix) Angle Valve

(b) The above items shall not be measured and paid separately under Sch 'A' Sec II or in other schedules under any circumstances as the cost of above item shall be deemed to be included in lump sum cost of building in Sch 'A' Part-I.

15.1.7 **STAINLESS STEEL KITCHEN SINK**

(a) Kitchen Sink in pantry: Supply and fix IS embossed (IS: 13983) single bowl kitchen sink with drainage board in glossy finish; made of stainless steel grade 304AISI 18/8 & 1mm thick with overall size 41"x20" and bowl size 20"x16" of 8" depth with side border as specified in IS code unless untill specified in drawings. AISI 304 (18/8) stainless steel to be embossed on each kitchen sink. Sink shall be connected with 40mm dia waste coupling and PVC waste pipe of flexible type.

(b) -BLANK-

15.1.7 **MIRROR**

15.1.8.1 Size of mirror shall be 600 mm x 600 mm in 6 mm thickness with beveled edges having back side support of HIPS (An Engineering Thermoplastic) Sheet of 600mm X 600mm in 2mm thickness pasted with vacuum pressure Techniques and beveled edges are covered with silicon coating. Provided with 4 round Steel Studs of 7mm thickness in 19 mm dia on front side to support 2 Steel wall hanging hooks with Plastic washer on the back side

15.1.8.2 -BLANK-

15.1.8
15.1.9 **TOWEL RAIL / RACK**

For Major, Captain Qtrs. Of any type Towel Rail shall be 60cm long of make. Wall thickness of towel rail shall be 1.6 mm thick.

15.1.10 **FLUSHING CISTERN**

Flushing cistern 3 / 6 Ltr dual capacity ISI marked, white, feather touch PVC low level of make commander or equivalent brand of PARRY or CERA or Hindustan as approved by PM with 32 mm

bore polythene flush pipe of sufficient length, including internal fitting (valve less syphonic) white colour, ISI marked (IS: 7231).

15.1.11 Toilet Paper Holder – Toilet paper holder shall be provided in all

15.1.12 **SHELF IN TOILETS**

Two corner shelves with 8 mm float glass shall be provided in one corner of each toilet in each DU as directed by PM. The radius of each shelf shall be 300 mm. the cost of shelves shall be deemed to be included in Lump sum cost of the building under Sch 'A', Sec-I.

15.2 PIPE AND FITTINGS

General location of soil, waste, vent, anti syphonage pipes are indicated in the drawings. Detailed layout shall be marked on the walls in coloured chalk and approved by PM before execution of work.

15.2.1 All soil, waste vent and anti-syphonage pipes including fittings shall be UPVC (SWR). The pipe fitting, laying and jointing shall be done all as specified in clause 18.67.7A on page 382 of SSR Part-I and as per manufacturers instructions. All soil and waste pipes with rubber ring joints shall be type B and antisyphonage pipes & vent pipes shall be type 'A' marked ISI 13592. All fittings shall be UPVC injection moulded fittings for soil and waste discharge system, ISI marked (IS-14735)

15.2.2 The vent pipes shall be taken from soil pipes to a height to 30 cms, height for inaccessible roof and 2 m above in case of accessible roof measured from top of roof (of last storey) to the bottom of the cowl. Cowl shall be provided on top of vent pipes and shall be fixed with solvent supplied by the manufacturer.

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15.2.3 Soil pipes shall be taken upto 45 cms below ground level and provided with ducks foot bend.

15.2.4 Soil/drain pipes from ducks foot bend shall be of UPVC (SWR) up to first manhole and waste pipe from gully traps shall be of SGSW pipe grade 'A' conforming to IS upto manholes.

15.2.5 The waste pipe shall be taken upto 15 cm. below plinth protection level and provided with ducks foot bend.

15.2.6 All exposed bends / branches and other junctions shall be provided with oval pattern access doors with bolts as per relevant IS and 3mm rubber insert packing to make them air and water tight.

15.2.7 The branch connection with the vertical pipes shall be so arranged that the vertical pipe is at least 5 cm away from the face of the wall. It should also be ensured that no joint between branch piece and vertical pipe terminates. Irrespective of what is shown on drawings, separate stacks for soil, waste and anti syphon age pipes shall be provided.

15.2.8 Irrespective of what is shown on drawings, sizes of pipes shall be as follows: -

(a)	Soil pipes	-	110mm bore
(b)	Waste pipes	-	75mm bore

(c) Anti syphon age pipes & vent pipes - 75mm bore

15.3 **FLOOR TRAP**

15.3.1 Floor trap shall conform to1S-3989 and shall be of CI with CI grating (without hinges) and outlet with nominal diameter of 75mm shall be provided in the situations where shown on drawings. The outlet of floor trap shall be with long arm and shall be jointed to connecting pipe / branch pieces with lead joint. Floor trap shall be provided in lieu of nahani trap wherever shown / specified on drawings.

15.3.2 **COCKROACH TRAP**

In kitchen, stainless steel cockroach trap shall be provided. Stainless steel of trap should be of good quality so that it does not get rusted.

15.3.3 **Gully Trap**

Gully trap shall be salt glazed stone ware with rebated top and 100mm dia (bore) outlet and cast iron or mild steel grating of size 15 cm x 15 cm. It shall be set in cement concrete (1:3:6) Type C-1 foundation of size 53 cm x 53 cm with overall depth equal to depth of gully trap and (10 cm below gully trap) and kerb of P.C.C. (1 :2:4) Type B-1 on top of PCC foundation block around CI or MS grating of size 32.5 cm x 32.5 cm. Gully trap shall be provided in the situations where shown on the drawings.

15.3.4 **Smoke Test**

All soil, waste, vent and anti syphonage pipes shall be subject to smoke test as specified in P.M DEPMC/ACDS Schedule Part I.

15.3.5 First Manhole of size 60cmx75cm (internal dimension) shall be constructed as shown on drawing using Fly ash bricks and plastered from inside with 15mm thick in CM (1:4) finished with extra cement slurry. It shall be set in cement concrete (1:3:6) Type C-1 foundation with depth equal to 15cm and PCC kerb of (1:2:4) type B-1 on top of brick masonry all around Cement Concrete Cover of size 60 cm x 75 cm as shown on drawing. PCC benching inside manhole chamber shall be done in Cement Concrete (1:3:6) Type C-1 of size as shown on drawings. Manhole shall be part of Building Lump Sum cost and shall be provided in the situations where shown on the drawings.

14.4 MISCELLANEOUS

15.4.1 PVC SERVICE WATER TANK

Rotational moulded HDPE overhead water tanks of capacity as shown on drawings shall be 'ISI' marked double layered of make as specified in Appendix 'D'

15.4.2 RAILING

MS powder coated solid square bars of 20x 20mm baluster, and intermediate rails & as shown on Drawings. Top rail shall be of 50mm dia Stainless steel hollow pipe as shown in drg.

15.4.3 **BUILT IN FURNITURE ITEMS**

15.4.3.1 **-BLANK-**

15.4.3.2 **- BLANK -**

15.4.3.3 **-BLANK-**

15.4.4 **-BLANK-**

15.4.4.1 **RCC JALI**

-BLANK-.

15.4.4.2 **ARRANGEMENT FOR DRYING CLOTHES**
-BLANK-

15.4.4.3 **CUP BOARD** :
-BLANK-

15.4.4.4 **LETETR BOX** :
-BLANK-

15.4.4.5 **LOFT DOOR -** :
-BLANK-

15.4.4.6 **OPENING FOR AC-** :
-BLANK-

15.4.4.7 **Glass Shelves -** :
-BLANK-

16. INTERNAL WATER SUPPLY

16.1.1 Internal water supply include, all water tubing and tube fittings except those specified in particular specifications hereinbefore. Cutting chases and making good are deemed included in the unit rates for relevant building in schedule 'A', Sec I.

16.1.2 The following Indian Standards shall be applicable in addition to those mentioned in SSR Part I.

IS No.	Subject
1172	Basic requirement for water supply, drainage and sanitation (Revised)
2065	Water supply in building code of practice

16.2 **MATERIAL**

16.2.1 All materials including fittings, accessories, etc., shall be of approved make and shall comply with

appropriate Indian standards and ISI marked.

16.2.2 Stop valves, shower roses and bib taps, Angle valve, wall mixer conforming to IS 8931-1993 shall be of cast copper alloy finish or with chromium plated finish as specified in relevant item of Sch 'A' Sec-II. Fittings shall be ISI marked. Chromium plated fitting shall be as per Appendix 'E' list of approved makes.

16.2.3 GI tubing shall use medium grade conforming to latest IS specifications (duly ISI marked) and of make as per Appendix 'E' list of approved makes.

The pipes shall be galvanized mild steel welded pipes and seamless, screwed and socketed tubes confirming to the requirement of IS 1239 for medium grade. They shall be of the diameter specified in the design by the nominal bores of the pipes.

The pipes and sockets shall be clearly finished, well galvanized in and out free from cracks, surface flaws, laminations and other defects. All screw threads shall be clean and well cut. The ends shall be cut clean and square with the axis of the tube. Unless otherwise specified the pipe below ground or concealed or installed on walls or floor shall be "B"class.

All screwed tubes and sockets shall have pipe threads conforming to the requirements of IS: 554 Screwed tubes shall have taper threads while the sockets shall have taper threads while the sockets shall have parallel threads.

16.2.4 **CP BATH ROOM FITTINGS AND OTHER ACCESSORIES**

The technical specification of CP Bathroom fittings(Quarter Turn) are as under:- The minimum wall thickness of the casted body shall not be less than 2.0mm at any section and minimum 0.6mm for tube wherever used. The operation knob shall be made of Brass Casting / Brass Rod wherever used is given below:-

Consistuents	**Composition %**	**Brass**
Rod	**Brass Casting**	
Copper	58.0 – 63.0	56.0 – 59.0
Tin	0.0 – 1.0	-
Lead	0.5 – 2.5	2.0 – 3.5
Nickel	0.0 – 1.0	-
Iron	-	0.0 – 0.35
Aluminium	0.2 – 0.8	-
Manganese	0.0 – 0.5	-
Total Impurity	0.0 – 0.2	-
Zinc	Remainder	Remainder

This fulfills requirements of EN 200.

(c) The seat bore at inlet and outlet of the body and internal water passage of the body for 15mm nominal size shall be minimum 12.7mm. Better flow than Type I of EN 200. Minimum flow is 22.0 Litres/minute at 3.0 bar.

(d) Thread size of bonnet shall be M28 x 1.5 made of Brass Rod as per IS:319–1989, meets this requirements having composition mentioned at above para (b).

(e) Spindle used in the cartridge shall be made of extruded brass rods as per IS:319. Major diameter = 16.9 mm and smaller diameter =11.9 mm

(f) Ceramic Disc diameter should be 21.0 mm

(g) Rubber "O" Ring of sizes 24 x 2.5mm, 8 x 2.2mm , 12 x 2.5mm shall be provided with following composition;-
Shore hardness – 70 + 30 Tensile Strength Kgf/cm2 – minimum 125
Elongation (%) – minimum 230
Specific Gravity – minimum 1.22
It must have food grade conformity.

(h) The thread provided for the fitting of the component to the wall fitting shall pass through G½ . or G¾.

(j) The item shall be made of brass and the chemical composition of the same must be as per IS:1264–1989 and similarly all parts made from Brass Rod as per IS:319–1989. Chemical composition mentioned at above para (b).
This fulfills requirements of EN 200.

(k) The minimum plating thickness at all points of the plated body section and knob shall confirm to the following specifications as per IS:1068;
Nickel – minimum 10 micron
Chromium – minimum 0.3 micron
Beside thickness, the product should pass minimum 200 Hrs. of SALT SPRAY test per EN 248 or CSA B125.

(l) The product shall withstand a pressure of 25 Kg./cm2 for a minimum period of 5 minutes during which period there shall no sweating or leakage from the product as per EN 200.

(m) 10mm dia food grade braided hose shall be used in Central Hole Basin Mixer and it shall withstand pressure of 10 Kg/cm2. It should have approval for food grade conformity.

(n) Aerator: The aerator shall as per EN: 246. This eliminates oxygen deficiency present in water.

(o) Finish: the CP bathroom fittings shall be free from all visual defects like pinholes, grinding marks, scratches etc. as per EN 248.

(a)

16.2.5 GI tubing shall be medium grade conforming to latest IS specifications (duly ISI marked) and of make as per Appendix 'E' list of approved makes.

The pipes shall be galvanized mild steel welded pipes and seamless, screwed and socketed tubes confirming to the requirement if IS 1239 for medium grade. They shall be of the diameter specified in the design by the nominal bores of the pipes.

The pipes and sockets shall be clearly finished, well galvanized in and out free from cracks, surface flaws, laminations and other defects. All screw threads shall be clean and well cut. The ends shall be cut clean and square with the axis of the tube. Unless otherwise specified the pipe below ground or concealed or installed on walls or floor shall be "B"class.

All screwed tubes and sockets shall have pipe threads conforming to the requirements of IS: 554 Screwed tubes shall have taper threads while the sockets shall have taper threads while the sockets shall have parallel threads.

16.2.6 **PIPE FITTINGS:**

The fittings shall be of malleable cast iron or galvanized mild steel tubes as called or designated by the respective nominal bores of the pipes for which they are intended. The fitting shall have screw

threads at the ends and conform to the requirements of IS:554. Female threads of fitting shall be parallel and male threads (except on running nipples and collars or unions) shall be taper.

16.2.7 **CUTTING, LAYING AND JOINTING:-**

The pipes and fittings shall be inspected at site before use to ascertain that they conform to the specification given above. Defective pipes shall be rejected. Where the pipes have to be cut or rethreaded, the ends shall be carefully filed out so that no obstruction to bore is offered. The ends of the pipe dies and taps carefully in such a manner as it shall not result in slackness of joints when two pieces are jointed together. The taps and dies shall be used only for straightening the screw threads which have become bent or damaged and shall not be used for turning of the threads so as to make them slack.

The pipes shall be cleaned of all foreign matter before being laid. In jointing the pipes , the inside of the socket and the screwed end of the pipes shall be oiled and rubbed over with white lead and sample turns of Teflon tape wrapped round the screwed end of the pipe. The end shall then be screwed in the socket, tee etc, with pipe wrench. Care shall be taken that all pipes and fittings are properly jointed so as to make the joints completely water tight and pipes are kept at all time free from dust and dirt during the fixing. Burr from the joint shall be removed after screwing. After laying, the open ends of the pipes shall be temporarily plugged to prevent access of water, soil or any other foreign matter.

Any threads exposed after jointing shall be painted or in the case of underground piping thickly coated with approved anti- corrosive paint (bitumen) to prevent corrosion or wrapped with hessain cloth.

a. The contractor shall employ licensed skilled plumbers for all internal water supply works.
b. Layout of pipes for internal water supply work shall be as indicated on drawings and as directed by Project Manager.
c. The requirement pertaining to materials conform to with National Building Code, workmanship, testing, recording of installations shall be all as specified in P.M DEPMC/ACDS Schedule clause 18.40 and 18.41. Laying and jointing of GI pipe shall be in accordance with Clause 18.50 and 18.51 of P.M DEPMC/ACDS Schedule.
d. All pipe work shall be laid or fixed to be completely airtight and water tight as specified.
e. Testing of pipe shall be carried out as specified in clause 18.50.4 of P.M DEPMC/ACDS Schedule. Record of testing shall be maintained separately for each block.
f. Water tubing fixed/laid inside the building shall be concealed in wall.

16.2.8 **INTERNAL WORK:**

Pipes shall run in the wall chase inside the toilets and kitchen but on the surface in the service ducts and laboratory. For exposed pipes, the fixing shall be done by means of standard pattern holder bat clamps, keeping the pipes about 15cm clear of the wall. When the pipe is concealed, chasing may be adopted. For pipes fixed in the ducts or recesses etc. sufficient space shall be provided to work on the pipes, with the usual tools. Pipes shall not ordinarily be buried in solid floors. Where unavoidable, pipes may be buried for short distances provided adequate protection is given against damage. Where a pipe is passing through a wall or floor provision shall be made for expansion and contraction. Where pipes are encased within chases made in the wall, they shall be fixed to the wall with clamps so as to prevent movement before filling in and making good the

chase. The pipe should not come in contact with lime under the floors, the pipe shall be laid in a layer of sand filling made under concrete floors.

16.2.9 Irrespective what is shown on drawing at serial No. 125 to 127, 129 to 131, 133 & 135 to 136, only one kitchen sink cock wall mounted shall be provided in kitchen sink and one long body bib tap shall be provided in ground sink in kitchen at 600 mm level from finished floor for direct fresh water.

16.2.10 Irrespective what is shown on drawing one angle valve 15 mm bore shall be provided in kitchen in all DUs for aqua guard

16.3 WORKMANSHIP OF PIPES & FIITINGS

16.3.1 The contractor shall use proper bends/ elbows/ tees at turning/ corners. Bending of pipes shall be done by tools as per recommendation of manufacturer. Bending of pipes by hands is not permitted.

16.3.2 Unions shall be provided at appropriate as ordered places by the PM, DEPMCwithout any extra cost to the department so that in repair, etc, long lengths of pipes are not to be taken down.

16.3.3 In case of concealed pipe up to 20 mm dia all pipes & fittings inside the buildings shall be embedded in walls/ floors. Pipes fixed on walls shall be secured with approved pipe hooks at about 0.75 meter intervals and shall be painted with two coats of enamel paint over a coat of primer. Cost of paint to be included in the item rate of pipes.

16.3.4 As far as possible, pipes shall be fixed in shafts (where applicable) in such way so that they do not give an ugly appearance inside. Pipes shall be fixed 15mm away from the walls where they are required to be embedded/ concealed.

16.3.5 Proper unions, sockets shall be provided in rising/ delivery main to end from service tank before or after the stop valve without any extra cost to the Government.

16.3.6 RECORD OF DRAWINGS

Three copies of line plans of completed work indicating the line of pipe, sizes, position of fittings and water control valve, etc., shall be submitted by the contractor to the PM, on completion of work.

16.3.7 BALL VALVE

The ball valve shall be brass high pressure type and shall conform to IS -1703. The ball shall be of high quality polythene to withstand the required pressure with all necessary fittings and shall conform to relevant IS. Ball floats, excluding floats shall be of brass. The float shall be of PVC. The minimum finished mass of ball valves (excluding float). Thickness of float shall be as specified in Clause No. 18.19 of SSR Part I

16.3.8 TESTING OF PIPE LINES

Pressure and leakage tests of pipelines and fittings shall be carried out as per clause 18.48.7 on page 371 of P.M DEPMC/ACDS Schedule (part-I).

17 INTERNAL ELECTRIFICATION

17.1 All electrical work shall be carried out in accordance with this specification. These specifications shall be read in conjunction with the relevant Indian Standard, NEC, Indian Electricity Rules, P.M DEPMC/ACDS specification and Regulations.

(a) Relevant Indian Standards

(b) Indian Electricity Rules 1956

(c) National Electrical Code

(d) P.M DEPMC/ACDS specifications

List of major Indian Standards is given below and latest edition of these shall be applicable:

IS-280: Specification for mild steel wire for general engineering purposes

IS-371: Ceiling roses

IS-694: PVC insulated cables for working voltages up to and including 1100V

IS-732: Code of practice for electrical wiring installation

IS-1258: Bayonet lamp holder

IS-1293: Three pin plugs and socket outlets

IS-1646: Code of practice for fire safety of buildings (general) electrical installation

IS-2147: Degree of protection provided by enclosure for low voltage switchgear and control gears

IS-2215: Starters for fluorescent lamps

IS-2268: Electric call bells and buzzers

IS-2309: Code of practice for protection of building and allied structures against lightning

IS-2418: Tubular fluorescent lamps for general lighting service

IS-2551: Danger notice board

IS-2667: Fittings rigid steel conduits for electrical wiring

IS-3043: Code of practice for earthing

IS-3419: Fittings for rigid non-metallic conduits

IS-3480: Flexible steel conduits for electrical wiring

IS-3646: Code of practice for interior illumination

IS-3837: Accessories for rigid steel conduits for electrical wiring

IS-3854: Switches for domestic and similar purposes

IS-4160: Interlocking switch socket outlets

IS-4615: Switch socket outlets (non-interlocking type)

IS-4648: Guide for electrical layout in residential buildings

IS-5039: Specification for distribution pillars for voltages not exceeding 1000V

IS-5133: Boxes for enclosure of electrical accessories Part-1 : Steel & cast iron boxes

IS-5216: Recommendation safety procedures and practices in electrical works.

IS-8828: Electrical accessories – circuit breakers for house hold and similar application (MCB)

IS-9537: Rigid steel conduits

IS-10118: Code of practice for selection, installation and maintenance of switchgear and control gears

IS-11353: Guide for uniform system of marking and identification of conductors and apparatus

IS-13947: Specification for low voltage switchgear and control gears

17.2 Internal Electrification for Main building

The Power supply for main building & security room shall be taken from the dedicated feeder from nearest Feeder Pillar through underground cable up to the existing Meter Board.

Meter board shall house the main incoming MCCB, bus bars and outgoing MCB's and meters for main building & security room.

From the meter board, sub main wiring shall be taken in the recessed conduits to the main building Distribution Board.

The point wiring for lights, fans and sockets shall be taken in the recessed conduits.

17.3 Technical Specifications:-

17.3.1 General Requirements

17.3.1.1 Materials

All materials, fittings, appliances etc. used in electrical installation shall comply with the requirements of relevant Indian Standard specifications and shall be well finished. Materials for which Indian Standard specifications do not exist, shall conform in quality to the samples maintained by PM or as approved by him.

17.3.1.2 Execution of work

Unless otherwise exempted under the rule of the Indian Electricity Rules, the work of electrical installation shall be carried out under the supervision of a person holding a certificate of competency issued by the recognised authority. The workmen shall also hold certificate of competency. Good workmanship is an essential requirement for compliance with these specifications.

The work shall be executed in such sections and in a manner as directed by the Engineer-in-charge (EIC) to suit building operations or convenience of users/occupants.

17.3.1.3 Testing of Installation

All electrical work executed shall be systematically tested by the Contractor in the presence of EIC to ensure compliance with the specifications laid down. Test results shall be recorded and signed by the Contractor and the EIC, if the test results are not acceptable, all required repairs,

replacement and extra work of removal and relaying or re-fixing shall be carried out by the Contractor at his expense and installation shall be re-tested until test results indicates compliance with the prescribed requirements.

The Contractor shall supply the necessary apparatus, labour and instruments or equipment required for testing.

17.3.1.4 Record of Installation

On completion of the work, the Contractor shall submit to EIC complete wiring diagram for each of the installation in the case of internal electrical work, schematic diagram of equipment and connections for substations and switch gear works and the route layout plans incase of external overhead lines or underground cable work. Five sets of all plans along with soft copy in CD shall be submitted and it shall be ensured that the plans indicate complete site data of the installation.

All circuits shall be clearly indicated and numbered in the wiring diagram and all points shall be given the same number as the circuit to which they are electrically connected.

17.3.1.5 Safety procedures & Practices

In all major electrical installations such as substations, industrial establishments, transmission & distribution lines and cable networks, safety procedure instructions for working on low, medium and high voltage mains and apparatus and safety practices listed in IS-5216 : Guide for safety procedures and practices in electrical works shall be followed to the extent applicable. The Contractor shall provide all workmen with safety devices and appliances.

17.3.1.6 Fire safety

All electrical equipment shall satisfy the requirements laid down in IS-1646 : Code of practice for fire safety of buildings (general) electrical installation and IS-3034 : Code of practice for fire safety of industrial buildings, generating stations and distribution stations to the extent applicable.

17.4 Electrification of Residential building

Electrical wiring inside individual flats shall be in concealed PVC conduits with 2.5 sq. mm. PVC insulated FRLS copper conductor for light point wiring and minimum 4 sq.mm PVC insulated FRLS copper conductor for power point wiring if not otherwise mentioned in Sch ‘A’.

Separate meter for individual flat shall be installed at meter board on ground floor of each building by the supply company.

Each meter board shall be earthed to 2 nos. earthing pits.

Separate circuits for staircase lighting shall be provided directly from the dedicated meter of meter board and these circuits shall be laid in separate conduits.

17.5 Scale of Fittings

Conduit Wiring

17.5.1 Scope

The scope under this section covers rigid metal conduit wiring for the following:-

- Lighting circuits
- Power circuits
- Telephones & TV points wherever applicable.
- The wiring for mains of individual flat from meter room to DB shall be concealed in slab / wall beyond vertical run.

17.5.2 Standard

The following standards and rules shall be applicable:-

1) IS:732 : Code of practice for Electrical Wiring installation (System Voltage not exceeding 650V).
2) IS:1646 : Code of practice for fire safety of Buildings (General) Electrical Installation.
3) IS : 14927 (part-1) : PVC casing –n capping & accessories
4) IS : 9537 (part-II) : Rigid steel conduit and accessories.
5) IS:1554 : PVC insulated cables
6) IS:3854 : Switches for Domestic and similar purposes
7) IS:1293 : 3 pin plugs and sockets.
8) IS : 4648 : Guide for electrical layout in residential building

17.5.3 Conduit Wiring

17.5.3.1 Type and size of Conduits

All rigid PVC conduits used shall conform to IS:9537. The conduit may be threaded type and shall be used with the corresponding accessories. The conduits shall be designated by their nominal outside diameters.

17.5.3.2 Bunching of Cables

Conductors of different circuits / different phases / different voltagesshall be bunched in separate conduits. The number of insulated cables that may be drawn into single conduit is given in the following table with maximum space factor of 40%.

Nominal Cross section area mm^2	Number and diameter in mm of wires	Size of Conduit(mm) outside diameter				
		19/20	25	32	40	50
		S/B	S/B	S/B	S/B	S/B
1.5	1/1.4	7/5	12/10	20/14	---	---

2.5	**1/1.8**	**6/5**	**10/8**	**18/12**	**---**	**---**
4.0	**1/ 2.24**	**4/3**	**7/6**	**12/10**	**---**	**---**
6	**1/ 2.8**	**3/2**	**6/5**	**10/8**	**---**	**---**
10	**1/ 3.55**	**2/0**	**5/4**	**8/7**	**---**	**---**
16	**7/1.7**	**---**	**2/0**	**4/3**	**7/6**	**---**
25	**7/2.24**	**---**	**---**	**3/2**	**5/4**	**8/6**
35	**7/2.5**	**---**	**---**	**2/0**	**4/3**	**7/5**
50	**7/3**	**---**	**---**	**---**	**2/0**	**5/4**

The above table shows maximum capacity of conduits for the simultaneous drawing of cables. Supply to runs of conduit which has distance not exceeding 4.25M between drawn in boxes and which do not deflect from the straight run by an angle more than 15^{O}. The B applies to runs of conduit, which deflect from the straight run by an angle more than 15^{O}.

17.5.3.3 **Conduit joints**

Conduits shall be joined by means of screwed couplers and screwed accessories only. Where there are long runs of straight conduit, inspection type couplers shall be provided at intervals. Threads on conduits in all cases shall be 13 mm to 19 mm long, sufficient to accommodate full threaded portion of couplers or accessories. For conduit fittings and accessories reference may be made to IS:2667. Cut ends of conduits shall have neither sharp edges nor any burrs as otherwise these may damage the insulation of conductors while drawing them through such pipes.

17.5.3.4 **Fixing of Conduits**

Conduit pipes shall be fixed by heavy gauge saddles and spacing plates secured to suitable wood plugs or other approved plugs with screws in an apporved manner, at a distance of 300mm from the center of such fittings. The saddle shall comply with the requirements of IS:3837.
Where conduit pipes are laid along the trusses, steel joists etc. the same shall be secured by means of ordinary clips or girder clips as required. Where it is not permitted to drill holes in the truss members, suitable clamps with bolts and nuts shall be used. The width and thickness of the ordinary clips or girder clips shall not be less than as given in following table:

Size of conduit (mm)	Width of clip (mm)	Thickness of clip (mm)
20	20	0.9
25	20	0.9
32 and above	25	1.25

For concealed conduit, above requirements shall be applicable and in addition, following clauses shall also be complied with.

Making of chases

Chases in the wall shall be made neatly and shall be of ample dimensions to permit the conduit to be fixed in the desired manner. In the case of building under construction, conduits shall be buried in the wall before plastering and shall be finished neatly after erection of conduit. In case

of exposed brick / rubble masonry work, special care shall be taken to fix the conduit and accessories in the position along with the building work.

Fixing of conduit in chase

Conduit pipe shall be fixed by means of staples or by means of saddles not more than 600mm apart. Fixing of standard bends or elbows shall be avoided as far as practicable and all curves shall be maintained by bending the conduits itself with a higher bending radius, which will permit easy drawing in of conductors. All threaded joints of conduit shall be treated with approved preservative compound to secure protection against rust.

Fixing of MS/cast iron conduit boxes in wall

Conduit boxes of mild steel or cast iron shall be fixed in the wall with cement and sand mortar 1:2. No screwing of conduit boxes shall be required when fixed in recessed conduit wiring system

Inspection Boxes

Inspection boxes shall be provided to permit periodical inspection and to facilitate replacement of wires, when necessary. These shall be mounted flush with the wall. Suitable ventilating holes shall be provided in the inspection cover box.

To facilitate drawing of wires in the conduit, galvanized iron fish wire of 3.25mm diameter shall be provided along with laying of recessed conduit.

17.5.3.5 **Bends in conduit**

All necessary bends in the system including diversion shall be done by bending conduit or by inserting suitable solid or inspection type normal bends, elbows or similar fittings or by fixing cast iron inspection boxes as approved by PM . Conduit fittings shall be avoided, as far as possible, in outdoor installations. Radius of bends in conduit shall not be less than 75mm.

17.5.3.6 **Outlets**

The switch or regulator box shall be made of metal on all sides, except on the front. In the case of cast boxes wall thickness shall be at least 3mm and in case of welded mild steel boxes, the wall thickness shall not be less than 1.22mm for boxes up to size of 200x300mm; and above this size, 1.63mm thick mild steel boxes shall be used. Except where otherwise mentioned, 3mm thick phenolic laminated sheets shall be fixed on the front with brass screws. Clear depth of the box shall not be less than 60mm and this shall be increased suitably to accommodate mounting of fan regulators in flush pattern. The metal box shall be effectively earthed with conduit.

In order to minimize condensation or sweating inside the conduit, all outlets of conduits system shall be properly drained and ventilated but in such a manner as to prevent the entry of insects, etc. as far as possible.

17.5.3.7 Heat may be used to soften the conduit for bending and forming joints in case of plain conduits. Caution should be exercised in the use of this conduit in locations where the ambient temperature is 40° C or above. Use of such conduits in places where ambient temperature is 45° C or above is prohibited.

17.5.3.8 Conduits to be rendered continuous before pulling the wires.

17.5.3.9 Conduits to be free from sharp edges and burrs and necessary check nuts & spring washers etc. to be provided for fixing of conduit at each junction box and out boxes.

17.5.5 **Distribution Board inside the Flat:**

17.5.5.1 MCB Distribution Boards of suitable outgoings shall be used. Supply and erection of triple / single pole and neutral distribution board (conforming to IS 13032 and IEC standard of IP-20) shall be surface / flush mounted as required. This shall be made from 18 gauge sheet steel / CRCA with stove enamel paint / powder coated, suitable for incorporating incoming MCB with required number of outgoing MCBs with electrolytic copper busbar of 100A per phase and shall be erected on angle iron frame complete. (similar to MDS series 3000DB).

All the DBs / sub DBs in residential and non-residential buildings shall be MCB type.

All MCBs shall be as per IS 8828 of 1996 with required wiring connections and lugs etc.

17.5.5.2 Wires shall conform to IS:694 and comply to following features:-

- PVC insulated stranded copper conductors.
- 1100V grade wires for single phase and 3 phase circuits.
- Colour coded as below:

Phase-R - Red
Phase-Y - Yellow
Phase-B - Blue
Neutral - Black
Earth - Green.

17.5.5.3 Incoming supply system with suitable rating of PVC insulated 1100V grade FRLS wires from Metering feeder at ground floor to Main Incomer of Flat shall be laid through PVC Conduits. Voltage drop shall be limited to 2.5% of the system voltage for motor load like Pumps etc. and 5% of the system voltage for other loads.

17.5.5.4 Conduit wiring which is passing to Main incoming Flat shall be concealed in the slab with Heavy gauge Rigid metal Conduits.

17.5.5.5 Wiring inside the flat shall be with PVC conduits.

17.5.5.6 Load on each Lighting circuit shall not exceed 800 W for lighting and 2000W for Power sockets. Separate circuit mains shall be provided for the independent socket outlets.

17.5.5.7 Circuit mains i.e. from MCB board to switch board for Lighting circuits, shall be 2.5 sq.mm copper conductors.

17.5.5.8 For 5/15A power points, minimum size of 4 sq.mm copper wire shall be used.

17.5.5.9 For 5A independent switch socket points 12.5 sq.mm copper wire shall be used.

17.5.5.10 For each circuit, neutral and earth wire shall be separate.

17.5.6 **Point Wiring**

17.5.6.1 Light /fan/bell point wiring shall be carried out with 1.5 sq.mm. copper PVC wires of 1100V grade along with neutral looping method in concealed conduits or on wooden batten as specified in Sch 'A'.

17.5.6.2 Earthing continuity conductor from DB shall be 1.5 sq.mm Copper conductors.

17.5.6.3 In case of batten, wires shall be laid in one length without any joint.

17.5.6.4 Three core flexible wires of required length shall be provided from ceiling JB/ ceiling rose to the fittings.

17.5.6.5 In case of group control point wiring for group of points up to 3 shall be controlled by 5/6A SP piano type switch and group of above 3 points shall be controlled by 15A SP piano type switch.

17.5.6.6 Point wiring shall start from DB / DP for residential installation and for non residential installation, the point wiring shall start from immediate switch board or from boards where circuit mains are provided.

17.5.6.7 Control switches to be connected to phase conductor only.

17.5.6.8 TV points from each shall be distributed through suitable type of splitters and finally connected to the junction box at terrace floor of each building. Cable for the system shall be RG-6 for inside the Building.

17.5.6.9 Point wiring for light / fan / bell in residential buildings shall be carried out with ISI mark 2 nos 1.5 sq.mm. copper PVC insulated wire 1.1 kV grade with accessories conforming to IS complete erected with ISI mark piano type switch / bell push erected on MS box with top of 3mm thick hylam sheet / 4mm plywood pasted with Sunmica of thickness not less than 1.5mm with round headed brass screws and cup washers and ISI mark ceiling rose / batten holder / slanting holder erected on PVC accessories / polished double TW folded / screwed board with top of either TW or plywood pasted with Sunmica complete in all respect.

17.5.6.10 Point wiring for 6A socket on light or fan board in residential buildings shall be carried out with ISI mark 2nos. 1.5 sq.mm 1.1 kV grade PVC insulated & PVC sheathed / PVC insulated copper wire with 1.5 sq.mm ISI mark PVC insulated copper wire in green colour used for earthing for plug both of ISI mark (earth wire shall be taken from DP / DB or intermediate switch board).

17.5.6.11 Point wiring for independent plug in residential buildings shall be carried out with ISI mark 2 nos minimum 2.5 sq.mm. copper PVC insulated wire 1.1 kV grade with 1.5 sq.mm ISI mark PVC insulated copper wire in green colour used as continuous earth wire end to end complete in all respects in an approved manner.

17.5.7 **Fittings and accessories**

17.5.7. <u>Ceiling Rose and similar attachments.</u>

17.5.7.1.1 A ceiling rose or any other similar attachment shall not be used on a circuit, the rated voltage of which exceeds 250 V AC.

17.5.7.1.2 Only one flexible cord shall be attached to a ceiling rose. Specially designed ceiling rose shall be used for multiple pendants.

17.5.7.1.3 A ceiling rose shall not embody fuse terminals as an integral part of it.

17.5.7.2 Control Switches, sockets and plugs.

17.5.7.2.1 The control switches and sockets shall be with ISI marking and of rated capacity. This shall comply with the following features:-

- Control switches
- Silver contacts with shrouded current carrying terminates.
- Moulded area formaldehyde casing and cover plates.

17.5.7.2.2 5A / 6A piano switch or bell push and other accessories shall be fixed on best quality sunmica top, MS board.

17.5.7.2.3 A Socket outlet shall not embody fuse terminals as an integral part of it, but the fuse may be embodied in the plug.

17.5.7.2.4 Every Socket outlet shall be controlled by a switch, which shall preferably be located immediately adjacent thereto or combined therewith.

17.5.7.2.5 The switch controlling the socket outlet shall be connected to the live side.

17.5.7.2.6 Ordinary socket outlet may be fixed at any convenient place about 23 cm. from the floor level, and shall be away from the danger of mechanical injury. In situations where the socket outlet is accessible to children, it is necessary to install an interlocked plug and socket.

17.5.7.2.7 In an earthed system of supply, a socket outlet with plug shall be of three pin type with the third terminal connected to earth. When such socket outlets with plug are connected to any current consuming device of metal or any non-insulating material or both, conductors connecting such current consuming devices shall be of flexible cord with an earthing core.
The earthing core shall be secured by connecting between the earth terminal of plug and the current consuming devices.

17.5.7.2.8 Every Plug containing a fuse shall be non-reversible and shall be so arranged and connected that the fuse controls a phase conductor or the non-earthed conductor of the circuit.

17.5.8 Earthing

17.5.8.1 Earthing shall be done in accordance with IS-3043 of 1987.

17.5.8.2 For each building, earth stations shall be provided as, 2nos for electrical system and required number for lightning protection as per IS – 2307.

17.5.8.3 Distance between two earth pits shall be minimum 3M

17.5.8.4 Equipment to be earthed.

Except for equipment provided with double insulation, all the non-current carrying metal parts of electrical installation are to be earthed properly. Specially body of table lamp, table fan, fan regulator and metallic parts of fluorescent fittings are to be earthed. In case of medium voltage installation, all metal conduits, trunking, cable sheaths, switchgear, distribution boards and all other parts made of metal shall be bonded together and connected by means of two separate and distinct connection with earth.

17.5.8.5 Structural metal work -

Earthing of the metallic parts shall not be effected through any structural metal work which houses the installation. Where metallic parts of the installation are not required to be earthed and are liable to become alive should the insulation of conductors become defective, such metallic parts shall be separated by durable non-conducting material from any structural work.

17.5.8.6 Systems of earthing –

Equipment and portions of installation shall be deemed to be earthed only if earthed in accordance with the direct earthing system. In all cases, the relevant provisions of Rules 33 and 61 of the Indian Electricity Rules. 1956 shall be complied with.

17.5.8.7 General Rules Applying to All Systems of Earthing

Method of earthing :

(a) Connections to earthing conductors:

1) Main earthing conductor – It shall be taken from the earth connection at the main switchboard to an electrode to which the connection is to be made or to an earthing terminal provided by the supplier near service cutouts.

2) Sub-main earthing conductor– It shall run from the main switch board to distribution board.

3) Circuit earthing conductor – It shall run from the exposed metal of equipment and shall be connected to any point on the main earthing conductor, sub-main earthing conductor, earth connection at it's distribution board or to an earth leakage circuit breaker.

(b) Earthing of equipment (General)

Unless otherwise provided in (c) to (f) the exposed metal of equipment shall be earthed according to 1(a) (3) above.

(c) Conduits, cable sheathing and armouring –

They shall be earthed at the ends adjacent to switch boards at which they originate, or other wise at the commencement of the run by an earthing conductor connected to an earth clip, clamp or gland in effective electrical contact with the conduit or cable sheathing and armouring.

(d) Equipment mounted on metal frame work –

The exposed metal of equipment shall be deemed to be earthed if the metal framework on which it is mounted and is in effective electrical contact with which it is directly earthed.

(e) Exposed metal of equipment connected by flexible cord –

Where equipment is connected by flexible cord, all exposed metal parts of the equipment shall be earthed by means of an earthing conductor enclosed with the current carrying conductors within the flexible cords.

(f) Switches, accessories, lighting, fittings, etc. (use of screwed conduits for earthing)

Such fittings which rigidly secured effective electrical contact with a run of screwed conduit by screwing, lock-nuts or clamps may be considered as a part of the run of conduit for earthing purpose, provided that the run of conduit is earthed.

(g) Prohibited connections –

Sprinkler pipes or pipes conveying gas, water or flammable liquid conduit, metallic enclosures of cables and conductors and lightning protection system shall not be used as a means of earthing an installation or even as a link in an earthing system.

17.5.8.8 Metallic enclosures for wiring – continuity and resistance –

17.5.8.8.1 Continuity:

The metallic enclosures for wiring shall be mechanically and electrically continuous.

17.5.8.8.2 Resistance:

The electrical resistance of metallic enclosures for cables and conductors measured between earth connection at the main switch board and any other point on the completed installation shall be low enough to permit the passage of current necessary to operate fuse, circuit breaker or the earth leakage release of the circuit breaker protecting the circuit and shall not exceed 2 ohms.

17.5.8.9 Earthing Conductor –

Every earthing conductor shall be either stranded, flat strips or circular or rectangular bar. Protection against mechanical injury shall be provided where necessary. The earth conductor may be of high conductivity copper or aluminium or galvanised solid iron.

17.5.8.10 Installation of Earthing Conductor –

a) Position, fixing and protection of earth conductors : Earthing conductors shall be so placed and connected that it shall not be accidentally damaged or cut. It shall be fixed over it's entire length by clamps, clips, saddles, staples, clouts etc. which in no way will damage the conductor. Aerial earthing conductor shall be supported on suitable insulators and shall be clearly identified.

b) Buried earthing conductor – It shall be protected against mechanical damage.

c) Earth connections – Any connection between an earthing conductor and electrode or the metallic sheathing of under ground supply cables shall be accessible, shall in no case be in a damp situation and shall be suitably protected where likely to be exposed to mechanical damage.

d) Joints – Joints in main earthing conductors shall be made by soldering, brazing or welding for conductors of size up to 7/1.70mm; for larger main earthing conductors, mechanical clamping may be used. Joints in either earthing conductors shall be made by soldering or by mechanical clamping.

17.5.8.11 Earth clips –

Paint, enamel compound, corrosion and other non-conducting material shall be removed from the surface of the metal section to which earth clip is attached.

17.5.8.12 Earth electrodes:

a) Type:
Earth plate electrodes shall be provided and they shall not be less than 60cm x 60cm x 6.3mm in case of galvanised plate or 60cm x 60cm x12mm in case of galvanised cast iron or 60cm x 60cm x 3.15mm in case of copper as per clause 9.2 of IS 3043.

b) Installation:
Electrodes shall as far as possible, be embedded below permanent moisture level. In addition, they shall be buried at a depth of not less than 1.5M. Complete installation shall be as per IS-3043 and as per section 19 of P.M DEPMC/ACDS SSR specification.

a) Earth plate shall be 60cm x 60cm x 6.3mm in case of galvanised plate or 60cm x 60cm x12mm in case of galvanised cast iron or 60cm x 60cm x 3.15mm in case of copper buried in specifically prepared earth pit so as to keep top of earth plate 1.5M below ground with 40 kgs each charcoal and salt with alternate layers of charcoal and salt with 19mm dia. GI pipe with funnel with a wire P.M DEPMC/ACDSh for watering and brick masonry block, CI cover complete as per para 9 of IS 3043 of 1987 with necessary length of double GI earth conductor bolted with lug to the plate and covered in 12mm dia. GI pipe 2.5M long complete connected to the nearest switch gear with end socket as per directions and duly tested by earth tester and recording results.

17.5.9 Lighting Fittings:

17.5.9.1 Every lighting fitting shall be controlled by a switch and where control at more than one point is necessary, by as many two-way and intermediate.

17.5.9.2 Where lighting fitting is supported by one or more flexible cords, the maximum weight to which the twin flexible cords may be subjected shall be as follows.

Nominal cross- sectional area of twin flexible cord (mm^2)	Number and diameter in mm of wires	Maximum permissible weight(kg)
0.4	12/0.200	1.4
0.65	22/0.200	2.3
1.00	32/0.200	3.5
1.2	38/0.200	4.5

17.5.9.3 No inflammable or low melting point material shade shall form a part of lighting fitting unless such shade is well protected against all risks of fire.

17.5.9.4 Where conductors are required to be threaded through tubes or channels formed in the metal work of fittings, such tubes and channels shall be of such size as will enable them to be wired with the conductors used for the final sub circuits without removing the braiding taping or outer covering. All tubes or channels shall be of sufficient size to permit 'looping back' wires. Where, with prior approval of the PM, 'Electrolier wire' is used for wiring fitting, the sub circuit leads shall terminate in a ceiling rose or connector from which this wire is carried to the fittings.

17.5.9.5 All nipples of the fittings shall not be less than 12mm (half inch).

17.5.9.6 Fittings and lamp holders for gas filled lamps shall be adequately ventilated.

17.5.9.7 Lamp Holders

17.5.9.7.1 Lamp holders shall be metal cased type or insulated type as indicated and shall comply with IS-1258:1979, specification for bayonet lamp holder. Lamp holder shall be suitable for fixing in pendent or to bracket or angular as required. Lamp holder for use on brackets etc. shall have not less than a half inch female nipple and all those for use with flexible pendants shall be provided with cord grips. All cases must be solid and substantial.

17.5.9.7.2 Edison Screw holders shall not be provided for lamps 100W and below.

17.5.9.7.3 All lamp holders shall be provided with shade carrier ring.

17.5.9.7.4 Where center contact Edison screw lamp holders are used, the outer or screw contact shall be connected to the 'middle wire', the neutral or the earthed conductor of the circuit.

17.5.9.8 Outdoor lamp holders

17.5.9.8.1 External and road lamp shall have weather proof fitting of approved design so as to effectively prevent the admission of moisture. An insulating distance piece of moisture proof material shall be inserted between the lamp holder nipple and the fitting. Flexible cord and cord grip lamp holder shall not be used where it is exposed to weather. In verandah and similar exposed situations where pendants are used, they shall be fixed by rod type.

17.5.9.8.2 **Lamps**

All incandescent lamps, unless otherwise specified in the special conditions of contract and suitably protected, shall be hung at a height of minimum 2.45M (8ft) above floor level.

17.5.9.9 Fans, Regulators and clamps

17.5.9.9.1 All ceiling fans shall be suspended from hooks or shackles with insulators between hooks and suspension rods. There shall be no joints in the suspension rod, but if joint is unavoidable then such joints shall be screwed to special couplers of 5cm minimum length and both ends of pipes shall touch together with couplers and shall in addition be screwed by means of split pins. Alternatively, the two pipes may be welded.

17.5.9.9.2Fan clamps shall be of suitable design according to the nature of construction of ceiling on which these clamps are fitted. In all cases fan clamps shall be fabricated from tested mild steel of suitable sizes and they shall be as close to fitting as possible. Fan clamps for reinforced concrete roofs shall be buried in the concrete and due care shall be taken to tie them with the reinforcement properly. Fan clamps for wood beams shall be of suitable flat iron fixed on two sides of the beam and according to size and section of the beam, one or two MS bolts passing through the beam shall hold both flats irons together. Fan clamps for steel joints shall be fabricated from tested flat iron to fit rigidly to the bottom flange of the beam. Care shall be taken during fabrication that the metal does not crack while hammering to shape. Other fan clamps shall be made to suit the position, but in all cases care shall be taken to see that they are rigid and safe.

17.5.9.9.3The canopy and wood block at the top of the suspension rod shall effectively hide the suspension. Canopies on bottom of suspension rod shall effectively hide connection to fan motor.

17.5.9.9.4 All ceiling fans shall be wired to ceiling roses or to special connector boxes. The leading in wire shall be of nominal cross sectional area not less than 1.5sq.mm. and shall be protected from abrasion.

17.5.9.9.5 All fans shall be hung 2.9M (9ft & 6 inches) above floor or as directed by the PM.

17.5.9.10 **Exhaust Fans**

17.5.9.10.1 For fixing of an exhaust fan, a circular 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 with cement and brought to the original finish of the wall. The exhaust fan shall be connected to exhaust fan point by means of flexible cord, care being taken that the blades rotates in proper direction.

17.5.9.10.2 **CEILING FANS**

ISI marked electric ceiling fan capacitor type with double ball bearing complete with capacitor, 300mm down rod, canopies, three number blades made of aluminum alloy, electronic stepped speed regulator suitable for single phase AC, 230 volt, 50 Hz supply and confirming to class I of IS:374/1979 with amendment number 1 to 6 :-

(a) Blade thickness without paint shall be as follows:-

Sweep size	Minimum blade thickness
900mm & 1200mm	1.0mm
1400mm & 1500mm	1.1mm

(b) The material of the blade shall be H3 Grade Aluminium Alloy sheet conforming to IS:737/1976.
(c) The load bearing bolt shall be of min. 6mm dia with aluminium clamp, Spring Washer, Nut and Check nut and spilt pin.
(d) Down rod shall be of 1.5 to 1.6mm nominal thick ERW pipe of appropriate length.
(e) Shackle made from 2mm nominal thick CRC sheet.
(f) Bolts (2 Nos) shall be 6 mm with Spring washer Nut and Check nut and spilt pin.

(g) Shank shall be made of CRC Sheet of thickness 1.6mm minimum without paint for all size.
(h) Powder coated Super Enamel paint with Primer Coating, white colour.
(j) Electronic stepped speed regulator as per IS: 11037 shall be capable of reducing the speed of the fan at least 50% of the full speed at the test voltage. Fans shall be capable of running at all the running position of the regulator at the rated voltage.
(k) Capacitor of size ranging from 1.70 to 2.50 mfd to be put and fixed for easily replacement and placed at sufficient distance from the windings, comply with IS:1709-1984 and shall be suitable for working at full load under ambient air temp up to 70^0 C.

EXHAUST FANS 300 MM 6 POLES

Exhaust fan 300mm sweep as per IS:2312-1967 with amendment No 1 to 8 suitable for single phase AC 230 Volts, 50 c/s Capacitor run complete with mounting ring four Nos fixing holes with louver shutters.

(a)	Sweep	300 mm
(b)	Number of poles	6 poles
(c)	Air deliver at rated voltage (cubic meter per hour)	1145
(d)	Power input	55 watt
(e)	Current at rated voltage	0.26 A
(f)	Rated Voltage with frequency	230 volts 50 Hz Single Phase
(g)	Power factor	0.9
(h)	Rated speed in RRM	900+5%
(j)	Fan casting material	Aluminum
(k)	Mounting ring frame material its thickness Type and Grade	Frame MS Sheet, 0.8mm
(l)	Class of insulation of Motor	Class E
(m)	Type of bearing	Double ball bearing & made of steel
(n)	Type of lubricant system	Suitable grease cup shall be provided per bearing separately
(o)	Number of blades	Four
(p)	Material and thickness of blade	0.8 to 1.0 mm
(q)	Material and thickness of shaft	450 mm mild steel
(r)	Capacitor rating in Micro-farad	Comply with IS 1709-1960 (1.70 to 2 mfd)
(s)	Method of Mounting Capacitor	Capacitor should be mounted on fan Motor back over with suitable clamp.
(t)	Type and grade of primer and finishing	Grey enameled paint with primer coats.
(u)	Thickness of bracket	3 mm
(v)	Louver shatters	Frame MS Sheet 0.7 mm Louvers Aluminum Sheet 0.40 mm

(w)	Flexible rubber pads (Heavy duty)	To reduce fan motor vibrations.

ELECTRIC WATER HEATER CAPACITY 25 LTRS

Storage type Electric Water Heater of 240 Volts single phase AC 50 Hz supply (ISI Marked to IS : 2082/1993 with latest amendment). Stainless Steel inner container shall conform to material grade 07Cr18Ni of IS : 1570 (Part-5)/85Outer container shall be made of CRCA sheet duly pretreated and finished in either white stove enamel paint or powder coated in white colour. In coastal areas/heavy rainfall area the outer cover shall be of Poly Carbonate moulded min 2 mm thickness. Storage Electric Water Heater shall be complete in all respect with fittings as listed in below:-

(a) Heating Unit
(b) Thermostat
(c) Indicating Lamp
(d) Thermal cutout
(e) Drain Plug
(f) Two meter three flexible cable with 3-pin plug of 16A capacity.
(g) Provision for vent pipe pressure relief valve/device.
(h) Fusible plug fitted on the crown of water heater with operating temperature between 90 degree C to 100 degree C.

(a)	Rated Capacity	25 Ltr
(b)	Material and thickness of outer shell (with tolerance).	0.56 to 0.70 mm CRCA Sheet
(c)	Material and thickness of inner shell (with tolerance)	0.56 to 0.62 mm Stainless Steel sheet
(d)	Material & Grade of insulation between inner & outer shell.	Resin bonded Glass Wool Insulation
(e)	Thickness of Insulation between inner & outer shell	35 to 40 mm Approximate
(f)	Hot Water out put in litres (min)	45 Degree/Centigrade
(g)	Operating Temperature of Thermal cut out	90 +/- 6 Degree/Centigrade
(h)	Thermostat setting	70 Degree/Centigrade
(j)	Standing losses	1.386 Kwh/Per 24 hrs
(k)	Details of Mounting of Heating Elements in the water Heater.	Cup Type with pocket for the Thermal cut out fixed by means of 3 clamps/triangular type fixed with 3 nut bolt.
(l)	Heating Element	As per IS 302-2-21(1992)

17.5.9.11 Attachment of fittings and accessories.

17.5.9.11.1 All ceiling roses, brackets, pendants and accessories attached to wall or ceiling shall be mounted on substantial polished teak wood blocks except in case of conduit wiring for workshop type installation, after all fixing holes are made in them. Ceiling rose shall be surface type and shall comply with IS:371-1979, specification for roses having two or three terminal plates and of outside diameter not less than 63.5mm. ceiling roses shall be provided with means for gripping flexible cords 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.

17.5.9.11.2 In case of installation in the premises like commercial complex, permanent indication should be made on or near each T.switch to indicate type of fittings its controls.

17.6 Distribution Boards / Feeder Pillars

17.6.1 Scope

The scope under this section covers distribution board and feeder pillar.

17.6.2 Standards

The latest edition of following standards and rules shall be applicable:-

1) IS:2675: Enclosed Distribution Fuse Boards and cut-outs for Voltages not exceeding 1000V.
2) IS:2607 : Air break isolator for voltages not exceeding 1000V.
3) IS:5578 : Marking and arrangement of switch gear busbars, main connections and auxiliary wiring.
4) IS: 8828: Miniature circuit breaker
5) IS:12640: Earth leakage circuit breaker
6) IS:13947: Moulded Case Circuit breaker
7) IS: 623 Low voltage switchgear and control gear assemblies.

17.6.3 Construction.

Distribution feeder pillar shall be as per IS-5039. These shall be double pole and neutral link, triple pole or triple pole & neutral link type. it shall be fabricated out of MS sheet of 3.15mm thickness suitable for outdoor use. The top of the pillar shall be fitted with slopping canopy so that rainwater shall not accumulate on the top. Distribution pillar shall have a set of double hinged doors at the front. Similar door shall be provided at rear if indicated. The hinges shall be suitable for door opening of 150^{O} and shall permit doors to be removed completely when required. The doors shall be provided with suitable outdoor type lock. Pillar shall be provided with apron. They shall be easily removable. Thickness of sheet shall be 3.15mm. pillar shall be provided with anti-corrosive primer with epoxy based paint.

- 2 nos. Earthing terminals for connection to external earthing conductor.
- Circuit diagram indicating load distribution.
- Phase barriers of insulating materials

17.6.4 Busbars

The busbars shall be as follows:-

- The electrical high conductivity electrolytic grade insulated copper busbars suitable for incoming feeder with minimum 100A.
  Neutral busbar – 50% of phase busbar
- Individual phase and neutral bars located in respective phase cubicle for.

17.6.5 Miniature Circuit Breakers

The MCB's shall have the following features and shall comply with requirements of IS: 8828:-

- Short circuit capacity of 10 KA as mentioned in BOQ.
- Quick make, quick break non welding silver alloy contacts suitable for manual and automatic operation.
- Inverse time over load and instantaneous short circuit tripping mechanism with trip free operation.
- Common operating handle and integral tripping for multiple MCB.
- Pressure clamp terminals for users upto 4 mm2 .
- Phenol formaldehyde moulded enclosure.

18. ROADS AND PATHS

18.1 EARTH WORK

18.1.1 Excavation / earth work shall be in any type of soil (soft / loose / hard / dense) and shall be measured and paid for under site clearance & Earth work schedule.

18.1.2 Earth work in embankment shall be carried out all as specified in clause 3.22 on of SSR 2009 (Part I). However, the compaction of the earth shall be carried out with power road roller of capacity 8 to 12 tonne.

18.1.3 Before commencement of earth work existing ground levels shall be taken jointly by PM and Contractor at an interval of not more than 10 mtr longitudinally and cross sections shall be prepared showing existing ground levels, proposed formation levels, proposed gradient and camber on graph sheet which shall be signed by PM and contractor. Ground levels shall be entered in MB as a record and earth work shall be computed by Simpson's Rule. The finished formation level shall also be taken jointly and shall also be recorded in MB and signed jointly. The earthwork payable shall be calculated on the basis of these levels.

18.2 GRANULAR SUB-BASE

18.2.1 Description

This work shall consist of laying and compacting well-graded material on prepared subgrade in accordance with the requirements of these specifications. The material shall be laid in one or more layers as necessary according to lines, grades and cross sections shown on the drawings or as directed by the DEPMC/PMACDS .

18.2.2 Materials

The material to be used for the work shall be natural sand, moorum, gravel, crushed stone, crushed slag, crushed concrete, brick metal, laterite, Kankar etc. or combinations thereof depending upon the grading required. The mixed material shall be free from organic or other deleterious constitutents and conform to one of the three gradings given in Table.

TABLE GRADING FOR GRANULAR SUB-BASE MATERIALS

Sieve designation	**Percent by weight passing the sieve**		
	Grading 1	**Grading 2**	**Grading 3**
80mm	100	100	100
63mm	90-100	90-100	90-100
4.75mm	35-70	40-90	50-100
75 micron	0-20	0-25	0-30
CBR Value (minimum)	30%	25%	20%

Note : The material passing 425 micron sieve for all the three gradings when tested according to IS:2720 (Part V) shall have liquid limit and plasticity index of not more than 25 per cent and 6 per cent respectively.

18.2.3 **Physical requirements** : The fraction of material passing 20mm sieve shall give a CBR value as specified in Table 400-1 or more as specified in the Contract, when tested in accordance with IS : 2720 (Part XVI) after preparing the samples at maximum dry density and optimum moisture content corresponding to IS : 2720 (Part VII) and soaking the same in water for 4 days.

18.2.4 **Construction Operations**

18.2.5 **Preparation of Subgrade :** Immediately prior to the laying of subgrade already finished to Section 301 or 305 as applicable, shall be prepared by removing all vegetation and other extraneous matter, lightly sprinkled with water if necessary and rolled with one pass of 8-10 tonne smooth wheeled roller.

Moisture content of the loose material shall be checked in accordance with IS:2720 (Part II) and suitably adjusted by sprinkling additional water from a house line, truck mounted water tank or other approved means so that at the time of compaction it is from 1 per cent above to 2 per cent below the optimum moisture content corresponding to IS: 2720 (Part VII). While adding water, due allowance shall be made for evaporation losses. After water has been added, the material shall be processed by mechanical or other approved means if so directed by the Engineer-in- Charge until the layer is uniformly wet.

Immediately thereafter, rolling shall be started with 8 to 10 tonne smooth wheeled rollers or other approved plant. Rolling shall commence at the edges and progress towards the centre longitudinally except that on superelevated portions it shall progress from the lower to the upper edge parallel to the centre line of the pavement. Each pass of the roller shall uniformly overlap not less than one third of the track made in the preceding pass. During rolling , the grade and camber shall be checked and any high spots or depressions which become apparent corrected by removing or adding fresh material.

Rolling shall be continued till the density achieved is at least 100% of the maximum dry density for the material determined as per IS :2720 (Part VII). The surface of any layer material on compaction shall be well closed, free from movement under compaction planes, ridges, cracks or loose material. All loose, segrated or otherwise defective areas shall be made good to the full thickness of layers and re-compacted.

18.2.6 Surface Finish and Quality Control of Work.

The Surface finish of construction shall conform ot the requirements of Clause 901 of specified for Road and Bridge works issued by Ministry of surface Transport.

Control on the quality of materials and works shall be exercised by Engineer-in-Charge in accordance with Clause 902 of specified for Road and Bridge works issued by Ministry of surface Transport.

18.2.7 **Arrangements for Trafffic**

During the period of construction, flow of traffic shall be maintained in accordance with Clause 105 of specified for Road and Bridge works issued by Ministry of surface Transport.

18.2.8 **Measurements for Payment**

Granular sub-base shall be measured as finished work in position in cubic metres.

18.3 WATER BOUND MACADAM (WBM)

WBM shall consist of two layers of 7.5 cm thick (consolidated thickness) making total thickness as 15 cm ,of broken / crushed stone metal (quartzite). Stone shall be hard and durable and shall be free from excess of flat and elongated, soft and disintegrated particles, dirt and other objectionable matter. It shall be consolidated in one layer. Stone aggregate shall be grading 2 or 3 as given on serial page No. 20-1 & 20-2 under clause 20.A.3 of P.M DEPMC/ACDS Sch (Part I). Screening shall be of red Bajri/ Moorum. Unless otherwise specified the laying, compacting and rolling, etc, shall be as specified in P.M DEPMC/ACDS Sch Part I. Stone for WBM shall be laid out as specified in clause 20A21.1 to20.A.21.4on page 20-8 to 20-9 of SSR-91 (part I).

18.4 ……BLANK……

18.5 SEMI DENSE ASPHASTIC CONCRETE / ASPHALTIC CONCRETE

18.5.1 **Description**
This work shall consist of constructing a single layer of 25mm and 40 mm thick asphaltic concrete wearing course to the following specifications on a previously prepared base.

18.5.2 **Materials**:

a) **Binder**: The binder shall be straight run bitumen of a suitable grade satisfying the requirements of IS: 73. The actual grade of the binder shall be decided by the DEPMC /PM ACDS

b) **Coarse aggregate**: the coarse aggregates shall consist of crushed stone, crushed gravel (shingles) or other stones. These shall be clean, strong, durable, of fairly cubical shape, free of disintegrated pieces, organic or other deleterious matter and adherent coatings. The aggregates shall preferably be hydrophobic and of low porosity and shall satisfy the physical requirements

c) **Fine aggregates**: The fine aggregates shall be the fraction passing 2.36 mm sieve and retained on 75 micron sieve, consisting of crusher run screenings, natural sand or a mixture of both. These shall be clean, hard, durable, uncoated, dry and free from any injurious, soft or flaky pieces and organic or deleterious substances.

d) **Filler**: The filler shall be an inert material, the whole of which passes through 600 micron sieve, at least 90 per cent passing through 150 micron sieve and not less than 70 per cent passing through 75 micron sieve. The filler shall be stone dust, cement, hydrated lime, fly ash or other non-plastic mineral matter approved by the DEPMC /PM ACDS

18.5.3 **Aggregate gradation**: The minerals aggregates, including minerals filler for semi dense bituminous concrete shall be so graded or combined as to conform to the grading set forth in table 500-20 of Specifications for Road and Bridge Works issued by Ministry of Surface Transport

(Roads Wing) unless otherwise directed, Grading-1 shall be adopted for 25 mm compacted thickness and Grading-2/3 for higher thickness

TABLE 500-20, AGGREGATES GRADATION FOR SEMI-DENSE BITUMINOUS CONCRETE

IS Sieve Designation	Percent by weight passing the IS sieve		
	Grading-1	Grading-2	Grading-3
22.4 mm	--	100	100
13.2 mm	100	85-100	79-100
11.2 mm	88-100	70-92	68-90
5.6 mm	42-64	42-64	33-55
2.8 mm	22-38	22-38	22-38
710 micron	11-24	11-24	6-22
355 micron	7-18	7-18	4-14
180 micron	5-13	5-13	2-9
90 micron	3-9	3-9	0-5

For Asphaltic Concrete the grading shall be conforming to Table 500-23 as under: -

TABLE 500-23, AGGREGATES GRADATION FOR BITUMINOUS CONCRETE

IS Sieve Designation	Percent by weight passing the IS sieve
26.5 mm	100
19 mm	90-100
9.5 mm	56-80
4.75 mm	35-65
2.36 mm	23-49
300 Micron	5-19
75 Micorn	2-8

18.5.4 **Mix Design**

Requirement of mix: Apart from conformity with the grading and quality requirements of individual ingredients, the mix shall meet the requirements set forth in

Binder Content: The binder content shall be so fixed as to achieve the requirements of the mix set forth in tables 500-20 & 500-23 mentioned above and shall be in the range of 5.5 to 6.0% by weight of total mix.

18.5.5 **Job mix formula**: The contractor shall intimate to the DEPMC /PM ACDS in writing, at least 20 days before the Start of the work,

Requirements of Asphaltic Concrete Mix / Semi Dense Bituminous Concrete

Sl no.	Description	Requirements
1	Marshall stability (ASTM designation : D 1559) determined on Marshall specimens compacted by 75 compaction blows on each end	820 Kg minimum

2	Marshall flow (mm)	2-4
3	Per cent voids in mix	3-5
4	Per cent voids in mineral aggregate filled with bitumen	65-75
5	Binder content per cent by weight of mix	4.5-5.5

The job mix formula proposed to be used by him for the work and shall give the following details:

i) The source and location of all materials.

ii) Proportions of all materials expressed as follows where each is applicable:

(a) Binder — As percentage by weight of total mix.

Coarse aggregate I
Coarse aggregate II
Fine aggregates I
Fine aggregates II
Minerals Filter
— as percentage by weight of total aggregate including minerals filler

iii) A single definite percentage passing each sieve for the mixed aggregate

iv) The results of test enumerated in tables mentioned above as obtained by the contractor.

While working out job formula the Contractor shall ensure that it is based on a correct and truly representative sample of the materials that will actually be used in the work and that the mix and its different ingredients satisfy the physical strength requirements of the specification.
Approval of the job mix formula shall be based in independent testing by the DEPMC /PM ACDS for which samples of all ingredients of the mix shall be the responsibility of contractor as required by the former

The approved job mix formula shall remain effective unless and until modified by the PM (ACDS). Should a change in the source of materials be proposed a new job mix formula shall be established and got approved from the PM before actually using these materials.

18.5.6 **Permissible variations from the job mix formula**: It shall be the responsibility of Contractor to produce a uniform mix conforming to the approved job mix formula subject to the permissible variations indicated in Table. These variations are intended to apply to individual specimens taken for quality control tests.

PERMISSIBLE VARIATION FROM THE JOB MIX FORMULA FOR SEMI DENSE BITUMINOUS CONCRETE

S. No.	Description of ingredient	Permissible variation by weight of total mix in percentage
1.	Aggregate passing 13.2 mm sieve and larger sieves	± 8
2.	Aggregate passing 11.2 mm sieve and 5.6 mm sieves	± 7
3.	Aggregate passing 2.8 mm sieve and 1.40 mm sieves	± 6
4.	Aggregate passing 710 micron sieve and 355 micron sieves	± 5
5.	Aggregate passing 180 micron sieve	± 4
6.	Aggregate passing 90 micron sieve	± 2
7.	Bitumen	± 0.3
8.	Mixing Temperature	± 10°C

18.5.7 **Construction Operations**:

18.5.7.1 **Weather and seasonal limitations**: Asphaltic concrete shall not be laid during rainy weather or when the base course is damp or wet.

18.5.7.2 **Preparation of base**: The base on which semi dense bituminous concrete / asphaltic concrete is to be laid shall be prepared shaped and conditioned to the specified levels, grade and camber in accordance with SSR Clause & as directed by the DEPMC /PM ACDS The surface shall be thoroughly swept and scraped clean and free of dust and other foreign matter.

18.5.7.3 **Tack coat**: A tack coat complying with Clause-502 of specified for Road and Bridge works of Ministry of surface Transport shall be applied over the base. Application of tack coat shall, however, not be necessary when the laying asphaltic concrete follows soon after t he provision of a bituminous base / leveling course.

18.5.7.4 **Preparation of Mix**: Hot mix plant of adequate capacity and capable of producing a proper and uniform quality shall be used for preparing the mix. The plant may either be of batch type or continuous one, having co-ordinated set of essential units such as dryer for heating the aggregates, device for grading and batching feeding by weight or volume, the required quantities of aggregates, a binder heating and control unit for metering out the correct quantity of heated binder together with a paddle mixer for immediate mixing of the binder and aggregates. A fine feeder for incorporation of the correct quantity of filler is also a necessary auxiliary.

The temperature of binder at the time of mixing shall be in the range 150^0C to 177^0 C and of aggregates in the range 155^0C to 165^0 C. Provided also that at no time shall the difference in temperature between the aggregates and binder exceed 14^0C.

Mixing shall be thorough to ensure that a homogeneous mixture is obtained in which all particles of the mineral aggregates are coated uniformly.

The mix shall be transported from the mixing plant to the point of use in suitable vehicles. The vehicles employed for transport shall be clean and be covered over in transit, if so directed by the DEPMC /PM ACDS

18.5.7.5 **Spreading**: The mix transported from the hot mix plant to the site shall be spread by means of a self propelled mechanical paver with suitable screeds capable of spreading, tamping and finishing the mix true to specified grade, lines and cross sections. The temperature of the mix at the time of laying shall be in the range 121^0C to 165^0 C

Longitudinal joints and edges shall be constructed true to the delineating lines parallel to the centre line of the road. Longitudinal joints shall be offset by at least 150 mm from those in the binder course. All joints shall be cut vertical to the full thickness of the previously laid mix and the surface painted with hot bitumen before placing fresh material.

18.5.7.6 **Rolling**: After the spreading of mix by paver. It shall be thoroughly compacted by rolling with a set of rollers moving at a speed not exceeding 5 km per hour. The initial or breakdown rolling shall

be with 8-12 tonne three wheel roller and the surface finished by final rolling with 8-10 tonne tandem rollers or suitable pneumatic rollers.

The wheels of roller shall be kept moist to prevent the mix from adhering to them but in no case shall fuel / lubricating oil be used for this purpose. Rolling shall commence longitudinally from the edges and progress towards the centre except that on super elevated portions it shall progress from the lower to upper edge parallel to the center line of the pavement. The roller shall proceed on the fresh material with rear or fixed wheel leading so as to minimize the pushing of the mix and each pass of the roller shall uniformly overlap not less than one third of the track made in the

proceeding pass. Rolling shall be continued till the density achieved is at least 95% of that of the laboratory Marshall Specimen and all roller marks are eliminated.

Rolling operations shall be completed in every respect before the temperature of the mix falls below 100^0C.

18.6 OPENING TO TRAFFIC

Traffic may be allowed immediately after completion of the final rolling when the mix has cooled down to the surrounding temperature.

18.6.1 Surface finish and quality control of work

The surface finish shall conform to the requirements of Clause 901 of Specification for road & bridges works of Ministry of surface Transport (Roads wing). Control on the quality of materials and works shall be exercised by the DEPMC / PM ACDS in accordance with Clause of SSR.

18.6.2 Arrangements for Traffic

The provision of Clause shall apply as regards the flow of traffic during construction.

18.6.3 Measurements for Payment

Asphaltic concrete shall be measured as finished work in square metres.

18.7 Surface Finish

The surface shall be tested with camber boards and straight edges for depressions. Any depressions more than 6mm over 3 metres length shall be made good by loosening the mix, adding materials as required and then recomposing it.

19. SEWAGE DISPOSAL

19.1 Sewage Disposal

The manhole shall be provided all as shown on drawings & as directed by the PM. The broad specifications for various items of work required for construction of manholes are as 'follows:-

i) Excavation in any type of soil, return filling and ramming and disposal of surface spoil unto distance not exceeding 50 metres.

ii) PCC in Foundation (1 :3:6) Type C-2.
iii) Brick work in cement and sand mortar (1 :4).
iv) 15mm thick plaster internally in cement and sand mortar (1 :3) mixed 'with waterproofing compound as specified here in before with surface even & smooth without using extra cement. External surface shall be pointed flush as the work proceeds.
v) PCC benching and kerb in PCC (1:2:4) Type B-1.
vi) Manhole covers and frames shall be of PFRC (Plastic Fibre Reinforced Concrete) medium duty 560mm dia as per the requirement IS – 1726 and IS-12592.
vii) Manholes shall pass the water test as specified in clause 18.79.3 on serial page 386 and 387 of SSR-2009 (part-I) and contractors percentage shall include for the aforesaid test and dewatering sub soil water if encountered during the execution of the work and no extra payment on such account shall be admissible to the contractor.

Note: All manholes upto a distance of 3 metres from the outer faces of building if required due to site conditions shall be deemed to be included in Sch 'A' section-I. Specification for manholes shall be as described in Clause 19.1 above.

19.1.2 **Salt Glazed Stone Ware (SGSW) Pipes**

Glazed stone ware pipes and fitting shall be ISI marked (IS-651) and shall be laid all as specified in para 18.69 and 18.70 on serial page No. 383 of SSR- 2009 (Part 1).

19.1.3 **Concrete Bedding and Hunching for SGSW Pipes**

Bedding, hunching and surrounding / encasing to glazed stoneware pipes shall be with PCC (1 :3:6) Type C-2 all as directed by PM and as shown on drawings and all as specified under clause 18.68 on serial page Nos. 382 and 383 of SSR 2009. However, thickness of concrete bed below pipe shall be 10 cm for pipes up to and including 150mm dia and 15 cm for pipes more than 150mm dia irrespective of what is shown on drawings.

19.1.4 **Water Test**

Salt glazed stoneware pipes shall be subjected to water test as specified in clause 18.79.3 serial page No' 386 and 387 of SSR-2009 (part-I). The test shall be carried out twice, once after the pipes are laid and jointed & second time on completion of the work. No extra payment on such account shall be admissible to the contractor.

19.1.5 **Smoke Test**

All soil waste, vent and anti syphonage pipes shall be subjected to smoke test as specified in Clause 18.79.2 on Page 386 of SSR (Part I).

19.1.6 **Cast Iron Pipes**

20. AREA DRAINAGE

20.1 Provide all items of work as mentioned in respective section of Sch 'A'. Specifications of all allied materials and workmanship shall be as specified here in before. The scope under this particular package is identified in Master plan drawings.

21. BLANK

22. FENCING GATE & CATTLE TRAP

22.1 Provide all items of work as mentioned in respective section of Sch 'A' Section-VI. Specifications of all allied materials and workmanship shall be as specified here in before. The scope under this particular package is identified in Master plan drawings.

23. SITE CLEARANCE

23.1 Provide all items of work as mentioned in respective section of Sch 'A' Section-X. Specifications of all allied materials and workmanship shall be as specified here in before. The scope under this particular package is identified in Master plan drawings.

24. RAIN WATER HARVESTING

24.1 Provide all items of work as mentioned in respective section of Sch 'A' Section-VII. Specifications of all allied materials and workmanship shall be as specified here in before. The scope under this particular package is identified in Master plan drawings.

25. SOLAR HEATING SYSTEM

25.1 Solar Water Heating System with Type 2 for warm regions with Solar flat plate collector conforming to IS: 12933 (part 1) with amdt.no.1 and IS:12933(Part 2)/2003 suitable for inlet water with chlorine and fluorine content up to 100 ppm and supply hot water at the outlet.

25.2 Solar water heating system comprising of solar flat plate collector, collectors stand assembly, stainless steel insulated hot water storage tank with heat exchanger and various other components. Solar flat plate collector component shall have:

(a) Solar flat plate collector cover plate made of toughened glass

(b) Sheet for absorber made of copper

(c) Absorber made of copper sheet and copper tube.

25.3 Solar Flat Plate Collector Specifications Solar flat plate collector shall conforming to IS: 12933 (part 1) with amdt.no.1 and IS: 12933 (Part 2)/2003 and various components shall be as under:

25.3.1 **Cover Plate :-** Cover plate shall be toughened glass and thickness of 4.0 mm (min.) conforming to section-1 of IS: 12933(pt-2/2003 . The solar transmittance of the cover plate shall be minimum 82 percent at near normal incidence.

25.3.2 **Collector Box :-** Collector box shall be made of Aluminum sections only. Type, grade, size, workmanship and finish of the material used shall be as per section-2 of IS: 12933 (pt2/2003. The minimum thickness of Aluminum shall be as under: -

(i) Channel section for sides 1.6 mm

(ii) Sheet for bottom 0.7 mm

(iii) Support for glass retaining 1.2 mm

(iv) Sheet for entire body 1.0 mm

25.3.3 **Absorber :-** Absorber shall consist of riser, header and sheet for absorber. The Diameter of header shall be 25.4 +/-0.5mm and thickness 0.71mm.. The Diameter of riser shall be 12.7 +/-0.5mm and thickness 0.56mm and made of copper only. The distance between the risers from center to center shall be 120mm. Type grade, size, workmanship and finish of the material used shall be as per section-3 of IS:12933 (pt2)/2003. Riser and header assembly designed for working pressure up to 24.5 K Pa (2.5 kg/cm square) shall be tested for leakage at a minimum hydraulic pressure of 490 k Pa (5 Kg/cm square).

25.3.4 **Sheet for absorber :-** Sheet for absorber shall be made of copper only. Type, grade, size, workmanship and finis of the material used shall be as per sectiob-3 of IS:12933 (pt2)/2003. A sample piece of the absorber for having minimum area of 400 square cm. shall be heated in an oven at temperature of 175 degree C for 2 hours. After heating, the sample shall be taken out from the oven and cooled at room temperature. The cooled sample shall be inspected visually for damages, if any. There shall not be any appearance of blistering/rupture/peeling off of the coated/painted surface and of weakening of the bonding between absorber sheet and risers/headers.

25.3.5 **Collector box insulation :-** Insulation shall be provided at back and sides. Thermal Resistance (R) of insulation material shall be minimum 0.96 m square degree C/W for back insulation and minimum 0.48 m square degree C/W for side insulation. This shall be derived after determining thermal conductivity (K) value at 100 degree C mean temperature in accordance with IS:3346.Collector box insulation shall conform to sec.4 of IS: 12933(pt-2)/ 2003

25.3.6 **Gaskets and Grommets :-** Gaskets and Grommets shall conform to sec.5 of IS:12933 (pt2)/2003.

25.3.7 **Summery of collector specification :-**

i)	Type	:	Cu-Cu
ii)	Size	:	2080 mm x 1070 mm x 100mm.
iii)	Absorber area	:	2 m2.
iv)	Weight	:	46 kgs (Dry)
v)	Absorber coating	:	Selective -NALSUN
vi)	Absorbtivity	:	>0.95
vii)	Emissivity	:	<0.2
viii)	Frame material	:	Extruded aluminum, 16 SWG
ix)	Insulation	:	Rock Wool
x)	Glazing	:	Toughened Glass
xi)	Grommet	:	EPDM
xii)	Glass beeding	:	EPDM
xiii)	Hardware	:	Stainless Steel 304

xiv) Finish : Yellow painted.

25.4 **Insulated hot water storage tank:-** The thickness of the water storage tank shall be uniform.

25.4.1 **Material:-** Insulated hot water storage tank shall be non-pressure type and made of stainless steel grade (X04Cr19Ni9 or X07Cr18Ni9 of IS: 1570(part 5)/1985), TIG welded.

25.4.2 **Insulation:-** Solar water heating system (SWHS) up to and including 500 LPD shall be insulated with 40mm thermal grade PUF insulation of 32 Kg/ meter cube or higher density. PUF insulation could be pre extruded type fitted with FRP exterior cladding or alternatively injection moulded in a twin walled steel tank and PPE end cap. Other systems shall be insulated with 100mm thick Rock wool of 48Kg/m3 density with 22swg Aluminum cladding. Systems up to 500 LPD may also alternatively be installed with 100 mm thick Rock wool of same specifications with aluminum or G.I. powder coated cladding.

25.4.3 Tank stand assembly shall be made of MS angle of size (min) 38x38x4 mm duly pretreated and stove enameled with black Colour paint. Alternatively tubular structure with Powder coating could also be provided.

25.5 System inter connecting piping :ISI marked G.I. pipes, medium class of IS: 1239 duly insulated with 50mm thick rock wool of 48 Kg/m3 density and 26swg Al cladding. EPDM hose pipes can also be used for systems up to and including 500LPD.

25.6 Collector stand assembly shall be made of MS angle of size 38x38x4 mm duly pretreated and stove enameled with black Colour paint. Alternatively tubular structure with Powder coating could also be provided.

25.7 The capacity of make up tank shall be 5 liters up to 500 LPD and 10 liters for 1000 LPD and above.

25.8 Temperature Gauge: Dial type, duly calibrated and suitable for temperature range from 0 degree C to 120 degree C and shall be provided for capacity above 500 LPD.

25.9 Suppliers shall furnish 3 valves, one for inlet, outlet and make up tank each as under:-

(a) Type : Screwed Ends

(b) Material : Gun metal

(c) Make : ISI make.

25.10 **Strainer**

(a) Type : 'Y' Type

(b) Material : Cast iron

(c) Purpose : Filtration of suspended material

25.11 Other component essential for completeness of the system as per tenderers specification.

25.12 General arrangement drawing shall clearly show all the parts of the system (such as solar flat plate collectors, collectors stand assembly, stainless steel insulated hot water storage tank complete with stainless steel heat exchanger, sacrificial anode, electrical back up, internal and external piping, tank stand assembly, various valves, pressure gauges, temperature gauges, water meter etc) and their fixing arrangements. Shall be get approved by PM before installation.

25.13 Contractor shall supply two sets of instruction manual to the consignee without any extra cost. Instruction manual shall containing the following details:

(a) Schematic diagram of the solar collector and a domestic hot water system.

(b) Instructions for installation (including mounting details) and use and safety precautions.

(c) Instructions for repair and maintenance including causes for common failures, such as, dust ingress on glass cover, peeling of paint, scaling, damaged sealant, gasket and grommets and their remedies and

(d) List of service outlets.

25.14 Make of solar water Heating system **-BLANK-**

25.15 **-BLANK-**

25.16 All civil work related to installation **-BLANK-**

25.17 Detailed Specifications pertaining to Plumbing

25.17.1 **Plumbing – -BLANK-**

25.17.2 **Insulation on pipe** - **-BLANK-**

25.18 AUTOMATION PLC BASED AUTOMATIC MOTOR PUMP CONTROLLER

(i) **PUMP ON/OFF –**The system shall switch ON/OFF the pump as per level of water in the Sump and Overhead Tank / as per preset timings / as a combination of both.

(ii) **AUTOMATIC PRIMING –** The system shall ensure automatic Priming of the selected pump by opening the priming solenoid valve and air release valve of the selected pump / pumps for a preset time period.

(iii) **MOTOR ACTUATED BUTTERFLY VALVES AT DELIVERY OF PUMPS** - After switching ON the pump it is advisable to develop sufficient pressure before opening the delivery

valve to ensure that the pump does not draw excess current in an attempt to develop requisite pressure. Also before switching OFF the pump it is advisable to close the delivery line so as to avoid water hammer on the Impeller. To achieve this, motorised Butterfly valve installed at the delivery of pump shall open only after requisite pressure is achieved and close before the pump is switched OFF.

(iv) **AUTOMATIC TOGGLING -** Ensures optimum use of the pumps by switching between them i.e. the pumps shall be switched ON sequentially as required to ensure healthy functioning of all pumps.

(v) **AUTO CHANGE OVER IN CASE OF PUMP FAILURE -** If either pump fails to start or starts but does not pump water due to any reason, within a preset time interval, the pressure switch provided detects this generates a visual alarm and automatically the pump switches OFF and the stand by pump takes over the pumping operation.

(vi) **AUTO STAND BY SENSOR SYSTEM** – In case the first set of magnetic sensors fails then the second set of sensors (stand by sensors) shall switch ON / OFF the pumps.

(vii) **ANNUNCIATION AND CONTROL PANEL -** The PLC based Panel installed in the Pump house shall depict various relevant conditions like Pump On, Pump Fail, Valve Open/Close, Valve Open Fail / Close Fail etc. The panel shall also depict the level of water in the sump and the Overhead tank.

Signature of Contractor — Director (Contracts)

Dated: — For Accepting Officer

APPENDIX 'A'

PERFORMANCE GUARANTEE (ON NON-JUDICIAL STAMP PAPER OF APPROPRIATE VALUE) TO BE EXECUTED BY CONTRACTORS FOR REMOVAL OF DEFECTS AFTER COMPLETION IN RESPECT OF RECONSTRUCTIONAL ANTI-TERMITE TREATMENT

ARTICLES OF AGREEMENT made at New Delhi, this..... day of .....two thousand &....."..... between Director General, Married Accommodation Projects, having its office at Kashmir House, New Delhi -110011 hereinafter referred to as the "Accepting Officer" of the part and messrs..... , a firm registered under the Companies Act of 1956 and having their registered office at....., ..." ...." ..... here inafter referred to as the "Guarantor" (which expression shall mean and include the partners or partner for the time being of the firm .and their or his respective heirs, executors and administrations/its successors and assigns in law) in the other part.

WHEREAS THIS AGREEMENT is supplementary to the Contract (hereinafter called the 'said contract') between the Accepting Officer and messrs .....hereinafter called the 'Contractor'), whereby the contractor inter-alia, undertook to render the building and structures, in the said contract, safe from termite proof and completely termite proof.

AND WHEREAS THE GUARANTOR agreed to give a guarantee to the effect that the said structures will remain termite proof for ten years from the date of completion of work as certified by the PM.

AND WHEREAS contractors has furnished a Guarantee Bearing No _____ for Rs _____.

NOW THE GUARANTOR hereby guarantees 'that termite proofing treatment given by him will render the structures completely termite proof and the minimum life of such termite proofing treatment shall be ten years to be reckoned from the date of completion of work as certified by PM.

Provided that the guarantor will not be responsible for termite infestation caused by earthquake or structural defects or misuse or alteration:

The decision of the Accepting Officer with regard to cause of termite infestation shall be final.

During this period of guarantee the guarantor shall make good all defects and in case of any defect being found, render the building termite proof to the satisfaction of the PM at his own cost and shall commence the work for such rectification within seven days from the date of issue of the notice from the Govt calling upon him to rectify the defects falling which the work shall be got done by the department by some other contractor at the Guarantor's cost and risk. The decision of the Accepting Officer as to the cost, payable by the Guarantor shall be final and binding.

That if the guarantor fails to make good defects or commits breach thereunder then the guarantor will indemnify the Accepting Officer and his successors against all loss, damage, cost, expense or otherwise which may be incurred by him by reason of any default on the part of the GUARANTOR in performance and observance of this supplementary agreement. As to the amount of loss and/or
damage and/or cost incurred by the Accepting Officer the decision of the Accepting Officer will be final and binding on the parties.

Signature of Guarantor

Signature of Accepting Officer

Witness 1.

Witness 2.

Witness 1.

Witness 2.

Appendix 'B'

CEMENT SUPPLY & ACCEPTANCE REGISTER

1 CA No & Name of Work
2 Control No*
3 Name of Manufacturer / Brand Name / Gde of cement (a) Manufacturer _____ (b) Brand _____ (c) Grades _____
4 Qty of cement & Lot No / Week No (in Bags): (a) Qty _____ (b) Lot No / Week No _____
5 Manufacturer's test certificate No _____
6 Random Test Details: (a) Physical test report from _____ (Name of approved Lab / Engg College) vide their letter No _____)
(b) Chemical test report from _____ (Name of approved Lab / Engg College) vide their letter No_____)
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 Chatellar	Soundness by Auto Clave	Initial Setting Time (Minutes)	Final Setting Time (Minutes)	Compressive Strength (MPa) 03 days	07 days	28 days	Temp during testing 0C	Standard Consistency (%)	Lime Saturation Factor (Ratio)	Alumina Iron Ratio (Ratio)	Insoluble Residue %	Magnesium (%)	Sulphuric Anhydride (%)	Loss on ignition (%)	Alkailes (%)	Chlorides (%)
As per relevant IS																		
As per manufacturer's test certificate																		
As per random test certificate																		

Remarks with Signature

Accepted / Rejected

Contractor Civil Engineer (DEPMC) RE DEPMC Project Manager

Remarkes of BOO / Inspecting Officer / ACDS

* To be allotted serially by PM / consignment wise.

FREQUENCY OF TESTS AND RECOVERY CHARGES FOR TESTING OF MATERIALS **Appendix 'C'**

Legend: A-site Lab, B-Zonal Lab, C-National Test House/Semi/Govt. Approved Lab/Engg.Collage.

S. No 1.	Materials 2.	Tests 3.	Method of Testing 4.	Frequency of Tests 5.			Level of Test 6.	Rate 7.	Remarks 8.
1.	Bricks			As per IS: 5454 as given under					
				Lot size	Sample Size	Permissible % of Defective Bricks			Checks for visual and dimension shall be also carried out as per IS -5454.
				1001 to 10,000	5	0			
				10,001 to 35,000	10	0			
				35,001 to 50,000	15	1			
		i) Compressive Strength	IS -3495 (Part-II)				A	180.00	
		ii) Water absorption	-do-				A	150.00	
		iii) Efflorescence	-do- (Part-I)				A	180.00	
2.	Coarse Aggregate	i) Seive Analysis	IS -2386 (Part-I)	One test of every 100 cubic meter of aggregate or part thereof			A	120.00	
		ii) Flakiness index	-do-	-do-			A	90.00	
		iii) Estimation of deleterious materials	-do-	One test for every 100 cubic meter of aggregate or part thereof			A	120.00	
		iv) Organic impurities	-do-	One test per source of supply			C	120.00	

		v) Moisture content	IS -2386 (Part-II)	Regularly as required	A	120.00	
		vi) Specific gravity	-do-	One test for each source of supply	B	120.00	
3.	Fine Aggregate	i) Sieve Analysis	IS-2386 (Part-I)	One test for every 15 Cum of FA or part when brought to site	A	180.00	
		ii)Test for clay silt and impurities	-do-	-do-	A	90.00	
		iii)Specific gravity	-do- (Part-II)	One for each source of supply	B	180.00	
		iv)Moisture content	-do- (Part-II)	Regularly as required subject to 2 tests / day when being used.	A	180.00	
		v)Test for organic impurities	-do- (Part-II)	One test for each source of supply	C	180.00	
4.	Cement	i)Setting time	IS-4031 (latest edition)	Once for each consignment or as and when required	B	180.00	
		ii)Soundness	-do-	-do-	C	120.00	
		iii)Compressive strength	-do-	-do-	B	360.00	
		iv)Fineness	-do-	-do-	C	120.00	
5.	Structural concrete (M-15 grade and above)	i)Slump test or compacting factor test or VEE.BEE time	IS-1199	The minimum frequency of sampling of concrete of each grade shall be as under: -	A	180.00	i) Random sampling shall be carried out to cover all mixing units.
				Qty of concrete in the work (m3) / No of Samples			ii) Refer IS-456-clause for frequency of samples
				1-5 / 1			
				6-15 / 2			
				16-30 / 3			
				31-50 / 4			
				51 and above additional 50 cubic metre or part thereof / 4+1 for each 50 Cum Meter or part thereof			

		ii)Compressive strength IS-516		-do-	A	120.00	
6.	a) PCC block for walling (hollow block)	i)Compressive Strength	IS-2156 (Appx-B)	08 blocks out of total of 14	A	60.00	Samples : 14 blocks from consignment of every 5000 blocks or part thereof
		ii)Water absorption	-do- (Appx- E)	03 blocks out of total of	B	120.00	-do-
		iii)Density	-do- (APPX-A)	-do-	B	90.00	-do-
	b) PCC solid blocks for walling	i) Compressive strength	IS-2185	12 blocks out of total of 18	A	60.00	i) Sample : 18 blocks from consignment of every 10,000 blocks or part thereof ii) These blocks to be checked for dimensions and weight also
		ii) Water absorption	-do-	03 -do-	A	120.00	
		iii)Density	-do-	03 -do-	A	120.00	
7	a)Cement flooring tiles / terrazzo tiles	i)Water absorption	IS-1237-(APPX-D)	06 tiles out of total of 18	B	180.00	Samples : 18 tiles from each source of supply selected at random
		ii)Wet transverse strength	-do- (APPX-E)	-do -	B	144.00	
		iii)Resistance to wear	-do- (APPX-F)	-do-	C	540.00	
8.	Burnt clay roofing tiles (hand made). As per IS-2690 (Part-II) Length : 150 mm to 250 mm Width : 100 mm to 200 mm Thickness : 35 to 50 mm	i)Water absorption	IS-3495 (Part-II)	06 tiles out of total of 12	B	216.00	Samples : 12 tiles from each source of supply Selected at random
		ii)Compressive strength	-do- (Part-I)	-do-	A	180.00	

9.	Mangalore Pattern Roofing tiles	i)Water absorption	IS-654 (APPX-A)	6 tiles out of total 32	B	180.00	Sample : 52 tiles from each consignment of 3000 tiles or part there of. These tiles shall be checked for dimension and weight also
		ii) Breaking load	-do- (APPX-C)	-do-	B	120.00	
10.	Timber	i) Specific gravity and weight	IS-1708-	Minimum 3 samples from a lot of 4 cubic meter or 250 pieces of seasoned timber	B	120.00	
		ii) Moisture	IS-1708-	-do-	A	120.00	
10.	Water for construction purpose			Once at the stage of approval of source of water			Also refer clause-4.3 of IS-456 & its subsequent sub clause regarding suitability of water
		i) Test for acidity	IS-456&3015		B	240.00	
		ii) Test for alkalinity	-do-		B	240.00	
		iii) Test for soild content	-do-		C	300.00	
12.	Welding of steel work	Visual inspection test	IS-822 Clause-7.1	100% by visual inspection	Work Site	360.00	Specialised tests, their method and frequency to be decided on consideration of their importance by the Accepting Officer
13.	Timber panelled and glazed door (wooden shutters including			Frequency of sampling from each lot shall be as under: -			
				Lot size	Sample size		
				20 to 50	05		
				51 to 100	08		
				101 to 150	13		

	factory made shuters).			151 to 300	20			
				301 to 500	32			
				501 to 1000	50			
				1001 and above	80			
		a) Dimensions, sizes, work menship and finish	IS-1003-(Part-I)			A	180.00	
		b) Strength test						
		i)Slamming	IS-1303	From Each Lot 5% of the factory made shutters shall be tested for strength test		Manufacturer		
		ii)Impact ndentation	-do-			-do-		
		iii)Shock resistance	-do-			-do-		
		iv)Edge loading	-do-			-do-		
14.	Plywood (IS-303)	a)Moisture content	IS-1734 (Part-I)	6 test pieces from each of the board selected as per table		C	240.00	Sampling shall be as per IS-7835 table-I
		b)Water resistance test	-do- (Part-6)	As per Table-I shall be subjected to tests		C	240.00	
15.	WoodParticle Board Medium density)	a)Density	IS-2360 (Part-III)	Three test specimen from each sample (size 150 mm x 75 mm)		A	60.00	Sampling shall be as per 3487 with moisture metre.
		b)Moisture content	-do-	-do-		A& B	60.00	
		c)Water absorption	-do- (Part-16)	-do- (Size 300 x 300mm)		A	66.00	
		d)Swelling due to surface absorption	-do- (Part-17)	-do- (size 125 x 100mm)		A	60.00	
		e)Swelling in water	-do-	-do- (size 200 x 100mm)		A	60.00	
		f)Modules of rupture	-do- (Part-4)	Three test specimen as per IS:2380		B	90.00	
		g)Screw with drawl strength	-do- (Part-4)	-do- as per IS:2385		C	120.00	

Signature of contractor

For Accepting Officer

APPENDIX 'F'

GUARANTEE TO BE EXECUTED BY CONTRACTORS FOR REMOVAL OF DEFECTS AFTER COMPLETION IN RESPECT OF WATER PROOFING WORKS.

The Agreement made this..... date of ..... ,Two Thousand …….. between …… .....(hereinafter called the Guarantor of the one part) and the Director General, Married Accommodation Projects, ACDS (hereinafter called the Government of the other part).

WHEREAS THIS AGREEMENT is supplementary to the Contract (hereinafter called the 'said Contract") dated..... and made between the GUARANTOR of the one part and the Government of the other part, whereby the Contractor inter-alia undertook to render the building and structures, in the said contract, completely water and leak proof and seepage proof.

AND WHEREAS THE GUARANTOR agreed to give a guarantee to the effect that the said structures will remain water and leak proof for ten years from the date of completion of work as certified by PM.

AND WHEREAS contractor has furnished a Guarantee Bearing No _____ for Rs_____.

NOW THE GUARANTOR hereby guarantees that the building / structure so constructed and water proofing treatment installed by him will render the structures completely water and leak proof, seepage proof and the minimum life of such water proofing treatment shall be ten years to be reckoned from the date of completion of work as certified by PM.

Provided that the guarantor will not be responsible for leakage caused by earthquake or structural defects or misuse or alteration:

The decision of the Government with regard to cause of leakage, seepage shall be final.

During this period of guarantee the guarantor shall make good all defects and in case of any defect is found, and render the building water proof to the satisfaction of the Government at his own cost and shall commence the work for such rectification within seven days from the date of issue of the notice from Government calling upon him to rectify the defects failing which the work shall be got done by the Department by some other contractor at the GUARANTOR'S cost and risk. The decision of the Government as to the cost, payable by the Guarantor shall be final and binding.

That if guarantor fails to make good the defects or comments breach there under then the guarantor will indemnify the Government and his successors against all loss, damage, cost, expense or otherwise which may be incurred by him by reason of any default on the part of the GUARANTOR in performance and observance of this supplementary agreement. As to the amount of loss and/or damage and/or cost incurred by the Government the decision of the Government will be final and binding on the parties.

IN WITNESS WHEREOF these presents have been executed by the obligator..... For and on behalf of Director General, Married Accommodation Projects on the day, month year first above written.

SIGNED, SEALED AND DELIVERED by OBLIGATOR in the presence of :

1……

.....

2.....

.....

.....

.....

.....

SIGNED FOR AND ON BEHALF OF DIRECTOR GENERAL,
MARRIED ACCOMMODATION PROJECTS, NEW DELHI -110011

IN PRESENCE OF :

1……

. ...

2.....

.....

…….

.. ..……..

.....

STEEL SUPPLY & ACCEPTANCE REGISTER

Appendix"G'

1 CA No & Name pf work

2 Contract No

3 Name of Manufacturer's T.C No

4 Manufacturer

5 Random Test details (a) Physical test report from ……. vide their letter No (Name of approved Lab / Engg College)

(b) Chemical test report from ……. vide their letter No (Name of approved Lab / Engg College)

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						Remarks
	Carbon %	**Sulphur %**	**Phosphorous %**	**Manganese %**	**Silicon %**	**Corrosion Resistant elemment**	**Wt per meter**	**Stress (N/mm^2) 0.2% proof**	**Tensile strength (N/mm^2)**	**Elongation %**	**Bend Test**	**Rebend test**	
As per IS 1786													
As per Manufacturer's test certificate													
As per independent test certificate													

Remarks with signature (Accepted/Rejected)

Contractor Civil Engineer (DEPMC) RE DEPMC PM

Appendix `H'

FREQUENCY FOR NORMAL MASS, TENSILE BEND AND REBEND TESTS OF STEEL

NORMAL SIZE	QUANTITY
STEEL FOR CONCRETE	
1 Bars size less than 10 mm	1 sample (3 Specimens) for each test for every 25 tonnes or part thereof
2 Bars size 10 mm to 16 mm	1 sample (3 Specimens) for each test for every 35 tonnes or part thereof
3 Bars size over 16 mm	1 sample (3 Specimens) for each test for every 45 tonnes or part thereof
SATRUCTURAL STEEL	
4 Tensile Test	1 test for every 25 tonnes of steel or part thereof
5 Bend Test	1 test for every 10 tonnes of steel or part thereof

Note :-

1. For various tests, acceptance criteria, tolerance etc refer to Appendix `G' and relevant BIS Codes.
2. Testing as per above frequency is mandatory before payment is released to the contractor or steel is incorporated in the work. However, tests shall not be insisted upon for the steel required for guard bars, hold fasts, grills and such allied items. Any items of steel not meeting the requirements shall be rejected and the particular consignment removed from the site by the contractor at his own cost. The contractor shall have no claim on this account. Cost of test and test samples as per above frequency shall be borne by the contractor irrespective of test result.
3. The PM may also increase frequency and number of samples/tests for his satisfaction and, cost of samples, transportation and other overheads shall be borne by the contractor irrespective of test result.