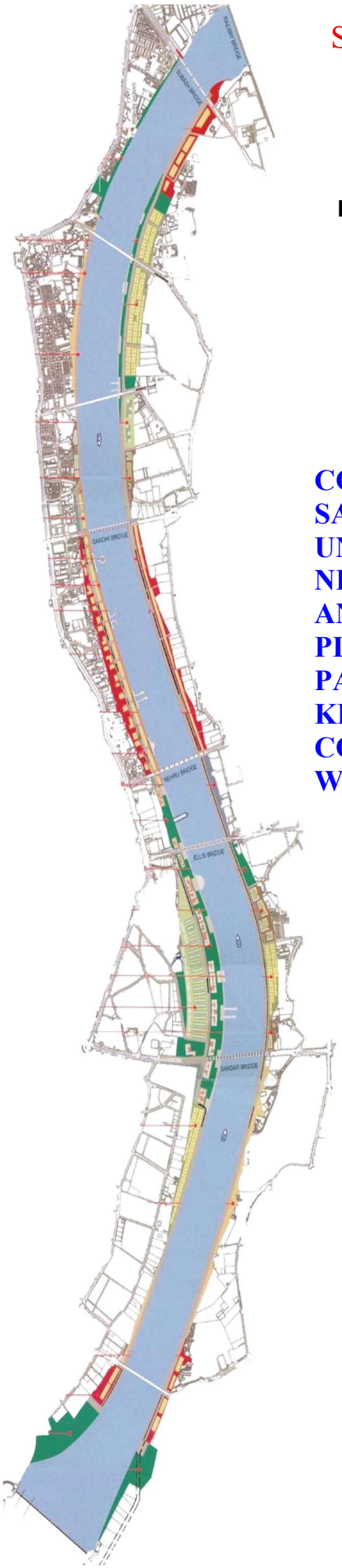
SABARMTI RIVERFRONT DEVELOPMENT



Sabarmati River Front Development Corporation Limited

2nd Floor, Riverfront House,
B/h H.K Arts College,
Between Gandhi Bridge and Nehru Bridge,
Pujya Pramukh swami Marg
(River Front Road-West)
Ahmedabad-380009

BID DOCUMENT

CONSTRUCTION OF RIVERSIDE SAVORIES I.E. BUILDING WITH UNDERGROUND ROAD BETWEEN NEHRU BRIDGE AND ELLISBRIDGE AND CONSTRUCTION OF PUBLIC PLAZA AND UNDERGROUND PARKING FACILITY AT SANSKAR KENDRA - TAGORE HALL CAMPUS CONNECTING RIVERFRONT ON WESTBANK FOR SRFDCL.

Contract Package : SRFDCL

VOLUME-02

IV) Technical Specification-CIVIL

SECTION IV

TECHNICAL SPECIFICATIONS

Part A: - Riverside Savories

SPECIFICATIONS OF ITEMS OF B.O.Q.

BIDDERS, PLEASE READ CAREFULLY AND COMPULSORY SIGN. WITH SEAL:

1. This section gives detail specifications for mainly used materials, for other materials refer to Building Specifications.

2. For detailed specifications refer to the R & B Dept. Booklet for General Technical Specification for building works.

3. Proper care has been taken to note down specifications of all the items, but if any item is not found hereby, it shall be executed only as per the guidelines of the consultants, no payment shall be made if the guidelines are not followed.

   a. Samples for all the materials to be used shall be approved before placing the order and then the approved sample shall be deposited with the Project Consultants / SRFDCL locker safely.
   b. In case of non-availability of materials in metric unit, the unit shall be converted by the Project Consultants, for which neither extra cost shall be paid, nor rebate shall be given/ recovered on those items / materials.
   c. The contractor shall submit the original Testing Certificate of the material tested, if in any case, the Consultants find the Tests to be repeated, the contractors shall do the same with no extra cost to be borne by the clients / consultants.
   d. The contractor may also be asked for the originality of the material used; this certificate may be asked for from the vendor / manufacturer from whom the materials have been procured.
   e. For all materials stored on site, the contractors shall be solely responsible for wastage, theft or any other kind of losses.
   f. Wherever in the tender document, two statements or two brands conflicts/ differs, the superior material quality / brand shall be followed, and same for any construction activity such as strength of material / grade of the material / mortar / concrete mix shall be followed the superior one only, any discrepancy in this regard shall be solved by the SRFDCL or Project Consultants and the decision of the Client shall be final and binding to the Contractors without any oppose.

4. We agree and abide to follow the specifications / instructions given to us during the course of execution.

Sign. & Seal of the Bidders

Applicable Standards

For

Civil Work

Section: A - Applicable Standards for Civil work

1	Conversion factors	IS:786
2	Method of Measurement of building works	IS:1200
3	Code of practice for measurement of civil engineering works	IS:3385
4	Materials and workmanship for earthwork and excavation	IS:1200 (PART I)
5	Safety code for blasting and related drilling operations	IS:4081
6	Safety code for excavation work	IS:3764
7	Moisture content in sand for filling	IS:2720
8	Determination of moisture content	IS:2720 (PART II)
9	Determination of moisture content & dry density relation using light compaction	IS: 2720 (PART VIII)
10	Determination of dry density of soils in-place by the sand replacement method	IS:2720(PART XXVIII)
11	Determination of dry density of soils in-place by the core cutter method	IS:2720 (PART XXIX)
12	Anti termite treatment	IS:6313(PARTI TO III)
13	Construction water	IS:456
14	Methods of sampling and test (physical and chemical water used in industry)	IS:3025
15	Ordinary (33 grade)/low heat Portland cement	IS:269
16	Ordinary Portland cement (43 grade)	IS:8112
17	Ordinary Portland cement (53 grade)	IS:12269
18	White Portland cement	IS:8042-E
19	Portland pozzolana cement	IS:1489
20	Rapid hardening Portland cement	IS:8041, IS:269
21	Portland(blast furnace) slag cement	IS:455
22	Hydrophobic cement	IS:8043
23	High alumina cement	IS:6452
24	Super sulphated cement	IS:6909
25	Oil well cement	IS:8229E
26	Standard for testing of cement	IS:650
27	Methods of physical tests for hydraulic cement	IS:4031
28	Specification for standard sand for testing of cement	IS:650
29	Coarse and fine aggregates for concrete	IS:383, IS:515
30	Gradation of coarse aggregates	IS:383(TABLEII)
31	Gradation of fine aggregates	IS:383 (TABLE III)
32	All-in aggregates	IS:383 (TABLE IV)
33	Method of tests for aggregates for concrete	IS:2386 (PART- I to VIII)
34	Methods of determination the maximum qty. of deleterious materials in aggregate	IS:2386 (PART II)
35	Limiting values of the maximum quantities of deleterious materials in aggregate	IS:383 (TABLE I)
36	Flakiness index of aggregates	IS:2396(PART-I),IS:5640
37	Moisture content test for aggregates	IS:2386 (PART III)
38	Specification for mild steel and medium tensile steel bars and hard drawn steel wire for concrete reinforcement.	IS:432 (PART I & II)
39	Specification for plain hard drawn steel wire fabric for cement concrete	IS:1566

40	Specification for cold twisted steel bars for concrete reinforcement	IS:1786
41	Specifications for hot rolled mild steel and medium tensile steel deformed bars	IS:1139, IS:1739
42	Code of practice for bending and fixing of bars for concrete reinforcement	IS:2502
43	Mild steel binding wire	IS:280
44	Code of practice for welding of mild steel bars used for RCC	IS:2751
45	Code of practice for plain and reinforced concrete	IS:456
46	Code of practice for general construction of plain and RCC for dams	IS:457
47	Testing of reinforced cement concrete	IS:516
48	Method of tests for strength of concrete	IS:516
49	Methods of sampling & analysis of concrete	IS:1199
50	Code of practice for concrete structures for storage of liquids	IS:3370 (PART I TO IV)
51	Code of practice for composite construction	IS:3935
52	Code of practice for construction of reinforced concrete shell roof	IS:2204
53	Criteria for the design of RCC shell structures and folded plates	IS:2210
54	Specification for batch type concrete mixers	IS:1791
55	Specification for portable swing weigh batchers for concrete	IS:2722
56	Specification for roller pan mixer	IS:2438
57	Specification for concrete vibrators immersion type	IS:2505
58	Specification for screed board concrete vibrators	IS:2506
59	Specification for concrete vibrating tables	IS:2514
60	Specification for pan vibrators	IS:3366
61	Specification for form vibrators for concrete	IS:4656
62	Code of practice for use of immersion vibrators for consolidated concrete	IS:3558
63	Air entraining agent	ASTM:6260
64	Criteria for design and construction of precast concrete trusses	IS:3201
65	Prestressed concrete	IS:1343
66	Specification for high tensile steel bars used in code of practice for pre-stressed concrete	IS:2090
67	Specification for plain hard drawn steel wire for pre-stressed concrete	IS:1785 (PART I)
68	Specification for plywood for concrete	
69	Shuttering work	IS:4990
70	Code of practice for steel tubular scaffolding	IS:4014 (PART I & II)
71	Specification for steel scaffolding	IS:2750
72	Safety code for scaffolds and ladders	IS:3696
73	Common burnt clay building bricks	IS:1077
74	Classification of burnt clay bricks	IS:3102
75	Burnt clay building bricks, heavy duty	IS:2180
76	Burnt clay facing bricks	IS:2691,IS:1077
77	Method of sampling and testing clay building bricks	IS:3495 (PART I - IV)
78	Mortar for brick work	IS:2250
79	Code of practice for brick work	IS:2221
80	Masonry works	IS:3466

81	Structural safety etc. Of building masonry walls	IS:1905
82	Load bearing hollow concrete blocks	IS:2185
83	Lime - cement - cinder hollow concrete blocks	IS:5498
84	Lime - cement - cinder solid blocks	IS:3115
85	Code of practice for construction of stone masonry	IS:1597 (PART I)
86	Stone tests	IS:1124
87	Code of practice for design and installation of joints in buildings	IS:3414
88	Joint sealing compound	IS:834
89	Pre-moulded bituminous joint filler	IS:1838
90	Timber door, window and ventilator frames	IS:4021
91	Material & workmanship for wood work	IS:883, IS:4021
92	Wooden flush door shutters (solid core type)	IS:2202 (PART I)
93	Timber panelled and glazed shutters	IS:1003 (PART I & II)
94	Method of tests for wooden flush doors, type tests	IS:4020
95	Plywood & tests	IS:303
96	General tests for wood work	IS:1659
97	Red lead for wood knot	IS:103
98	Oil type wood preservative	IS:218
99	Particle board	IS:3087
100	Transparent sheet glass for glazing & framing purposes	IS:1761
101	Resin bonded fiber glass	IS:3144
102	Putty for glazing	IS:420
103	Steel door frames	IS:4351
104	Steel window	IS:1361
105	Steel doors	IS:1038
106	Steel ventilators	IS:1081
107	Rolling shutters	IS:6248
108	Primer for steel doors, windows & ventilators	IS:102
109	Aluminium alloy for door/window frames	DSGN. HEA-WPO IS:733
110	Sections	IS:1948
111	Anodizing	BS:1616
112	Hydraulic lime & storage	IS:712
113	General tests for lime	IS:6932 (PART I TO X)
114	Field tests for lime	IS:1624
115	Lime mortar preparation	IS:1625
116	Slacked lime	IS:1639
117	Surkhi	IS:1344
118	Code of practice for application of lime plaster finish	IS:2394
119	Rough cast plaster	IS:1661(CLAUSE-165)
120	Specification for integral cement water proofing compounds	IS:2645
121	Water proofing asphalt/maxphalt	IS:702
122	Bitumen saturated layer	IS:1322
123	Bitumen felt	IS:1322
124	Bitumen	IS:702
125	Code of practice for laying and finishing of cement concrete flooring tiles	IS:1443
126	Material & workmanship for flooring	IS:1197, IS:1344
127	Code of practice for laying in situ terrazzo floor finish	IS:2114
128	Code of practice for laying in-situ cement concrete flooring	IS:2571
129	Mosaic tiles	IS:1237
130	Glazed earthenware tiles	IS:777
131	Marble chips & marble mosaic terrazzo	IS:2114
132	Plain cement tiles & tests	IS:1237

133	Marble mosaic tiles	IS:1237
134	Marble slab	IS:1130
135	PVC flooring tiles & sheets	IS:3461,IS:3462
136	Broken marble mosaic tiles	IS:1257
137	Oxy-chloride	IS:658
138	Magnesium chloride	IS:657
139	C.I. grid tiles	IS:210
140	Pigment for terrazzo flooring	IS:459
141	Rivets	IS:1148
142	Electrodes for welding	IS:814
143	Code of practice for use of electric arc welding for general construction in steel	IS:813
144	Tests for welding works	IS:1181
145	Welding works	IS:816
146	Bolts and nuts	IS:1367
147	Tests for bolts and nuts	IS:1608
148	Structural steel sections & tests	IS:226
149	Structural steel plates	IS:2062
150	Defects in structural steel	IS:229
151	Dimension & properties of steel section	IS:808
152	Structural steel work	IS:226, IS:4948
154	Expanded metal steel sheet	IS:412
155	Mild steel wire gauze jali	IS:280
156	Welding procedure & edge preparation	IS:823
157	Washers	IS:2016
158	Storage of welding wire & electrodes	IS:816
159	Primer to structural surface for bolts	IS:2074
160	Chequered plates	IS:3502
161	Code of practice for painting of ferrous metal in building and allied finishes	IS:1477 (PART I & II)
162	Distemper and dry color	IS:427
163	Code of practice for painting concrete, masonry and plaster surfaces	IS:2395
164	Distemper and oil emulsion	IS:428
165	Enamel paints	IS:2933
170	Coat of zinc chromate	IS:104
171	French spirit polish	IS:348
172	GI sheets	IS:227
173	Ac sheets	IS:459
174	Ac sheet fixing	IS:730
175	Mangalore pattern tiles	IS:654
176	Fiber glass reinforced polyester	IS:4154
177	Galvanized steel for barbed wire	IS:278
178	Insulation of hot water pipes, tanks & heat exchanger	BS:476
179	GI pipes & MS tubes	IS:1239 (PART I)
180	Screw down bib cocks & stop cocks	IS:781
181	Vitreous sanitary fixtures(general)	IS:2556 (PART I)
182	Gun metal wheel, globe, check, gate & non return valves	IS:778
183	Wash basin	IS:2556(PART IV), IS:771
184	European W.C.	IS:2556, IS:771
185	Solid plastic seat & cover	IS:2548
186	Orissa pan W.C.	IS:2556 (PART III)
187	Squatting pans & traps	IS:2556 (PART III)

188	Indian W.C. (wash down W.C.)	IS:2556(PART II), IS:771
189	Urinals	IS:2556 (PART VI)
190	Half round channels	IS:2556 (PART VII)
191	Specific requirements of siphonic wash down W.C.	IS:2556 (PART VIII)
192	Ss sink/C.I./flushing tank brackets	IS:775
193	C.I. siphonic flushing cistern	IS:774
194	Lead pipes	IS:404 (PART I)
195	Sand cast pipes & fittings	IS:1729
196	C.I. spun soil pipes & fittings	IS:3939
197	Gully trap	IS:651
198	Glazed stone ware pipes & fittings	IS:651
199	Ac pipe	IS:1626,IS:1626(PART I)
200	High pressure/crydon ball valve	IS:1703
201	C.I. sluice valve	IS:780
202	Capstan head	IS:1795
203	Malleable iron fittings	IS:1879 (PART I TO X)
204	C.I. pipes	IS:1536, IS:1537
205	Molten (pig)lead	IS:782
206	C.I. manhole frames & covers	IS:1726
207	Concrete pipes	IS:458
208	Threads for screwed pipes	IS:554
209	Lead jointing	IS:718
210	Carbon steel for pipes	IS:9161
211	Low level ceramic cistern	IS:774
212	Bowl pattern flat back urinals	IS:2556 (PART IV)
213	Showers	IS:2064
214	Heavy C.I. pipes	IS:1729
215	Concrete mix design	IS:10262
216	Code of practice for construction of floor and roof with joists and filler blocks	IS:6061 (PART I)
217	Code of practice for construction of light weight concrete block masonry	IS:6042
218	Specification for load bearing light weight concrete blocks	IS:3590
219	Code of practice for construction of hollow concrete block masonry	IS:2572
220	Specification for concrete masonry units (hollow and solid concrete blocks)	IS:2185 (PART I)
221	Chemical composition of ordinary Portland cement	IS:4032
222	Sulphate resistant cement	BS:4027 & ASTMC-150 TYPE II
223	Specifications for circular hollow sections	IS:1161
224	Properties of rectangular & square hollow sections	IS:4923
225	Cold formed welded & seamless carbon steel structural tubing	ASTMA 500
226	Cold but not formed welded & seamless carbon steel structural tubing	ASTMA 501
227	Hot formed welded & seamless high strength low alloy tubing	ASTMA 618
228	Hot rolled structural steel hollow section	BS:4848/
229	(Part 1) Code of Practice for design and construction of pile foundation concrete piles cast-in-situ bored piles.	IS : 2911
230	Recommendation for detailing of Reinforcement in Reinforced Concrete Works.	IS : 5525
231	Guidelines for dewatering during construction	IS: 9759 : 1981

Note:

For the reference of all Codes and Standards, the latest version of the above specified Standards shall be followed, Wherever, such Standards are not specified for the construction materials, equipment and method, the relevant Indian Standard Codes of Practice shall be followed, in the absence of Indian Standards corresponding British Standard Codes of Practice or relevant American Standards shall be followed.

List of Approved Makes
For
Civil Work

Section B - List of Approved Make for Civil Works

1.	Ordinary Portland Cement	Ultratech, Ambuja, Birla Cement, ACC, J.K. Laxmi, Sanghi, Nuvoc vistus pvt. ltd.
2.	White Cement	Birla white, J.K.
3.	Reinforcement Steel	Tata, RINL, (VIZAG), SAIL
4.	Structural Steel sections	Tata, SAIL, RINL, Jindal, JSW steel, JSPL
5.	Structural Hollow steel sections	Tata, Asian, Jindal, Surya, Apollo
6.	Coarse Aggregates (machine cut) 6mm to 40mm sizes (Hard black trap stone)	Approved quarry from Sevalia, Bayad, Vadagam & Vatrak
7.	Stone /Rubbles & Gravels (Hard black trap stone)	Approved quarry from Sevalia, Bayad, Vadagam & Vatrak
9	Shuttering plywood	Kit ply, green ply, Archid ply, Duroply, Century, India plywood, sylvan ply
10	Precast Paver block	Vyara, Super Basant batons, Winner Conmat
11.	Precast Kerbing, and other elements	Vyara, Basant batons, Winner Conmat, Fuji, Sachi
12.	Rolling shutter	Sona, Gandhi Automation
13.	Ceramic tiles, Vitrified tiles	Johnson, Somani, AGL, Simpolo
14.	Admixtures	BASF, Sika, Fosroc, MapeiCico, Fairmate, Pidilite, MYK Arment
15.	Water proofing coating, Chemical Water proofing & Integral water proofing compound	Pidilite, Mapei, Asian, MYK Arment
	Crystalline water proofing	Penetron, Kryton, Xypex
16.	PVC Water stop/Water bar	Penetron, Kryton, Xypex, Pidilite, Mapei, Asian, MYK Arment, Jyoti polyvinyl, Kanta polyvinyl.
17.	Silicon sealant	Wacker, Dow corning, GE, Soudal, Bostik, Mapei, Pidilite
	Polysulphide sealant	Pidilite, Chawksey, Mapei, Fosroc, Fairmat
18.	P.U sealant/ Fire rated PU	Sikka (Exterior grade - UV resistant)
19.	Paint, primer, putty	Asian paint, Nerolac, Berger, Birla (putty), JK (Putty)
20.	Tile adhesives & grouting material	Laticrete, Kerakoll, Pidilite, Mapei
21.	Anchor Fasteners	Hilti, Fischer, Mungo, Wurth
22.	Non-shrink general purpose grout	Fosroc, BASF, Sikka, Mapei, Pidilite
23.	Anchoring chemical for rebar dowel bar, Core cutting	Hilti, Fischer, Wurth
24.	Expansion joint pre-moulded filler board	BridgeWY, Migua
25.	Road marking paint	Kataline, Asian, Automark, Berger, STP

26.	Mold release agent	Fosroc, Pidilite, BASF, Fairmate, Sika
27.	Silicone paint (water repellant coating)	Wacker, Dow corning, Killick guard Specialty, Akemi, MYK Laticrete, Ardex Endura
28.	Colour admixture for colour concrete	Lanxess, Bomanite
29.	Water Stops - Hydrophilic Swellable rubber strip (Not bentonite type)	Penetron, Kryton, Xypex, Pidilite, Mapei, MYK Arment, Jyoti Polyvinyl, Kanta Polyvinyl.
30.	Modular Signage	Cosign, Vista
32.	Vinyl Sticker and lamination for signage	3M
33.	FRP Manhole cover & tree pit cover	Fibrocast, HP strong drain, Thermodrain, Everlast
34.	Metal recessed manhole cover	Lidco, ACO, Weimar
35.	Structural Steel Paints	Asian, Nerolac, Jotun, Berger
36.	Anti-Termite Treatment Chemistry Agency	Central Insecticide Board approved (ISI Marked) Chemical
		M/s Paragon; M/s PECOPP; M/s Pest Control India Ltd; M/s Express pesticide corporation or as approved. Specialized agency shall be a Member of IPCA (Indian Pest Control Association)
37.	BRICK	Compressive strength Avg. 35 KG. Per sq.CM.
38.	AAC blocks	Aerocon, Ascolite, Magicrete, Biltech, Litecone, Ecolite, Xtralite, Anjani, Globconmake (autoclaved aerated block) or Equivalent as Approved by EIC
39.	Synthetic Enamel Paint for steel	Asian, Nerolac, Jotun, Berger, Sunanda, MYK Arment
40.	PU paint & Spar Varnish	Asian, Nerolac, Jotun, Berger, Sunanda, MYK Arment
41.	Modular Toilet Partition	Marino, Greenlam
42.	Metal Fire Doors	M/s Shakti Hormann, M/s Navier, M/s J C, M/s Signum Fire Door, M/s Bajaj Fire Door
43.	Plain Glass	M/s Modi Guard; M/s Saint Gobain, M/s Indo-Asah Glass
44.	Reflective Glass	M/s Saint Gobain, M/s Indo-Asahi Glass, M/s Glaverbel (Europe); M/s Pilkington (USA, UK).
45.	Flush Door Shutter	M/s Kalpatru, M/s Kutty Flush Door, M/s Century, M/s Kitply, M/s Sylvan Ply, Kolkata

46.	Plywood	M/s Century, M/s Kitply, M/s India Plywood, M/s Green Ply, M/s Sylvan Ply, Kolkata
47.	Fire rated hardware & system	Dormakaba, Hafele, Geze, Hormann, Becker
48.	Veneers	M/s Century, M/s Kitply, M/s India Plywood, M/s Green Ply, M/s Timex, M/s Merino
49.	Laminate	M/s Formica, M/s Greenlam, M/s Century Ply, M/s Merino, M/s Timex, M/s Royal Touche
50.	Fire rated hardware & system	Dormakaba, Assa Abloy (Yale), Hafele, Geze, Hormann, Becker
51.	Automated Sliding door	Dorma, Geze, Hafele, Kitch, Ozone
52.	Fire seal, fire smoke seal	3M, Hilti, Dormakaba, Sealz, Lorient, Kelargo, Raven, Athmer
53.	Acoustic Seal/ Door seal	Athmer, Lorient, Raven, Dormakaba, 3M, Kelargo, Reddiplex
54.	Wood Adhesive	Speedex Fevicol, Araldite, kerakol, Astral
55.	Door Fittings & Fixtures (MS, Al, SS, Brass)	M/s Ebco, M/s Guardian, M/s Hafele, M/s Hettich, M/s Ozone, Dorma Kaba
56.	Decorative High SS Finish Fittings and Fixtures	M/s Guardian, M/s Hafele, M/s Hettich, M/s Ozone, M/s Dorma Kaba
57.	Mortise Locks, Night Latch	M/s Godrej, M/s Guardian, Hettich, Hafele, Dorma
58.	Door Closer	M/s Hardwyn, M/s Godrej, M/s. Garnish, M/s Dorma
59.	Floor Spring	M/s Hardwyn, M/s Godrej, M/s. Garnish, M/s Dorma M/s Hafele
60.	Glass patch Fittings	M/s Dorma, M/s Ozone
61.	Gypsum Based False Ceiling	M/s Saint Gobain Gyproc India Ltd, USG Boral
62.	Cement board false ceiling	M/S Everest industries
63.	Tensile Fabric	Serge Ferrari, Sherfil, Chucko ,F.I. T , Fiber tech
64.	Water Cooler	Voltas, Blue Star
65.	Corner Guards	As Per Architect Selection
66.	PVC Speed Breaker	
67.	Safety Convex Mirror	

68.	Drinking water fountain	
69.	Stainless steel dustbin	
70.	All Type of Façade System	Schuco, Alusleek, Blick, Lilli , Reynaers & VS1
71.	Coating for Aluminium profile with shade and micron thickness	Powder from Akzonobel, Jotun , Nerolac
72.	Coating for All External Façade Aluminium profiles/sheets cladding	Powder from Akzonobel, Jotun , Nerolac
73.	Glass For All Type of Façade System	Saint Gobain, Equi. AIS, Guardian. Coating warranty as per manufacture.
74.	Glass Processor	IPH -AMD, FG-Mumbai ; Creative-Baroda ; Swastik Glass - AMD
75.	MS Brackets	MS-Jindal , Tata Steel , ESSAR With Local Vendor fabrication.
76.	Anchors	Wruth , HILTI , Fischer , Klimas
77.	Bolts ,Nuts,Screws, Washers	Kundan , Vardhaman , Precise
78.	Silicon	GE , DC
79.	Gaskets	Blick , Lilli , Reynaers & VS1
80.	Flashing	Local Supplier
81.	Handle for Windows	Blick , Lilli , Reynaers & VS1
82.	Smoke Seal Insulation	Side-Rise
83.	shadow box	Side-Rise , Thermafibre , Rockwool International Curtainrock 80
84.	MS Materials (Profiles)	Jindal , Tata Steel , ESSAR
85.	Coating	Primer & Paint from Akzonobel ; Asain Paint : Bargar
86.	Aluminium Flat Sheet	Viva , Virgo , Alstone
87.	Alum. Frame Door	Blick , Lilli , Reynaers & VS1
88.	Aluminium D/W hardware	Blick , Lilli , Reynaers & VS1
89.	Glass Railing System	Q-railing , KLM , Façade One

90.	Backer Rod	Supreme
91.	Autocad Sliding Door	Dormakaba , OZONE , Geze
92.	Setting block	EPDM , NYLON , Hard PVC
93.	Bi Metal Separator between Bracket & Aluminium	EPDM , PVC
94.	Protective tape for glass/aluminum etc.	Local Vendor
95.	Masking Tape	Abro , Local vendor
96.	Double sided tape	Norton
97.	POP Rivets	Avdel , Rivets India
98.	Façade Cleaning System	Ccarryon Access, Cradle Runways System , Simple Eng. Services
99.	Acoustic microperforated metal cloud	Knauf (Armstrong), Gyproc, Ecotone, USG Boral, Godrej

Note:

All the Materials/ Makes listed above and other than as specified above shall be used after obtaining prior approval from the Architect & Engineer-in-charge.

Cement Consumption

Section C - Cement Consumption

No.	Item	Ratio/ Grade	Consumption per Unit	
A.	**CEMENT CONCRETE (OPC 53 grade Cement)**			
	BBCC (Volumetric)	1:5:10	2.60	Bags/m^3.
		1:4:8	3.40	Bags/m^3.
	PCC (Volumetric)	1:6:12	2.30	Bags/m^3.
		1:5:10	2.60	Bags/m^3.
		1:4:8	3.40	Bags/m^3.
		1:3:6	4.30	Bags/m^3.
	PCC (Controlled concrete)	M7.5	3.40	Bags/ m^3.
	PCC (Controlled concrete)	M10	4.70	Bags/m^3
	PCC (Controlled concrete)	M15	5.50	Bags/ m^3.
	RCC (Controlled concrete Minimum cement content	M15	5.70 (285 Kg)	Bags/m^3.
		M20	6.0 (300 Kg)	Bags/m^3.
		M25	6.5 (325 Kg)	Bags/m^3.
		M30	7.0 (350 Kg)	Bags/m^3.
		M35	7.5 (375 Kg)	Bags/m^3.
	Minimum cement content for exposed finish wall shall be	M25	7.6 (380 Kg)	Bags/m^3.
B.	**MORTARS**			
	Cement and Sand mortar			
		1:1	20.4	Bags/m^3.
		1:2	13.6	Bags/m^3.
		1:3	10.2	Bags/m^3.
		1:4	7.60	Bags/m^3.
		1:5	6.2	Bags/m^3.
		1:6	5.0	Bags/m^3.
		1:8	3.83	Bags/m^3.
C.	**MASONRY WORK**			
	Brickwork in Cement sand mortar **(Conventional)**			
		1:3	2.55	Bags/m3.
		1:4	1.90	Bags/m3.
		1:5	1.56	Bags/m^3.
		1:6	1.27	Bags/m^3.
		1:8	0.95	Bags/m^3.
	Stone masonry, Coursed			
		1:3	3.06	Bags/m^3.

		1:4	2.28	Bags/m^3.
		1:6	1.50	Bags/m^3.
		1:8	1.18	Bags/m^3.
	Stone masonry Uncoursed			Bags/m^3.
		1:5	2.04	Bags/m^3.
		1:6	1.65	Bags/m^3.
	Half Brick work **(Conventional)**	1:3	0.29	Bags/m^2.
		1:4	0.21	Bags/m^2.
		1:5	0.17	Bags/m^2.
D.	**PLASTERING**			
	10 mm. thick plaster in Cement mortar, on ceiling & soffit of stair, chajjas etc.			
		1:3	0.12	Bags/m^2.
		1:4	0.1	Bags/m^2.
	15 mm. thick single coat plaster in on walls			
		1:3	0.17	Bags/m^2.
		1:4	0.13	Bags/m^2.
	20 mm. thick plaster in Cement mortar, on unfair side of brick in single coat			
		1:3	0.23	Bags/m^2.
		1:4	0.17	Bags/m^2.
	20 mm. thick plaster in Cement mortar, on unfair side of brick in double coat (First coat 15mm in 1:4 and second coat of 5mm in1:3)		0.18	Bags/m^2.
	20 mm. thick Sand Face plaster (First coat 15mm in 1:4 and second coat of 5mm in 1:2)		0.22	Bags/m^2.
	15mm. thick Water Proof plaster in 1:3 Cement mortar		0.21	Bags/m^2.
	Neat Cement finishing		0.044	Bags/m^2.
E.	**POINTING**			
	Flush, Grooved or Struck in Cement Brick masonry			
		1:1	0.092	Bags/m^2.
		1:2	0.046	Bags/m^2.
		1:3	0.03	Bags/m^2.
		1:4	0.023	Bags/m^2.
	Flush, Grooved or Struck in Cement Random Stone masonry			
		1:3	0.023	Bags/m^2.
F.	**FLOORING**			
	Precast Mosaic Tiles of 40mm		0.30	Bags/m^2.

	thk. in cement mortar 1:6			
	20mm thk. Green Kotah/Granite Stone in flooring, skirting & dado of 50mm thk. in cement mortar 1:6		0.50	Bags/m².
	20 mm thick. Green Kotah/ Granite Stone in Risers and Treads		0.50	Bags/m².
	20 mm thick. Double Polished Kotah/Granite Stone		0.50	Bags/m².
	25mm thick. Rough Kotah, Dholpur, Red Mandana, Bansipahadpur stone etc. in flooring, skirting & dado of 50mm thk. in cement mortar 1:6		0.50	Bags/m².
	Glazed Tiles, Ceramic tiles, vitrified tiles flooring in 25 mm thick. Bedding of C:M 1:6		0.20	Bags/m².
	Glazed Tiles, Ceramic tiles, vitrified tiles dado in C:M 1:1		0.20	Bags/m².
	China mosaic with 25 mm bedding mortar in C:M 1:6		0.22	Bags/m².
	18-20mm Marble, Granite, Jesalmer Slab with avg. 50mm bedding mortar in cement mortar 1:6		0.50	Bags/m².
	I.P.S.	40 mm. thick	0.35	Bags/m².
		50 mm. thick	0.40	Bags/m².
		75mm. thick	0.55	Bags/m².
	115mm water proofing plaster		0.40	Bags/m².
	Brick-on-edge		0.12	Bags/m².
	Wet stone cladding in C:M 1:2		0.2	Bags/m².
	Chemical water proofing 3 coats		0.05	Bags/m².
	Sandwich platform		0.5	Bags/m².
G.	**MISCELLANEOUS**			
	Filling Zaris with			
	C.M.	1:3	5.0	Bags/ 100 m.
	C.C	1:2:4	3.2	Bags/100 m.
H.	**ROADWORK**			
	Precast exposed Curbs M20	1:2:4	35	Bags/100 m.
		230 mm. dia.	1.8	Bags/100 m.

Note:

For the items not covered in above list, CPWD co-efficient shall be followed or proportionate from CPWD co-efficient or actual consumption shall be checked in the beginning, during execution of item in consultation with EIC.

GENERAL TECHNICAL SPECIFICATIONS FOR BUILDING WORK

GENERAL

1. In the specifications, "as directed"/"Approved" shall be taken to mean, "as directed"/approved" by the Engineer-in-charge.

2. Wherever a reference to any Indian Standard appears in the specifications, it shall be taken to mean as a reference to the latest edition of the same in force on the date of agreement.

3. In "Mode of Measurement" in the specifications wherever a dispute arises in the absence of specific mention of a particular point or aspect, the provisions on these particular points, or aspects in the relevant Indian Standards shall be referred to.

4. All measurements and computations, unless otherwise specified, shall be carried out nearest to the following limits:

4.1 Length, width and depth (height)-------0.01 Meter.
4.2 Areas -----0.01 Sq. Mt.
4.3 Cubic Contents ------0.01 Cu.Mt.

5. The distance, which constitutes lead, shall be determined along the shortest practical route and not necessarily the route actually taken. The decision of the Engineer-in-charge in this regard shall be taken as final.

6. Where no lead is specified, it shall mean "all leads"

7. Lift shall be measured from plinth level.

8. Upto "floor two level" means actual height of floor (Maxi. 4 M.) up to 3 Mt. above plinth level.

9. Definite particulars covered in the items of work, though not mentioned or elucidated in it, specifications should be deemed to be included there.

10. Reference to specifications of materials as made in the detailed specification of the items of work is in the form of a designation containing the number of the specifications of the material and prefix 'M' e.g. 'M-5'.

11. Approval of the samples of various materials given by the Engineer-in-charge shall not absolve the contractor from the responsibility of replacing defective material brought on site or materials used in the work found defective at a later date.

12. The contract rate of the item of work shall be for the work completed in all respects.

13. No collection of materials shall be made before it is got approved from the Engineer-in-charge.

14. Collection of approved materials shall be done at the site of work in a systematic manner. Materials shall be done at the site of work in a systematic manner. Materials shall be stored in such a manner as to prevent damage, deterioration or intrusion of foreign matters and to ensure the preservation of their quality and fitness for the work.

15. Materials, if and when rejected by the Engineer-in-charge, shall be immediately removed from the site of work.

16. No materials shall be stored prior to, during and after execution shall be kept in sufficient numbers and in good working conditions on the site of the work.

17. All works shall be carried out in a workmanlike manner per the best techniques for the particular item.

18. All tools, templates, machinery and equipment for correct execution of the work as well as for checking lines, levels, and alignment of the works during execution shall be kept in sufficient numbers and in good working condition on the site of the work.

19. The mode, procedure and manner of execution shall be such that it does not cause damage or overloading of the various components of the structure during execution or after completion of the structure.

20. Special modes of construction not adopted in general Engineering practice, if proposed to be adopted by the Contractor, shall be considered only if the contractor provides satisfactory evidence that such a special mode of construction is safe, sound and helps in speedy construction and completion of work to the required strength and quality. Acceptance of the same by the Engineer-in-Charge shall not, however, absolve the contractor of the responsibility of any adverse effects and consequences of adopting the same in the course of execution of completion of the work.

21. All installations pertaining to the water supply and fixtures thereof as well as drainage lines and sanitary fittings shall be deemed to be completed only after giving satisfactory tests by the Contractor.

22. The contractor shall be responsible for observing the rules and regulations imposed under the “Minor Minerals Act", and such other laws and rules prescribed by the Government from time to time.

23. All necessary safety measures and precaution (including those laid down in the various relevant Indian Standards) shall be taken to ensure the safety of men, materials and machinery on the works as also of the work itself.

24. The testing charges of all materials shall be borne by the Contractor unless a recovery at one percent towards testing charges is separately made.

25. Approval of any of the executed items for the work does not in any way relieve the contractor of his responsibility for the correctness, soundness and strength of the structure as per the drawings and specifications.

26. Contractor shall set up testing laboratory on site. Laboratory shall be equipped with minimum following equipments / instruments.

26.1 Beaker-Measuring Cylinder
26.2 Flakiness Index
26.3 Elongation Index
26.4 Aggregate Impact Value
26.5 Oven
26.6 Slump Cone
26.7 Concrete cube testing Machine
26.8 Concrete Test Cubes
26.9 Vicat Apparatus
26.10 90 micron Sieve
26.11 Mortar Cube Mould
26.12 Plate Vibrator
26.13 Micrometer Screw
26.14 Varner Calipers
26.15 Thermometer
26.16 5 kg- Weigh Scale /Balance
26.17 Electronics Balance – 20 kg
26.18 300 kg- Weigh Scale /Balance
26.19 Core cutter set
26.20 Mortar Mixture
26.21 Casgranade Apparatus
26.22 Welding gauge
26.23 Dye penetration material-set
26.24 Pycnometer
26.25 Proctor mould
26.26 GI tray/ Ceramic tray
26.27 Distilled Water
26.28 Wire basket
26.29 PH meter
26.30 TDS meter
26.31 IS 1852
26.32 Electronic vernier
26.33 Welding gauge
26.34 Theodolite
26.35 Auto Level/ Staff

27. In case of any discrepancy or contradiction if any in the provision of above specification the order of the precedence shall be followed.

27.1 Technical Specification in this Volume IS Provisions
27.2 MORTH and CPWD Specification IRC Provisions
27.3 Sound Engineering Practice
27.4 Manufacture specification for special items

28. Unacceptable work

All defective works are liable to be demolished, rebuilt and defective materials replaced by the contractor at his own cost. In the event of such works being accepted by carrying out repairs etc. as specified by the engineer in charge, the cost of repairs will be borne by the contractor and will be paid for the works actually carried out by him at reduced rates of the tendered rates, as may be considered reasonable by the engineer in charge, in the preparation of final or on account bills.

SPECIFICATIONS OF MATERIALS

M-1. Water:

1.1. Water shall not be salty or brackish and shall be clean, reasonably clear and free objectionable quantities of silt and traces of oil and injurious alkalis, salts, organic matter and other deleterious material which will either weaken the mortar or concrete or cause efflorescence or attack the steel in R.C.C Container for transport, storage and handling of water shall be clean. Water shall conform to the standards specified in I.S.456-1978.

1.2. If required by the Engineer-in-charge it shall be tested by comparison with distilled water. A comparison shall be made by means of standard cement tests for soundness, time of setting and mortar strength as specified in I.S.269-1976. Any indication of unsoundness, change in time of setting by 30 minutes or more or decrease of more than 10 per cent in strength of mortar prepared with water sample when compared with the results obtained with mortar prepared with distilled water shall be sufficient cause for rejection of water under test.

1.3. Water for curing mortar, concrete or masonry should not be too acidic or too alkaline. It shall be free of elements which significantly affect the hydration reaction or otherwise interfere with the hardening of concrete during curing or those which produce objectionable stains or other unsightly deposits on concrete or mortar surfaces.

1.4. Hard and bitter water shall not be used for curing.

1.5. Portable water will be generally found suitable for curing mortar or concrete.

M-2. Lime:

2.1. Lime shall be hydraulic lime as per I.S. 712-1973. The necessary test shall be carried out as per I.S. 6932 (Parts I to X), 1973.

2.2. The following field tests for limes are to be carried out:

(1) A very rough idea can be formed about the type of lime by its visual examination, i.e. fat lime bears pure white colour, lime in form of porous lumps of dirty while colour indicates quick lime, and solid lumps are the unburnt limestone.

(2) Acid tests for determining the carbonate content in lime, Excessive number of impurities and rough determination of class of lime.

2.3. Storage shall comply with I.S. 712-1973. The slaked lime, if stored, shall be kept in a weatherproof and damp-proof shed with impervious floor and sides to protect it against rain, moisture, weather and extraneous materials mixing with it. All lime that has been damaged in any way shall be rejected and all rejected materials shall be removed from site of work.

2.4. Field testing shall be done according to I.S. 1624-1974 to show the acceptability of materials.

M-3. Cement:

3.1 Cement shall be ordinary Portland slag cement as per I.S. 269-1976 or Portland slag cement as per I.S. 455-1976.

M-4. White Cement:

4.1 The white cement shall conform to I.S. 80412-E 1978.

M-5. Coloured Cement:

5.1 Coloured cement shall be with white or gray Portland cement as specified in the item of the work.

5.2 The pigments used for coloured cement shall be of approved quality and shall not exceed 10% of cement used in the Mix. The mixture of pigment shall be properly grounded to have a uniform colour and shade. The pigments shall have such properties to provide durability under exposure to sunlight and weather.

5.3 The pigment shall have the property such that it is neither by the cement nor detrimental to it.

M-6. Sand:

6.1. Sand shall be natural sand, clean, well graded, hard strong durable and gritty particle free from injurious amounts of dust clay, kankar nodules, soft or flaky particles shale, alkali, salts organic matter, loam, mica or another deleterious substance and shall be got approved from the Engineer-in-charge. The sand shall not contain more than 8 percent silt as determined by field test. If necessary, the sand shall be washed to make it clean.

6.2. Coarse Sand: The fineness modulus of coarse sand shall not be less than 2.5 and shall not exceed 3,0.
The sieve analysis of course shall be as under:

I.S. Sieve	**Percentage by weight**	**I.S. Sieve**	**Percentage by weight**
Designation	Passing Sieve	Designation	Passing Sieve
4.75 mm.	100	600 Micron	30-100
2.36 mm.	90 to 100	300 Micron	5-70
1.18 mm.	70-100	150 Micron	0-50

6.3 Fine Sand:

The fineness modulus shall not exceed 1.0. The sieve analysis of fine sand shall be as below:

I.S. Sieve	**Percentage by weight**	**I.S. Sieve**	**Percentage by weight**
Designation	Passing Sieve	Designation	Passing Sieve
4.75 mm.	100	600 Micron	40-85
2.36 mm.	100	300 Micron	5-50
1.18 mm.	70-100	150 Micron	0-10

M-7. Stone Dust:

7.1. This shall be obtained from crushing hard black traps or equivalent. It shall not contain more than 8% silt as determined by field test with measuring cylinder. The method of determining silt contents by field test is given as under:

7.2. A sample of stone dust to be tested shall be placed without drying in a 200 mm. measuring cylinder. The quantity of the sample shall be such that it fills the cylinder upto100 mm. mark. The clean water shall be added up to the 150 mm. mark. The mixture shall be stiff vigorously, and the content allowed to settle for 3 hours.

7.3. The height of silt visible as settled layer above the stone dust shall be expressed as percentage of the height of the stone dust below. The stone dust containing more than 8% silt shall be washed so as to lower the silt content within the allowable limit.

7.4. The fineness modulus of stone dust shall not be less than 1.80.

M-8. Stone Grit:

8.1. Grit shall consist of crushed or broken stone and be hard strong, dense, durable, clean, of proper gradation and free from skin or coating likely to prevent adhesion of mortar Grit shall generally be cubical in shape and as far as possible flaky elongated pieces shall be avoided. It shall generally comply with the provisions of I.S. 383-1970. Unless special stone of particular quarries is mentioned, grit shall be obtained from the best black trap or equivalent hard stone as approved by the Engineer-in-charge. The grit shall have no deleterious reaction with cement.

8.2. The grit shall conform to the following gradation as per sieve analysis:

I.S. Sieve	**Percentage by weight**	**I.S. Sieve**	**Percentage by weight**
Designation	through Sieve	Designation	through Sieve
12.50 mm.	100%	4.75 mm.	0-20%
10.00 mm.	85-100%	2.36 mm.	0-25%

8.3. The crushing strength of grit will be such as to allow the concrete in which it is used to build up the specified strength of concrete.

8.4. The necessary tests for grit shall be carried out as per the requirements of I.S.2386(Parts I to VII) 1963, as per instructions of the Engineer-in-charge. The necessity of the test will be decided by the Engineer-in-charge. The necessity of the test will be decided by the Engineer-in-charge.

M-9. Cinder:

9.1 Cinder is well burnt furnace residue, which has been fused or sintered into lumps of varying sizes.

9.2 Cinder aggregates shall be well burnt furnace residue obtained from furnace using coal fuel only. it shall sound like cleaning free from clay, dirt ash or other deleterious matter.

9.3 The average grading for cinder aggregates shall be as mentioned below:

I.S. Sieve Designation	**Percentage passing**	**I.S. Sieve Designation**	**Percentage passing**
20 mm.	100	4.75 mm.	70
10 mm.	86	2.36 mm.	52

M-10. Lime Mortar:

10.1. Lime shall confirm to specification M-2 Water shall conform to specification M-1.

Sand: Sand Shall conform to specification M-6.

10.2. Proportion of Mix: 10.2.1. Mortar shall consist of such proportions of slaked lime and sand as may be specified in the item. The slaked lime and sand be measured by volume.

10.3. Preparation for Mortar:

10.3.1. Lime mortar shall be prepared by wet process as per I.S. 1625-1971. Power driven mills shall be used for preparation of lime mortar. The slake of lime shall be placed in the mill in an even layer and ground for the 180 revolutions with sufficient water. Water shall be added as required during grinding (care being taken not to add more water) that will bring the mixed material to a consistency of stiff paste. Thoroughly wet sand shall then be added evenly and the mixture ground for another 180 revolutions.

10.4. Storage:

10.4.1 Mortar shall always be kept damp, protected from summer and rain till used up, covering it by tarpaulin or open sheds.

10.5. Use:

10.5.1 All mortars shall be used as soon as possible after grinding and it should be used on the day on which it is prepared. But in no case mortar made earlier than 36 hours shall be permitted for use.

M-11. Cement Mortar:

11.1 Water shall conform to specification M –1. Cement: Cement shall conform to specification M- 3. Sand: Sand shall conform to M-6.

11.2 Preparation of Mix :11.2.1 Cement and shall be mixed to specified proportion, sand being measured by measuring boxes. The proportion of cement will be by volume on the basis of 50 kg / Bag of cement being equal to 0.0342 Cu.m. The mortar may be hand mixed, or machine mixed as directed.

11.3 Preparation of mortar : 11.3.1 In hand mixed mortar cement and sand in the specified proportions shall be thoroughly mixed dry on a clean impervious platform by turning over at least 3 times or more till a homogenous mixture of uniform colour is obtained., Mixing platform shall be so arranged that no delirious extraneous material shall get mixed with mortar or mortar shall be gradually added and thoroughly mixed to form a stiff plastic mass of uniform colour so that each particle of sand shall be completely covered with a film of wet cement. The water cement ratio shall be adopted as directed.

11.3.1 The mortar so prepared shall be used within 30 minutes of adding water. Only such quantity of mortar shall be prepared as can be used within 30 minutes.

M-12 Stone Coarse Aggregate for Nominal Mix Concrete:

12.1 Coarse aggregate shall be machine crushed stone of black trap or equivalent and be hard, strong m dense, durable clean and free form skin and coating likely to prevent proper adhesion for mortar.

12.2 The aggregate shall generally be cubical in shape. Unless special stones of particular quarries are mentioned, aggregates shall be machine crushed from the best black trap or equivalent hard stone as approved. Aggregate shall have no deleterious reaction with cement. The size of the coarse aggregate for plain cement concrete and ordinary reinforced cement concrete shall generally be as per the table given below. However, in case of reinforced cement concrete the maximum limit may be restricted to 6 mm. less than the minimum lateral clear distance between bars or 6 mm. less than the cover, whichever is smaller.

TABLE

I.s. sieve	percentage passing for single sized aggregates of nominal size			I.S. Sieve Designation sized	Percentage passing for single aggregates of Nominal size		
80 mm.	--	--	--	12.5 mm.	--	--	--
63 mm.	100	--	--	10 mm.	0.5	0.02	0.30
40 mm.	85-100	100	--	4.75 mm	--	0.5	0.5
20 mm.	0-20	85-100	100 mm.	2.35	--	--	--
15 mm.	--	--	85-100				

NOTE: This percentage may be carried somewhat by Engineer-in-charge when considered necessary for obtaining better density and strength of concrete.

12.3. The grading test shall be taken in the beginning and at the change of source of materials. The necessary test indicated in I.S. 383-1970 and I.S. 456-1978 shall have to be carried out to ensure the acceptability. The aggregates shall be stored separately and handled in such a manner as to prevent the intermixing of different aggregates. If the aggregate. are covered with dust; they shall be washed with water to make them clean.

M-13. Black Trap or Equivalent Hard Stone Coarse:

13.1 Aggregate For Design Mix Concrete: Coarse aggregate shall be of machine crushed stone of black traps or equivalent hard stone and be hard strong dense, durable clean and free skin and coating likely to prevent proper adhesion of mortar.

13.2 The aggregates shall generally be cubical in shape. Unless special stones of particular quarries are mentioned, aggregates shall be machine crushed from the best, black trap or equivalent hard stones as approved. Aggregate shall have no deleterious reaction with cement.

13.3 The necessary tests indicated in I.S. 383-1970 and I.S. 456-1978 shall have to be carried out to ensure the acceptability of the material.

13.4 If the aggregate is covered with dust, it shall be washed with water to make it clean.

M-14. Brick Bats Aggregate:

14.1 Brick bat aggregate shall be broken from well burnt or slightly over burnt and dies brick. It shall be homogeneous in texture, roughly cubical shape, clean and free from dirt of any other foreign material. The brick bats shall be 40 mm. to 50 mm. in size unless otherwise specified in the item. The unburnt or over burnt brick bats shall not be allowed.

14.2 The brick bats shall be measured by volume by suitable boxes or as directed.

M-15 Bricks:

15.1 The bricks shall be hand or machine moulded and made from suitable soil and kiln burnt. They shall be free from crack and nodules of free lime. They shall have smooth rectangular faces with sharp corners and shall be of uniform colour. The bricks shall be moulded with a frog of 100 mm. X 40 mm. and 10 mm. to 20 mm. deep on one of its flat sides. The bricks shall not break when thrown on the ground from a height of 600 mm.

15.2 The size of modular bricks shall be 190 mm. X 90 mm. X 90 mm. X 90 mm.

15.3 The size of the conventional bricks shall be as under: (9”x$4\frac{3}{8}$” x $2\frac{3}{4}$”) 225 x 110 x 75 mm.

15.4 Only bricks of one standard size shall be used on one work. The following tolerances shall be permitted in the conventional size adopted in a particular work. Length: 1.8 (3.0 mm.) Width: 1/6 “(1.51 mm.) Height: 1/6” 1.50 mm.)

15.5 The crushing strength of the bricks shall not be less than 35 Kg. /Sq.Cm. The average water abscriptics shall not be more than 20 prevent by weight. Necessary tests for crushing strength and water absorption etc. shall be carried out as per I.S. .3493 (Part-I to IV) 1976.

M-16 Stone:

16.1 The stone shall be of a specified variety such as Granite/Trap Stone. Quartzite or any other type of good hard stones. The stones shall be obtained only from the approved quarry and shall be hard, sound, durable and free from defects like cavities, cracks, sand holes, flaws, injurious veins, patches of loose or soft materials etc. and weathered

portions and other structural defects or imperfections tending to affect their soundness and strength. The stone with round surface shall not be used. The percentage of water absorption shall not be more than 5% of dry weight, when tested in accordance with I.S. 1134-1974. The minimum crushing strength of the stone shall be 200 kg. /Sq. Cm. unless otherwise specified.

16.2 The samples of the stone to be used shall be approved before the work is started.

16.3 The Khanki facing stone shall be dressed by chisel as specified in the item for khanki facing in required shape and size. The face of stone shall be so dressed that the bushing on the exposed ace shall not project by more than 40 mm. from the general wall surface and on face to be plastered it shall not project by more than 19 mm. nor shall it have depressions more than 10 mm. from the average wall surface.

M-17. Laterite Stone:

17.1 Laterite stone shall be obtained from the approved quarry. It shall be compacted in texture, sound, durable and free from soft patches. It shall have a minimum crushing strength of 100 K.G/S.q. Cm. in its dry condition. It shall not absorb water more than 20% of its own weight, when immersed for 24 hours in water. After quarrying the stone shall be allowed to weather for some time before use in work.

17.2 The stone shall be dressed into regular rectangular blocks so that all faces are free from waviness and unevenness, edges true and square.

17.3 Those types of stone in which white clay occur should not be used.

17.4 Special cornerstones should be provided where so directed.

M-18. Mild Steel Bars:

18.1 Mild-steel bars reinforcement for R.C.C. work shall conform to I.S. 432(Part-II) 1966 and shall be tested quality. It shall also comply with the relevant part of I.S. 456-1978.

18.2 All the reinforcement shall be clean and free from dirt, paint, grease, mile scale or loose or thick rust at the time of placing.

18.3 For the purpose of payment, the bar shall be measured correctly up to 100 mm. length and weight payable worked out at the rate specified below:

1.6mm x 0.22 Kg. /Rmt	8. 20mm.2.47 Kg. /Rmt
2.8mm x 0.39 Kg. /Rmt.	9. 22mm.2.98 Kg. /Rmt
3.10mm x 0.62 Kg. /Rmt	10. 25mm. 3.85 Kg. /Rmt
4.12mm x 0.89 Kg. /Rmt	11. 28mm. 4.83 Kg. /Rmt
5.14mm x 1.21 Kg. /Rmt	12. 32mm. 6.31 Kg. /Rmt
6.16mm x 1.58 Kg. /Rmt	13. 36mm.7.99 Kg. /Rmt
7.18mm x 3.00 Kg. /Rmt	14. 40mm9.86 Kg. /Rmt.

M-19. High yield Strength Steel Deformed Bars:

19.1 High yield strength steel deformed bars are either cold twisted or hot rolled, which shall conform to I.S. 1739-1966 and I.S.1139-1966 respectively.

19.2 Other provisions and requirements shall conform to specification NO. M-18 for Mild Steel Bars.

M-20. High Tensile Steel Wire:

20.1 The high-tensile wires for use in prestressed concrete work shall conform to I.S. 2090-1962.

20.2 The tensile strength of the high tensile steel bars shall be as specified in the item. In absence of the given strength, the minimum strength shall be taken as per para 6.1 of I.S. 1785-1962. Testing shall be done as per I.S. requirements.

20.3 The high tensile steel shall be free from loose mill scale, rust oil, grease, or any other harmful matter, Cleaning of steel bars may be carried out by immersion in solvent solution, wire brushing or passing through a pressure box containing carborundum.

20.4 The high tensile wire shall be obtained from manufactures in coil having diameter not less than 350 times the diameter of wire itself so that wire springs back straight back straight on being uncoiled.

M-21. Mild Steel Binding Wire:

21.1. The mild steel wire shall be of 1.63 mm or 1.22 mm. (16 or 18 gauge) diameter and shall conform to I.S. 280-197.

21.2. The use of black wire be permitted for binding reinforcement bars. It shall be free from rust, Oil paint, grease, looser mile scale or any other undesirable coating which may prevent adhesion of cement mortar.

M-22. Structural Steel:

22.1. All structural steel shall conform to I.S. 226-1965. The steel shall be free from the defects mentioned in I.S. 226-1975 and shall have a smooth finish. The material shall have a smooth finish. The material shall be free from loose mile scale, rust pits or other defects affecting strength and durability. Rivet bars shall conform to I.S. 1148-1973.

22.2. When the steel is supplied by the Contractor test certificates of the manufactures shall be obtained according to I.S. 226-1975 and other relevant Indian Standards.

M-23. Galvanized Iron Sheets:

23.1 The galvanized iron sheets shall be plain or corrugated sheets specified in item. The G.I. sheets shall conform it I.S. 217-1977. The sheets shall be undamaged in carriage and handling either by rubbing off of zinc coating or otherwise they shall have clean and bright surface and shall be as directed as per site condition.

23.2 The length and width of the G.I. sheet shall be as directed as per site condition.

M-23 (A) G.I Valleys gutter ridges:

23.A.1. The G.I.ridges and hips shall be plain galvanized sheets, class-3 of the thickness as specified in the item. These shall be 600 mm. in width and properly bent up to shape without damage to the sheets in the process of bending.

23.A.2. Valleys gutters and flashings shall also be galvanized sheet of thickness as specified in item. Valleys shall be 900 mm. Wide overall, and flashing shall be 380 mm. wide overall. They shall be bent to the required shape without damaging the sheet in the process of bending.

M-24. Asbestos Cement Sheets:

24.1. Asbestos cement sheets plain, corrugated or semi corrugated shall conform to I.S. 459-1970.

24.2. Ridges & Hips :

24.2.1 Ridges and hips shall be the same thickness as that of A.C. sheets. The types of ridges are suitable for the type of sheets and locations.

24.2.2 Other accessories to be used in the roof such as flashing pieces, caves filler pieces valley gutters, north light and ventilator curves, barge boards etc. shall be standard manufacture and shall be suitable for the type of sheets and location.

M-25. Mangalore Pattern Roof Tiles:

28.1 The Mangalore pattern tiles shall conform to I.S. 654-1972 for Class AA or Class "A" type as specified in item. Samples of the tiles to be provided shall be got approved by the Engineer-in-charge. Necessary tests shall be carried out as directed.

M-26. Shuttering:

26.1. The shuttering shall be either of widen planking of 30 mm. minimum thickness with or without steel lining roof steel plates stiffened by steel angles. The shuttering shall be supported on battens and beams and props of vertical ballies properly cross braced together so as to make the centering rigid. In places of bully props, brick pillar of adequate section built in mud mortar may be used.

26.2. The form work shall be sufficiently strong and shall have camber, so that it assumes correct shape after deposition of the concrete and shall be able to resist forces caused by vibration of live load of men working over it and other incidental loads associated with it. The shuttering shall have smooth and even surface and its joints shall not permit leakage of cement grout.

26.3. If at any stage of work during or after placing concrete in the structure, the form work sags or bulges out beyond the required shape of the structure, the concrete shall be removed and work redone with fresh concrete and adequately rigid form work. The completion of the work shall be inspected by and got approved by the engineer-in-charge, before the reinforcement bars are placed in position.

26.4. The props shall consist of bullies having 100 mm. minimum diameter measured at mixed length and 80 mm, at thin end and shall be placed as per design requirement. These shall rest squarely on wooden sole plates 40 mm. thick and minimum bearing area if 0-10 sq. m. laid on sufficiently hard base.

26.5. Double wedges shall further be provided between the sole plate and the wooden props so as to facilitate tightening and easing of shuttering without jerking the concrete.

26.6. The timber used in shuttering shall not be so dry as to absorb water from concrete and swell or bulge nor so green or wet as to shrink after erection. The timber shall be properly sawn and planted on the sides and surface coming in contact with concrete. Wooden from work with metal sheet lining or steel plates stiffened by steel angles shall be permitted.

26.7. As far as practicable, clamps shall be used to hold the forms together and avoid nails and spikes being avoided.

26.8. The surface of timber shuttering that would come in contact with concrete shall be well wet and coated with soap solutions before the concrete is done. Alternatively, a coat of raw linseed oil or oil of approved manufacturer may be applied in place of soap solution. In case of steel shuttering either soap solution or raw linseed oil shall be applied after thoroughly cleaning the surface. Under no circumstances shall black or burnt oil be permitted.

26.9. The shuttering for beams and slabs shall have camber of 4 mm. per meter (1 to 250) or as directed by the Engineer-in-charge so as to offset the subsequent deflection. For cantilevers, The camber at free end shall be 1/50 of the projected length or as directed by the Engineer-in-charge.

M-27. Expansion joints-pre-moulded filter:

27.1 The item provides for expansion joints in R.C.C frame structures for internal joints, as well as exposed joints, with the use of pre moulded bituminous joint filler.

27.2 Pre moulded bituminous joint filler, i.e. performed strip of expansion joint filler shall not get deformed or broken by twisting, bending or other handling when exposed to atmospheric condition. Pieces of joint filler that have been damaged shall be rejected.

27.3 Thickness of the pre-moulded joint filler shall otherwise be specified.

27.4 Pre moulded bituminous joint filler shall conform to I.S. 1838-1961.

M-28 Expansion joints-Copper strips & hold fasts:

28.1 The item provides for expansion joints in R.C.C frame structure for internal joints as well as for exposed joints with the use of necessary copper strip and hold fasts.

28.2 The copper sheet shall be 1.25 mm. thick and 1.25 mm. width when the 'U' shape in middle. Copper strips shall have held fast of 3 mm. diameter copper rod fixed to the plate soldered on strip at intervals of about 30 cm. or as shown in the drawing or as directed. The width of each flange (horizontal side) of the copper plate to be embedded in the concrete work shall be 25 mm. Depth of 'U' to be provided in the expansion joint, in the copper plate shall be of 25 mm.

M-29. Teak wood:

29.1 The teak wood shall be of good quality as required for the item to be executed. When the kind of wood is not specifically mentioned, good Indian teak wood as approved shall be used.

29.2 Teak wood shall generally be free from large, loose, dead or cluster knots, flaws, shakes, warps, twists bends or any other defects. It shall generally be uniform in substance and of straight fibres as far as possible. It shall be free from rot, decay, harmful fungi and other defects of harmful nature which will affect the strength durability of its usefulness for the purpose for which it is required. The colour shall be uniform as far as possible. Any effort like painting, using any adhesive or resins materials made to hide the defects shall render the pieces liable to rejection by the Engineer-in-charge.

29.3 All scantlings, planks etc. shall be sawn in straight lines and planes in the direction of grains and of uniform thickness.

29.4 The tolerances in the dimensions shall be allowed at the rate of 1.5 m.m. per face to be planed.

29.5 **First class teak wood: 29.5.1.** First class teak wood shall have no individual hard and sound knots, more than 6 sq. cm. size and the aggregate area of such knots shall not be more than 1% of area of piece. The timber shall be closed grained.

29.6 **Second Class Teak Wood: 29.6.1.** No individual hard and sound knots shall be more than 15 Sq. cms. in size and aggregate area of such knots shall not-exceed 2% of the area of piece.

M-29. (A) Non-teak wood:

The non-teak wood shall be chemically treated, seasoned as per IS Specifications and of good quality. The type of wood shall be approved before collecting the same on site. Fabrication of wooden members shall be started only after approval.

For this purpose, wood of Bio, Kalali, Siras, Behda, Jamun, and Sisoo will be used for door frames whereas only Kalali, Siras, Halda, Kalam etc. will be permitted for shutters after proper seasoning and chemical treatment.

The non-teak wood shall be free from large, loose, dead cluster knots, flows, shakes warps bends or any other defect. It shall be uniform in substance and of straight fibers as far as possible. It shall be free rots, decay, harmful fungi and other defects of nature which affect strength, durability or its usefulness for the purpose for which it is required. The colour of wood should be uniform as far as possible. The scantlings plank etc. shall be sawn in straight lines and planes in the direction of grain and uniform thickness.

The department will use the Agency to produce certificates from forest Department in event of Disputes and the decision of the Department shall be final and binding to the contractor. The tolerance in the dimension shall be allowed as 1.5 mm. per face to be planned.

M-30. Wooden flush door shutters (solid core):

30.1 The solid core type flush door shutters shall be decorative or non-decorative as specified in the drawing. The size and thickness of the shutter shall be as specified in drawings or as directed. The timber species for core shall be used as per I.S. 2202- (Part-I) 1980. The timber shall be free from decay and insect attack. Knots and knot holes are less than half the width of cross-section of the members in which they occur may be permitted. Pitch pockets, Pitch streaks and harmless pin holes shall be permissible except in the exposed edges of the core members. The commercial Plywood cross-bands shall conform to I.S. 303-1275.

30.2 The face panel of the shutters shall be formed by gluing by the hot press process on both faces of the core with either plywood or cross-bands and face veneers. The hopping rebating opening of glazing, Venetian etc. shall be provided if specified in the drawing.

30.3 All edges of the door shutters shall be square. The shutters shall be free twist or warp in its plane. Both faces of the shutters shall be sand papered to smooth even texture.

30.4 The shutters shall be tested for

(1) End immersion test: The test shall be carried out as per I.S. 2202 (part-I) 1980. There shall be no delamination at the end of the test.

(2) Knife test: The face panel, when tested in accordance with I.S. 1659-1979, shall pass the test.

(3) Glue adhesion Test: The flush door shall be tested for glue adhesive test in accordance with I.S. 2202 (Part-I) 1980. The shutters shall be considered to have passed the test if no delamination occurs in the glue lines in the plywood and if no single delamination more than 80 mm. in length and more than 3 mm. in depth has occurred in the assembly glue lines between the plywood face and the style and rail. Delamination at the corner shall be measured continuously around the corner. Delamination at the knots, knots holes and other permissible wood defects shall not be considered in assessing the sample.

30.5 The tolerance in size of solid core type flush door shall be as below:
In Normal thickness + 1.2 mm. In Normal height + 3 mm.

30.6 The thick of the shutters shall be uniform throughout with a permissible variation of not more than 0.8 mm. when measured at any two points.

M-31. Aluminum doors, Windows, Ventilators.

31.1 Aluminum alloy used in the manufacture of extruded window sections shall conform to I.S. designation HEA-WP of I.S. :733-1975 and also to I.S. Designation WVG-WP of I.S. 1285-1975. The Section shall be as specified in the drawing and design. The fabrication shall be done as directed.

31.2 The hinges shall be cast or extruded aluminum hinges of same type as in windows but of large size.

31.3 The hinges shall normally be of 50 mm. projecting type. Non-projecting types of hinges may also be used if directed. The handles of the door shall be specified in the drawing and design. The fabrication shall be done as directed.

M-32. Rolling Shutters:

1 The rolling shutter shall conform to I.S. 6248-1979. Rolling shutters shall be supplied of specified types with accessories. The size of the rolling shutters shall be specified in the drawings. The shutters shall be constructed with interlocking lath sections formed from cold rolled steel strips not less than 0.9 mm. thick and 80 mm. wide for shutters up to 3.5 mm., width not less than 1.25 mm. thick and 80 mm. wide for shutters 3.5 mm in width and above unless otherwise specified.

2 Guide channels shall be of mild steel deep channel section and of rolled pressed or built up (fabricated) jointures construction. The thickness of sheet used shall not be less than 3.15 mm.

3 Hood covers shall be made of M.S. Sheets not less than 0.92 mm. thickness for shutters having width 3.5 Meter and above the thickness of M.S. Sheet for the hood cover shall be not less than 1.25 mm.

4 The spring shall be of the best quality and shall be manufactured from tested high tensile spring steel wire or strip of adequate strength to balance the shutters in all positions. The spring pipe shaft etc. shall be supported on strong M.S. or malleable C.I. brackets. The brackets shall be fixed on or under the lintel as specified with raw plugs and screws bolts etc.

5 The rolling shutters shall be of self-rolling type up to 8 Sq.m. clear area without ball bearing and p to 12 Sq.m. clear area with ball bearing. If the rolling shutters are larger, then gear operated type shutters shall be used.

6 The locking arrangement shall be provided at the bottom of the shutter at both ends. The shutters shall be opened from outside.

7 The shutters shall be completed with door suspension shafts, locking arrangements pulling hooks, handles and other accessories.

M-33. Collapsible Steel Gate:

33.1 The collapsible steel gate shall be in one or two leaves and size as per approved drawings or as specified. The gate shall be fabricated from best- quality mild steel channels, flats etc. Either steel pulleys or ball bearings shall be provided in every double channel. Unless otherwise specified the particulars of collapsible gate shall be as under:

(a) Pickets: These shall be of 20 mm. M.S., channels of heavy sections unless otherwise shown on drawings. The distance from center to center of pickets shall be 12 cms. with an opening of 10 CMS.

(b) Pivoted M.S. flats shall be 20 mm x 6 mm.

(c) Top and bottom guides shall be from tee or flat iron of approved size.

(d) The fittings like stoppers, fixing hold fasts, locking cleats, brass handles and cast-iron rollers shall be of approved design and size.

M-34. Welded Steel Wire Fabric:

34.1. Welded steel wire fabric for general purpose shall be manufactures from cold drawn steel wire “as drawn” or galvanized steel conforming to I.S. 226-1975 with longitudinal and transverse wire securw4ely connected at every intersection by a process of electrical resistance welding and conforming to I.S. 4948-1974. It shall be fabricated

and finished in workmanlike manner and shall be free from injurious defects and shall be rust proof. The type of mesh shall be oblong or square as directed. The mesh sizes and size of wire for square as well as oblong welded steel wire fabric shall be as directed. The steel wire fabric in panels shall be in one whole piece in each panel as far as stock size permits.

M-35. Expanded Metal Sheets:

35.1. The expanded metal sheets shall be free from flaws, joints, broken strands, laminations and other harmful surface Expanded metal steel sheet shall conform to I.S. 412-1975, Except that blank sheets need not be with guaranteed mechanical properties. The size of the diamond mesh of expended metal and dimensions of strands (width and thickness) shall be as specified. The tolerance in nominal weight of expended metal sheets shall be of + 10 percent.

35.2. Expanded metal in panels shall be in one whole piece panel each as far as stock size permit. The expanded metal sheets shall be coated with suitable protective coating to prevent corrosion.

M-36. Mild Steel Wire (Wire Gauze Jali):

36.1 Mild steel wire may be galvanized, as indicated All finished steel wires shall be well cleanly drawn to the dimensions and size of wire as specified in item. The wire shall be sound, free from splits, surface flaws, rough jagged and imperfect edges and other harmful surface defects and shall conform to I.S. 280-1978.

M-37. Plywood:

37.1 The plywood for general purposes shall conform I.S. 303-1975. Plywood is made by cementing together thin boards or sheets of wood into panels. There are always an odd number of layers 3,5,7,9 ply etc. The plies are placed so that the grain of each layer is right angle to the grain in the adjacent layer.

37.2 The Chief advantages of plywood over a signal board of the same thickness is the more uniform strength of the plywood, along the length and width of the plywood and grater resistance to cracking and splitting with change in moisture content.

37.3 Usually, synthetic resins are used for gluing, phenolic resins are usually cured in a hot press which compresses and simultaneously heats the piles between hot plates which maintain a temperature of 90 degrees C. to 140 degrees C. and a pressure of 11 to 14 kg/sq.cm. on the woods. The heating time may be anything from 2 to 69 minutes depending upon thickness.

37.4 When water glue are used, the wood absorbs so much water that the finished plywood must be dried carefully. When synthetic resins are used as adhesive finished by plywood, they must be exposed to an atmosphere of controlled humidity until the proper amount of moisture has been absorbed.

37.5 According to I.S. 303-1975 the plywood for general purpose shall be of three grades **BWR, WWR** and **CWR,** depending upon the adhesives used for bonding and veneers, and it will be further classified into six types namely AA,AB,AC,BB,BC and CC based on the quality of the two faces, each face being of three kinds namely, A,B and C, After pressing, the finished plywood should be reconditioned to a moisture content not less than 8 percent and not more than 16 percent.

37.6 Thickness of Plywood Boards:

TABLE

Board	Thickness	Board	Thickness	Board	Thickness	Board	Thickness
3 ply	3 mm.	5 ply	5 mm.	7 ply.	9 mm.	9 ply.	16 mm.
	4 mm.		6 mm.		13 mm.		19 mm.
	5 mm.		8 mm.		16 mm.	11 ply.	19 mm.
	6 mm.		9 mm.	9 ply.	13 mm.		22 mm.
							25 mm.

M-38. Glass:

38.1 All glass shall be of the best quality free from specks, bubbles, smoke, veins, air holes, blisters and other defects. The king of glass to be used shall be mentioned in the item or specification or in the special provisions or as shown in detailed drawings. The thickness of glass panes shall be uniform. The specifications or different kinds of glass shall be as below.

38.2 Sheet Glass:

38.2.1 In absence of any specified thickness or weight in the item or detailed specifications of the item of work, sheet glass shall be weighing 7.5 Kg/Sq.m. for panes up to 600 mm x 600 mm.

38.2.2 For panes larger than 600 mm. x 600 mm. and up to 800 m. x 800 mm. the glass weighing not less than 8.75 Kg/Sq.m. shall be used. For bigger panes up to 900 mm. x 900 mm. glass weighing not less than 11.25 Kg/Sq.m. shall be used.

38.2.3 Sheet glass shall be patent flattened glass of the best quality and for glazing and framing purposes shall conform to I.S.: 1761-1960. Sheet glass of the specified colors shall be used, if so, shown on detailed drawings or so specified. For important buildings and for panes with any dimension over 900 mm. plate glass of specified thickness shall be used.

38.3. Plate Glass. 38.3.1. When plate glass is specified, it shall be 'Polished patent plate glass' of best quality. It shall have both the surface ground flat and parallel and polished to obtain clear undisturbed vision and reflection. The plate glass shall be of the thickness mentioned in the item or as shown in the detailed drawing or as specified. In absence of any specified thickness and type of glass shall be as per details on drawings or as specified or as directed.

38.4 Obscured Glass: 38.4.1. This type of glass transmits light so that vision is Partially or almost completely obscured. Glass shall be plain rolled, figured, ribbed or fluted or frosted glass as may be specified as required. The thickness and type of glass shall be as per details on drawings or as specified or as directed.

38.5. Wired Glass: 38.5.1 Glass shall be with wire netting embedded in a sheet of plate glass electrically welded 13 mm. Georgian square mesh may be used. The thickness of glass shall not be less than 6 mm. Wired glass shall be of type and thickness as specified.

M-39. Acrylic Sheets:

39.1. Acrylic sheets be of thickness as specified in the item and of a specified shape and size as the case may be. Panels may be flat or curved. It should be light in weight. It shall be colorless or coloured or opaque as specified in the item. Colorless sheets shall be as transparent as the finest optical glass. Its light transmission rate shall be about 95%. Transparency shall not be affected by sheets of larger thickness. It shall be extremely resistant to sunlight, weather and low temperatures. It shall not show any significant yellowing or change in physical properties or loss of light transmission over a longer period of use. The sheet shall be impact resistant also. Sheets should be available in a complete range of standard transparent, translucent and opaque colors. Sheets shall be

of such quality that they can be cut, bent and joined as desired. The solution for the joints shall be used as per the requirement of the manufacturer.

M-40. Particle board:

40.1. The particle boards used for face panels shall be of the best quality free from any defects. The particle boards shall be made with phenol aldehyde adhesive. The particle boards shall conform to I.S. 3087-1965. "Specification for wood particle board for general purpose". The size and the thickness shall be as indicated.

M-41. Expanded polystyrene of framed stopper slabs:

41.1 The expanded polystyrene ceiling boards and tiles shall be approved make and shall be of size, thickness, finish and colour as indicated. It shall be of high density and suitable for use as insulating material. The insulating material shall be like slab of Thermocol etc.

M-42. Resin bonded fiber glass:

42.1 The resin bonded fiber glass tiles, or rolls shall be of approved make and shall be of sizes, thickness and finish as indicated.

42.2. For the test of Mineral wool thermal insulation Blanket I.S.: 3144?1965 shall be followed.

42.3. Insulation wool blanket shall be with following coverings on one or both sides as indicated.

(1) Bituminized hessain Kraft paper for keeping out dust.

(2) Hessian cloth or Kraft paper for keeping out dust.

(3) G.I. wire netting, suitable for the surface to be plastered over.

M-43. Fixtures and fastenings:

43.1. General

43.1.1 The fixtures and fastenings, that is, butt, hinges, tee and strap hinges sliding door bolts, tower bolts, door latch, bathroom latch, handles, door stoppers, casement window fasteners and ventilators catch shall be made of the metal as specified in the item or its specifications.

43.1.2 They shall be of iron, brass, aluminum, chromium plated iron chromium plated brass, copper oxidized iron, copper oxidized brass or anodized aluminum as specified.

43.1.3 The fixtures shall be heavy, Medium or light type. The fixtures and fastenings shall be finished smoothly and shall be such as will ensure ease of operation.

43.1.4 The samples of fixtures and fastenings shall be approved as regards quality and shape before providing them in position.

43.1.5 Brass and anodized aluminum fixtures and fastenings shall be bright finished.

43.2. Holdfasts:

43.2.1. Holdfasts shall be made from mild steel flat 30 cm. length and one of the holdfasts shall be bent at right angle and two nos. of 6 mm. diameter holes shall be made in it for fixing it to the frame with screws. At the other end. The holdfast shall be forked and bent at right angles in opposite directions.

43.3. Butt hinges:

43.3.1. Railway standard heavy type butt hinges shall be used when so specified.

43.3.2. The strap hinges shall be manufactured from M. S. Sheet.

43.4 Siding door bold (AL drops): 43 The AL drops as specified in the item shall be used and shall be got be got approved.

43.5 Tower bolts (Barrel Type):43.5.1: Tower bolts as specified in the item shall be used as shall be used and shall be got approved.

43.6 Door Latch:**43.7.1** The size of door latch shall be taken as the length of latch.

43.7 Bathroom Latch :43.5.1 Bathroom latch shall be similar to tower bolt.

43.8 Handle: The size of the handles shall be determined by the inside grip length of the handles. Handles shall have a base plate of length 50 mm more than the size of the handle.

43.9 Door Stopper: 43.9.1 door stoppers shall be either floor door stopper type or door catch type floor stopper shall be of overall size as specified as shall have rubber cushion.

43.10 Door Catch :43.10.1 Door catch shall be fixed as height of about 900 mm from the floor level so that one part of the catch is fitted on the inside of the shutter and the other part is fixed in the wall with necessary wooden plug arrangements for appropriate fixate. The catch shall be fixed 20 mimesed the face of the door for easy operation of catch.

43.11 Wooden Door stops with highs:

43.11.1wooden doors stop of size 100mm X 60 mm X 40 mm shall be fixed on the door frame with a height of 75 mm size at high of 900 mm from the floor level the wooden doorstop shall be provided with 3 coats of approve oil paint.

43.12 Case meant window fastener: Casement window fastener for single leaf window shutter shall be left or right handled as directed.

43.13 Casement stays (straight peg stay):

43.13.1 The stays shall be made from a channel section having three holes at appropriate position so that the window can be opened either fully or partially as directed as directed. size of the stay shall be 250 mm to 300 mm as directed.

43.14 Ventilators catch:

43.14.1 The pattern and shape of the catch shall be as approved.

43.15 Pivot:

43.15.1 The base and socket plate shall be made from minimum 3 mm thick plate and projected pivot shall not be less than 12 mm length and shall be firmly riveted to the base plate in case of brass pivot.

M-44. Paints:

44.1 (A) Oil Paints:

44.1.1. Oil Paints shall be of the specified colour and shade, and as approved. The ready mixed paints shall only be used. However, if ready mixed paint or specific shade or tint is not available, white ready mixed paint with approved stainer will be allowed. In such a case, the contractor shall ensure that the shade of the paint so allowed shall be uniform.

44.1.2. All the paints shall meet the following general requirements:

(i) Paint shall not show excessive setting in a freshly opened full can and shall easily be redispersed with a paddle to a smooth homogeneous state. The paint shall show no curing, levering, caking or colour separation and shall be free from lumps and skins.

(ii) The paint as received shall brush easily, possess good levelling properties and show no running or sagging tendencies.

(iii) The paint shall not skin within 48 hours in three quarters filled with closed container.

(iv) The paint shall dry to a smooth uniform finish free from roughness, grit, unevenness and other imperfections.

44.1.3. Ready mixed paint shall be used exactly as received from the manufacturers and generally according to their instructions and without any admixtures whatsoever.

(B) Enamel Paints:

44.2.1. Enamel paint shall satisfy in general requirements as mentioned in specification of oil paints. Enamel paint shall conform to I.S. 2933-1975.

M-45 French polish:

45.1. The French polish of requirement and shape shall be prepared with the below mentioned ingredients and other necessary materials:

(I) Denatured spirit of approved quality (ii) Chandras (iii) Shellac (iv) Pigment.

45.2. The French polish so prepared shall conform to I.S.: 348-1968.

M-46 Marble chips for marble mosaic terrazzo:

46.1. The marble chips shall be of approved quality and shades. It shall be hard, sound, dense and homogenous in texture with crystalline and coarse grains. It shall be uniform in colour and free from stains, cracks, decay and weather.

46.2. The size of various colors of marble chips of approved quality and colors only as per grading as decided by the Engineer-in-charge shall be used for marble mosaic tiles or works.

46.3. The marble chips shall be machine crushed. They shall be free from foreign matters, dust etc. Except as above, the chips shall conform to I.S. : 2114-1962.

M-47. Flooring Tiles:

47.1. (A) Plain Cement tiles:

47.1.1. The plain cement tiles shall be general purpose type. These are the tiles in the manufacturer of which no pigments are used Cement used in the manufacturer of tiles shall be as per Indian Standards.

47.1.2. The tiles shall be manufactured from a mixture of cement and natural aggregates by pressure process. During manufacture, the tiles shall be subjected to a pressure of not less than 140 Kg/Sq. Cm. The proportion of cement to aggregate in the backing of the tiles shall be not less than 1:3 by weight. The wearing face through the tiles are of plain cement, shall be provided with stone chips of 1 to 2 mm. Size. The proportions of cement to the marble chips aggregate in the wearing layer of the tiles shall be three parts of cement to one-part chips by weight. The minimum thickness of the wearing layer shall be 3 mm. The colour and texture of the layer shall be uniform throughout its face and thickness. On removal from mould, the tiles shall be kept in moist conditions continuously for at least seven days and subsequently, if necessary, for such long period as would ensure their conformity to requirements of I.S.: 1237-1980 regarding strength resistance to wear and water absorption.

47.1.3. The wearing face of the tiles shall be plain, free from projections, depressions and cracks and shall be reasonably parallel to the back face of the title. All angles shall be right, and all edges shall be sharp and true.

47.1.4. The size of tiles shall generally be square shape 24.85 Cm. x 24.85 Cm. or 25 Cm. x25 Cm. The thickness of tiles shall be 20 mm.

47.1.5. Tolerance of length and breadth shall be plus or minus one millimeter, Tolerance or thickness shall be plus 5 mm.

47.1.6. The tiles shall satisfy the tests as regards transverse strength, resistance to wear and water absorption as per I.S.:1237-1980.

47.2. (B) Plain Coloured Tiles:

47.2.1. These tiles shall have the same specification as per plain cement tiles as per (A) above except that they shall have a plain wearing surface where pigments are used. They shall conform to I.S. 1237-1980.

47.2.2. The pigment used for coloring cement shall not exceed 10 percent by the weight of cement used in the mix. The pigments, synthetic or otherwise, used for coloring tiles shall have permanent colour and shall not contain materials detrimental to concrete.

47.2.3. The colour of the tiles shall be specified in the item or as directed.

47.3. (C) Marble mosaic tiles:

47.3.1. These tiles have the same specifications as per plain cement tiles except for the requirements as stated below:

47.3.2. The marble mosaic tiles shall conform to I.S. 1237-1980. The wearing face of the tiles shall be mechanical ground and filled. The wearing of tiles shall be free from projections, depressions and cracks and shall be reasonably parallel to the back face of the tiles. All angles shall be right angles, and all edges shall be sharp and true.

47.3.3. Chips used in the tiles be from smallest up to 20 mm. size. The minimum thickness of wearing layer of tiles shall of 6 mm. For the pattern of chips to be used on the wearing face, a few samples with or without their full-size photographs as directed shall be presented to the Engineer-in-charge for approval.

47.3.4. Any particular samples, if found suitable, shall be approved by the Engineer-in-charge, or he may ask for a few more samples to be prepared, indicating roughly the particular sized chips to be more or less in the samples presented. The samples have to be made by the contractor till a suitable sample is finally approved for use in the work.

The Contractor shall ensure that the tiles supplied for the work shall be in conformity with the approved sample only, in terms of its dimensions, thickness of backing layer and wearing surface, materials, ingredients, colour shade, chips, distribution etc. required.

47.3.5. The tiles shall be prepared from cement conforming to Indian Standards or coloured Portland cement generally depending upon the colour of tiles to be used or as directed.

47.4. (D) Chequered Tiles:

47.4.1. Chequered tiles shall be plain cement tiles or marble mosaic tiles. The former shall have the same specification as per (A) above and the letter as per marble mosaic tiles as per (C) except as mentioned below :

47.4.2. The tiles shall be of nominal size of 250 mm. x 250 mm. or as specified. The center-to-center distance of chequered shall not be less than 25 mm. and not more than 50 mm. The overall thickness of the tile shall be 22 mm.

47.4.3. The grooves in the chequered shall be uniform and straight. The depth of the grooves shall not be less than 3 mm. The chequered shall be plain, coloured or mosaic as specified. The thickness of the upper layer measured from the top of the chequered shall not be less than 6 mm. The tiles shall be given the first grinding with machine before delivery to site.

47.4.4. Tiles shall conform to relevant I.S. 1237-1980.

47.5 (E) Chequered Tiles for Staircases:

47.5.1. The requirements of these tiles shall be the same as chequered as per (D) above except in following respects.

(1) The length of a tile including nose shall be 330 mm.

(2) The minimum thickness shall be 28 mm.

(3) The noise should have also the same wearing layer as at the top.
(4) The nosing edge shall be rounded.
(5) The front portion of the tile for a minimum length of 75 mm. from and including the nosing shall grooves running parallel to noisily and at center not exceeding 25 mm. Beyond that the tiles shall have normal chequered pattern.

M-48. Rough Kotah Stone:

48.1. The kotah stones shall be hard, even, sound, and regular in shape and generally be green. Brown colour stones shall not be allowed for use. They shall be without any soft veins, cracks or flows.

48.2. The size of the stones to be used for flooring shall be of size 600 mm x 600 mm and/or size 600 mm x 450 mm, as directed. However smaller sizes will be allowed to be used to the extent of maintaining the required pattern. Thickness shall be as specified.

48.3. Tolerance of minus 30 mm. on account of chisel dressing of edges shall be permitted for length as well as breadth. Tolerance in thickness shall be + 3 mm.

48.4. The edges of stones shall be truly chiseled and tables rubbed with coarse sand before paving. All angles and edges of the stone shall be true, Square and free from chipping and the surface shall be true and plain.

48.5. When machine cut edges are specified, the exposed edges and the edges at joints shall be machine cut. The thickness of the exposed machine cut edges shall be uniform.

M-49. Polished Kotah Stones

49.1. Polished kotah stone shall have same specifications as per rough kotah stone except as mentioned below:

49.2. The stones shall have machine polished smooth surface. When brought on site, the stones shall be single polished or double polished depending upon its use. The stones for paving shall generally be single polished. The stones to be used for dedo, skirting, platforms, sink, veneering, sills, steps, etc. Where machine polishing after the stones are fixed in situ is not possible, it should be double polished.

M-50. Dholpur Stone Slab:

50.1. The Dholpur stone slab shall be of the best quality as approved by the Engineer-in-charge The stone slab shall be even, sound and durable, regular in shape and of uniform colour.

50.2. The size of the stone shall be specified in the item or detailed drawings or as approved by the Engineer-in-charge. The thickness of the stone shall be as specified in the item of work with the permissible tolerance of plus or minus 2 mm. The provisions in respect of polishing as for polished Kotah stone shall apply to polished Dholpur stone also. All angles and edges of the face of the stone slab shall be fine chiseled or polished as specified in the item of work and all the four edges shall be machine cut. All angles and edges of the stone slab shall be true and plane.

50.3. The sample of stone shall be got approved from the Engineer-in-charge for shade and tint for a particular work. It shall be ensured that stones to be used in a particular work shall not differ much in shade or tint from the approved sample.

M-51. Marble Slab:

51.1. The marble slab shall be white or of another colour and of best quality as approved by the Engineer-in-charge

51.2. Slabs shall be hard, uniform and homogeneous in texture. They shall have even crystalline grain and free from defects and cracks. The surface shall be machine

polished to an even and perfectly plant surface and edges machine cut true and square. The rear face shall be rough to provide key for the mortar.

51.3. Marble slabs with natural veins, if selected shall have to be laid as per the pattern given by the Engineer-in-charge. The size of the slab shall be a minimum of 450mm x 450mm. and preferably 300 mm x 600 mm. However, smaller sizes will be allowed to be used to maintain the required pattern.

51.4. The slab shall not be thinner than the specified thickness at its thinnest part. A few specimens of the finished slab to be used shall be deposited by the Contractor in the office for reference.

51.5. Except as above, the marble slabs shall conform to I.S. 1130-1969.

M-52 Granite Stone Slab:

52.1 Granite shall be of approved colour and quality. The stone shall be hard, even, sound regular in shape and generally uniform in colour. It shall be without any soft veins, cracks of flow.

52.2 The thickness of the stone shall be as specified in items.

52.3 All exposed faces shall be double polished to tender truly smooth and the even reflecting surface. The exposed edges and corners shall be rounded off as directed. The exposed edges shall be machine cut and shall have uniform thickness.

M-53 P.V.C. Flooring:

53.1 P.V.C sheets for P.V.C. floor covering shall be homogenous flexible type, conforming to I.S. 3452-1966. The P.V.C covering shall neither develop any toxic effect while put to use nor shall give off any disagreeable order.

53.2 The thickness of flexible type covering tiles shall be as specified in the description of the item.

53.3 The flexible type shall be backed with Hussein or other woven fabric. The following tolerances shall be applicable on the nominal dimension of the sheet rolls or tiles :

(a) Thickness + 0.15 mm

(b) Length or Width:

1. 300 mm. square tiles+ 0.20 mm.
2. 600 mm. square tiles+ 0.40 mm.
3. 9.00 mm. square tiles+0.30 mm.
4. Sheets and rolls+0.10 percent

53.4 Adhesive:

53.4.1 The adhesive for PVC flooring shall be of the type and recommended by the manufacturers of PVC sheets/tiles.

M-54. Facing tiles:

54.1. The facing tiles (burnt clay facing bricks) shall be free from cracks, flaws and nodules of free lime. They shall be thoroughly burnt and shall have plane rectangular faces with parallel sides and sharp straight right edged faces. The texture of the finished surface that will be exposed when in place, shall conform to an approved sample consisting not less than four stretcher bricks each representing the texture desired. The facing tiles shall have a pleasing appearance, sufficient resistance to penetration by rain and greater durability than common bricks. The tiles shall conform to I.S. 2691-1972.

54.2. The standard size of facing brick tiles shall be 19 x 9 x 4 cms. The facing brick tiles shall be provided with frog which shall conform to I.S. 1077-1976.

54.3. The permissible tolerance in dimensions specified above shall be as follows:

	Size Tolerance for	
	1st class Brick	2nd class Brick
19 cm.	+ 6 mm.	+ 10 mm.
9 cm.	+3 mm.	+ 7 mm.
4 cm.	+1.5mm	+ 3 mm.

54.4 The tolerance for distortion or war page of face or edges of individual brick from a plane surface and from a straight line respectively shall be as follows:
Facing dimensions Permissible tolerance
Max. below 19 cms. Max. 2.5 mm.
-do- above 19 cm. Max 3.0 mm.

54.5 The average compressive strength obtained as a sample of five tiles when tested in accordance with the procedure laid as per I.S. 1077-1976 shall be not less than 175 Kg. /Sq. Cm. The average compressive strength of any individual bricks shall be not less than 160 Kg/Sq.Cm.

54.6 The average water absorption for five bricks tiles shall not exceed 12 percent of the average weight of brick before testing.
The absorption for each individual brick shall not exceed 25 percent.

54.7 The brick tiles when tested in accordance with I.S. 1077-1976, the rate of efflorescence shall not be more than 'Slightly effloresced.

M-55. White glazed tiles:

55.1 The tiles shall be of the best quality as approved by the Engineer-in-charge. They shall be flat and true to shape. They shall be free from cracks, crazing, spots chipped edges and corners. The glazing shall be of uniform shade.

55.2 The tiles shall be nominal size of 150 mm x 150 mm. unless otherwise specified. The maximum variation from the stated sizes, other than the thickness of tile, shall be plus or minus 1.5 mm. The thickness of tile shall be 6 mm. Except as above the tiles shall conform to I.S. 777-1970.

M-56. Galvanized iron pipes and fittings:

56.1. The galvanized iron pipe shall be of the medium type and of required diameter and shall comply with I.S. 1239-1979. The specified diameter of the pipes shall refer to the inside diameter of the bore, Clamps, screw and all galvanized iron fittings shall be of the standard 'R' or equivalent make.

M-57. Bib cock and stop cock:

57.1 A bib cock is a draw off tap with a horizontal inlet and free outlet. A stop cock is a valve with a suitable means of connection for insertion in a pipeline for controlling or stopping the flow.

57.2 They shall be of screw down type and of brass chromium plated and of diameter as specified in the description of the item. They shall conform to I.S. 781-1977 and they shall be of best Indian make. They shall be polished brightly.

57.3 The minimum finished weight of bib cock and stop cock shall be as given below:

Diameter	Bib cock	Stop cock
8 mm.	0.25 Kg.	0.25 Kg.
15 mm.	0.40 Kg.	0.40 Kg.
10 mm.	0.30 Kg.	0.35 Kg.
20 mm.	0.75 Kg.	0.75 Kg.

M-58. Gun metal wheel valve:

58.1. The gun metal wheel valve be of approved quality. These shall be gun metal fitted with wheel and shall be of gate valve opening full way and of the size as specified. These shall conform to I.S. 778-1971.

M-59. White glazed porcelain wash basin:

59.1. Wash basin shall be of white porcelain first quality best Indian make, and it shall conform it I.S. 2556 (Part-IV) 1972 and I.S. 771-1979.
The size of the wash basin shall be as specified in the item, Wash basin shall be of one-piece construction with continued over-flow arrangements. All internal angles shall be designed so as to facilitate cleaning. The wash basin shall have a single tap hole, or two holes as specified. Each basin shall have a circular waste hole which is either rebated or beveled internally with 65 mm. diameter at top and 10 mm. depth to suit the waste fitting. The necessary stud slot to receive the bracket on the underside of the basin shall be provided. Basin shall have an internal soap holder recess which shall fully drain into the bowl.

59.2. White glazed pedestal of the quality and colour as that of the basin shall be provided where specified in the item. it shall be completely recessed at the back for reception of supply and wash pipe. It shall be capable of supporting the basin rigidly and adequately and shall be so designed as to make the height from floor to top of basin 750mm. to 800 mm. as directed.

M-60. European type water closet/with low level flushing :

60.1. The European type of water closet shall be white glazed porcelain first quality and shall be of wash down type conforming to I.S. 2556-1973 and I.S. 771-1979.

60.2. 'S' trap shall be provided as required with water seal not less than 50 mm. The solid plastic seat and cover shall be of the best Indian make conforming to I.S. 2548-1980. They shall be made of moulded syntactic materials which shall be tough and hard with high resistance to solvents and shall be free from blisters and other surface defects and shall have chromium plated brass hinges and rubber buffer of suitable size.

M-61. Orissa type water closet:

61.1. The specification of Orissa type white glazed water closet of first quality shall conform to I.S. 2556 (Part-III) 1981 and relevant specification of Indian type water closet except that pan will be with the integral squatting pan of size 580 mm x 440 mm. with raised footrest.

M-62. Indian type water closet:

62.1. The Indian type of white glazed water closet of first quality shall be of size as specified in the item and conforming to I.S. 771-1979 and I.S. 2556 (Part-II) 1981. Each pan shall have an integral flushing ring of suitable type with an adequate number of holes alroung as directed to have satisfactory flushing. It should also have an inlet at back or front connecting flush pipe as directed. The inside of the bottom of the pan shall have sufficient slope from the front towards the outlet and the surface shall be uniform and smooth.
Pan shall be provided with 100 mm. diameter 'P' or 'S' traps with approximately 50 mm. water seal and 50 mm. diameter vent horn.

M-62. (A) Footrests:

62-A-1 A pair of white glazed earthenware rectangular footrests of minimum size 250 mm. x 130 mm 20 mm. shall be provided with water closet.

M-63. Glazed Earthen Ware Sink:

63.1. The glazed earthen-ware sink shall be specified size, colour and quality. The sink shall conform to I.S. 771 Part-II-1979, waste coupling of standard pattern with brass chain and rubber plug shall be provided with sink.

63.2. The pipes shall conform to I.S. 1239-Part-I 1973 and I.S. 404-1962 for steel and lead pipes respectively 32 mm. brass waste coupling of standard pattern with brass chain and rubber plug shall be provided with sink.

M-64. Glazed earthen ware Lipped type flat back urinal/corner type urinal:

64.1 The lipped type of urinal shall be flat back or corner type as specified in the item and shall conform to I.S. 771-1979. It shall be of best Indian make and size as specified and approved by the Engineer-in-charge. The flat back or corer type urinal must be 1st quality free from any defects, cracks, etc.

M-65. Low level enamel flushing tank:

65.1. The low-level flushing tank shall be of 15 liters capacity. It shall conform to I.S. 774-1971. The flushing vaster shall be of the best quality and free from any defects. The flushing tank shall have an outlet of 32 mm. diameter. The outlet shall be connected with W.C. Pan by lean pipe or P.V.C. pipe as specified. The flushing tank shall be provided with an inlet and outlet for fixing G.I. inlet pipes and over-flow pipes. The flushing castern shall be provided with chromium plated handle for flushing. The flushing tank shall be provided with brackets of cast iron so that it can be fixed on the wall at a specified height. The brackets shall Conform to I.S. 775-1970.

M-66. Cast iron flushing cistern:

66.1. The cast iron flushing cistern shall be of 15 liters capacity. It shall conform to I.S. 774-1971. The flushing cistern shall be of the best quality free from any defects. The flushing cistern shall have an outlet of 32 mm. diameter. The outlets shall be connected to lead pipes of 32 mm. diameter. The lead pipe shall conform to I.S. 404 (Part-I) 1962. For fixing G.I. inlet pipes and overflow pipes 20 mm. diameter. an inlet and outlet shall be provided. The flushing cistern shall be provided with galvanized iron chain and pull of sufficient length and shall be got approved from the Engineer-in-charge. The cast iron flushing cistern shall be painted with one coat of anticorrosive paint and two coats of paint. The flushing cistern shall be fixed on two C.I. brackets. The C.I. brackets shall conform to I.S. 775-1970.

M-67. Flush cock:

67.1. Half turn flash cock (Heavy Weight) shall be of gun metal chromium plated of diameter as specified in the description of the item. The flush cock shall conform to relevant Indian Standard.

M-68. Cast iron pipes and fittings:

68.1. All soil waster, vent and anti-siphonage pipes and fittings shall conform to I.S. 1729-1964. The pipe shall have spigot, and socket ends with head on spigot end. The pipes and fittings shall be true to shape, smooth, cylindrical, their inner and outlet surfaces being as nearly as practicable concentric. They shall be sound and nicely cast and shall

be free from cracks, laps, pinholes or other imperfections and shall be neatly dressed and carefully fettled.

68.2. The end of pipes and fittings shall be of reasonable square to their axis.

68.3. The sand cast iron pipes shall be of the diameter as specified in the description and shall be in lengths of 1.5 M, 1.8 M. and 2 M. including socket ends of the pipe unless shorter lengths are either specified or required at junctions etc. The pipes and fittings shall be supplied without ears unless specified or directed otherwise.

68.4. Tolerance.

68.4.1. The Standard weights and thickness of pipes shall be as shown in the following table: A tolerance up to minus 10 percent may however be against these standard weights.

Sr. no.	Nominal	Thickness	Overall, Weight of pipe excluding ears		
			1.5 m. long	1.8m. long	2.m. long
1.	75 mm.	50 mm.	12.83 Kg.	16.52 Kg.	18.37 Kg.
2.	100 mm.	5.0 mm.	18.14 Kg.	21.67 Kg.	24.15 Kg.

68.4.2. A tolerance upto minus 15 percent in thickness and 20 mm. in length will be allowed. For fittings, tolerance in lengths shall be plus 15 mm. and minus 10 mm.

68.4.3. The thickness of fittings and their socket and spigot dimensions shall conform to the thickness and dimensions specified for the corresponding sizes of straight pipes. The tolerances in weights and thickness shall be the same as for straight pipes.

M-69. Nahni Trap:

69.1. Nahni trap shall be of cast iron and shall be sound and free from porosity or other defects which affect serviceability The thickness of the base metal shall not be less than 6.5 mm. The surface shall be smooth and free from craze, ships and other flaws or any other kind of defects which affect serviceability. The size of nahni trap shall be as specified and shall be of self-cleaning design.

69.2. The Nahni trap shall be of quality approved by the Engineer-in-charge and shall generally conform to the relevant Indian Standards.

69.3. The Nahni trap provided shall be with deep seal, minimum 50 mm, except at places where trap with deep seal cannot be accommodated. The cover shall be cast iron. The performed cover shall be provided on the trap of appropriate size.

M-70. Gully Trap:

70.1 Gully Trap shall conform to I.S. 651-1980. It shall be sound, free defects such as fire cracks. The glaze of the traps shall be free from crazing. They shall give a sharp clear note when struck with a light hammer. There shall be no broken blisters.

70.2 The size of the gully trap shall be as specified in the item.

70.3 Each gully trap shall have one C.I. gratings of square size corresponding to the dimensions of inlet of gully trap, It will also have a water tight. C.I. cover with frame inside dimensions 300 mm. x 300 mm., cover with frame inside dimensions, 300 mm. 300 mm., the cover weighing not less than 4:53 Kg. and the frame is not less than 2.72 Kg. The grating cover and frame shall be of sound and good casting and shall have truly square machined seating faces.

M-71. Glaze Stone Ware Pipe and Fitting:

71.1. The pipes and fittings shall be of the best quality as approved by the Engineer-in-charge. The pipe shall be of best quality manufactured from stoneware of fire clay, salt glazed thoroughly burnt through the whole thickness, of a close even texture, shall be smooth and perfectly glazed. The pipe shall be capable of withstanding pressure of 1.5 mm.

lead without showing sign of leakage. The thickness of the wall shall not be less than 1/12th of the internal dia. The depth of the socket shall not be less than 38 mm. The socket shall be sufficiently large to allow a joint of 1 mm. around the pipe.

71.2. The pipes shall generally conform to relevant I.S. 651-1980.

M-72. Wall Peg Rail:

72.1. The aluminum wall peg rail shall have three aluminum pegs of approved quality and size. It shall be fixed on teakwood plant of size 450 mm. x 75 mm. x 20 mm. The teakwood shall be French polished, or oil painted as specified.

M-73. G.I. Water Spot:

73.1. The G.I. pipes of 40 mm. Dia shall be of medium quality and specials shall be of 'R' brand or equivalent brand of best approved quality.

73.2. The pipe shall have length as required for the thickness of wall in which it is fixed. and at the outside end tee and bend cut at half the length shall be provided and at other end coupling shall be provided to have better fixing. The waterspout shall be provided as per detailed drawings or as directed.

M-74. Asbestos Cement Pipe (A.C. Pipe):

74.1. The asbestos cement pipe of diameter as specified in the description of the item shall conform to I.S. 1626-1980. Specials like bends, shoes cowls, etc. shall conform to relevant Indian Standards. The interior of pipe shall have a smooth finish, regular surface and regular, internal diameter. The tolerance in all dimensions shall be as per I.S. 1626-Part-I 1980.

M-75. Crydon Ball valve:

75.1. Ball valve of screwed type including polyethylene float and necessary lever etc. shall be of the size as mentioned in the description of item and shall conform to I.S. 1703-1977.

M-76. Bitumen Felt for Water Proofing And Damp Proofing:

76.1 Bitumen felt shall be on the fiber bases and shall be type 2, self-finished grade-2 and shall conform to I.S. 1322-1970.

M-77 Selected Earth:

77.1. The selected earth shall be hat obtained from excavated material or shall have to be brought from outside as indicated in the item. If item does not indicate anything, the selected earth shall have to be brought from outside.

77.2. The selected earth shall be good yellow soil and shall be got approved from the Engineer-in-charge. In no case black cotton soil or similar expansive and suitable soil shall be used. It shall be clean and free of all rubbish and perishable materials, stones or brick bats. The clods shall be broken to a size of 50. mm or less, Contractor shall make his own arrangement at his own cost for land for borrowing selected earth. The stacking of material shall be done as directed by the Engineer-in-charge in such a way as not to interfere with any construction activities and in proper stacks.

77.3. When the excavated material is to be used, only selected stuff got approved form the Engineer-In-Charge shall be used. It shall be stacked separately and shall comply with all the requirements of selected earth mentioned above :

M-78. Barbed Wire:

78.1. The barbed wire shall be of galvanized steel, and it shall generally conform to I.S. 278-1978. The barbed wire shall be type-I whose nominal diameter for line wire shall be 2.5 mm. and point wire 2.24 mm. The nominal distance between two bars shall be 75 mm. Unless otherwise specified in the item. The barbed wire shall be formed by twisting together two-line wires, one containing the barbs. The size of the line and point wires and barb spacings shall be as specified above. The permissible deviation from the nominal diameter of the line wore and point wire shall not exceed + 0.08 mm.

78.2. The barbs shall carry four points shall be formed by twisting two-point wires each two turns, lightly round one line wire, making altogether four complete turns. The barbs shall be so finished that the four points are set and locked at right angles to each other. The barbs shall have a length of not less than 13 mm. and not more than 13 mm. and not more18 MM. The points shall be sharp and cut at an angle not greater than 35 degrees of the axis of the wire forming the barbs.

78.3. The lind and point wire shall be circular section free from scale and other defects and shall be uniformly galvanized. The line wire shall be in continuous length and shall not contain any weld other than those in the rod before it is drawn. The distance between two successive splices shall not be less than 15 meters.

78.4. The lengths per 100 Kg. of barbed wire I.S. type I shall be as under
Nominal 1000 meters Minimum 834 Meter Maximum 1066 Meter.

TECHNICAL SPECIFICATIONS FOR CIVIL ITEMS

Item Specifications for Civil Works

CONSTRUCTION OF RIVERSIDE SAVORIES I.E. BUILDING WITH UNDERGROUND ROAD BETWEEN NEHRU BRIDGE AND ELLISBRIDGE AND CONSTRUCTION OF PUBLIC PLAZA AND UNDERGROUND PARKING FACILITY AT SANSKAR KENDRA - TAGORE HALL CAMPUS CONNECTING RIVERFRONT ON WESTBANK FOR SRFDCL.
(A) A printed Booklet for GENERAL TECHNICAL SPECIFICATION FOR BUILDING WORK (B) A printed Booklet for VOLUME "B1" LIST OF THE APPROVED PRODUCTS SCHEDULE OF RATES (GOVT.OF GUJARAT, ROADS AND BUILDINGS DEPARTMENT, ELECTRICAL WING) (C) A Printed Booklet for TENDER FOR PLUMBING & FIRE PROTECTION WORK for Roads and Building Department Government of Gujarat. (D) A Printed Booklet for TENDER FOR ELECTRICAL & ELV WORK for Roads and Building Department Government of Gujarat. (E) A Printed Booklet for TENDER FOR HVAC WORK for Roads and Building Department Government of Gujarat. (F) A Printed Booklet for TENDER FOR ELEVATOR / LIFT WORK for Roads and Building Department Government of Gujarat.
The above may be referred to in the printed Booklet of PWD which may also be available from Gujarat Book Stores, Sector-21, Gandhinagar - 382 021. Note: 01. The work shall be carried out in accordance with the relevant specifications contained in PWD Handbook Vol. I & II with the correction slips from time or the latest addition. 02. The references as indicated with page Nos. are as per the above referred Booklets

Item No: -1

Clearing and grubbing road land including uprooting rank vegetation grass bushes, Shrubs, sapling and trees girth up to 300 mm removal of stumps of trees cut earlier and disposal of unserviceable materials. (C) By mechanical means in area of light jungle

Jungle Clearence

Jungle clearance shall comprise uprooting of rank vegetation, grass, brushwood, shrubs, stumps, trees and saplings of girth up to 30 cm measured at a height of one meter above the ground level. Where only clearance of grass is involved, it shall be measured and paid for separately.

Uprooting of Vegetations

The roots of trees and saplings shall be removed to a depth of 60 cm below ground level or 30 cm below formation level or 15 cm below sub-grade level, whichever is lower. All holes or hollows formed due to removal of roots shall be filled up with earth rammed and levelled. Trees, shrubs, poles, fences, signs, monuments, pipelines, cable etc., within or adjacent to the area which are not required to be disturbed during jungle clearance shall be properly protected by the contractor at his own cost and nothing extra shall be payable.

Stacking and Disposal

All useful materials obtained from clearing and grubbing operation shall be stacked in the manner as directed by the Engineer -in-Charge. Trunks and branches of trees shall be cleared of limbs and tops

and stacked neatly at places indicated by the Engineer-in- Charge. The materials shall be the property of the Government. All unserviceable materials which, in the opinion of the Engineer-in-Charge cannot be used or auctioned shall be removed up to a distance of 50 m outside the periphery of the area under clearance. It shall be ensured by the contractor that unserviceable materials are disposed of in such a manner that there is no likelihood of getting mixed up with the materials meant for construction.

Clearance of Grass
Clearing and grubbing operations involving only the clearance of grass shall be measured and paid for separately and shall include removal of rubbish up to a distance of 50 m outside the periphery of the area under clearance.

Measurements
The length and breadth shall be measured correctly to the nearest cm and area worked out in square metres correctly to two places of decimal.

Rates
The rate includes the cost of all the operations described above.

Item NO: -2

Cutting and felling trees of girth as specified below (measured at a height of 1 m above ground level) including cutting of trunks and branches, removing the roots and stacking of serviceable material and disposal of unserviceable materials within campus at directed place etc. complete all as per specifications and as directed by the Engineer-in-charge
Girth beyond 30 cm, up to and including 60 cm girth.
Girth beyond 60 cm, up to and including 120 cm girth.

Felling
While clearing jungle, growth trees above 30 cm girth (measured at a height of one meter above ground level) to be cut, shall be approved by the Engineer-in-Charge and then marked at site. Felling trees shall include taking out roots up to 60 cm below ground level or 30 cm below formation level or 15 cm below sub-grade level, whichever is lower.

All excavation below general ground level arising out of the removal of trees, stumps etc. shall be filled with suitable material in 20 cm layers and compacted thoroughly so that the surfaces at these points conform to the surrounding area. The trunks and branches of trees shall be cleared of limbs and tops and cut into suitable pieces as directed by the Engineer-in-Charge.

Stacking and Disposal
Wood, branches, twigs of trees and other useful materials shall be the property of the Government. The serviceable materials shall be stacked in the manner as directed by the Engineer-in-Charge up to a lead of 50m.

All unserviceable material, which in the opinion of Engineer-in-Charge cannot be used or auctioned shall be removed from the area and disposed of as per the directions of the Engineer-in-Charge. Care shall be taken to see that unsuitable waste materials are disposed of in such a manner that there is no likelihood of these getting mixed up with the materials meant for construction.

Measurements
Cutting of trees above 30 cm in girth (measured at a height of one metre above level) shall be measured in numbers according to the sizes given below:
(a) Beyond 30 cm girth, up to and including 60cm girth.
(b) Beyond 60 cm girth, up to and including 120 cm girth.
(c) Beyond 120 cm girth, up to and including 240 cm girth.
(d) Above 240 cm girth.

Rate
The rate includes the cost involved in all the operations described above. The contract unit rate for cutting trees above 30 cm in girth shall include removal of stumps as well.

ITEM NO:-3
Demolition and disposal of unserviceable materials with all lead and lift. (I) Cement concrete.

Workmanship:

The demolition shall consist of demolition of one or more parts of the building as specified or shown in the drawings. Demolition implies taking up or down or breaking up. This shall consist of demolishing whole or part of work including all relevant item as specified or shown in the drawings.
The demolition shall always be planned before hand and shall be done in reverse order of the one in which the structure was constructed. This scheme shall be got approved from the Engineer- in-charge before starting the work. This however will not absolve the Contractor from the responsibility of proper and safe demolition.
Necessary dropping, shoring and under pinning shall be provided for the safety of the adjoining work or property, which is to be left intact, before dismantling and demolishing is taken up and the work shall be carried out in such a way that no damages is caused to the adjoining property.
Wherever required, temporary enclosures or partitions shall also be provider. Necessary precautions shall be taken to keep the dust nuisance down as and where necessary.
Dismantling shall be commenced in a systematic manner. All materials which are likely to be damaged by dropping from a height or demolishing roof, masonry etc. shall be carefully dismantled first. The dismantled articles shall be properly stacked as directed.
AH materials obtained from demolition shall be the property o. Government unless otherwise specified and shall be kept in safe custody until handed over to the Engineer-in-charge.
Any serviceable materials, obtained during dismantling or demolition shall be separated out and stacked properly as directed, with all lead and lift. All unserviceable materials, rubbish etc. shall be slacked as directed by the Engineer-in- charge.
On completion of work, the site shall be cleared of all debris rubbish and cleaned as directed.

Mode of measurements & payment:

Measurements of all work except hidden work shall be taken before demolition or dismantling and no allowance for increase in bulk shall be allowed. The demolition of Cement concrete shall be measured under this item. Specification for deduction for voids, openings etc. shall be on same basis as that employed for construction of work.
All work shall be measured in decimal system as fixed in its place subject to the following limits, unless otherwise slated hereinafter:
(a) Dimensions shall be measured to the nearest 0.01 mt.
(b) Area shall be worked out to the nearest 0.01 sq. mt.
(c) Cubical connection shall be worked out to the nearest 0.01 Cu. m.
The rate shall include cost of all labour involved and tools used in demolishing and dismantling including scaffolding. The rate shall also include the charges far separating out and stacking the serviceable materials properly and disposing the unserviceable materials with all lead and lift. The rate also includes for temporary storing for the safety of the portion not required to be pulled down or of adjoining property and providing temporary enclosures or partitions where considered necessary.

The rate shall be for a unit of one cubic meter.

ITEM NO:-4

Dismantling tiled of stone floors laid in mortar including stacking of serviceable materials and disposal of unserviceable materials with all lead and lift.

Workmanship:

The relevant specifications of item No.3 shall be followed except the dismantling of tiled or stone floors laid on mortar shall be done. Dismantling implies carefully taking up or down or these are fixed by nail, screws, bolts etc. these shall be taken out with proper tools.

Mode of measurements & payment

1) The supporting materials such as joints, beams if any etc. shall be measured separately, the relevant specification of item No.3 shall be followed. The rate shall include stacking the unserviceable materials as directed will lead and lift.
2) The rate shall be for a unit of one sq. meter.

ITEM NO:-5

Demolition including stacking of serviceable materials and disposal of unserviceable materials with all lead and lift. (I) R.C.C. work

Workmanship:

The relevant specifications of item No.3 shall be followed except that demolition of R.C.C. work is to be done.

Mode of measurements & payment

1) The relevant specifications of item No.3 shall be followed except that the demolition of reinforced concrete structure. The unserviceable materials shall be disposed of at all leads and lifts. The rate excludes scraping straightening of reinforcement but includes cutting of reinforcement.
2) The rate shall be for a unit of one cubic metre.

Item NO: -6

Dismantling barbed wire in fencing including making rolls and also including dismentling fencing posts including all earth work concrete in base and making good the disturbed ground stacking useful materials as directed and disposing as directed and disposing of the unserviceable materials with all lead and lift.

Workmanship :

The relevant specifications of item No. 3 shall ho followed except that the dismantling of barbed wire fencing shall be carried out.

Mode of measurements & payment:

1) The relevant specifications of item No.3 shall be followed.
2) The rate includes making rolls of dismantled wires and including dismantling fencing posts, concrete work, in case and making good the disturbed ground etc. complete.

3) The serviceable materials shall be stacked as and where directed and the unserviceable materials shall be disposed with all leads and lifts.
4) The rate shall be for a unit of one running meter.

Item No:-7

Demolition of Brick work and stone masonry including stacking of serviceable materilas and disposal of unserviceable materials with all lead and lift.(ii) In Cement Mortar.

Workmanship :

The relevant specifications of item No.3 shall be followed except demolition of brick or stone masonry in cement mortar is to be done

Mode of measurements & payment:

1) The relevant specifications of item No.3 shall be followed. The unserviceable materials shall be stacked as directed by Engineer-in-charge with all leads and lifts.

Item No:-8

Dismantling and stacking within 50 metres lead, fencing posts or struts including all earth work and dismantling of concrete etc. in base of : T' or 'L' iron or pipe

Scarifying gravelled macadam or bitumen macadam surface 6cm to 10cm .depth including stacking useful materials on roadside and disposing off remaining stuff.

Refer Specification from CPWD Specification Vol 1 & Vol 2.

Item No:-9

Dismantling wood work, wrought frame and fixed in frames, trusses including stacking the materials with all lead and lift.

Workmanship :

The relevant specifications of item No.3 shall be followed except the wood work, wrought framed, and fixed in frames, trusses, etc. shall be dismantled.

Mode of measurements & payment:

1) The relevant specifications of item No.3 shall be followed.
2) The materials shall be stacked as and where directed with all lead and lifts,
3) The rate shall be for a unit of one cubic metre.

Item No:-10

Dismentaling steel work including dismembering and stacking the materials with all lead and lifts.

Materials:

The relevant specifications of item No.3 shall be followed except the dismantling of steel work shall be carried out.

Mode of measurements & payment:

1) The relevant specifications of item No.3 shall be followed.
2) The weight of the member shall be computed from standard tables unless the actual weight can be readily determined.

3) Riveted works where rivets are required to be cut, the same shall be carried out under this item and nothing extra shall be paid.
4) In farmed steel gate, the weight of any covering materials or filling such as iron sheets and expanded metal shall be added to the weight of the main articles if such covering is not ordered to be taken out separately.
5) The rate includes stacking the materials as and where directed with all leads and lifts.
6) The rate shall be for a unit of one kg.

Item No:-11

Excavation for foundation up to 1.5 m DEPTH including sorting out and stacking of useful material sand disposing off the excavated stuff up to 50 Meter lead. (A) Loose or soft soil

General:

Any soil which generally yields to the application of pickaxes and shovels, spades, rakes or any such ordinary excavating implement or organic soil, gravel, silt, sand turf loam, clay, peat etc. falls under this category. For materials and workmanship for earthwork and excavation, relevant specifications of IS: 1200 (Part I) and IS: 3764 shall be followed.

The depth of the excavation shall be as per the item description

Clearing the Site:

The site on which the structure is to be built shall be cleared and all obstructions, loose stones, materials and rubbish of all kinds, bush, and wood shall be removed, as directed. The materials so obtained shall be the property of the Client and shall be conveyed and stacked as directed, within 50m lead. The roots of the trees coming in the sides of the trenches shall be cut and coated with hot asphalt.

All types of trees, woods etc. which require prior permission of the Govt. / Forest Authority, before cutting shall be cut after obtaining such permission from them. It shall be the Contractor's responsibility to obtain such permission from the respective authorities.

The rate of site clearance is deemed to be included in the rate of earthwork, for which no extra will be paid.

Setting out: After cleaning the site, the centerlines will be given by the Architect and Engineer-in-charge. The Contractor shall assume full responsibility for alignment, elevation and dimension of each and all parts of the work. Contractor shall supply labours, materials, etc. required for setting out the reference marks and benchmarks made of MS angle iron and embedded in 1:2:4 C.C. They shall maintain the same as long as required and directed.

Excavation:

The excavation in the foundation shall be carried out either manually or by mechanical means, in true line and level and shall have the width and depth, as shown in the drawings or as directed. The Contractor shall do the necessary shoring and strutting or shall provide necessary slopes to a safe angle or steps, as required or directed, at his own cost. No extra payment shall be made for such precautionary measures taken. The bottom of the excavated area shall be leveled both longitudinally and transversely, as directed, by removing excess soil and watering, as required. No earth filling will be allowed for bringing it to level, if by mistake or any other reason, excavation is made deeper or wider than shown on the drawings or as directed. The extra depth or width shall be made up of concrete of the same proportion, as specified for the foundation concrete, at the cost of the Contractor.

The Contractor shall at his own expense and without extra charge make provision of supporting all utility services, lighting the trenches, separating and stacking serviceable materials neatly, shoring, timbering, strutting, bailing out water either sub-soil or rainwater, including pumping at any stage of the work. Trenches shall be kept free of water while masonry or concrete works are in progress and till the Architect and Engineer-in-charge considers it necessary, i.e. till the concrete is sufficiently set.

Disposal of the Excavated Stuff:

The excavated stuff of the selected type shall be used in filling the trenches and plinth or leveling the ground in layers, including ramming and watering etc. complete.

The Contractor shall remove the balance of the excavated quantity from the site of work to a place, as directed, within a lead up to 50m measured from the outer face of the building / work under consideration and for all lift.

The lead is the shortest practical route and not necessarily the route actually taken. The decision of Engineer-In charge shall be final in this regard.

Mode of Measurement and Payment:

The measurement of excavation in trenches for foundation shall be made according to the sections of trenches shown on the drawing or as per sections given by the Architect and Engineer-in-charge. No payment shall be made for surplus excavation made in excess of the above requirements or due to stepping and sloping back as found necessary, on account of conditions of soil and requirements of safety.

The rate shall include clearing the site, surface dressing, making layout of the building, fixing permanent grid points with MS iron posts, embedded in C.C. 1:2:4, placed sufficiently away from the building and establishing benchmarks etc. The rates shall include necessary shoring, timbering and strutting for protection of sides of the excavated trenches and pits, pumping out rain or surface water at any stage of construction so as to keep the trenches/pits dry, to the satisfaction of the Architect / Engineer-in-charge.

The rate shall include leveling and ramming the bottoms of excavations to receive concrete, etc. including trimming to slope wherever necessary etc. complete. The rate shall be for a unit of one Cubic meter.

Item No:-12

Excavation for foundation up to 1.5 m TO 3.0M DEPTH including sorting out and stacking of useful material sand disposing off the excavated stuff upto 50 Meter lead.(A) Loose or soft soil

Workmanship:

1) The relevant specifications of item No.11 shall be followed except that the excavation work shall be carried out in loose or soft soil with lift 1.5 M. to 3.0 M.

Mode of measurement and payment:

1) The relevant specification of item No.11 shall be followed.
2) The excavation work of lift 1.5 M. to 3.0 M. shall be measured under this item.
3) The rate shall be for a unit of one cubic meter.

Item No:- 13

Excavation for foundation for depth from 3.0 m to 5.0 m including sorting out and stacking of useful materials and disposing off the excavated stuff upto 50 Meter lead.(A) Loose or soft soil

Workmanship :

1) The relevant specifications of item No.11 shall be followed except that the excavation work shall be carried out from 3.0 M. to 5.0 M. lift in loose of soft soil.

Mode of measurement and payment:

1) The relevant specifications of item No. 11 shall be followed.
2) The excavation work from 3.0 M. to 5.0 M, lift shall be measured under this item.
3) The rate shall be for a unit of one cubic meter.

Item No:-14

Extra for additional depth more than 5.0 m for excavation for foundation including sorting out and stacking of useful materials and disposing of the excavated stuff upto 50 m lead.(A) Loose or soft soil

Workmanship:

1) The relevant specifications of item No. 11 shall be followed except that the excavation work Shall be carried out from more than 5.0 M. lift in loose or soft soil.

Mode of measurement and payment:

1) The relevant specifications of item No. 11 shall be followed.
2) The rate shall be paid extra over and above the rate of No. 11 for carrying out excavation work for additional depth from 5.0 M. and above.
3) The rate shall be for a unit of one cubic metre per meter**.**

Item No:-15

Extra for additional depth more than 6.0 m for excavation for foundation including sorting out and stacking of useful materials and disposing of the excavated stuff upto 50 m lead.(A) Loose or soft soil

Workmanship:

2) The relevant specifications of item No. 11 shall be followed except that the excavation work Shall be carried out from more than 6.0 M. lift in loose or soft soil.

Mode of measurement and payment:

4) The relevant specifications of item No. 11 shall be followed.
5) The rate shall be paid extra over and above the rate of No. 11 for carrying out excavation work for additional depth from 6.0 M. and above.
6) The rate shall be for a unit of one cubic metre per meter**.**

Item No:-15

Filling available excavated earth (excluding rock) in trenches. plinth, sides of foundations etc. in layers not exceeding 20cm. In depth consolidating each deposited layer by ramming and watering.

Workmanship:
The earth to be used for filling shall be free from salts, organic or other foreign matter. All clouds of earth shall be broken to a size not bigger than 50mm.

As soon as the work in foundation has been completed and measured, the sides of foundation shall be cleared of all debris, brick bats, mortar droppings etc. and filled with earth in layers not exceeding 20cm. Each layer shall be adequately watered, rammed well and consolidated before the succeeding layer is laid. The earth shall be crammed with mechanical rammer of different capacity as per site condition.

The plinth shall be similarly filled with earth in layers not exceeding 20cm, adequately watered and consolidated by ramming with iron rammers/ mechanical rollers. When filling reaches the finished level, the surface shall be flooded with water for at least 24 hours and allowed to dry and then rammed and consolidated.

The finished level of filling shall be kept shaping and gradient, intended to receive any floor finish.

In case of large heavy-duty flooring like factory flooring, the consolidation may be done by power rollers, where so specified or as directed. The extent of consolidation required shall also be as specified or as directed.

The excavated stuff of the selected type only shall be allowed to be used for filling the trenches and plinths. Under no circumstances, black cotton soil shall be used for filling the plinths.

The soil used for backfilling shall have optimum moisture content (OMC).The compaction shall be carried out to achieve Proctor density of 95%. The procedure for OMC and proctor density shall be carried out as per relevant IS codes. The samples for the test shall be as per the relevant IS codes.

Mode of Measurements and Payment:
The payment shall be made for filling in plinth and sides of foundations. No deductions shall be made for shrinkage or voids, if considered as instructed above.

1) The rate includes the cost of mechanical compactions by compactors.
2) The rate shall be for a unit of one m3.
3) Only consolidated measurements of the fill shall be measured and paid for under this item.
4) Foundation filling shall be measured and paid only if the excavation item is without backfilling.

Item No:-16

Carring out plinth treatment to pre or post construction / existing structure by spraying chemical solution for termite control treatment including labour and material consistment with I.S.I specification. Using Chlordene and Chiorpurfiles 20 EC. As Per 6131_paret-II Consentration Weight one percent is recommended i.e one litre 20 EC chemical emulsion with 19 liter give 1 % concrentration inclusive of one litre chemical emulsion appication at the rate of 5 Litre chemical / Sqm of surface is recommended as per I.S and as per directions of Clerk-of-Work. For all levels and leads.

Providing and injecting Chemical emulsions for pre-construction anti-termite & Fungal treatment and

creating continuous chemical barrier under and all around the columns pits, wall trenches, basement excavation, top surface of plinth filling, junctions of wall & floors, along the external perimeter of building, Expansion joints, over the top surface of the consolidated earth on which plinth protection is to be laid, surrounding pipes and conduits etc. complete. in first stage of work, & furniture, & necessary floors in second stage of construction work in accordance with IS: 6313 (Part-II) with using Chlorpyriphos Emulsifiable concentrate 1.00%. (IS.: 8944-1978), Lindens 1.00% (IS.: 632), Imidacloprid 0.075% with relevant IS: code (Rates are Incl. proposed Furniture & Plinth area of the building at ground floor level shall Only be measured.)

Anti –termite specification

Chemicals used during treatment

Imidacloprid 30.5% SC

Chlorpyriphos 2% EC

Providing & injecting emulisifiable concentrate imidacloprid 30.5 SC with (0.075%) concentration chemical emulsion by Avitus India Pest Management Pvt. Ltd. for anti – termite & Fungal treatment & creating chemical barrier under & around the column pits, wall trenches, basement, excavation, top surface of plinth filling junction of wall & floor along the external perimeter of the building expansion joints surrounding of pipes conduits etc., in the first stage of work and using Chlorpyriphos Emulsifiable concentrate 1.00%. (IS.: 8944-1978) for wooden fixed furniture (Wooden frames and doors). Complete plinth area of the building shall be measured in square mtr. (m^2) on the basis of the basement area of the building.

METHOD OF TREATMENT FOR TERMITE CONTROL

AVITUS INDIA PEST MANAGEMENT PVT. LTD. is using a New Generation Insecticide for Termite Control that contains IMIDACLOPRID as active ingredient. It is an appropriate insecticide for the control of Termites in building and premises, which can be used both for PRE-& POST construction treatments.

Mode of Action

We create a non–detectable treated zone that function not as a repellent barrier, but as a “killing field” whose effects may be transmissible to other Termites and leads to eradication of the colony. It acts by interfering with the transmission in the nervous system and resulting in their death.

We are injecting concentrated Chemical Emulsion for Anti – Termite treatment for creating chemical barrier under & around column pits, wall trenches, basement, excavation, top surface of plinth filling junction of wall and floor along external perimeter of the building, expansion joints, surrounding of pipes conduits etc.

PRE-CONSTRUCTION TREATMENT

1. Bottom surface and side pits up to a height of 30cm will be treated 05 (Five) Ltr. Chemical Emulsion per Sq. Mtr. of surface area.
2. Back fill earth in immediate contact with the foundation structure will be treated 7.5 Ltr. per Sq. Mtr. of the vertical surface of substructure of each side.
3. Treatment of RCC foundations: Treatment should start at depth of 50cm below ground level 7.5 Ltr. per Sq. Mtr.

4. Treatment of top surface of plinth filling: The top surface of the earth consolidated within plinths wall shall be treated with Chemical Emulsion 05 (Five) Ltr. per Sq. Mtr. of the surface before the sand bed or sub grade is laid.
5. Soil treatment along the external perimeter of building: Earth along the external walls of the building should be treated at an interval of 15cm and to a depth of 30cm exposing the wall surface. Chemical Emulsion will be poured along the wall 7.5 Ltr. per Sq. Mtr of vertical surface.

POST CONSTRUCTION TREATMENT

The treatment comprises drilling holes at the wall and floor junction level and filling it after pumping in sufficient quantity of chemical.

This ensures a continuous chemical barrier for termites to make an entry and protect the treated structure.

a) Treatment to wall and floor junction:
   Holes of diameter 12mm (1/2" approx.) are drilled at approximately 30cm (12 inches) intervals along the inner junction of wall and floor in the entire premise. Water based chemicals will be injected under pressure into these holes, to create a barrier against termite.
b) Treatment to soil under floor:
   If the subject premises on the ground floor and if cracks are noticed on the floor because of construction joints, expansion joints or shrinkage, the soil below floor needs to be treated. Holes of 12mm (1/2" approx.) dia. 30cm apart will be drilled along the cracks and water-based chemicals will be injected under pressure into these holes.
c) Treatment to wooden fixtures:
   Holes of diameter 12mm (1/2" approx.) will be drilled at the base of wooden works such as window frames; door frames etc. insect in the flooring and chemical will be injected. An oil-based chemical will be sprayed on all the wooden work infected by termites within the premises.
d) Treatment to termite tubes:
   Visible shelter mud tubes will be removed and the infested area treated with Waterbase chemical.
e) All the drilled holes will be sealed and made good using cement In the case Soil Treatment along External Perimeter of a Building is done.

MODE OF MEASUREMENT: -

The rates of the Anti-Termite treatment shall be on the basis of area in sq.mt. Measurements shall be based on the actual plinth area and payment will be made accordingly.

Guarantee:

The treatment against termite infestation shall remain fully effective for a period of not less than ten years from the date of issue of final certificate of completion of the work. If at any time during this period, if any defects in the treatment are revealed on any evidence of infestation in any part of the building or structure is noticed, the Contractor shall have to rectify the defects within fifteen (15) days of receipt of the notice from the Owner / Architects / Consultants. On the Contractor's failure to do so, the Owner / Architects / Consultants may get the same rectified through any other agency at the Contractor's risk and cost and the decision of the Owner / Architects / Consultants. As to the cost payable by the Contractor for the same shall be final and binding on the Contractor.

A Guarantee Bond on appropriately stamped paper(s) shall be given by the Contractor to the Owner In the manner and form as prescribed below.

Form of Guarantee Bond

"I / we . . . . . (Name of Contractor) hereby guarantee that the work will remain unaffected and will not be in any way damaged by termites (white ants) or any other germs of similar type for a period of ten (10) years after completion of the work of anti-termite treatment as per the terms and conditions of the contract and the Contractor hereby indemnifies and agrees to save harmless the Owner, ... from any loss and/or damage that might be caused on account of termites (white ants) and or other similar type of germs and hereby guarantees to make good any loss or damages suffered by the Owner, ...……. and further guarantees to redo the defective work without claiming any extra cost.

This guarantee shall remain in force for the period of ten (10) years from the completion of the work under the contract and it shall remain binding to the Contractor for the said period of ten (10) years.

The deposit in the form of Bank Guarantee at the rate of 5 per cent of the cost of this item from the running and final bills shall be recovered and shall be refunded only after the completion of the guarantee period.

Item No:-17

Providing and laying cement concrete 1:2:4 (1-Cement:2-Coarse sand:4-graded stone aggregates 20mm nominal size) and curing complete excluding cost of formwork in (A) Foundation and Plinth

Materials:

Water shall conform to M-l. Cement shall conform to M-3. Sand shall conform to M-6. Grit shall conform to M-8. Graded stone aggregate 20 mm. nominal size shall conform to M-12.

General:

The concrete mix is not required to be designed by preliminary tests. The proportion of the concrete mix shall be 1: 2:4 (1 cement: 2 coarse sands; 4 graded stone aggregate 10 mm. nominal size) by volume. Concrete work shall have exposed concrete surface or as specified in the item.

The designation ordinary M-100, M-150, M-200, M-250 specified as per. I.S. Corresponding approximately to 1:3: 6, 1: 2: 4, 1:1 1/2:3 and 1:1:2 nominal mix of ordinary concrete by volume respectively.

The ingredients required for ordinary concrete containing one beg of cement of 50 Kg. by weight (0.0342 Cu. M.) for different proportions of mix shall be as under:

Grade of Concrete	Total quantity of dry aggregate by volume per 50Kgs of cement to be taken as the sum of individual volume of fine and coarse aggregates, Maximum	Proportion of fine aggregate to coarse aggregate	Quantity of water per 50 Kgs of cement Maximum
M100(1:3:6)	300 Liters	Generally, 1:2 for fine aggregate	34 Liters

M150(1:2:4)	220 Liters	To coarse aggregate by volume	32 Liters
M200(1:1.5:3)	160 Liters	But subject to and upper limit	30 Liters
M250(1:1:2)	100 Liters	Of 1:1.5 and lower limit 1:3	27 Liters

The water cewment ratios shall not more than those specified in the above table. The cement content of the mix specified in the Table shall be increased if the quantity of water in a mix has to be increased to overcome the difficulties of placement and compaction so that the water-cement-ratio specified in the Table is not exceeded.

Workability of the concrete shall be controlled by maintaining a water-cement-ratio that is bound to give a concrete mix which is just sufficiently wet to be placed and compacted without difficulty with the means available.

The maximum size of coarse aggregate shall be as large as possible within the limits specified but in no case greater than one fourth of the minimum thickness of the member, provided that the concrete can be placed without difficulty so as to surround all reinforcement thoroughly and to fill the comers of the form.

For reinforced concrete work, coarse aggregates having a nominal size of 20 mm. are generally considered satisfactory. For heavily reinforced concrete members as in the case of ribs of main beams, the nominal maximum size of coarse aggregate should usually be restricted to 5 mm. less than the minimum, clear distance between the main bars, or 5 mm. less than the minimum cover to the reinforcement whichever is smaller.

Where the reinforcement is widely spaced as in solid slabs, limitations of size of the aggregate may not be important and the nominal maximum size may sometimes be as great as OF greater than the minimum cover.

Admixture may be used in concrete only with approval of Engineer-in-charge based upon the evidence that with the passage of time, neither the compressive strength of concrete is reduced nor are other requisite qualities of concrete and steel impaired by the use of such admixtures.

Workmanship:

Proportioning: Proportioning shall be done by volume, except cement which shall be measured in terms of bags of 50 Kg. weight. The volume of one such bag being taken as 0.0342 Cu. meter. Boxes of suitable sizes shall be used for measuring sand aggregate. The size of the boxes (internal) shall be 35 cms. x 25 cms. and 40 Cms. deep. While measuring the aggregate and sand, the box shall be filled without shaking ramming or hammering. The proportioning of sand shall be on the basis of its dry volume and in case of damp sand, allowances for bulkage shall be made.

Mixing:

For all work, concrete shall "be mixed in a mechanical mixer which along with other aecessories shall be kept in first class working condition and so maintained throughout the construction. Measured quantity of aggregate, sand, cement required for each batch shall be poured into the drum of the mechanical mixer while it is continuously running. After about half a minute of dry mixing, measured quantity of water required for each batch of concrete mix shall be added gradually and mixing continued for another one and a half minute. Mixing shall be. continued till materials are uniformly distributed and uniform colour of the entire mass is obtained and each individual particle of the coarse aggregate shows complete coating of mortar containing its proportionate amount of cement. In no case shall the

mixing be done for less than 2 minutes after all ingredients have been put into the mixer.

When hand mixing is permitted by the Engineer-in-charge for small jobs or for certain other reasons, it shall be done on the smooth watertight platform large enough to allow efficient turning over the ingredients of concrete before and after adding water. Mixing platform shall be so arranged that no foreign material gets mixed with concrete nor does the mixing water flow out. Cement in required number of bags shall be placed in a uniform layer on top of the measured quantity of fine and coarse aggregate, which shall also be spread in a layer of uniform thickness on the mixing platform. Dry coarse and fine aggregate arid cement shall then be mixed thoroughly by turning over to get a mixture to uniform colour. Specified quantity of water shall then be added gradually through a rose-can and the mass turned over till a mix of required consistency is obtained. In hand mixing, quantity of cement shall be increased by 10 percent above that specified.

Mixers which have been out of use for more than 30 minutes shall be throughly cleaned before putting in a new batch. Unless otherwise agreed to by the Engineer-in-charge the first batch of concrete from the mixture shall contain only two thirds of normal quantity of coarse aggregate. Mixing plant shall be thoroughly cleaned before changing from one type of cement to another.
Consistency: The degree of consistency which shall depend upon the nature of the work and methods of vibration of concrete, shall be determined by regular slump tests in accordance with I.S. 1199-1959. The slump of 10 mm. to 25 mm. shall be-adopted when vibrators are used and 80 mm. when vibrators are not used.

Inspection:

Contractor shall give the Engineer-in-charge due notice before placing any concrete in the forms to permit him to inspect and accept the false work and forms as to their strength, alignment, and general fitness but such inspection shall not relieve the contractor of his responsibility for the safety of men, machinery, materials and for results obtained. Immediately before concreting, all forms shall be thoroughly cleaned.

Centering design and its erection shall be approved by the Engineer-in-charge. One carpenter with a helper shall invariably be kept present throughout the period of concrete. Movement of labour and other people shall be totally prohibited for reinforcement laid in position. For access to different parts, suitable mobile platforms should be provided so that steel reinforcement in position is not disturbed. For ensuring proper cover, mortar blocks of suitable size shim be cast and tied to the reinforcement. Timber, kapachi or metal pieces shall not be used for this purpose.

Transporting and laying:

The method of transporting and placing concrete shall be as approved. Concrete shall be so transported and placed that no contemination segregation or loss of its constituent material takes place.

All form work shall be cleaned and made free from standing water, dust, shower or ice immediately before placing concrete. No concrete shall he, placed in any part of the structure until the approval of the Engineer-in-charge has been obtained.

Concreting shall proceed continuously over the area between construction joints. Fresh concrete shall not be placed against concrete which has been in position for more than 30 minutes unless a proper construction joint is formed. Concrete shall be compacted in its final position within 30 minutes of its discharge from the mixer. Except where otherwise agreed to by the Engineer-in-charge concrete shall be deposited in horizontal layers to a compacted depth of not more than 0.45 metre when internal vibrators are used and not exceeding 0.30 metre in all other cases.

Unless otherwise agreed to by the Engineer-in-charge, concrete shall not be dropped into place from a height exceeding 2 metres. When trucking or chutes arc used, they shall be kept close and used in such a way as to avoid segregation. When concrete has to be resumed on a surface which has hardened, it

shall be roughened, swept clean, thoroughly wet and covered with a 13 mm. thick layer of mortar composed of cement and sand in the same ratio as in the concrete mix itself. This 13 mm. layer of mortar shall be freshly mixed and placed immediately before placing new concrete. Where concrete has not fully hardened, all laitance shall be removed by scrubbing the wet surface with wire or bristle brushes, care being taken to avoid dislodgement of any panicles of coarse aggregate. The surface shall then be thoroughly wet, all free water removed and then coated with neat cement grout. The first layer of concrete to be placed on this surface shall not exceed 150 mm. in thickness and shall be well rammed against old work, particular attention being given to corners and close spots. 3.5.4. All concrete shall be compacted to produce a dense homogeneous mass with the assistance of vibrators unless, otherwise permitted by the Engineer-in-charge for exceptional cases, such as concreting under water, where vibrators cannot be used. Sufficient vibrators in serviceable condition shall be kept at site so that spare equipment is always available in the event of breakdowns.

Concrete shall be judged to be compacted when the mortar fills the spaces between the coarse aggregate and begins to cream up to form an even surface. Compaction shall be completed before the initial setting starts i.e. within 30 minutes of addition of wafer to dry mixture. During compaction, it shall be observed that needle vibrators are not applied on reinforcement which is likely to destroy the bond between concrete and reinforcement.

Curing: Immediately after compaction, concrete shall be protected from weather, including rain, running water, shocks, vibration, traffic, rapid temperature changes, frost and drying out process. It shall be covered with wet sacking, hassain or other similar absorbant material approved, soon after the initial set and shall be kept continuously wet for a period of not less than 14 days from the date of placement. Masonry work over foundation concrete may be started after 48 hours of its laying but curing of concrete shall be continued for a minimum period of 14 days.

Sampling and testing of concrete:

Samples from fresh concrete shall be taken as per I.S. 1199-1959 and cubes shall be made, cured and tested at 7 days or 28 days as per requirements in accordance with I.S. 516-1959. A random sampling procedure shall be adopted to ensure that each concrete batch shall have a reasonable chance of being tested i.e. the sampling should be spread over the entire period of concrete and cover all mixing units. The minimum frequency of sampling of concrete of each grade shall be in accordance with the following:

Quantity of concrete in the work	No. of samples	Quantity of concrete in the works	No. of samples
1-5Cmt.	1	16-30Cmt.	3
6-15Cmt.	2	31-50	4

51 and above 4 + one additional for each additional 50 M. or part thereof.

NOTE: At least one sample shall be taken from each shift. Ten test specimens shall be made from each sample, five for testing at 7 days and the remaining five at 28 days. The samples of concrete shall be taken on each day of the concreting as per above frequency. The number *of* specimens may be suitably increased as deemed necessary by the Engineer-in-charge when procedure of tests given above reveals a poor quality of concrete and in other special cases.

The average tire strength of the group of cubes cast for each day shall not be less than the specified cube strength of 150 Kg/Cm at 28 days. 20% of the cubes cast for each day may have value less than the specified strength provided the lowest value is not less than 85% of the specified strength. If the concrete made in accordance with the proportions given for a particular grade docs not yield the specified strength, such concrete shall be classified as belonging to the appropriate lower, grade concrete made in accordance with the proportions given for a particular grade shall not, however, be placed in a higher grade on the ground that the test strength are higher than the minimum specified.

Stripping:
The Engineer-in charge shall be informed in advance by the contractor of his intention lo strike the form work. While fixing the time for removal of form work, due consideration shall be given to local conditions, character of the structure, the weather and other conditions that influence the setting of concrete and pf the materials used in the mix. In normal circumstances (generally where temperatures are above 20 ° C) and where ordinary concrete is used, forms may be struck after expiry of periods specified in respective item of form work.

All form work shall be removed without causing any shock or vibration as would damage the concrete. Before the soffit and struts are removed, the concrete surface shall be exposed, where necessary in order to ascertain that the concrete has sufficiently hardened. Centring shall be gradually and uniformly lowered in such manner as to permit the concrete to take stresses due to its own weight uniformly and gradually. Where internal metal ties are permitted, they or their removable parts shall be extracted without causing any damage to the concrete and remaining holes filled with mortar. No permanently embedded metal part shall have less than 25 mm. cover to the finished concrete surface. Where it is intended to re-use the form work, it shall be cleaned and made good to the satisfaction of the Engineer-in- charge. After removal of form work and shuttering, the Executive Engineer shall inspect the work and be satisfied by random checks that concrete produced is of good quality.

Immediately after the removal of forms, all exposed bolts etc., passing through the cement concrete member and used for shuttering or any other purpose shall be cut inside the cement concrete member to a depth of at least 25 mm. below the surface of the concrete and the resulting holes be filled by cement mortar. All fine caused by form joints, all cavities produced by the removal of form ties and all other holes and depressions honeycomb spots, broken edges or corners and other defects shall be thoroughly cleaned, saturated with water and carefully pointed and rendered true with mortar of cement and fine aggregate mixed in the proportions used in the grade of concrete that is-being finished and of as dry consistency as is possible to use. Considerable pressure shall be applied in filling and pointing to ensure thorough Riling in all voids. Surfaces which are pointed shall be kept moist for a period of 24 hours.

If rock pockets/honeycombs in the opinion of the Engineer in- charge are of such an extent or character to affect the strength of the structure materially or to endanger the life of the steel reinforcement, he may declare the concrete defective and require the removal and replacement of the portions of the structure affected.

Mode of measurement and payment:
The consolidated cubical contents of concrete work as specified in item shall be measured. The concrete laid in excess of section shown on drawings or as directed shall not be measured. No deduction shall be made for

(a) Ends of dissimilar materials such as joist, beams, posts, girders, rafters, purlins trusses, corbels and steps etc up to 500 Sq. Cm. in section.
(b) Opening up to 0.1 Sq. M.

The rate includes cost of all materials, labour, tools and plant required for mixing, placing, position, vibrating and compacting, finishing, as directed, curing and all other incidental expenses for producing concrete lied strength. The rate excludes the cost of form work.
The rate shall be for a unit of one cubic meter.

Item No. 18

Providing and laying in position M- 250 grade concrete for reinforced cement concrete work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transporting the concrete from Plant to point of laying, excluding the

cost of centering shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash

Providing and laying in position M-350 grade concrete for reinforced cement concrete work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transporting the concrete from Plant to point of laying, excluding the cost of centering shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash

Materials & Workmanship:

The relevant specification of item no. 11 shall be followed except that the work shall be carried out for reinforced concrete work and grade of concrete shall be as specified in the item.

In addition, the following stipulations shall be followed :
The bars shall be kept in position by the following methods:

In case of beam, slab, wall and column, sufficient number of PVC block or precast cover block in cement mortar 1:2 (1 cement: 2 coarse sand) about 4cm x 4cm round or square section and of thickness equal to as specified in the drawing shall be placed between the bar and shuttering to maintain the requisite cover in the concrete member. In case of cantilevered or doubly reinforced beams/slabs, the top main reinforcing bars shall be held in position by introducing chair of appropriate bar spacers or supports bar at 1.0 to 1.2m centers.

The bars shall be tied with GI binding wires as per the instructions given by Architect or Engineer-in-charge.

In case of columns and walls, the vertical bars shall be kept at the top of the mould in position by means of timber / steel templates with slots accurately cut out in them. The templates shall be removed after concrete has been done below it. The bars may also be suitably tied by means of annealed GI wires to the shuttering to maintain their position during concreting. The GI wire shall be tied in such a way that they shall not get embedded in the concrete.

All dowel bars projecting from columns, columns beams, slabs, etc., to which other bars and concrete are to be attached or bounded to later on, shall be protected with a coat of thin neat cement grout, if the bars are not likely to be incorporated with succeeding mass of concrete within the following 10 days. This coat of thin neat cement shall be removed before concreting. All dowels to be kept in position by tying stirrups or a bar.

The cost of the reinforcement and formwork shall be included or excluded as per the item description.

The concrete shall be placed at all heights and for all shapes.

General:
The relevant specifications of item no. 2.01 shall be followed except that the concrete mix shall be designed from preliminary tests the proportioning of cement and aggregates shall be done by weight, and necessary precautions shall be taken in the production to ensure that the required work cube strength

is attained and maintained. The controlled concrete shall be in grades of M-20, M-25, M-30, M-35 and M-40, with prefix controlled added to it. The letter "M" refers to mix, and numbers specify 28 days works cube compressive strength of 150mm cubes of the mix expressed in N/mm2.

Before quoting the rate, the contractor shall confirm the exposure condition for the design of concrete. Mix design shall be carried out for environmental exposure conditions as given in IS 456:2000.
All concrete work shall have fair finish concrete surface unless otherwise specified in the drawing.

For exposed concrete element specified in the drawing fair finish steel shuttering made out of MS sheet not less than 14 gauge / laminated plywood and supporting framework shall be of steel. Proper care shall be taken in MS shuttering at the time of concreting during monsoon to achieve rust free concrete surface. The concrete surface shall be rendered if required to give fair finish.

For other concrete shuttering material shall be as follows:
Columns: Moulds from marine ply with wooden battens.
Straight walls / Curved wall in plan: Marine plywood with wooden battens / Acro make or equivalent make plates and soldiers.
Beam: Bottom - timber / steel plates, Sides - Steel plates / marine ply with battens.

The concrete shall be designed as per relevant IS code- IS 10262 and SP 23, with or without chemical admixture to provide the grade of concrete having required workability and characteristic strength as per IS 456:2000. The proportion of cement, sand and coarse aggregates shall be determined by weight. The weight batch machine shall be used for maintaining proper control over the proportion of aggregates as per mix design. The design mix shall be got approved by the Engineer in-charge before starting the concrete work. The minimum cement content shall depend on the exposure condition of the concrete. The minimum cement content given in table (IS 456:2000, table 5) shall be adopted irrespective of whether the contractor achieves the desired strength with less quantity of cement. The strength requirements of different grades of concrete shall be as below:

Grade of Concrete	Compressive strength of 15 cm. cubes in N/mm2 at 7 and 28 days conducted in accordance with IS: 516-1959.		
	At 7 days	At 28 days	Max size of agg. in mm
M-10	7	10	20
M-15	10	15	20
M-20	13.5	20	20
M-25	17	25	20
M-30	21	30	20
M-35	24	35	20
M-40	28	40	20

In all cases, the 28 days compressive strength specified in the above table is the criteria for acceptance or rejection of the concrete.
Where the strength of a concrete mix as indicated by tests lies in between the strength of any two grades specified in the above table, such concrete shall be classified in for all purposes as concrete belonging to the lower of the two grades between which its strength lies.

The Contractor shall take necessary care to avoid sand streaks, air holes, honey combining etc., on finished concrete surface.

Workmanship:

Proportioning

The proportions for ingredients chosen shall be such that concrete has adequate workability for conditions prevailing on the work in question and can be properly compacted with means available except where it can be shown to the satisfaction of the Architect and Engineer-in-charge that the supply of properly graded aggregate of uniform quality can be maintained till the completion of work. Grading of aggregate shall be controlled by obtaining the coarse aggregate, indifferent sizes and blending them in the right proportions as required. Aggregate of different sizes shall be stocked in separate stockpiles. The required quantity of material shall be stockpiled for several hours, preferably a day before use. The grading of course and find aggregate shall be checked as frequently as possible, the frequency for a given job being determined by the Architect and Engineer-in-charge to ensure that the suppliers are maintaining the uniform grading, as approved for samples used in the preliminary tests.

In proportioning concrete, the quantity of both cement and aggregate shall be determined by weight. Where the weight of cement is determined by accepting the maker's weight per bag a reasonable number of bags shall be weighed separately, to check the net weight, where cement is weighed from bulk stocks at site and not by bags. It shall be weighed separately from the aggregates. Water shall either be measured by volume in calibrated tanks or weighed. All measuring equipment should be maintained in clean and serviceable condition. Their accuracy shall be periodically checked and calibrated in a standard laboratory.

Mixing, consistency, inspection, transportation and laying, formwork for concrete, sampling & testing of concrete and stripping time for the form works: These shall be same as item no. 2.01 The compressive strength and slump test shall be performed by third party or outside laboratory is required.

It is most important to keep the specified water cement ratio constant and at its correct value. To this end, moisture content in both fine and coarse aggregates shall be determined by the Architect and Engineer-in-charge, according to the weather conditions. The amount of mixing water shall then be adjusted to compensate for variations in the moisture content. For the determination of moisture content in the aggregates, IS: 2386 (Part III) shall be referred to. Suitable adjustments shall also be made in the weights of aggregates due to variation in their moisture content.

All RCC works shall be carried out as per the detailed drawings and direction of Architects and Engineer-in-charge. The concrete shall be placed at all heights, levels and for all shapes.

Mode of Measurements and Payment:

The relevant specifications item no. 2.01 shall be followed except that the controlled concrete RCC work for work as specified in item shall be measured under this item. The rate shall exclude or include the cost of formwork and reinforcement as per the item description.
The volume occupied by reinforcement shall not be deducted from RCC work.

The rate shall be for a unit of one m3.

The rate shall be inclusive of chemical admixture like plasticizers etc. No additional payment shall be made on this account. The rate includes placing the concrete at all heights, levels and shapes.

Item No: -19

Providing TMT Bar FE 550D reinforcement for R.C.C. work including bending, binding and placing in position complete up to floor two level.

Extra for additional lift of reinforcing steel for all R.C.C. work above floor two level.

Materials:
Binding wires shall be confirmed to M-18. TMT (FE-550D) shall be confirmed to M-17.

Workmanship:
The work shall consist of furnishing and placing reinforcement to the shape and dimensions, as shown on the drawings or as directed.
The type of reinforcement shall be as per the item description. The contractor shall submit the test certificate from steel manufacturer as and when required. The test results shall be verified, if required in any reputed laboratory.

Steel shall be clean and free from rust and loose mill scale, at the time of fixing in position and subsequent concreting.

A bar bending schedule shall be made by the contractor before starting the work. The payment shall be done based on the quantity worked out in bar bending schedule. The bar bending schedule shall be prepared as per SP 34.

TMT bars
Reinforcing steel shall conform accurately to the dimensions given in the bar bending schedules shown on relevant drawings. Bars shall be bent cold to specified shape and dimensions or as directed using a proper bar bender, operated by hand or power to attain proper radius of bends. Bars shall not be bent or straightened in a manner that will injure the material. Bars bent during transportation or handling shall be straightened before being used on work. They should not be heated to facilitate bending. Unless otherwise specified, a 'U' type hook at the end of each bar shall invariably be provided to main reinforcement. The radius of the bend shall not be less than twice the diameter of the round bar and the length of straight part of the bar beyond the end of the curve shall be at least 4 times the diameter of the round bar. In case of bars which are not round and incase of deformed bars, the diameter shall be taken as the diameter of circle having an equivalent effective area. The hooks shall be suitably encased to prevent any splitting of the concrete. The bars shall be used with or without hooks at the end. Deformed bars without hooks shall comply with relevant anchorage requirements.

All the reinforcement bars shall be accurately placed in exact position shown on the drawings and shall be securely held in position with 16 Gauge GI binding wire of size not less than 1mm as approved by Engineer-in-charge or Architect. The re-bars shall be placed with stay blocks or metal chair spacers, metal hangers, supporting wires or other approved devices at sufficiently close intervals. Bars shall not be allowed to sag between support or displaced during concreting or any other operations of the work. All devices used for positioning shall be of non-corrodible material. Wooden and metal supports shall not extend to the surface of concrete, except where shown on drawing. Placing bars on layers of freshly laid concrete as the work progresses for adjusting bar spacing shall not allowed. Pieces of broken stone or brick and wooden blocks shall not be used. Layers of bars shall be separated by spacer bars; Precast mortar blocks or PVC cover blocks shall be used to maintain the cover of the concrete members as directed by Engineer In-charge or Architect. Reinforcement after being placed in position shall be maintained in a clean condition until completely embedded in concrete. Special care shall be exercised to prevent any displacement of reinforcement in concrete already placed. To prevent reinforcement from corrosion, concrete cover shall be provided as indicated on drawing. All the bars projecting from concrete and to which other bars are to be spliced and which are likely to be exposed for a period exceeding 10 days shall be protected by a thick coat of neat cement grout.

Bars crossing each other where required shall be secured by 16-gauge GI binding wires (annealed) of size not less than 1mm, in such manner that they do not slip over each other at the time of fixing and concreting.

As far as possible, bars of full length shall be used. In case this is not possible, overlapping of bars shall be done as directed. Where directed, where practicable, overlapping bars shall not touch each other, but be kept apart by 25mm or 1.25 times the maximum size of the coarse aggregate, whichever is greater by concrete between them. Where not feasible, overlapping bars shall be bound with annealed wires not less than 1mm thick, twisted tight. The overlaps shall be staggered for different bars and located at points along the span where neither shear nor bending movement is maximum in beam and slab.

Whenever indicated on the drawings or desired by the Architect and Engineer-in-charge, bars shall be joined by couplings which shall have a cross section sufficient to transmit the full stresses of bars. The ends of the bars that are joined by coupling shall be upset for sufficient length so that the effective cross sectional the base of threads is not less than normal cross section of the bar. Threads shall be standard threads. Steel coupling shall conform to IS: 226.

When permitted or specified on the drawings, joints of reinforcement bars shall be welded with appropriate welding rod as per the instructions given by Structural Engineer. The type of welding, size of fillet etc. shall be as approved by Structural Engineer. Welded joints shall preferably be located at points when steel will not be subject to more than 75% of the maximum permissible stress and welds so staggered that any one section not more than 20% of the rods are welded. Only electric arc welding using a process which excludes air from the molten metal and conforms to any or all other special provisions for the work shall be accepted. Suitable means shall be provided for holding bars securely in position during welding. It shall be ensured that no voids are left in welding and when welding is done in 2 or 3 stages, the previous surface shall be cleaned properly. The ends of the bars shall be cleaned of all loose scale, rust, grease paint and other foreign matter before welding. Only competent welders shall be employed on the work. The M.S electrodes used for welding shall conform to IS: 814. Welded pieces of reinforcement shall be tested. Specimen shall be taken from the actual site, and their number and frequency of test shall be as directed.

At the time of concrete, a bar fitter shall remain at site to keep the reinforcement in position.

Rolling margin shall be checked for each lot of steel received at site. This rolling margin shall be considered for reconciliation of steel at the end of the project or after the end of each month as per the decision of engineer –in-charge. Allowable wastage and rolling margin for the reconciliation of reinforcement steel shall be applicable.

Mode of Measurements and Payment:
Reinforcement shall be measured in length including overlaps, separately for different diameters as actually used in the work. Where welding or coupling is resorted to in place of lap joints, such joints shall be measured for payment as equivalent length of overlap as per design requirement. From the length so measured, the weight of reinforcement shall be calculated in tones by using standard IS co-efficient. Length shall include hooks at the ends. The waste of steel and binding wires shall not be measured, and the cost of these items shall need to be included in the rate for reinforcement. The rolling margin of steel shall not be paid extra.

The rate for reinforcement includes cost of GI binding wires. Cutting, bending, placing, binding and fixing in position as shown on the drawings and as directed. It shall also include all devices like chairs, pins etc. for keeping reinforcement in approved position, cost of joining as per approved method and all wastage, covers –PVC or Cement mortar and spacer bars.

The rate shall be for a unit of one Kg.

Item No:- 20

Formwork:

Providing, erecting, fixing, in position, striking/removing and cleaning shuttering & centering for formwork of with Sheathing Steel sheets or Plywood Sheets (Using Minimum 12 mm thick Shuttering Plywood, conforming to IS:4990) so as to give a Fair Exposed F3 finish including centering shuttering strutting and propping etc. Height of propping and centering below supporting floor to ceiling not exceeding 4 M. and removal of the same for in situ reinforced concrete and plain concrete work in.

(A) Foundation, Footings, Bases of columns etc. and Mass Concrete.

(B) Flat Surfaces such as soffits of suspended floors slabs landings and the like (1) Floors etc. up to 200mm in thickness

(C) Vertical surface such as walls (any thickness) partitions and the like including attached buttresses & string course & the like

(G) Columns Pillars Posts and Struts. (1) Square, Rectangular or polygonal in plan.

(H) Sides and Soffits of Beams

PLEASE NOTE:

FOR COLUMNS, SHUTTERING PLATES WITH NUT AND BOLT SHALL BE USED AND CONVENTIONAL SHUTTERING SHALL NOT BE ALLOWED.

Materials:

The shuttering to be provided shall be of ordinary timber planks and shall conform to M-26 The dimensions of scantlings and battens shall conform to the design. The strength of the wood shall not be less than that assumed in the design.

Workmanship:

The form work shall conform to the shape lines and dimensions on the plans and be so constructed as to remain sufficiently rigid during the placing and compacting of the concrete. Adequate arrangements shall be made by the contractor or safeguard against any settlement of the form work during the course of concreting and after concreting. The form work of shuttering, concreting, scaffolding bracing etc shall be as per design.

Cleaning & Treatment of forms:

All rubbish, particularly chippings shaving and saw dust shall be removed from the interior of the form before the concrete is placed and the form work in contact with concrete shall be cleaned and thoroughly wet or treated. The surface shall be then coated with soap solution applied before concreting is done. Soap solutions for the purpose shall be prepared by dissolving yellow soap in water to get consistency of paint. Alternatively, a coat of raw linseed oil or form oil of approved manufacture may be applied in case steel shuttering is used. Soap solution or raw linseed oil shall be applied after thoroughly cleaning the surface. Care shall be taken that the coating does not get construction joint surface and reinforcement bars.

Stripping time:

In normal circumstances and where ordinary cement is used forms may be struck after expiry of the following periods:

(a) Sides of walls columns and vertical faces of beam - 24 to 48 hours.

(b) Beams soffits (props left under) - 7 days.

(c) Removal of props slabs

(1) Slabs spanning up to 4.5 m - 7 days.

(2) Spanning over 4.5 mm - 7 days.

(d) Removal of props to beams and arches

(1) Spanning up to 6 m - 14 days.

(2) Spanning over 6 m - 14 days.

However, this period may be increased or decreased at the discretion of Engineer-in-charge. Special care shall be taken while striking the centering of cantilevered slab canopies, portal frames, folded plate construction and period of striking centering shall be as determined by the Engineer-in- charge.

Procedure when removing the form work:

All formworks shall be removed without such shock or vibration as would damage the reinforcement of concrete surface. Before the soffits form work and struts are removed, the soffits and the concrete surface shall be exposed where necessary in order to ascertain that the concrete has sufficiently hardened.

Centering:

The centering to be provided shall be got approved. It shall be sufficiently strong to ensure absolute safety of the form work and concrete work before, during and after pouring concrete. Watch should be kept seeing that behavior of centering and form work is satisfactory during concrete. Erection should also be such that it would allow removal of forms in proper sequence without damaging either the concrete or the forms to be removed.

The props of centering shall be provided on firm foundation or base sufficient strength to carry the loads without any settlement.

The centering and form work shall be inspected and approved by the Engineer-in-charge before entering. But this will not relieve the contractor of his responsibility for strength, adequacy and safety from work and centering. If there is a failure of work or centering, contractor shall be responsible for the work, injury to life and language to property.

Scaffolding:

All scaffolding, hoisting arrangements and ladders etc required for the facilitation of concrete shall be provided and removed on completion at his own expense. The scaffolding, hoisting arrangements and ladders etc. shall be strong enough to withstand all live, dead and impact loads expected to act and shall be subject to the approval of the Engineer-in-charge. However, contractors shall be solely responsible for the safety of the hoisting arrangements and ladders shall allow easy approaches etc. The scaffolding hoisting arrangement and ladders shall allow easy approach to the work spot and afford easy inspection.

The rate is applicable to all conditions of working and height up to 4 mts. The rate shall include the cost of materials and labour for various operations involved such as:

(a) Splayed edges, notching, allowance for overlaps and passing at angles, battens centering, shuttering propping, bolting, nailing, easing, striking and removal.

(b) Filleting to from stop chamfered edges or splayed external angles not exceeding 20 mm width to beams, columns and the like.

(c) Temporary openings in the forms for pouring concrete, if required, removing rubbish etc.

(d) Dressing with oil to prevent adhesion of concrete with shuttering, and

(e) Raking or circular cutting.

Re-use:

Before re-use all forms shall be inspected by the Engineer-in-charge and their suitability ascertained. The forms shall be scarred, cleaned, and joints gone over, repaired where required, inside surface shall be retreated to prevent adhesion of concrete.

Measurements & payment:

From work shall be measured as the area in square meters of shuttering in contract with concrete except in the case of inclined member and portion of curved profile and upper side in which case only area of underside shall be measured for payment.

From work to secondary beams shall be measured up to the side of main beams but no deduction shall

be made from the work of the main beam at the inter section point.

No, deduction shall be made from the formwork of a column a inter section of beams. The rate is for the completed item.

The rate shall be for a unit of one Sq. meter or as per the B.O.Q.

For Exposed Finish

Material – Sheathing of steel sheets, and plates of steel or plywood instead of ordinary timber plank to obtain a desired smooth exposed finish of surface. The Surface shall be presentable without further treatment.

Item No:- 21

Earthwork for embankment including breaking clods, dressing with all lead and lift and including watering rolling and consolidation of subgrade in layers at O.M.C. to required dry density including filling the depression which occur during the process using power roller 8T to 10T.(E) From Borrow area within 3.0KM. lead

1. In the case of earth work consolidated under optimum moisture conditions each layer of earth shall be carefully moistened to give field moisture content of about +1% to -2% of the optimum moisture content (OMC). The OMC shall be determined according to IS 2720 (Pt.VIII) Methods of Tests for Soils. Each layer shall then be compacted by rolling with 8 to 10 tonnes power road roller and a sheep foot roller if required. The required amount of water shall be added during consolidation to keep the moisture content of the soil at the optimum as per test. The density to be achieved for each layer of the material shall not be less than 95% of the density obtained in the laboratory (Proctor Method).

2. Each compacted layer shall be tested in the field for density and accepted before the operations for next layer are begun.

3. Control on compaction in the field shall be exercised through frequent moisture content and density determinations. A systematic record of these shall be maintained. At all times during construction the top of the embankment shall be maintained at such cross fall as will shed water and prevent ponding.

4. Density Measurement and Acceptance Criteria

   a. One measurement of density shall be made for each 500 sqm of compacted area or for a smaller area as decided by the Engineer-in-Charge. Each measurement shall consist of at least 5 density determinations tests and the average of these 5 determinations shall be treated as the field density achieved. The determination of density shall be as per IS 2720 (Pt. XXVIII).

   b. In general the control at the top 40 cm thickness of the formation shall be more strict with density measurements being done at the rate of one measurement for 250 sqm of compacted area. Further for the determination of the mean density the number of tests in one measurement shall not be less than 10 and the work will be accepted if the mean dry density equals or exceeds the specified density.

c. When density measurements reveal any soft areas in the embankment, the Engineer-in-Charge shall direct that these be compacted further. If in-spite of that the specified compaction is not achieved the material in the soft areas shall be removed and replaced by approved materials and compacted to the satisfaction of the Engineer-in-Charge.

d. Control Tests on Borrow Material

Soil suitable for consolidation under O.M.C. conditions should preferably have the following characteristics:

i. Minimum percentage of clay-10%
ii. Liquid limit-14
iii. Plasticity index-4
iv. Percentage of silt should not exceed-50%
v. Peat, muck and organic soils are unsuitable.

e. The Engineer-in-Charge may, however, relax these requirements taking into account availability of materials, cost of transportation and other relevant factors.

f. Various test required to be conducted on the borrow material with their recommended frequency are indicated below. All the test need not be stipulated on every project. Depending upon site condition etc. only some may be found necessary at a particular project. The frequency of testing indicated refers generally to the minimum number of tests to be conducted. The rate of testing must be stepped up as found necessary depending upon the variability of the materials and compaction methods employed at a project.

i. Gradation: At least one test for each kind of soil. Usual rate of testing 1 to 2 tests per 8000 cum of soil.
ii. Plasticity: At least one test for each kind of soil. Usual rate of testing 1 to 2 tests per 8000 cum of soil.
iii. Proctor Tests: At the rate of 1 to 2 tests per 8000 cum of soil.
iv. Deleterious Contents: As required.
v. Moisture contents: One test for every 250 cum of soil.

5. Measurements:

The filling shall be measured and quantity of earth work computed from cross sections of filling or the embankment. No deduction shall be made for voids.

6. Rate: Rate shall include the cost of all operations described above including operation mentioned in 49 to the extent applicable.

Item No: -22

Construction of 300mm (as per IRC 37) Thick Granular sub base(GSB-I) by providing coarse graded material using B.T Metal 53 mm to 26.50 mm @ 35 % ,26.50 mm to 4.75mm 45% & Coarse sand below 2.36 mm 20 % in uniform layer with motor grader on prepared surface mixing by mix in place method with vibratory roller to achieve the desired density complete as per close 401

Construction of granular sub-base (Grade - I) by providing coarse graded material, spreading in uniform layers with motor grader on prepared surface, mixing by mix in place method with rotavator at OMC, and compacting with vibratory roller to achieve the desired density, complete as per MoRTH clause

401. The rate shall be for a unit of one Cubic Meter.

Item No:-23
Construction of Dry Lean Cement Concrete Sub-base over a prepared sub-grade with coarse and fine aggregate conforming to IS: 383, the size of coarse aggregate not exceeding 25 mm, aggregate cement ratio not to exceed 15:1, aggregate gradation after blending to be as per table 600-1, cement content not to be less than 150 kg/ cum, optimum moisture content to be determined during trial length construction, concrete strength not to be less than 10 Mpa at 7 days, mixed in a batching plant, transported to site, laid with a paver with electronic sensor, compacting with 8-10 tonnes vibratory roller, finishing and curing.

WIDTH AND THICKNESS OF DLC SUB-BASE The DLC
Sub-base shall extend beyond the pavement edges by 500 mm to facilitate further construction operations and provide an adequate support for the concrete slab.

The extra width facilitates the movement of paver tracks on the extended DLC. The offset will be 200 mm in case of semi mechanized or manual construction.
Although the actual thickness will be governed by the design considerations, a thickness of minimum 150 mm is recommended for all major projects of State Highways and National Highways. When DLC is adopted as subbase in case of roads other than the above roads its thickness of 100 mm is recommended. For further details, IRC:62 'Guidelines for Design and Construction of Low Volume Roads', may be referred, where in different combinations of constructing other type of subbases involving cement treated bases have also been provided.

Materials

Cement

Any of the following types of cement may be used with the approval of the Engineer.

i) Ordinary Portland Cement (OPC) IS:8112, IS:12269

If the subgrade soil contains soluble sulphates in a concentration more than 0.5 percent, the cement used shall be sulphate resisting Portland cement conforming to IS: 12330 or Portland slag cement with slag content upto 50 percent.

Aggregates

Aggregates for dry lean concrete shall be natural aggregate complying with IS:383. The aggregates shall not be alkali reactive. The deleterious materials content shall not exceed the limits as per IS:383. In case the aggregates are not free from dirt, the same may be washed and water drained out at least 72 hours before batching.

Coarse aggregate shall consist of clean, hard, strong, dense and non-porous pieces of crushed stone or gravel and shall not consist of disintegrated stone, soft, flaky, elongated, very angular or splintery pieces. The maximum size of the coarse aggregate shall be 26.5 mm. The water absorption of the aggregates shall not exceed 3 percent.

The fine aggregate shall consist of clean, natural sand or crushed stone sand or a combination of the two and shall conform to IS:383.

The fine aggregate shall be free from soft particles, clay, seashell, loam, cemented particles, mica, organic and other foreign matter in accordance with IS:383. Aggregates which have water absorption of more than 3 percent, shall not be used.

Grading of aggregates

The grading of fine aggregate shall conform to grading zones I, II, III or IV as given in IRC:15 or

IS:383. The grading of combined aggregate shall conform to

Table 1 Table 1 Grading of Aggregates

Sieve Designation (mm)	Percentage passing (by weight)
26.50 mm	100
19.00mm	75-95
9.50mm	50-70
4.75mm	30-55
2.36mm	17-42
600 micron	8-22
300 micron	7-17
150 micron	2-12
75 micron	0-10

Water

Water used for mixing and curing of concrete shall be clean and free from injurious amounts of oil, salt, acid, alkali, sugar, vegetable matter or other substances harmful to concrete. Water shall meet the requirements of IS:456. Potable water is generally considered satisfactory for mixing and curing. The pH value of water for mixing and curing upto 9 shall be permitted.

Mineral Admixtures

Fly ash, 15-30 percent or Ground Granulated Blast Furnace Slag (GBFS), 25-50 percent by weight of cementitious material may be used in concrete as part replacement of Ordinary Portland cement, and in such case, the Ordinary Portland cement content shall not be less than 1 00 kg/m^ of concrete. The fly ash shall conform to IS 381 2 (Part 1), and granulated blast furnace slag shall conform to 18:12089. Site mixing of fly ash or GBFS shall be permitted only after ensuring availability of the equipment at site for uniform blending through a specific mechanized facility with automated process control like batching and mixing plant.

All materials shall be stored in proper places so as to prevent their deterioration or contamination by foreign matter to ensure their satisfactory quality and fitness for use in the work.

Concrete Mix Proportions

The concrete mix shall be proportioned with a maximum aggregate cement ratio of 14:1 where ORG is used and 12:1 where PPC or PSC is used. The minimum cementitious materials content shall not be less than 140 kg/cum of concrete. If this minimum cementitious materials content is not sufficient to produce the concrete of the specified strength, it shall be increased as necessary. The fly ash or GBFS content shall be 15-30 percent or 25-50 percent by weight of cementitious materials respectively, as given in Clause 3.4. The concrete mix proportions are based on Central Road Research Institute (CRRI) test results.

The optimum water content shall be decided so as to ensure full compaction under rolling. Too much water will cause the concrete to be heaving up before the wheels and to be picked up on the wheels of the roller. Too little water will lead to inadequate compaction and segregation, a low in-situ strength and an open textured surface. Trial mixes of dry lean concrete shall be prepared with water content of 5.0, 5.5, 6.0, 6.5 and 7.0 percent of the total weight of material. Optimum moisture and density shall be established by preparing cubes with varying moisture contents, and moisture-density curve shall be drawn. Special vibratory hammer shall be used for compacting the specimens. While laying sub-base in main carriageway; the DLC may have 1 percent higher moisture content, to compensate evaporation

loss during transport.

DRAINAGE LAYER

To facilitate quick disposal of water that is likely to enter the subgrade, a drainage layer (GSB) shall be provided below the sub-base throughout the road width. For further details on the drainage layer, IRC:58 may be consulted.

SUBGRADE

The subgrade shall conform to the grades and cross-sections on the drawings and shall be uniformly compacted to the modified Proctor density not less than 97 percent, that is normally specified. Reference may be made to IS:2720 (Part 8) for this. The lean concrete sub-base shall not be laid on a subgrade softened by rain after its final preparation, surface trenches and soft spots, if any, must be properly backfilled and compacted to avoid any weak spot. As far as possible, the construction traffic shall be avoided on the prepared subgrade. A day before placing of the sub-base, the subgrade surface shall be given a fine spray of water and rolled with one or two passes of a smooth wheeled roller after a lapse of 2-3 hours in order to stabilise loose surface. If found necessary, another fine spray of water may be applied just before placing the sub-base.

CONSTRUCTION

Trial Mixes

Trial mixes of dry lean concrete shall be prepared with moisture contents of 5.0, 5.5, 6.0, 6.5 and 7.0 percent using cement content requirement of aggregate-cement ratio specified in para 4.2. Optimum moisture and density shall be established by preparing cubes with varying moisture contents. Compaction of the mix shall be done in three layers with vibratory hammer fitted with a square or rectangular foot. After establishing the optimum moisture, a set of six cubes shall be cast at that moisture for the determination of compressive strength at 3 and 7 days. Trial mixes shall be repeated if the strength is not satisfactory either by increasing cement content or using higher grade of cement.

If during the construction of the trial length, the optimum moisture content determined as above is unsatisfactory, suitable changes may be made in the moisture content to achieve a satisfactory mix. The cube specimens prepared with the changed moisture content should satisfy the strength requirement. Before production of the mix, natural moisture content of the aggregate should be determined on a day-to-day basis, so that the moisture content could be adjusted. The mix finally designed should neither stick to the rollers nor become too dry resulting in ravelling of surface.

General

The pace and programme of the lean concrete sub-base construction shall be matching suitably with the programme of construction of the cement concrete pavement over it. The sub-base shall be overlaid with Paving Quality Concrete (PQC) pavement not before 7 days after the sub-base construction.

Batching and Mixing

The batching plant shall be capable of separately proportioning each type of material by weight. The capacity of batching and mixing plant shall be at least 25 percent higher than the proposed capacity for the laying arrangements. The batching and mixing shall be carried out preferably in a forced action central batching and mixing plant having necessary automatic controls to ensure accurate proportioning and mixing. Calibration of the batching and mixing plant shall be carried out at regular intervals, normally every month. Other types of mixers shall be permitted subject to demonstration of their satisfactory performance during the trial length construction.

Transporting

Plant mixed lean concrete shall be discharged immediately from the mixer, transported directly to the point where it is to be laid and protected from the weather by covering with tarpaulin during transit. The concrete shall be transported by tipping trucks, sufficient in number to ensure a continuous supply of material to feed the laying equipment to work at a uniform speed and in an uninterrupted manner. The lead of the batching plant to the paving site shall be such that the travel time available from mixing to paving as specified in a para 7.6.2 will be adhered to.

Placing

Lean concrete shall be laid by a hydrostatic paver. The equipment shall be capable of laying the material in one layer in an even manner without segregation, so that, after compaction the total thickness achieved is as specified. The paving machine shall have high amplitude ramping bars to give good initial compaction to the sub-base. For more details, IRC:SP:86 'Guidelines for Selection, Operation, and Maintenance of Paver Finishers' may be referred. The laying of the two-lane road sub-base shall be done in full width. For a pavement more than two-lanes, the operation may be carried out by two pavers in echelon separated by appropriate distance (15-20 m). Transverse and longitudinal construction joints shall be staggered by 500-1000 mm and 200-400 mm respectively from the corresponding joints in the overlaying joints in the overlaying concrete slabs.

Compaction

The compaction shall be carried out immediately after the material is laid and levelled. In order to ensure thorough compaction, rolling shall be continued on the full width till there is no further visible movement under the roller and the surface is closed. The dry density obtained (from the average of density obtained from three density holes of 200 mm dia.) shall not be less than 97 percent of that achieved during the trial length construction. The densities achieved at the edges i.e., 0.5 m from the edge shall not be less than 95 percent of that achieved during the trial construction as per para 7.9. Rolling shall commence on the lower edge of camber/one side slope and proceed towards center/outer edge. The spreading, compacting and finishing of the lean concrete shall be carried out as rapidly as possible and the operation shall be arranged so as to ensure that the time between mixing of the first batch of concrete in any transverse section of the layer and the compaction and final finishing of the same shall not exceed 90 minutes, when the concrete temperature is between 25 and 30°C and 120 minutes, if less than 25°C. This period may be reviewed in the light of the results of the trial length but, in no case shall it exceed 2 hours. Work shall not proceed when the temperature of the concrete exceeds 30°C. If necessary, chilled water or addition of ice may be resorted to for bringing down the temperature. It is desirable to stop concreting when the ambient temperature is above 35°C. After compaction has been completed, roller shall not stand on the compacted surface for the duration of the curing period except during commencement of next day's work near the location where work was terminated the previous day.

Double Drum smooth-wheeled vibratory rollers of minimum 80 to 100 KN static weight are considered to be suitable for rolling dry lean concrete. In case, any other roller is proposed, the same will be used after establishing its performance. The number of passes required to obtain maximum compaction depends on the thickness of the lean concrete, compactibility of the mix, and the weight and type of the roller etc. and the same as well as the total requirement of rollers for the job shall be determined during trial run by measuring the in-situ density and the scale of the work to be undertaken.

In addition to the number of passes required for compaction there shall be a preliminary pass without vibration to bed the lean concrete down and again a final pass without vibration to remove roller marks and to smoothen the surface. Special care shall be exercised during compaction near joints, kerbs, channels, side forms and around gullies and manholes. In case adequate compaction is not achieved by the roller at these points, use of plate vibrator will be permitted.

The final lean concrete surface on completion of compaction and immediately before overlaying, shall be well closed, free from movement under roller and free from ridges, cracks, loose material, potholes, ruts or other defects. The final surface shall be inspected immediately on completion and all loose, segregated or defective areas shall be corrected by using fresh lean concrete material laid and compacted. For repairing honeycombed surface, fresh concrete of the grade of parent concrete, with aggregates of size 10 mm and below, shall be spread and compacted. It is necessary to check the level of the rolled surface for compliance. Any level deficiency should be corrected after applying concrete with aggregate of size 10 mm and below, after roughening the surface, when the concrete is still green.

Similarly, the surface regularity also should be checked with 3 m straight edge. The deficiency should be made up with concrete with aggregates of size 1 0 mm and below. At the end of the day's work/stoppage of work due to breakdown of any machinery, in the chain, the work shall be finished straight by placing a channel at the end and placing concrete in slope beyond the channel. On the next day the channel is removed and minor cutting to obtain vertical face as per para 7.7 may be needed.

Segregation of concrete in the dumpers shall be controlled by moving the dumper back and forth while discharging the mix into it and by other means. Even paving operation shall be such that the mix does not segregate.

Joints

Day's work shall be stopped by vertical joints. The edge of the compacted material shall be cut back to a vertical face, when work starts next day.

Curing

As soon as the lean concrete surface is completed, curing shall commence. a) Curing shall be done by covering the surface by hessian cloth in two layers which shall be kept continuously moist for 7 days by sprinkling water. b) If water-curing is not possible, the curing shall be done by spraying with liquid curing compound. The curing compound shall be white pigmented type with water retention index of minimum 90 percent, when tested in accordance with the test method given in Annexure-A. To check the efficiency of the curing compound, the supplier shall be required to provide the test certificate from a recognized laboratory. Curing compound shall be sprayed immediately after rolling is complete. As soon as the curing compound has lost its tackiness, the surface shall be covered with wet hessian for three days.

Trial Length Construction

The trial length shall be constructed (in two days), at least 14 days in advance of the proposed date of commencement of work. The length of trial construction shall be a minimum of 60 m length and for full width of the pavement. The trial length shall contain the construction of at least one transverse construction joint involving hardened concrete and sub-base to be laid subsequently, so as to demonstrate the soundness of the procedure. In one day, trial length of not more than 30 m shall be laid.

In order to determine and demonstrate the optimum moisture content which results in the maximum dry density of the mix compacted by the rolling equipment and the minimum cement content that is necessary to achieve the strength stipulated, trial mixes shall be prepared as per para 7.1

After the construction of the trial length, the in-situ density of the freshly laid material shall be determined by sand replacement method (as per IS:2720 part-8) with 200 mm dia density hole. Three density holes shall be made at locations equally spaced along a diagonal that bisect the trial length; average of these densities shall be determined. These main density holes shall not be made in the strip 500 mm from the edge. The average density obtained from the three samples collected shall be the

reference density and is considered as 100 percent. The field density of regular work will be compared with this reference density in accordance with para 7.6.1. A few cores may be cut so as to check segregation or any other deficiency and also to ascertain strength.

The hardened concrete shall be cut over 3 m width and reversed to inspect the bottom surface for any segregation taking place. The trial length shall be constructed after making necessary changes in the grading of aggregates and the mix to eliminate any segregation of the mix. The lower surface shall not have honeycombing and the aggregates shall not be held loosely at the edges.

The trial length shall be outside the main works. After the approval of the trial length construction has been given, the materials, mix proportions, moisture content, mixing, laying, compaction, plant, construction procedures shall not be changed.

Control of Thickness, Density and Strength

The tolerances for thickness shall be ± 10 mm. The dry density of the laid material shall be determined from density holes at locations equally spaced along a diagonal that bisects each 2000 sq.m or part thereof, of material laid each day. The control of strength shall be exercised by taking samples of dry lean concrete for making cubes at the rate of 3 samples for each 1000 sq.m or part thereof laid each day. The cube samples shall be compacted, cured and tested in accordance with IS:51 6.

Opening to Traffic

No heavy commercial vehicles like trucks and buses shall be permitted on the lean concrete sub-base after its construction. Light vehicles if unavoidable may, however, be allowed after 7 days of its construction with prior approval of the Engineer.

MODE OF MEASUREMENTS

In cu mt.

Item no;-23

Construction of reinforced, dowel jointed, plain cement concrete of M40, pavement over a prepared sub base with Ordinary Portland Cement @ 400 kg per cum, coarse and fine aggregate conforming to IS 383, maximum size of coarse aggregate not exceeding 25 mm, mixed in a batching and mixing plant as per approved mix design, transported to site, laid with a fixed form or slip form paver, spread, compacted and finished in a continuous operation including provision of contraction, expansion, construction and longitudinal joints, joint filler, separation membrane, sealant primer, joint sealant, debonding strip, dowel bar, tie rod, admixtures as approved, curing compound, finishing to lines and grades as per drawing.

Refer Specification from CPWD Specification Vol 1 & Vol 2.

Item No:- 24

Applying and providing Expansion joint sealing System on 100 mm vide joint including cleaning of expansion joint by mechanical means provision of adhesive and flexible membrane with required bond length as per menufracturer specification and 4mm thick alluminium strip covering with one side sloted and bolted with suitable system, inclusive of all manpower, machinery and material as per specification and as directed.

Specifications as per item description.

Item No;-25

Providing and laying C.C. pavement of mix M-25 with batch mixed concrete from batching plant. The concrete shall be casted in panel and finished with screed board vibrator, vacuum dewatering process and finally finished by floating, brooming with machine. Grooves to be made of size 5mm wide and one third of thickness of concrete within 48 Hours of concreting to form bay of 4 x 4 meters using heavy duty cutting machine with diamond cutting wheel and filling of the groove with appropriate sealant etc. complete as per specifications and as directed by the EIC. If trimix concrete shall be laid over on existing concrete surface, bonding agent shall be applied before laying of concrete at all basements floors. Reinforcement if required shall be paid in relevant tender item.

1. **Material and Workmanship:**
   - **1.1. General**
     - 1.1.1. The Contractor shall improve the quality of all concrete floor slabs by placing the concrete according to the Trimix system as indicated on the drawings and as specified herein.
   - **1.2. Technical Assistance/Training of Labour**
     - 1.2.1. During the placement of concrete, the Contractor shall have a minimum of one person present at all times who has been adequately trained by a representative of the equipment manufacturer. This person shall be experienced in the vacuum dewatering process, and in the operation of all related equipment and shall direct all concrete dewatering work performed. The Contractor shall provide the services of a representative from the manufacturer of the vacuum dewatering equipment on site for a period of time of at least eight (8) hours. The manufacturer's representative shall prove technical assistance for the vacuum dewatering process on the initial day of operation.
   - **1.3. Equipment for compacting, placing, vacuum processing and finishing of slab**
     - 1.3.1. All process equipment to be used shall be of a design representative of the state of the art and shall be subject to the approved of the engineer. Equipment shall be Trimix or approved equal. The system shall have a demonstrated five-year history of performing such work. The vacuum pumps shall be able to generate a minimum vacuum of 609mm (24 inches) of mercury (0.80 atmospheres) in actual operation using the maximum number and size of suction mats required for this work. The Contractor shall have at the job site sufficient equipment (vacuum pumps, mats, fitter pads and accessories) to ensure

that the vacuum dewatering process continues uninterrupted to completion. Stand by equipment is sometimes required.

1.4. Mix Design

1.4.1. The Contractor is responsible for the mix designs of the class as called for on the drawings and must submit the mix proposed for use in the contract before any work is started. All mix parameters must conform to the values specified in Trimix recommendations and design mix report. The Contractors shall utilize a knowledgeable and experienced concrete technician for the design and production of mix (mixes) meeting all the requirements of the specifications. Do not deliver any concrete to the construction site until all the approvals have been obtained.

1.5. Quality Control

1.5.1. The Contractor has the responsibility for achieving the quality of concrete specified by controlling the concrete mixes, placing, vacuum process finishing and curing. The concrete technician in charge must be present at the site when work is in progress.

1.5.2. The Contractor shall be responsible for mix adjustments, performing necessary tests, correcting deficiencies and trouble shooting in general.

1.5.3. The Contractor shall be required to maintain control charts showing individual test results for aggregate gradation, slump, air content, cement content and compressive strength.

1.6. Planning of Placing

1.6.1. The Contractors shall submit for review shop drawings for floor slabs detailing the location of all construction joints and the sequence of the slab placement and manufacturer's literature describing the equipment to be used. In addition to the shop drawings, the Contractor shall indicate the quantity of each piece of dewatering equipment that will be located at the construction site and shall include the dimensions of all suction mats. Before concreting is started the work should be planned with a view to determine areas to be placed daily, the required amount of equipment, size of vacuum mats, length of vacuum hoses, arrangement of rails, if any, or screeds etc. Crew required for the vacuum process is two men to handle the mats and the pump. Note that placing, vibration, vacuum treatment and floating follow immediately behind each other. Check position of vacuum pump in relation to vacuum mat location to find whether extra vacuum hoses are required or not.

1.7. Concrete Materials

1.7.1. Note: All concrete mix designs shall meet the requirements of this section and section TRIMIX concrete mix design recommendations.

1.8. Cement

1.8.1. Portland cement of normal grinding fineness, which corresponds to a specific surface of 2600-3500cm2 /g, is required. Cement of higher grinding fineness, e.g. rapid-hardened Portland cement of larger specific surfaces shall be avoided especially in concrete mixes with a cement content 590 LB/sq.yd. Recommended content is 421 to 590 LB/sq.yd.

1.9. Equipment Specification Trimix System

- Poker vibrator with high frequency preferably 335 hz. (20000 vibr./min) dia. 1 to 1 1/2".

- Surface vibrators type double beam with beam spacing 12".
- Preferably one-piece beam in full length exceeding bay width 8" to 24". Beam should easily be adjusted to absolute straightness and controlled every morning before placing of concrete starts.
- Suction mat type RM 60. 100% tight plastic material weight 650 gram/m2 . Width same as bay size and length 20' for capacity and flexibility.
- Filter Pad type RD 12 weight 600 g/m2 , width 4' length-bay width-minus 8".
- Vacuum Pump P 4001 8 with 10 HP engine and specially designed pump unit with heavy duty chrome housing and sealing. Adjustable vacuum by valve on top of tank for ease of operation with different mix designs.
- Skim floater type G 900/G 700 with disc which allows direct floating of dewatered concrete. Weight maximum 90kg (200 pounds) for 40"(W.disc.) Finishing is done with G 900, using blades only and is normally done with 30minutes intervals between passes.
- The above equipment specified should be used for the production of quality concrete floors according to the Trimix System. Inter-changeability of equipment is not recommended.

2. Execution Trimix System

2.1. General

2.1.1. The work shall be planned and executed so that there is no delay between the placement, screeding, dewatering and floating of the concrete. Concrete to be vacuum dewatered shall be handled and placed so as to prevent segregation. The concrete shall be internally vibrated prior to screeding.

2.2. Levelling

2.2.1. Immediately following placement, the concrete shall be leveled with a vibrating screeding running on a true surface, set at the proper elevation required to provide the specified finished elevation. The concrete surface shall be screeded high by 2% of the slab's thickness to compensation for the compaction caused by the vacuum dewatering process. (Slabs to have an aggregate hardener shall have compensation made to maintain elevation). The vibrating screed shall be moved forward as rapidly as proper consolidation allows. The proper surcharge of concrete must be maintained in front of the leading edge of the screed.

2.3. Vacuum

2.3.1. Immediately after levelling, the concrete shall be covered with filter pads and suction mats in strict accordance with the recommendation of the manufacturer to have the slab fully dewatered. The suction mat shall extend 4inches beyond the edge of the filter pad on all sides. The pads shall extend to within 4" of the edge of concrete slab, and the mats shall cover entire slab. Before connecting the hose on the suction mat to the vacuum pump, the edges of the mat shall be smoothed to enable an airtight seal to be created. A vacuum shall then be applied to the mat. After a minute the gauge on the vacuum pump should indicate a minimum vacuum of 0.70atmospheres (24.0 in. Hg) and if not, the mat must be checked for leakage. For concrete that dewaters readily the vacuum should then be maintained a wt. 0.70-0.80 atmospheres (24.0-25.5 in. Hg.) For concrete which dewaters less efficiently (e.g. air-entrained concrete) the vacuum shall then be reduced to 0.50-0.60atmospheres (15.0-18.0 in. Hg). After approximately 10 minutes the vacuum can then be increased to 0.80 atmospheres.

2.3.2. The vacuum shall be maintained for at least 3 minutes per inch of concrete thickness at 0.80 atmospheres. (Where aggregate hardeners are specified, sufficient moisture shall be maintained to meet manufacturer's requirements). The suction mats and filter pads shall then be removed and moved to the next section in leapfrog manner.

2.3.3. Stop the vacuum dewatering when light footprints only are left in the concrete when stepped upon. A suitable suction time can also be checked with a Proctor-apparatus, which should show 1.5-2 kp/cm2 .

2.4. Floating

2.4.1. Upon removal of the suction mats and filter pads the concrete surface shall be power-floated without delay until all imprints from the vacuum process are removed. If crusting occurs, the floating operation must be delayed till the concrete carries the machine.

2.4.2. The higher speed is recommended for the floating operation. Two passes with the floating disc should be made in the junction of two mats in order to avoid risk for cracking.

2.5. Finishing

2.5.1. The waiting time after the floating operation depends on concrete temperature and humidity and varies from 10minutes to 2 hours.

2.5.2. The troweling operation cannot take place before the concrete has hardened enough to carry the machine, i.e. the troweling blades will not leave any marks on the concrete. Repeated troweling. With intervals between the passes, which are adapted to the setting of the concrete, greatly improves the surface characteristics. The surface will be more wear resistant and less dusty.

2.5.3. At least two passes are recommended for floors, which are not to be covered.

2.6. Curing

2.6.1. Vacuum dewatered concrete should be cured like any other quality concrete in order to achieve a good final result with ponding.

2.7. Mode of measurement:

2.7.1. The item shall be measured and paid in sqm excluding cost of concrete & steel. The cost of steel & concrete shall be measured & paid separately under relevant items. Rate of shuttering with MS channels & cutting of grooves filling Polysulphide Sealant is inclusive. The cost of Joint filler shall include in the rate.

Item No:- 26

Masonry work using Aerated light weight concrete block having crushing strength not less than 35 kg/sqcm for Basement to floor two level in cement mortar 1:5 (1 cement : 5 fine sand) complete as per Technical Specification.

Brick work using common burnt clay building bricks having crushing strength not less than 35 kg./Sq.Cm. in Sub Structure below plinth level in Cement Mortar 1:5. (1-Cement : 5 -fine sand)(A) Modular

Materials: Water shall conform to M-1, Cement to M-3, Sand to M-6, Brick to M-15 and Cement mortar to M-11.

Workmanship:
Proportion:
The proportion of the CM shall be as mentioned in the item description (cement: medium sand), by volume.

Soaking of bricks:
The bricks required for masonry shall be thoroughly wetted with clean water for about 24 hours before use or as directed. The cessation of bubbles, when the bricks are wetted with water is an indication of thorough wetting of bricks.

Laying:
Bricks shall be laid in English bond unless directed otherwise. Half or cut bricks shall not be used except when necessary to complete the bond; closer and in such case, it shall be cut to required size and used near the ends of walls.

A layer of mortar shall be spread on full width for suitable length of the lower course. Each brick shall first be properly bedded and set home by gently tapping with the handle of the trowel or wooden mallet. Its inside face shall be flushed with mortar before the next brick is laid and pressed against it. On completion of the course, the vertical joints shall be fully filled from the top, with mortar.

The walls shall be taken up truly in plumb. All courses shall be laid truly horizontal and all vertical joint shall be truly vertical. Vertical joints in alternate courses shall generally be in one vertical plane. The thickness of brick course shall be kept uniform.
The bricks shall be laid with the frog facing upwards. A set of tools comprising of wooden straight edges, mason's spirit level, square half meter rub (right angle), pins, string, level pipe and plumb shall be kept on the site of work for frequent checking during the progress of work.

Both the faces of walls, having thickness greater than 23cm shall be kept in proper plumb. All the connected brickwork shall be kept not more than 1m over the rest of the work. Where this is not possible, the work shall be raked back according to bond (and not left toothed) at an angle not steeper than 45 degrees. In a day brick work shall not be laid more than 1m or 10 courses in height.

All the fixtures, pipe outlets of water, etc. which are required to be built in the wall shall be embedded in CM, as per the drawings or as directed. The frames of doors, windows, cupboards, etc. shall be housed into the brick work at the correct location and level, as directed. The heavy steel doors, windows frames, etc. shall be built in with brick work, but for ordinary steel doors and windows, required opening for frames, hold-fasts, etc. shall be left in the wall and frames shall be embedded later on in order to avoid damage to the frames.

Necessary scaffolding shall be provided by the Contractor. The supports of the scaffolding shall be sound and strong, tied together with horizontal pieces over which the scaffolding planks shall be fixed. Normally simple scaffolding only shall be allowed. In this case horizontal pieces of the scaffolding shall rest in the holes, made in the header course only. The Contractor is responsible for providing and maintaining sufficiently strong scaffolding so as to withstand all loads likely to come upon it.

No through holes shall be left in brickwork to support the scaffolding. Only double scaffolding shall be erected. In case the holes are left in the brickwork, it shall be filled with 1:4:8 PCC.

Joints:
Bricks shall be so laid that all joints are quite flush with mortar. Thickness of joints shall not exceed 12 mm. The face joints shall be raked out as directed by raking tools daily, during the progress of work, when the mortar is still green so as to provide key for plaster or pointing to be done, subsequently.

The face of bricks shall be cleaned every day on which the brick work is laid and all mortar dropping shall be removed.

At the end of the day's work or on holidays the top of unfinished masonry shall be kept wet. If the mortar becomes dry, white or powdery, for want of curing, work shall be pulled down and re-built at Contractor's expense.

Curing: Fresh work shall be protected from rain suitably. Masonry work shall be kept moist on all the faces for minimum period of 7 days. The top of masonry work shall be kept well wetted at the end of the day's work.

Preparation of foundation bed:
If the foundation is to be laid directly on the excavated bed, the bed shall be leveled, cleared off of all loose materials, cleaned and wetted before starting masonry work. If masonry is to be laid on concrete footing, the top of concrete shall be roughened, cleaned and moistened. The Contractor shall obtain approval of the Engineer-in-charge for the foundation bed before foundation masonry is started. When pucca flooring is to be provided flush with the top of the plinth, the inside of the plinth wall shall be lowered down having an offset of the same thickness of the flooring with respect to the outside plinth wall top or as directed.

Mode of Measurements and Payment:
The measurement of this item shall be taken for the brick masonry fully completed in foundation up to plinth or above plinth for all levels, heights, shapes and locations as per the item description. The limiting dimensions not exceeding those shown on the drawings or as directed shall be final. Battered, tapered and curved portions shall be measured net.

No deduction shall be made from the quantity of brick work, nor shall any extra payment be made for embedding in masonry or making holes in respect of following items:

(1) End of joists beams, posts, girders, rafters, purlins, trusses, corbel, steps etc. where cross sectional area does not exceed 500 cm2.
(2) Architectural openings in walls, parapet and compound walls, not exceeding 1.0 m2 area.
(3) Wall plates and bed plates, bearing of slabs, chhajjas and the like whose thickness does not exceed 10cm and the bearing does not extend to the full thickness of wall.
(4) Drainage holes, recesses for cement concrete blocks to embed hold fasts for doors, windows etc., forming toothings, grooves etc. and providing cramps for holding stone lining.
(5) Iron fixtures, pipes up to 300mm dia.; holdfasts and doors and windows built into masonry and sanitary and water supply pipes, etc., for concealed electrical wiring and any other fixtures or inserts.
(6) Forming chases of section not exceeding 350cm2 in masonry.

Apertures for fireplaces shall not be deducted nor shall extra labour required to make splaying of jambs, throating and making arches over the aperture be paid for separately. The rate shall include for work of any shape e.g. pillars of any size and shape, curved or tapered walls, drip courses, projections, parapets, load bearing walls, sills, ottas, steps, tank walls, platforms and counter walls, ducts, channels and architectural mouldings like corbelling, pattas, etc.

The rate shall be for a unit of one m3.

Item No:- 27

Providing 15 mm. thick cement plaster in single coat on fair side of brick wall for interior plastering upto floor two level finished even and smooth in [II] Cement mortar 1:4 (1 cement : 4 fine sand) For all levels, heights and leads of works. etc, complete for all floor heights as directed. Rate shall be inclusive of hexagonal chicken mesh at junction of concrete and brick work. Minimum width of the chicken mesh shall be 150 mm covering the brick / concrete surface equally, as directed by EIC.

Materials:

Water shall conform to M-1 and cement mortar of proportion 1:4 shall conform to M-11.

Workmanship:

Scaffolding:

Wooden ballies, bamboo, planks, trestles and other Steel scaffolding shall be sound. These shall be properly examined before erection and use. Stage scaffolding shall be provided for ceiling plaster, which shall be independent of the walls. The sample shall be approved by the architect or engineer-in charge before starting the work.

Preparation of background:

The surface shall be cleaned of all dust, loose mortar droppings, traces of algae, efflorescence and other foreign matter by water or by brushing. Smooth surface shall be roughened by wire brushing if it is not hard and by dense hacking if it is concrete. In case of concrete surface, if a chemical retarder or shuttering oil has been applied to the form work, the surface shall be roughened by wire brushing and all the resulting dust and loose particles shall be cleaned off and care shall be taken that none of the retarder is left on the surface. Trimming of projections on brick / concrete surface wherever necessary shall be carried out to get an even surface.

Raking of joints in case of masonry wherever necessary shall be allowed to dry out for sufficient period before carrying out the plasterwork.

Scaffolding for carrying out plastering work shall be double scaffolding having two sets of vertical supports so that the scaffolding is independent of the walls.

Preparation of Surface:

All putlog holes in brickwork and junction between concrete and brickwork shall be properly filled in advance. Joints in brick work shall be raked about 10mm and concrete surface shall be hacked to provide grip to the plaster. Projecting burrs of mortars formed due to gaps at joints in shuttering shall be removed. The surface shall be scrubbed clean with wire brush / coir brush to remove dirt, dust etc., and the surface thoroughly washed with clean water to remove efflorescence, grease and oil etc., and shall be kept wet for a minimum of two hours before application of plaster.

For external plaster, the plastering operation shall be started from the top floor and carried downwards. For internal plaster, the plastering operations may be started wherever the building frame and cladding work are ready and the temporary supporting ceiling resting on the wall of the floor have been removed. Ceiling plaster shall be completed before starting plaster to walls.

Applications of Plaster:

The plaster about 5cm x 5cm shall be first applied horizontally and vertically at not more than 2m intervals over the entire surface to serve as gauge. The surfaces of these gauges shall be truly in plane of the finished plastered surface. The mortar shall then be applied in uniform surface slightly more than the specified thickness, and then brought to a true surface by working a wooden straight edge reaching across the gauges with small upwards and sideways movements at a time. Finally, the surface shall be finished off true with a trowel or wooden float according to the texture, smooth or sandy granular, as may be required. Excessive Troweling or over working the float shall be avoided. All corners, arises, angles and junctions etc. shall be carried out with proper templates to the size required. The surface shall be finished smooth using neat cement at the ratio of 2.2 kg/m^2.

Cement mortar shall be used within half an hour after addition of water. Any mortar or plaster which is partially set shall be rejected and removed from the site.

In suspending the work at the end of the day, the plaster shall be left out, clean to line both horizontally and vertically. While recommencing the plaster, the edges of the old work shall be scrapped clean and wetted with cement putty before plaster is applied to the adjacent areas to enable the two to properly join together. Plastering work shall be closed at the end of the day on the body of the wall and shall not be nearer than 15cm to any corners or arises. Horizontal joints in plasterwork shall not also occur on parapet tops and copings as these invariably lead to leakage. No portion of the surface shall be left out initially to be patched up later on.

Each coat shall be kept damp continuously till the next coat is applied or for a minimum period of 7 days. Moistening shall commence as soon as plaster is hardened sufficiently. Soaking of walls shall be avoided and only as much water as can be readily absorbed shall be used, excessive evaporation on the sunny or windward side of building in hot air or dry weather shall be prevented by hanging mats or gunny bags on the outside of the plaster and by keeping them wet.

Mode of Measurements & Payment:

The rates shall include for work at any height, position, and floor and for all necessary scaffolding, etc. as may be required. The rates shall also include for hacking and/or bush hammering to form key for plaster and for spatter dash treatment, as specified, as and where necessary. The rates shall also include for all work in narrow width, arises, rounded angles, chamfered external angles, drip moulds, grooves and for making good after all trades. The rate shall also include for groove with cement finish up to 12mm x 6mm to be formed in plaster at junction of slab and beam and slab and brick without any extra charge. The rate shall also include for similar grooves in plaster at the junction of masonry and wood or steel door/window/ventilator frame or at bottom of beam/lintels as drip moulds without extra charge.

All plastering shall be measured in m^2, unless otherwise specified. Length, breadth or height shall be measured correct to a centimeter.

Thickness of the plaster shall be exclusive of the thickness of the key i.e. grooved or open joints in brick work, stonework, etc. or space between laths. **Thickness of plaster shall be average thickness with minimum 15mm, at any point on the surface.**

The measurement of wall plastering shall be taken between the walls or partitions (dimensions before plastering being taken) for length and from the top of floor or skirting to ceiling for height. Depth of cover of cornices if any shall be deducted. Soffits of stairs shall be measured as plastering on ceilings.

Flowing/folding soffits shall be measured separately.

For jambs, soffits, sills, etc., openings exceeding 0.5sqm and not exceeding 3.0sqm, area deductions and additions shall be made in the following manner: -

(a) No deductions shall be made for end joints, beams, posts, etc. for openings not exceeding 0.5sqm each and no addition shall be made for reels, jambs, soffits, sills, etc. of these opening for finish to plaster around ends of joints, beams, posts, etc.

(b) Deduction for openings exceeds 0.5sqm but not exceeding 3.0sqm each shall be made as follows and no addition shall be made for reveals, jambs, soffits, sills, etc. of these openings.

a. When both faces of any wall are plastered with same plaster, deduction shall be made for one face only.
b. When two faces of any wall are plastered with different types of plasters or if one faces is plastered and the other pointed, deductions shall be made from the plaster or pointing on the side of frame for door, windows, etc. on which width of reveals is less than that on the other side but no deductions shall be made on the other side. Where widths of reveals on both faces are equal, deductions of 50% of area of opening on each face shall be made from area of plaster and/or pointing as the case may be.

For openings having door frames equal to projection beyond the thickness of wall, full deduction for opening shall be made from each plastered face of the wall. Jambs, soffits and sills shall be measured separately and paid for.

In case of openings having area above 3.0m^2 each, full deduction shall be made for the opening but jambs, soffits, and sills shall be measured additionally.

The rate shall be for a unit of one m^2.

Item No:- 28

Providing and laying average 20 mm. thick double coat Sand face/Mala cement plaster on external walls upto any height above ground level and for all shapes consisting of average 14 mm. thick backing coat of CM 1:3 (1 cement: 3 coarse sand) and average 6 mm. thick uniform grained textured finish coat using wooden Gutka, in CM 1:1 (1 cement: 1 sand),with line , level & plumb, including scaffolding, forming grooves, drip moulds, pattas, hacking RCC surface, curing etc. complete. as directed by EIC. Rate shall be inclusive of hexagonal chickenmesh at junction of concrete and brick work. Minimum width of the chicken mesh shall be 150 mm covering the brick / concrete surface equally.

Materials:

Water shall conform to M-12. Cement mortar shall conform to M-11.

Workmanship:

The work shall be carried out in the coats: The backing coat (base coat) shall be 14 mm. thick in C. M. 1:3. The relevant specifications of item No. 60 shall be followed except that the thickness of back coat shall be 14 mm. average. Before the first coat hardens its surface shall be beaten up by edges of wooden tappers and close dents shall be made on the surface.

The subsequent coat shall be applied after this coat has been allowed to set for 3 to 5 days depending upon the weather conditions. The surface shall not be allowed to dry during this period.

The second coat shall be completed to 8 mm. thickness in C. M. 1:1 as described above, including raising sand facing by bushing. The sample of sand face shall be got approved before the work is started. The whole work shall be carried out uniformly as per sample approved.
Curing : The curing shall be started overnight after finishing of plaster. The plaster shall be kept wet for a period of 7 days. During this period, it shall be protected from all damages.

Mode of measurements & payment:

The relevant specifications of item No. 60 shall be followed except that the sand face plaster on outside upto m. above ground level shall be measured under this item.

The rate shall be for a unit of one sq. meter.

Item No:- 29

Providing 10mm thick cement plaster in single coat on ceiling upto floor two level and finished even and smooth in (ii) Cement mortar 1:4 (1-cement :4-sand)

Materials & Workmanship :

The relevant specifications of item No. 60 shall be followed except that the thickness of plastering shall be 10mm and this work is for ceiling and soffits of stairs, upto two floor level instead of plaster on walls.

The smooth concrete surface shall be suitably roughened to provide necessary bond before plastering.

Mode of measurements & payment:

The payment shall be made for a unit of one sq. meter of work done, extra over and above the payment plaster work on wall surfaces.

The rate shall be for a unit of one sq. meter.

Item No:- 30

Applying two coats of acrylic putty & two coats of primer of approved brand and manufacture on new wall surface to give an even shade including thoroughly brushing the surface free from mortar dropping and other foreign matter and sand papered smooth.

Providing and painting internal walls with two coats of plastic emulsion paint of approved make & of shade. The rate shall include for all ladders, scaffolding and supports and including complete surface preparation, including scraping the surface off existing surface paint, loose particles and cleaning and applying primer and putty as necessary to achieve a surface in perfect line and level. Wherever necessary, POP punning or cement plastering needs to be done as per site condition, if the plastered surface has chipped off. The final finished surface should be smooth and in perfect line and level without undulations on surface. etc. complete as directed by EIC.

Providing, applying and finishing wall with weather proof exterior emulsion paint on

wall surface (two coats) to give an required shape even shade after thoroughly brushing the surface to remove all dirt, and remains of loose powdered materials.etc complete. as directed by EIC.

Refer detailed specifications from "CPWD vol. 2"

Material

The paint shall be (Textured exterior paint/Acrylic smooth exterior paint/premium acrylic smooth exterior paint/100% premium acrylic emulsion paint) of an approved brand and manufacturer.

This paint shall be brought to the site of work by the contractor in its original containers in sealed condition. The material shall be brought in at a time in adequate quantities to suffice for the whole work or at least a fortnight's work. The materials shall be kept in the joint custody of the contractor and the Engineer-in- Charge. The empty containers shall not be removed from the site of work till the relevant item of work has been completed and permission obtained from the Engineer-in-Charge.

Preparation of Surface

For new work, the surface shall be thoroughly cleaned off all mortar dropping, dirt dust, algae, fungus or moth, grease and other foreign matter of brushing and washing, pitting in plaster shall make good, surface imperfections such as cracks, holes etc. should be repaired using white cement. The prepared surface shall have received the approval of the Engineer in charge after inspection before painting commenced.

Application

Base coat of water proofing cement paint

All specifications in respect of base coat of water proofing cement paint shall be as described under cement paint section in CPWD Vol. 2.
Before pouring into smaller containers for use, the paint shall be stirred thoroughly in its container, when applying also the paint shall be continuously stirred in the smaller containers so that its consistency is kept uniform. Dilution ratio of paint with potable water can be altered taking into consideration the nature of surface climate and as per recommended dilution given by manufacturer. In all cases, the manufacturer's instructions & directions of the Engineer-in-charge shall be followed meticulously.
The lids of paint drums shall be kept tightly closed when not in use as by exposure to atmosphere the paint may thicken and also be kept safe from dust.
Paint shall be applied with a brush on the cleaned and smooth surface. Horizontal strokes shall be given, First and vertical strokes shall be applied immediately afterwards. This entire operation will constitute one coat. The surface shall be finished as uniformly as possible leaving no brush marks.
The specifications in respect of scaffolding, protective measures, measurements and rate shall be as described under 13.14 in cpwd vol. 2.

DELUXE MULTI SURFACE PAINT FOR INTERIORS AND EXTERIORS

Material

The paint shall be (Deluxe multi surface paint for interiors and exteriors) of approved brand and manufacture.
This paint shall be brought to the site of work by the contractor in its original containers in sealed condition. The material shall be brought in at a time in adequate quantities to suffice for the whole work or at least a fortnight's work. The materials shall be kept in the joint custody of the contractor and the Engineer-in- Charge. The empty containers shall not be removed from the site of work till the relevant

item of work has been completed and permission obtained from the Engineer-in-Charge.

Preparation of Surface

For new work, the surface shall be thoroughly cleaned off all mortar dropping, dirt dust, algae, fungus or moth, grease and other foreign matter of brushing and washing, pitting in plaster shall make good, surface imperfections such as cracks, holes etc. should be repaired using white cement. The prepared surface shall have received the approval of the Engineer in charge after inspection before painting commenced.

Application

Base coat of special primer of same manufacturer shall be used.
All specifications in respect of base coat of water proofing cement paint shall be as described under 13.21.
Before pouring into smaller containers for use, the paint shall be stirred thoroughly in its container, when applying also the paint shall be continuously stirred in the smaller containers so that its consistency is kept uniform. Dilution ratio of paint with potable water can be altered taking into consideration the nature of surface climate and as per recommended dilution given by manufacturer. In all cases, the manufacturer's instructions & directions of the Engineer-in-charge shall be followed meticulously.
The lids of paint drums shall be kept tightly closed when not in use as by exposure to atmosphere the paint may thicken and also be kept safe from dust.
Paint shall be applied with a brush on the cleaned and smooth surface. Horizontal strokes shall be given, First and vertical strokes shall be applied immediately afterwards. This entire operation will constitute one coat. The surface shall be finished as uniformly as possible leaving no brush marks.
The specifications in respect of scaffolding, protective measures, measurements and rate shall be as described under 13.14.

Refer specifications from "CPWD vol. 2

Mode of measurement & payment

The rate shall include the cost of all materials, labour and scaffolding etc. involved in the operations described under workmanship. The rate shall be for a unit of One sq. meter.

Item No:- 31

Providing & laying broken white China mosaic flooring for plain and curved surfaces, comprising of 12 to 20 mm. size broken pieces of white glazed tiles laid over water proofing using cement mortar 1:3 bedding, The flooring shall be tampered to bring the mortar cream up to the surface, including rounding of the junctions and extending them upto 30 cm. along the parapet wall. The rate shall include bands, if different colour is used, any pattern or design as per drawing and direction, curing, cleaning with water and oxalic acid, etc. complete. as directed by EIC.

Materials:
Water shall conform to M-1, Cement mortar shall conform to M-11, China mosaic shall be from white glazed tiles of rejected quality or from broken pieces of white glazed tiles. White cement shall conform to relevant standards.

Workmanship:

1) The size of the broken pieces of white glazed tiles shall not be more than 20-25mm.

2) Triangular China mosaic pieces shall not be used. Rectangular or square pieces shall only be used.

3) The broken pieces shall be soaked in water for 24hrs. before using.

4) The sub-grade shall be cleaned, wetted and mopped. The cement slurry @ 2.75kg/sqm (with waterproofing compound) shall be applied on the sub-grade evenly. The bedding (average 25mm) shall then be laid evenly over the surface in CM 1:3 in the desired slope as mentioned in the drawing. The bedding shall be tamped and corrected to the desired level with wooden patti. The bedding shall be allowed to harden enough to offer a rigid cushion to the tile pieces and to enable the mason to place wooden planks across and squat on it.

5) The broken china pieces are laid manually as close as possible over the specified bedding (before it sets/ gets hard), which shall be laid to the required slope and gradient.

6) While laying the broken glazed tiles, neat cement paste shall be applied over the bedding.

7)After china mosaic is arranged, the entire surface shall be tampered by wooden piece with a wooden mallet so that tile pieces are properly embedded and leveled in the mortar and slurry starts oozing from the joints.

8) Vata shall be done along with the floor, keeping machine cut edges at the top end of the vata.

9) At the end of day's work, the entire work shall be cleaned with the minimum quantity of water and moped with cotton cloth.

10) The joints shall be grouted firmly with white cement paste with the help of steel trowel.

11) The entire work shall be cured for 7 days by ponding.

12) After curing period is over, china mosaic shall be cleaned with water & rubbing by plastic brush to remove the dirt, excess cement etc.

13) The surface shall then be cleaned with water and very-very mild oxalic acid.

Mode of measurement and payment:
The rate shall be for a unit of one sqm and shall be measured wall to wall in plan. No extra measurement shall be given for rounding off up to 30cm.

Materials:
Cinder shall be of the best quality and shall conform to latest relevant IS specifications. The material specification shall be as per M9.

The rate shall be for a unit of one cum.

Materials:
Water shall conform to M-1, Cement shall conform to M-3, Sand shall conform to M-6, Stone grit shall conform to M-8, Brickbats shall conform to M-14, and Cement mortar shall conform to M-11. Approved polymer based waterproofing compound shall be added in cement mortar as per manufacturer's specification.

Workmanship:

Unless otherwise specified, proprietary waterproofing treatment shall be executed through an approved specialized waterproofing agency. The contractor shall furnish a guarantee of 10 years on stamp paper to the employer directly and the tender rate shall be inclusive of the same. A guaranteed bond on appropriate stamp paper shall be given by the contractor to the client in the manner prescribed below:

Providing and laying integral cement based waterproofing treatment of the agency approved by department, including preparation of surface as required for treatment of roofs, terraces etc mixing with waterproofing compound as per IS:2645, with average thickness of 115mm and minimum thickness at drain point as 65 mm. Following works are included in above item

A) Applying and grouting a slurry coat of neat cement using 2.75 kg/sqm. of cement admixed with proprietary water proofing compound over the RCC slab including cleaning the surface before treatment.

B) Laying cement concrete using broken bricks/brick bats 25 mm to 100 mm size with 50% of cement mortar 1:4 (1 cement : 4 coarse sand) using Ready mix mortar admixed with proprietary water proofing compound over 20 mm thick layer of cement mortar of mix 1:4 (1 cement : 4 coarse sand) using Ready mix mortar admixed with proprietary water proofing compound to required slope and treating similarly the adjoining walls up to 300 mm height including rounding of junctions of walls and slabs.

C) After two days of proper curing applying a second coat of cement slurry admixed with proprietary waterproofing compound.

D) Finishing the surfaces with 20 mm thick jointless cement mortar of mix 1:4 (1 cement : 4 coarse sand) using Ready mix mortar admixed with proprietary water proofing compound and finally finishing the surface to receive the China Mosaic waterproofing treatment.

E) The whole terrace so finished shall be flooded with water for a minimum period of two weeks for curing and for final test. All above operations to be done in order and as directed and specified by the Engineer in Charge.

Providing and mixing integral crystalline admixture for waterproofing treatment to RCC structures like Rafts, Retaining Walls etc. into the drum of the ready-mix truck in powder form, using integral crystalline admixture @ 0.80% by weight of cement content per cubic meter of concrete or as recommended by Manufacturer. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e. by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 Part 5 & resistant to 16 bars hydrostatic pressure. The crystalline admixture shall be capable of self-sealing of cracks up to a width of 0.5 mm by forming insoluble microscopic needle shaped crystals through ctalyst reaction with un-hydrated cement particle and moisture. It should be hydrophilic in nature, should be able to grow crystals year after year to seal microcracks.

For M- 250 grade(Cement level 450 kg) (GRADE SLAB)
Admixture Dosage :- 3.6Kg/m3

Providing and mixing integral crystalline admixture for waterproofing treatment to RCC structures like Rafts, Retaining Walls etc. into the drum of the ready-mix truck in powder form, using integral crystalline admixture @ 0.80% by weight of cement content per

cubic meter of concrete or as recommended by Manufacturer. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e. by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 Part 5 & resistant to 16 bars hydrostatic pressure. The crystalline admixture shall be capable of self-sealing of cracks up to a width of 0.5 mm by forming insoluble microscopic needle shaped crystals through ctalyst reaction with un-hydrated cement particle and moisture. It should be hydrophilic in nature, should be able to grow crystals year after year to seal microcracks.
For M- 350 grade(Cement level 500 kg) (Foundation)(RCC Wall) (RCC SLAB)
Admixture Dosage :- 4Kg/m3

Providing and applying Synthetic Rubber based Swelling Water stop tape, 20mm x 5mm thick for construction joints treatment of RCC structure such as retaining walls and at the junctions of raft slab with the retaining walls etc. After cleaning the surface, one coat of required adhesive for swellable water stop shall be applied throughout the length of the joint. Over the primed surface Swelling Water stop shall be placed. The water stop conforms to the following swelling properties: Swelling percentage of swelling water stop in clear water 1000%, concrete water 800% & salt water 300%. The work shall be carried out all complete as per manufacturer specification.

WET Areas - Sunk Slab, Bathroom, Kitchen, Podium, Terrace, OHT & UGT Water Proofing

(Cleaning and Preparation of surface with help of wire brush or grinder, wash the slab with clean water. Remove all loose concrete, grease, oil using wire brush and scrubber. Repair and fill all cracks, joints and annular space is included)

Supply and application of 2mm thick with a covergae of 3.2kg/sqm in 2 coats two-component, high flexible, elastic cementitious mortar made from cementitious binders, fine-grained selected aggregates, special admixtures and synthetic polymers in water dispersion with an elongation of 120% (DIN 53504), Static crack bridging ability of >2.5mm (EN 1062-7), Permeability to water vapour sD = 3.6 m, μ = 1800 (EN ISO 7783-1), Impermeability to water < 0.05kg/m²·h0.5 (EN 1062-3), Permeability to CO_2 sDCO2 >50m (EN 1062-6), Reaction to fire (Euroclass): E (EN 13501-1), adhesion to concrete after 28 days: 1.3N/mm² (EN 1542) when applied @ 2mm thickness (in 2 coats) on the surface prepared for waterproofing to be carried out to ensure the mechanical properties of the product with Mapenet 150. The application of the product shall be carried out after the thorough preparation of the surface which includes cleaning, crack treatment, corner joint treatment, grouting and priming primer having Colour: opalescent Speci c gravity (kg/l): 1.01 Dry solids content (%): 15 Brook field Viscosity # 1, rpm 10 (mPa·s): 20 in dilution with water {1:1}.

Addionally apply fiber net for reinforcing the waterproofing membrane and with Mapenet 150 tensile strength should be complied minimum 3.2 MPa after curing.

1. Tensile Strength : 3.2 Mpa

2. Crack Bridging: 2.8 mm

Water Tank Plastering & Food Grade Epoxy

Underground Water Tank and Overhead Water Tank -Plastering & Internal coating

(Cleaning and Preparation of surface with help of wire brush or grinder, wash the slab

with clean water. Remove all loose concrete, grease, oil using wire brush and scrubber. Repair and fill all cracks, joints and annular space is included)

Plaster Over Waterproofing Membrane: Before application of food grade epoxy supply & application of concrete plaster on avg thickness of 15-20mm by adding water proofing compound @200 ml per bag of cement.

Food Grade Epoxy: Supply and application of two-component epoxy paint made from epoxy resins and special pigments with high covering capacity for anti-acid and non-toxic coatings on concrete surfaces. Apply two coats of the product on a solid, clean substrate treated with primer (not included) with a brush, roller or by airless spray. Wait between 6 and 24 hours between each coat, according to surrounding conditions. The product must comply with the principles defined in EN 1504-2/-9 and have the following characteristics like, Abrasion resistance:(EN ISO 5470-1) <600 mg, Permeability to CO_2: (EN 1062-6) > 900 m, Permeability to water vapour: (EN ISO 7783-1-2) Class III, Resistance to thermal shock (1x): (EN 13687-5) 3.5 MPa, Taber abrasion resistance (g): 0.1; viscosity - rotor 5.

Detailed Specifications are as per the item description.

FORM OF GUARANTEE BOND

"I/We .....(Contractor) hereby guarantee that work will remain unaffected and will not be in any way damaged by water or any other form of humid condition, for a period of 10 years after completion of the work of waterproofing as per the terms and conditions of the contract and the Contractor hereby indemnifies and agrees to save the Client from any loss and or damage that might be caused on account of water and or other similar form of humid conditions and hereby guarantees to make good any loss or damage suffered by the Client and further guarantees to redo the affected work without claiming any extra cost."

1. This guarantee shall remain in force for a period of 10 years from the completion of the work under the contract and it shall remain binding to the Contractor for period of 10 years.

2. While tendering the contractors should clearly stipulate the type of treatment proposed to be provided by them and the name and particulars of firm through whom they propose to carry out the treatment.

3. The surface shall be cleaned of foreign matter such as fungus, moss, dirt and dust by wire brushing and dusting. Any cracks which may allow leakage of water shall be identified by ponding before starting the treatment. The slab surface shall be washed with water and cement slurry with waterproofing compound @ 2.75kg / m^2.

4. Cement mortar 1:3 shall be laid on the slab with waterproofing compound. The dosage of the waterproofing compound shall be as per the manufacturer's specification.

5. The surface to be treated shall have a minimum slope of 1 in 120.The brickbats of varying size as per requirement shall be arranged in proper gradient using cement mortar 1:3 according to the desired slope. Suitable waterproofing chemical shall be added to make the CM water tight and then cement mortar 1:3 shall again be provided on top of the brickbats, including the waterproofing compound which shall be added in the CM and finishing on top with neat cement @ 2.75kg/m^2.

The top surface shall be finished rough surface as per the direction so as to receive the next finishing item.

6. The testing shall be done by ponding for at least 48 hours.

7. Well defined cracks other than hair cracks in the treated structure shall be cut to `V' section cleaned and then filled up flush with 1:1 cement sand mortar with polymer based waterproofing compound.

8. The surface under treatment, part of parapet (in case of balcony or terrace) and gutters, drain mouths etc. over which the water proofing treatment is to be applied, shall be cleaned of all foreign matter such as fungus, moss and dust by wire brushing and dusting.

9. Drain outlet shall be suitably placed with respect to the surface gradient to ensure rapid drainage and prevention of local accumulation of water on the treated surface. Masonry drain mouth shall be widened sufficiently and rounded with cement mortar.

10. For cast iron drain outlets, a groove shall be cut all around to touch the treatment.

11. When a pipe passes through a roof on which water proofing treatment is to be laid, a cement concrete angle fillet shall be built round it and the water proofing treatment shall be taken over the fillet.

12. In case of masonry parapet wall over 450mm in height, for tucking in the water proofing treatment, a horizontal groove 75mm wide and 65mm deep at minimum height of 300mm above terrace level shall be left in the vertical face at the time of construction, the horizontal face of the groove shall be shaped with cement mortar 1:4.

13. In case of low parapet where the height does not exceed 450mm, no groove shall be provided and the waterproofing treatment shall be carried right over the top.

14. In case of existing R.C.C. and stone wall cutting the chase for tucking in the water proofing treatment is not recommended.

15. At the junction between the terrace slab and vertical face of the parapet wall, a fillet 75-100mm in radius shall be constructed.

16. At the drain mouths the fillet shall be suitably cut back and rounded off for each application of waterproofing treatment for easy flow of water.

17. Outlet at every low dividing wall about less than 300mm in height shall be rounded smooth and corners rounded off for easy application of water proofing treatment.

18. The top surface shall be kept wired finish to receive the china mosaic. In case china mosaic is not to be provided, the surface shall be kept cement finished @ 2.75kg / m^2 and marked with 300 x 300mm false square (with string).

Mode of Measurements and Payment:

1. The rate shall include providing water proof cement concrete terracing of adequate thickness to give desired slope for drainage of rainwater from terraces.

2. The measurements for this item shall be taken as under:

   a. Water proofing of roof shall be measured in m^2, plan area of treated surface shall be measured correct to a centimeter.

   b. Measurement shall be taken for the plan area of roofing / terrace. Flashing treatment including flashing over the parapet wall up to 300mm from terrace. Low dividing walls and expansion joints and at the pipe projections etc. Overlapping and tucking into flashing grooves shall not be measured extra and paid for.

   c. In measurements, no deduction shall be made for either openings or recess for chimney stacks, roof lights etc. having areas up to $0.4m^2$ Deduction shall be made in measurements for full opening but nothing extra shall be paid for extra labour and materials in forming such openings.

3. The rate includes cost of all materials and labour required to carry the works as per the above specifications. The rate also includes cleaning and hacking the RCC parapet and inverted beam surface and treating the cracks shall not be paid separately. Cutting of horizontal grooves in parapet walls for tucking in water proofing treatment shall not be measured or paid separately.

4. Measurements shall be based on the drawings or as executed on site, the lesser of the two shall be given. No extra payment shall be made for rounding and vata at the junction of slab & parapet. A deposit at the rate of 50% of the cost of this item from the running and final bills shall be recovered and retained for the first one year after completion of the work and 10% of the same or equivalent bank guarantee shall be retained for the balance of the guarantee period and shall be refunded only after the completion of the guarantee period.

5. This item shall be measured and paid for in m^2

Item No: -32

Providing & laying machine cut & machine polished (mirror finish) 18mm - 20mm thick Granite Stone of Steel Grey /Sadarhalli / Z Brown / Brown or other approved colour at all floor & location in necessary cement mortar bedding /backing, close jointed & grouted with matching cement slurry and rounding of edges, finished to line, level,curing etc. as required, including cutting of stone slab, wastage, making cut outs, grooves wherever required, machine polishing/ hand polishing (where machine cannot have access) etc. complete all as per specifications, drawings and as directed by the Engineer in charge. Note: Top exposed surface on plan &exposed vertical finished face shall be measured for payment in Sqm.

In flooring with machine polished Granite stone of size 800mm x 800mm/ 1000mm x 1000mm / (and any other size and pattern as per drawing) laid over &

including 20mm thick cement mortar1:4 (1 cement : 4 coarse sand) bedding. (Using ready mix mortar) including cement slirry at 4.40 Kg/Sqm over bedding and matching slurry with white cement at 2.20 Kg/Sqm for grouting the joints.

18mm thick one side machine polished granite stone of approved colour, shade and surface finish for Cladding/dado/riser/treads with stone slabs of various sizes in pattern including 12 mm thick 1:4 cement mortar (Using ready mix mortar) backing, fixing of 6mm (approx.) size angular stone chips to the backside of granite after applying araldite to the unpolished surface of the granite to create a surface suitable for proper bond with backing and filling the space between granite and backing with cement slurry including adequate curing etc. complete as directed and including rounding & polishing all exposed edges in semicircle / chamfering / or as per drawing & as ditected.

For top of dwarf walls, parapets, seat wall, planter wall etc using machine polished Granite stone of approved colour, shade & size as per drawing laid over & including 20mm thick cement mortar1:4 (1 cement : 4 coarse sand) bedding. (Using ready mix mortar) including cement slirry at 4.40 Kg/Sqm over bedding and matching slurry with white cement at 2.20 Kg/Sqm for grouting the joints. including half round / semi circle / camfering moulding & polishing of exposed face etc complete.

Providing and laying Riverwash finish Dark grey / Steel Grey /Adhunik/ Any other approved color Granite stone flooring / Coping in required size, design and patterns, in linear as well as curvilinear portions all complete as per the architectural drawings with 30 mm thick stone slab over 20 mm (average) thick base of cement mortar 1:4 (1 cement : 4 Coarse sand), portions butt jointed or with 5-8 mm gap as per design and drawing in 1:2 (cement : fine sand) and pointing full depth (flushed) or struck pointed as per design and drawing with white cement slurry admixed with pigment of matching shade including rubbing, pointing, curing, polishing, moulding/ champhering at edges and final scrubbing using mechanical/ manual means to achieve clean surface etc. all complete as specified and as directed by the Engineer-in-Charge. Including Minimum 2 mockups for approval, complete for finished item of work. Wax polishing is strictly not allowed.

Providing and laying Riverwash finish Dark grey / Steel Grey /Adhunik/ Any other approved color Granite stone flooring / Coping in required size, design and patterns, in linear as well as curvilinear portions all complete as per the architectural drawings with 18-20 mm thick stone slab over 20 mm (average) thick base of cement mortar 1:4 (1 cement : 4 Coarse sand), portions butt jointed or with 5-8 mm gap as per design and drawing in 1:2 (cement : fine sand) and pointing full depth (flushed) or struck pointed as per design and drawing with white cement slurry admixed with pigment of matching shade including rubbing, pointing, curing, polishing, moulding/ champhering at edges and final scrubbing using mechanical/ manual means to achieve clean surface etc. all complete as specified and as directed by the Engineer-in-Charge. Including Minimum 2 mockups for approval, complete for finished item of work. Wax polishing is strictly not allowed.

Providing & laying machine cut machine polished natural stones as mentioned for the followings for kitchen / Basin platform topping, counter topping and facia over and including necessary cement mortar for backing / bedding, close jointed and grouted with matching cement slurry and finished to line, slope, level, plumb, curing etc, as required including cutting of stone slabs, wastages, making cut outs wherever required etc all as per specifications and as directed by the Engineer in charge. Notes : 1) Verticals, shelves, platform shall be embedded minimum 25 mm in wall/ flooring. 2) Top exposed surface on plan & exposed vertical finished face shall be measured for payment in sqm.

For kitchen / Basin platform top, Vertical support for Counter, upto 750 mm wide and maximum length upto 1.80 m in single piece consisting machine cut machine polished 35 mm thick cuddappah stone at bottom and mirror polished machine cut 18mm thick Jet black/ approved Granite stone at top fixed with 47 mm thick 1:3 cement mortar (Using ready mix mortar), between two stone slabs (Double stone slab sandwitch type) including providing cut out if any, moulding and polishing the edges etc complete.

For kitchen platform horizontal & vertical facia upto100 mm wide machine cut machine polished on one side 18 mm thick Jet black/ approved Granite stone fixed with epoxy resin base (Araldite adhesive or equivalent) including round moulding and polishing the edges etc complete.

Refer Specification from CPWD Specification Vol 1 & Vol 2.

Item No:- 33

Providing & laying at all floors & locations Homogeneous Full body Vitrified tile/ Glazed vitrified tile/ Anti Skid Vitrified tile double charge/ multi charge (Glossy /Matt/ Satin)/ approved manufacturers of sizes 600 mm X 600mm / 800mm X 800mm / 1000 mm X 1000 mm size or as per approved size and having minimum thickness 8.5 mm or as specified by approved manufacturer tiles conforming to IS:15622 having water absorption less than or equal to 0.08% (Group B I a), in flooring/ skirting/ dado/ cladding / staircase tread/ riser at all floors and location, heights/ levels and lead in approved pattern and colour, shade laid over cement mortar bedding/ backing/ adhesive backing, including cleaning and preparing the surface for bedding/backing, spreading the neat cement slurry, close jointed and grouted with matching coloured readymade cement grout and approved pigment as per manufacturer's specifications, finished to level, line, slope and plumb, cutting of tiles, wastage, making openings / cut out if necessary, final cleaning of surfaces, curing etc. all as per drawings, specifications & as directed by Engineer in charge.

In flooring using Anti Skid Finish tiles of size 600 mm X 600 mm laid over 20 mm thick cement mortar1:4 bedding (using ready mix mortar) and spreading neat cement slurry by using minimum cement about 2 kg/sqm prior to bedding and spreading cement paste using minimum cement of about 4.50 kg/sqm over bedding,, and including Providing and laying Durafloor protector XF 3 mm thick sheet of approved make and brand over the whole vitrified tile / stone flooring area along with removing and cleaning the same before handing over without damaging the finished surface & making good the damages, if any etc and including Providing in flooring & skirting 3 mm thick and 8.5 mm deep grout line

using PVC spacers for creating true alignment and gap between vitrified tile work, if shown in the drawing & the 3 mm spacer joints filled with approved cement based tile grout including all labour material, wastage complete.

In dodo / skirting / cladding / sloped skirting laid over 12 mm thick CM 1:4 (1 cement : 4 sand, using ready mix mortar) backing, including providing grooves as per drawing on top of skirting. (Using Antiskid vitrified tiles or Double charge vitrified tiles)

1. Materials:

Water shall conform to M-1, Cement mortar shall conform to M-11. Vitrified floor tiles shall confirm to M-41 from the list of approved make and of first quality.

2. Workmanship:

2.1. Bedding:

2.1.1. The sub-grade shall be cleaned, wetted and mopped. The bedding shall then be laid evenly over the surface, as described above, tamped and corrected to desired level and allowed to harden enough to offer a rigid cushion to tiles and to enable the mason to place wooden planks across and squat on it.

2.1.2. The white/coloured vitrified/ceramic tiles shall then be laid on the cement mortar bedding of an average 30-35mm thickness, in CM 1:4. The mortar shall have sufficient plasticity for laying and there shall be no hard lumps that would interfere with the evenness of the bedding. The base shall be cleaned and well wetted, before laying. The mortar shall then be spread in thickness not less than 18mm at any place and average 30-35 mm. thick. The proportion of the cement mortar shall be as specified in the item.

2.2. Fixing tiles:

2.2.1. The tiles before laying shall be soaked in water for at least two hours. Neat grey cement grout at 3.3 Kg cement/m^2 of honey-like consistency shall be spread over the mortar bedding as directed. The edges of the tiles shall be smeared with neat cement slurry. The tiles shall then be well pressed and gently tapped with a wooden mallet till they are properly bedded and in level with the adjoining tiles. There shall be no hollows in bed or joints. The joints between the tiles shall be as thin as possible in straight line or as per pattern.

2.2.2. The tiles shall not have staggered joints. The Nahni trap coming in the flooring shall be so positioned that its grating shall replace only one tile as far as possible. Where full size tiles cannot be fixed, they shall be cut (Sawn) to the required size and the edges rubbed smooth to ensure straight and true joints. The outlets for drainage shall be marked as per drawing and tile fixing shall be carried out accordingly after laying and testing the drainage lines. After the tiles are laid, the joints shall be cleaned of grey cement grout with a wire brush to a depth of about 5mm and then grouted with white cement / polymer-based grouting of approved make like BAL with or without pigment to match the shade of the topping of tiles. The same cement slurry shall then be spread over the whole surface in a thin coat to protect the surface from

abrasive damage and to fill up pinholes that may exist on the surface. White cement with or without matching pigment shall be used for pointing the joints. After fixing the tile finally in an even plane the flooring shall be kept wet and allowed to cure undisturbed for 7 days.

2.2.3. While laying, any chiseling which may be required for making the skirting or dado flush with the plaster and / or other finishes shall be done. Necessary grooves of required size in cm, between plaster and / or other finishes, dado or skirting (if required) shall be provided. Forming machine-cut / rounded edges, gutters, sills, platforms, channels, curbing, etc. if any, if required shall be provided as per the drawing and design.

2.2.4. All necessary slopes, gradients and levels shall be truly maintained as required and directed by the Architect and Engineer-in-charge.

2.3. Cleaning:

2.3.1. The surplus cement grout that may have come out of the joints shall be cleared off before it sets. Once the floor has set, it shall be carefully washed and cleaned by oxalic acid and dried. Proper precautions and measures shall be taken to ensure that the tiles are not damaged in any way till the completion of the construction.

2.3.2. If any tile is disturbed or damaged it shall be refitted or replaced, properly jointed and polished.

3. Mode of Measurements and Payment:

3.1. The work done shall be measured in m^2 for the visible area of work done in floor. The length and width of the flooring shall be measured between the faces of skirting or dados or plastered face of walls as the case may be. The paving under dado or skirting shall not be measured. No deduction shall be made or extra paid for any opening in the floor of area up to $0.1m^2$ nothing extra shall be paid for laying the floors at different levels in the same room. The dado will be measured from the finish floor level to the top of tile fixed.

3.2. The rate shall include the cost of all materials (inclusive of all taxes, levies, and delivery at site), labour & sundry involved in all the operations, curing etc. complete, at all floors, at any height and level, as described above. It shall also include for breakage and wastage. Floating materials and margin of profit shall also be included. All material samples shall be approved by the Architect/Engineer-in-charge before placing orders.

3.3. No extra shall be paid for any small quantities like narrow widths, mitered & returned ends, rounds & cutting, fixing and making good up to & around pipes, fittings and fixtures etc.

3.4. The rate shall include for fixing the flooring in composite pattern as per the drawings, using different materials and sizes. The measurements of the different materials shall be taken category-wise separately and paid accordingly.

3.5. The basic rate, if at all provided or agreed upon includes cost of material, all taxes, levies & cost of delivery at site.

3.6. Rate shall be inclusive for the protection of the tiles by laying plastic sheet & Plaster of Paris until the handing over. The plastic sheet & Plaster of Paris shall be removed & flooring shall be cleaned at the time of handing over the sheets.

3.7. The rate shall be for a unit of one m^2.

Item No:- 34

Providing and laying machine cut and machine Polished Kotah stone flooring, skirting, riser, treads at all floors, levels & location including cement mortar (using ready mix mortar) bedding / backing, close jointed & grouted with matching cement slurry and finished to line, level, curing etc. as required, including cutting of stone slab, wastage, making cut outs, wherever required, machine polishing/ hand polishing (where machine cannot have access) and including providing and laying 6 mm thick POP during construction period etc. complete all as per specifications, drawings and as directed by the Engineer in charge.

In flooring with mirror polished, 25 mm minimum thickness kotah stone slab of size 600mm x 600mm / 575mm x 575mm / (and any other size and pattern as per drawing) laid over bedding of 20 mm Ready mix mortar having Cement: Sand (1:4)

Polished Kotah stone of approved colour, shade and surface finish for cladding/ dado/skirting/ /Facia/Window Sill/riser/treads with stone slabs of various sizes in pattern including 12 mm thick 1:4 cement mortar (Using ready mix mortar) backing, fixing of 6mm (approx.) size angular stone chips to the backside of Kotah stone after applying araldite to the unpolished surface of the Kota stone to create a surface suitable for proper bond with backing and filling the space between Kota stone and backing with cement slurry including adequate curing etc. complete as directed and including rounding & polishing all exposed edges in semicircle / chamfering / or as per drawing & as directed.

1. Materials:

1.1. Water shall conform to M-1. Lime mortar shall conform to M-10. Cement mortar shall conform to M-11 polished Kota stone shall conform to M-49.

2. Workmanship:

2.1. Each slab shall be cut to the required size and shape and fine chisel dressed at all the edges. The sides thus dressed shall have a full contact if a straight edge is laid along. The sides shall be table rubbed with coarse sand before paving. All angles and edges of the slabs shall be true square and free form chippings and giving plain surface. The thickness shall be 35 mm. (Average) as specified in the item but not less than 30 mm. at any place of the slab.

2.2. Bedding for the Kota stone slabs shall be cement mortar 1:6 (1 cement : 6 coarse sand) of average thickness 20 mm. as given in the description of the item. Sub grade shall be cleaned, wetted and mopped. Mortar of the specified mix and thickness shall be then be spread on an area sufficient to receive one kota stone slab. The slab shall be washed clean before laying. It shall be laid on top pressed, tapped gently to bring it in level with the other slabs. It shall be lifted and laid aside. Top surface of the mortar shall then be corrected by adding fresh mortar at hollows or depressions. The mortar shall then be allowed to harden bit. Over this surface, cement slurry of honey like consistency shall be applied. The slab shall then be gently place in position and tapped with wooden mallet till it is properly pedded in level with and close to the adjoining slab. The joint shall be as fine as possible. The slabs fixed in the floor adjoining the wall shall enter not less then 10 mm. under the plaster skirting or dado. The junction between the wall floor shall be finished neatly. The finished surface shall be true to levels and slopes as directed.

2.3. The floor shall be kept wet for a minimum period of 7 days. So that bedding and joints set properly.

2.4. Polishing shall normally commenced after 14 days of laying the stone slab. First polishing shall be done with ear borundum stones of 120 grade grit fitted in the heavy machine and then second polishing shall be done with carborundum stone of 220 of 350 grade grit fitted in heavy machine. Water shall be properly used during polishing. The stone shall then be washed clean with water. When directed by the Engineer-in-charge wax polish of approved quality shall be applied on the surface with the help of soft cloth over a clean and dry surface. Then the polish machine fitted with bobs shall be run over it.

2.5. The holes required for Nahni traps, pipes any other fittings shall be made without any extra cost.

3. Mode of measurements & payment:

3.1. The rate shall include the cost of all materials and labour involved in all the operations described above. The Kota stone flooring shall be measured in square metres correct to two places of decimal, length and breadth shall be measured correct to a centimeter and between the finished face of skirting dado or wall plaster and no deduction shall be made nor extra paid for any opening in floor of area upto 0.1 sq. mt.

3.2. The rate shall be for a unit of one sq. meter.

Item No:- 35

Providing and fixing Pre cast Kerb blocks of various types (Half Batter, Bull nose, Flat, offlet, Transition, Dropper, etc,.) and size of 600x450x150mm steel mould Vacuum wet pressed for connecting roads, pathway-prominade area and other area with true line &

level, including grading, geometrical shapes in curves, circles etc. at respective finish level etc. completed as specified in drawing and specification. It shall be of CC- M25 grade of concrete and fitted and jointed in C:M 1:1 with throughly curing, rendering with cement slurry, cleaning the joints neatly etc. completed as directed by EIC. It allows to satisfy respective IS-codes for materials, manufacturing process and test results.

NOTE : Contractor shall provide integrated shop drawings which include all necessary details with dimensions as provided drawings by Architect along with submission of satisfactory documents for all material, proportions, methods/ workmanship, preparations, joining and fixing, management schedule to execute the same with Preceding and succeeding activities, site visits, factory visits (if any) etc. completed as per relevant IS codes with detailed specifications in Stipulated time to furnish the job for approval purpose before starting of the work. It allows one finished mock-up (free of cost) till the level of satisfaction as per EIC. All detailed specifications shall be followed by CPWD/ R&B (Govt. of Gujarat) for given item descriptions to satisfy designed Structural stability (with test results for all) with desired look & fill for Mock-up and entire product.

Parameters

Sr. No.	Parameters	Minimum Requirements
1	Percentage Water Absorption	Not Over 8%
2	Tolerance in size (Length + Breadth)	±1.5 mm
3	Tolerance in thickness of blocks	±4 mm

The face of the kerb shall not exhibit defects such as cracking or flaking when examined.

For kerb if produced with facing layer, the facing layer shall have a minimum thickness of 4 mm over that area claimed by the manufacturer to be faced. For faces described as flat and edges described as straight, the permissible deviations on flatness and straightness are given in Table.1

Length of Gauge (mm)	Permissible deviation in flatness and Straightness (mm)
300	±1.5
400	±2.0
500	±2.5
800	±4.0

Bending characteristic of kerb as per Table below. Table 2

Characteristics Bending Strength (Mpa)	Minimum Bending Strength (Mpa)
2.5	2.0

General Quality

The quality of materials method and control of manufacture and transportation of all concrete work in respect of mix, were reinforced or otherwise, shall conform to the applicable portions of these specifications.

The Engineer-in-charge shall have the right to inspect the sources of materials, the layout and operation of procurement and storage of materials, the concrete batching and mixing equipment's and the quality control system. Such an inspection shall be arranged by the contractor and the Engineer-in charge's approval shall be obtained prior to starting the concrete work.

Delivery, Storage, and Handling Kerb stone units are to be delivered on site in suitable packaging free from cracks, chippings, or discolorations of the material. Store materials on elevated platforms, under cover, and in a dry location. Do not use materials that have become damp.

Store all accessories, including metal items, to prevent corrosion and accumulation of dirt and oil. Contractor to be responsible for the safekeeping of all materials delivered to site and replacement at own cost as required.

Technical specification of Kerb

Manufacturer: from Suppliers Schedule provided or equivalent approved.
Application: For all typical edges with level drop of 150mm average.
Concrete type: Manufactured by using M-25 or above grade as specified of concrete using vibrocompaction process using jointless moulds.
Size (width x length x height): Refer the Relevant Drawings & Schedule
Special shapes: Refer the Relevant Drawings & Schedule
Finish: Smooth
Plan dimension deviation class: ± 2mm.
Diagonal deviation class: ± 2mm.
Thickness deviation class: ± 2mm.
Colour: Refer the Relevant Drawings & Schedule. Bedding: approved Kerb stone is to be laid onto a concrete base/ footing. The base should typically be as per structure consultant advice. It should be composed of compacted semi-dry concrete. A minimum of one-third of the unit must be fully bedded into the mortar mix. Joints: 5mm wide joint, Mortar colour to match edge Color.

Sealant movement joints: Refer to relevant Indian standards and updated CPWD specification.

400	±2.0
500	±2.5
800	±4.0

Fixing of the kerb and any structural related details to specification.
Contractor to reject any kerb units that do not comply with the above requirements. Engineer-in Charge to reserve the right to reject products that do not comply to specifications.

Flares

The flared sides of kerb ramps provide a graded transition between the ramp and the surrounding sidewalk. Flares are not considered an accessible path of travel because they are generally steeper than the ramp and often feature significant cross-slopes with excessive rate of change of cross-slope. If the landing width is less than 1.220 m, then the slope of the flares at the kerb face should not exceed 8.33 percent. If the landing width is greater than 1.220 m, a 10 percent slope is acceptable. If the kerb ramp is located where a pedestrian might normally walk, flares are useful indicators to people with visual disabilities. Flares may be replaced with returned kerbs if the kerb ramp is located where a pedestrian does not have to walk across the ramp or if the sides are protected by guardrails or handrails.

Laying

The unit must be laid directly onto a suitable pavement surface which should extend to width to fully support the units and any other haunching. The unit are bonded to the surface using a suitable mortar

having cement sand ratio 1:1 respectively. Kerbs are generally laid with unfilled, close joints with a minimum joint width of 2 mm, The mortar is freshly mixed, consisting of 1:1cement sand ratio. Where mortar joints are used it should be properly filled and fully compacted. Joints should be extended to through the line of the units at the joint and continue through the kerb race.

Units are set out to line and level using a string line between pegs or steel pins. The line and level of the laid units should then be checked, and any necessary adjustments made. Allowances should be made on curves, as the string line will be made up of series of straight line. Kerbs should normally be laid so that the water check is 25 mm above the surface of the road. At vehicle crossing points kerbs should be 25 mm above final road surface unless otherwise stated or instruction given by the Engineer-In Charge.

At pedestrian crossing points dropped kerbs should be laid 6 mm above the final road surface on the lower side of the road and level with the surface on the higher side to aid drainage or as per provided detailed drawing. For ease of wheelchair use, the upstand should be between 0- and 6-mm or as per instruction given by the Engineer-In-Charge. joints on the dropper units may need adjustment to achieve this. The long kerb should not be cut to less than 300 mm in length, with smaller units not being cut to less than 1/3 of their original length (and a minimum of 50 mm)

Mortar
The mix and type of fine aggregate specified in the description of the item shall be used for the respective coats. Also, same should be applied for the cement. It must be in a proportion of 1:1 (Cement: Sand ratio) having bedding thickness specified in a drawing or instruction given by Engineer-In-Charge. It must be prepared in the presence of Engineer-In-Charge and instructed by the Engineer-In-Charge.

Mode of measurement and payment
The rate shall be for a unit of RMT.
In case of discrepancy Refer specifications from "Central Public Works Department Vol.2" Item no 16.58, Page no 844.

Item No:- 36

Paver Block

Providing and fixing 80 mm thick (min.) factory made paver blocks of specified finish (shot blasted), approved make and colour, shade, size, shape laid in pattern manufactured with cement concrete grade not less than M-40 and conforming to IS:15658, including providing & laying 20 mm thick bedding of cement mortar (using ready mix mortar having cement: sand, 1:4) finishing to line, level and slope, finally filling the joints with matching cement mortar and cleaning the surface etc. complete all as per specification and as directed by the Engineer- in- Charge.

Providing and fixing 60 mm thick (min.) factory made paver blocks of specified finish (shot blasted), approved make and colour, shade, size, shape laid in pattern manufactured with cement concrete grade not less than M-40 and conforming to IS:15658, including providing & laying 20 mm thick bedding of cement mortar (using ready mix mortar

having cement: sand, 1:4) finishing to line, level and slope, finally filling the joints with matching cement mortar and cleaning the surface etc. complete all as per specification and as directed by the Engineer- in- Charge.

Base
Shot blasted paver block to be fixed on the bed 20 mm or specified otherwise thick 1:4 (Cement: Sand) mortar of approved specification and filling the joints with the sand of approved type and quality or as specified and as directed by Engineer-in-charge.

Shot blasted Paver Block
Factory made precast shot blasted steel mould concrete paver block of M-350 or otherwise specified grade, Confirming to IS 15658: 2006 to be used. Paver blocks to be of approved brand and manufacturer and of approved quality. Minimum strength as prescribed by manufacturer and as per direction of Engineer-in-Charge for the grade specified to be tested as per method mentioned in specification of subhead cement concrete of CPWD Specification 2019 Vol. I. Size of paver will be as approved by EIC/ Design consultant. 1:4 cement mortar shall be used for filling the joint.

Measurement & Rates
Area provided with paver block to be measured in sqm. correct up to two places of decimal. The rate includes the cost of the material, labour, tools etc. required in all the operations described above.

Refer specifications from "Central Public Works Department Vol.2" Item no 16.57 Page no 844.

Item No: -37

Providing and laying 30 mm thick (without pattern thickness) all type of tactile pattern stone with textured finish as a warning stone of required size and pattern, depth of pattern shall be as per standard of vision impaired persons (minimum 8mm above) in any colours and shades in for outdoor floors such as footpath, atrium, terrace location etc., laid on 30mm (average) thick base of cement mortar 1:4 (1 cement : 4 coarse sand) in all shapes and patterns including grouting the joints with white cement mixed with matching pigments etc. complete as per direction and approval of EIC.

(RATE ONLY ITEM)

Providing and fixing tactile pattern stone high strength and high wear resistant high finish in varying colours as specified in design intent and approved by EIC, for pathways and flooring as per detailed drawing. It shall be laid on 30mm (average) thick base of cement mortar 1:4 (1- cement : 4-coarse sand) for levelling with filling the joint in proper line and level etc. complete as per detail drawing.

The size of tiles to be used shall be as shown in drawings or as required by the Engineer-in-Charge. The centre to centre distance of chequers shall not be less than 2.5 cm and not more than 5 cm or as per the design drawing.

The overall thickness of the tiles shall not be less than 30 mm. The depth of the pattern shall not be less than 4 mm. The tiles shall be given the final finish before delivery to site.

Laying
Base concrete or RCC slab on which the tiles are to be laid shall be cleaned, wetted and mopped. The bedding for the tiles shall be with cement mortar of specified proportion and in conformity with

provisions in relevant para of chapter on 'Mortar'. Cement mortar 1:4 (1 Cement: 4 coarse sand) bedding shall be used. Average thickness of the bedding mortar shall be 30 mm and the thickness at any place shall not be less than 20 mm.

Cement mortar bedding shall be spread, tamped and corrected to proper levels and allowed to harden for a day before the tiles are set. If cement mortar is laid in bedding the chequered tiles, these shall be set immediately after laying the mortar. Over this bedding neat grey cement slurry of honey like consistency shall be spread at the rate of 4.4 kg of cement per square metre over such an area as would accommodate about twenty tiles. Tiles shall be washed clean and shall be fixed in this grout one after another, each tile being gently tapped with a wooden mallet till it is properly bedded, and in level with the adjoining tiles. The joints shall be kept as thin as possible not exceeding 1 mm and in straight lines or to suit the required pattern. The joints shall be properly cleaned before filling with cement grout of matching colour. The surface of the flooring during laying shall be frequently checked with a straight edge of length at least 2 metre, so as to obtain a true surface with the required slope. Where full tiles or half tiles can not be fixed, tiles shall be cut (sawn) from full tiles to the required size and their edges rubbed smooth to ensure a straight and true joint. Tiles which are fixed in the floor adjoining the wall shall enter not less than 12 mm under the plaster, skirting or dado. The junction between wall plaster and tile work shall be finished neatly and without waviness.
After the tiles have been laid, surplus cement grout that may have come out of the joints shall be cleared off.

Curing, Polishing and Finishing
The day after the tiles are laid all joints shall be cleaned of the cement grout with a wire brush or trowel to a depth of 5 mm and all dust and loose mortar removed and cleaned. Joints shall then be grouted with cement mixed with or without pigment to match the shape of the topping of the wearing layer of the tiles. The floor shall then be kept wet for a minimum period of 7 days.

Measurements
Laid area of tiles shall me measured in Square meter.

Rate
The rate shall include the cost of all materials and labour involved in all the operations described above.

Cobble Stone

Providing and fixing cobble stone of size 100 x 100 x 100 mm thick, in approved pattern and approved colour & shade, including providing & laying 20 mm thick bedding of cement mortar (using ready mix mortar having cement: sand, 1:4) finishing to line, level and slope, finally filling the joints with matching cement mortar and cleaning the surface etc. complete all as per specification and as directed by the Engineer- in- Charge.

Measurement & Rates

- Area provided with cobble to be measured in sqm. correct up to two places of decimal.

The rate include the cost of the material, labour, tools etc. required in all the operations described above.

- Mode of measurement shall be in sqm.

- Refer Specification from CPWD Specification Vol 1 & Vol 2.

Item No:- 38

Providing & Fixing M/F Suspended Plain Gypsum Ceiling which includes 20x28x30x0.5mm Perimeter Channel {Material-GI(IS513), YS-300Mpa, Finish-Galvanised 150GSM(IS 277)} is fixed along the perimeter of existing wall/ partition with the help of suitable HPS - 1 (6x40) impact anchor / PVC Anchor (6x40) at 600mm c/c for the brick wall, at 600mm centres. 25x10x0.5mm Ceiling Angle {Material-GI(IS513), YS-300Mpa, Finish-Galvanised 150GSM(IS 277)} is suspended at up to 1.5m height by fixing it to the 27x37x25x1.6mm Gyproc® soffit clit {Material-GI(IS513), YS-300Mpa, Finish-Galvanised 150GSM(IS 277)} with Soffit Cleat and or Rawl Plug- Ø8x45mm {Material-IS 513 CR2 grade, Zinc coating (7 to 8 microns)Pull Out Load- 7.5kN for M30 concrete grade} creating 1220mm x 1220mm grid. 15x45x15x0.9mm Intermediate channel {Material-GI(IS513), YS-300Mpa, Finish-Galvanised 150GSM(IS 277)} is fixed to the 25x10x0.5mm Ceiling Angle with M6 x 12mm Hex Bolt & Hex Nut arrangement {Material–As per EN 10083 Finish – Zinc Plating} or with 2 Nos of Ø4.2x13 metal to metal screw {Material-Carbon steel EN-ISO 7049/50 Finish- Zinc Coating Thickness-4.14micron.} The 80x26x0.5mm Ceiling Section {Material-GI(IS513),YS-300Mpa,Finish-Galvanised 150GSM(IS 277)} is then fixed to the 15x45x15x0.9mm Intermediate Channel {Material GI(IS513),YS-300Mpa,Finish-Galvanised 150GSM(IS 277)} with the help of Ø 2.64mm Connecting Clip {Material-High carbon spring steel wire (BS970Gr.En42)-46-48HRC,Finish-Zinc plating 4-6 micron} and in direction perpendicular to the Intermediate channel at 457mm c/c. Single-layer of 12.5mm thick Plain (conforming to IS 2095 Part 1: 2011, ISI Mark Certified, International EPD Verified) of size 1219 x 1829mm is then screw fixed to ceiling section with 25mm drywall screws {Material-Carbon steel EN-ISO 7049/50, Finish-Case hardened Grey Phosphating as per JIS G3507-1} standard at 230mm centres. Gypsum Board to be certified class 1 under BS-476 Part 5,6, & 7 & certified GreenPro by CII. Finally, square and tapered edges of the boards are to be jointed and finished to have a flush look which includes filling and finishing with Jointing Compound & Joint Paper tape. Serrated steel section has an effective thickness of 2T (2xdepth), better load carrying capacity, enhanced screw retention, Improved acoustic performance & fire resistance as compared to plain steel section. All metal components are Design Patented in India (325062). Vendor to submit MTC, material inspection report and/or performance certificate for the system. If required trap door also provided as per drawing is included.

Detailed Specifications are as per item description.

Item No:- 39

Providing and fixing tiled false ceiling of size (600x600)mm in true horizontal level suspended on inter locking metal grid of hot dipped galvanized steel sections. It consists of main "T" runner of size 24x32x0.3x3600mm, cross "T" of size 24x25x0.3x1200mm, secondary cross "T" of size 24x25x0.3x600mm and PPGI wall angle of size 24x24x0.4x3000mm. Bottom exposed capping of width 24 mm of all T-sections shall be of 0.25mm thick PPGI. PPGI wall angle 24x24x0.4x3000mm {Material-GI(IS513), YS-280Mpa, Finish-Galvanised 90GSM (IS277)} is fixed along the perimeter of the ceiling to Walls, partitions or columns etc., with wooden screws at 300mm centers or Hilti HPS 6x40mm placed at 600 mm c/c. soffit cleat 27x37x25x1.6mm {GI(IS513) YS-260Mpa, Finish-Galvanised 120GSM (IS277)} is fixed with Rawl Plug- Ø8x45mm {Material-IS 513 CR1 grade, Zinc coating (7 to 8 microns) pull out load- 6.8kN for M30 concrete grade} creating (1200x1200)mm grid. Main-T runners 24x32x0.3x3600mm are then suspended

at 1200mm c/c from ceiling using 4mm zinc electroplated butterfly level clips of size 85x30x0.8mm spaced at maximum 1200mm center to center along main T and not more than 150mm from spliced joints. The last hanger at the end of each main runner should not be greater than 600mm from the adjacent wall. 24x25x0.3x1200mm cross T {Material- GI(IS513),YS-280Mpa, Finish-Galvanised 90GSM (IS277)} is interlocked between the main T at 600mm center to center to form a grid of 1200x600 mm and then secondary cross "T" 24x25x0.3x600mm {Material-GI(IS513), YS-280Mpa, Finish-Galvanised 90GSM(IS277)} is then interlocked at middle of the (1200x600)mm grid to form grids of (600x600)mm. Cross Tees at the ends having length more than 600mm are to be supported independently. Finally 12.5mm thick square edge Gypsum tile (meets requirement of specification mentioned under DAR no. 12.52.3 in Delhi Schedule of rates (DSR)), of size 595x595mm, made of Gypsum plasterboard, manufactured from natural gypsum as per IS 2095 part I and laminated with white 0.16mm thick fire retardant PVC film on the face side and 12micron metalized polyester on the back side with all edges sealed with the face side PVC film which goes around and wraps the edges and is bonded to the edges, so as to make the tile a completely sealed unit, is placed in the grid.

Detailed Specifications are as per item description.

Item No:-40

Providing and Fixing Everest Metal Frame Suspended Ceiling which includes Perimeter Channel of 0.50mm thick, having one flange of 20mm and another flange of 30mm and a web of 27mm, fixed along the perimeter of ceiling, screw fixed to wall/ partitions with the help of nylon sleeves and steel screws. Then suspending Intermediate Channel of 0.90mm thick, web of 45mm with two equal flanges of 15mm each from the soffit at 900mm centres with ceiling angle of 0.50mm thick, having one flange of 10mm and another flange of 25mm, fixed to soffit with the help of soffit cleat (27 x 37 x 25 x 1.6mm), Ø12 x 45mm Metal Anchor Fasteners (Rawl Plugs) and M6 Bolt Nut (6 x 12mm). Ceiling Section of 0.50mm thick, having a web of 53mm (80mm overall width of the profile) with two equal flanges of 26mm each and equal lips of 10.5mm each are then fixed to the Intermediate Channel and in direction perpendicular to the Intermediate Channel at 488mm c/c(max) with GI connecting clips (wire diameter of 2.64mm). Additional members shall also be provided to support the plank joints, as per site conditions.

> **6mm Everest Fibre Cement Board (conforming to IS 14862: Type B- Category 3; Density >1200Kg/m3; MOR at EMC >10MPa and MOR in Wet Condition >7MPa; with Fire property classification as non-combustible, Class A and A2-s1-d0, when tested in accordance to BS 476, ASTM E84 - 18B and EN13501: Part 1, respectively) and 9mm Everest Heavy Duty Fibre Cement Board (conforming to IS 14862; Type A - Category 4 Density >1450Kg/m3, MOR in wet condition >14MPa, Class A and A1, when tested in accordance to BS 476, ASTM E84 - 18B and EN1350: Part 1, respectively), as substrate and finished ceiling board, shall then be screw fixed to the bottom of the ceiling section with 25mm and 35mm Everest self-tapping self-drilling countersunk screws, respectively. Screw fixing of the substrate board and the Heavy Duty Board shall be at 300mm c/c (max). The joints of the boards shall be staggered to avoid through joints. The exposed Everest Heavy Duty Fibre Cement Board shall be screw fixed with desired grove finish as per the specification.**

Detailed Specifications are as per item description.

DOORS AND DOOR ACCESSORIES

Item No:-41
Aluminium Framed Doors with Floor Spring
Design, Fabrication, Supply, Installation, Testing, Protection, Cleaning & Handover Single shutter aluminium framed door opening outward system to withstand the design wind pressure. The system shall have a Wool pile weather sealing at perifry of Door Frame. The profile system is in line with the tender drawing & minimum of 1.8 mm thickness.
Design, Fabrication, Supply, Installation, Protection, Cleaning & Handover Single leaf double swing Frame door made out of 12mm thick fully tempered (FT) glass with PT series patch fittings, Door lock and BTS 80, 90 deg with EN 1-4 spring capacity floor spring. Floor spring covers shall be SS satin finish, as per the Architect's approved shop drawings.
The extruded aluminium sections of Alloy 6063 T5 / T6 & tolerances confirming to DIN / EN standard from approved extruder. The structural profiles shall have minimum 1.8mm wall thickness. All the visible surfaces shall have high Durability (Akzonobel) / Super durable (Jotun) Powder coating of 60 - 80 micron confirming to AAMA 2604. The non visible aluminium surfaces shall have minimum chromatizing treatment.
All Material Make / Vendor list / Supplier list shall be as per tender specification.
All shade approval shall be as per Architect's Approval.
The quote rate shall include all Design & shop drawing approval from architect & consultant.
Aluminium framed door system with glass
Quote rate for complete system as mentioned above under item (B).
Aluminium Framed Single Swing Doors: - Double Shutter (Size:- 1610 mm (W) x 2400mm (H)
Aluminium Framed Single Swing Doors: - Double Shutter (Size:- 1425 mm (W) x 2400mm (H)
Aluminium Framed Single Swing Doors: - Double Shutter (Size: - 1500 mm (W) x 2400mm (H)
Vision Glass: - 12mm Thk.:- Providing and fixing glass:-
Glass: -12mm thk. (12mm thk. Clear tempered glass) (As per Client / Architect Approval sample).

Detailed Specifications are as per the item description.

Item No:-42
Spider Canopy with Laminated glass on SS Support Above Door.
Shop Drawing, Fabrication, Supply, Installation, Testing, Protection, Cleaning & Handover of SS316 Support canopy with spider system of DORMA / OZONE custom Shop Drawing with stand the Shop Drawing, wind pressure confirming to IS -875 part III. (The system must pass the proof test at 1.5 times Shop Drawing, wind pressure without any failure) with weather sealants, backer rod, Bracketing system with Aluminium Alloy of 6005 T5 brackets Shop Drawing,ed to accommodate three dimensional movements with serrated plate and serrated washers, SS 316 grade fasteners & Anchor Fasteners, nylon separators to prevent bi-metallic contacts, all complete required to perform as per specification and drawing in conjunction with BOQ.All SS members-Grade 316 With have satin finish inline with architect requirement.

The stainless steel spider system of Grade 316, supported on SS structure, all inline with the tender drgs. All the weather sealants shall be non staining of approved make, Stainless steel spider system of grade 316 with Articulated bolt assembly, with SS 316 grade fasteners and anchor bolts of approved make, Teflon/ nylon bushes & separators to prevent bi-metallic contacts, all in complete required to perform as per specification and drawing in conjunction with BOQ.
Shop Drawing, Fabrication, Supply and install required prefabricated grid on to the SS Steel portal with full Welded of as recommended by approved supplier to support given Shop Drawing, loads. The brackets shall have provision movement to accommodate the construction tolerances . Use of SS316 brackets with washers to prevent wind direction movement after final position.
All Material Make / Vendor list / Supplier list shall be as per tender specification.
All shade approval shall be as per Architect's Approval.
The quote rate shall include all design & shop drawing approval from architect & consultant.
Quote rate as mentioned above under item (D) with Laminated Glass.
17.52mm Laminated glass :- (8mm Clear FT Glass + 1.52mm Clear SGP Kuraray Lamination + 8mm Clear FT Glass)
Quote rate for complete SS works as mentioned in item (D).

Detailed Specifications are as per the item description.

Item No:-43
Aluminium Framed Doors with AHPL and Floor Spring.
Design, Fabrication, Supply, Installation, Protection, Cleaning & Handover Single leaf, double swing Aluminium Frame door System, The system shall have a wool pile weather sealing all side door frames. The profile system is in line with the tender drawing & minimum of 1.8 mm thickness. Patch fittings, Door lock and BTS 80, 90 deg with EN 1-4 spring capacity floor spring. Floor spring covers shall be SS satin finish, as per the Architect's approved shop drawings.
The extruded aluminium sections of Alloy 6063 T5 / T6 & tolerances confirming to DIN / EN standard from approved extruder. The structural profiles shall have minimum 1.8mm wall thickness. All the visible surfaces shall have high Durability (Akzonobel) / Super durable (Jotun) Powder coating of 60 - 80 micron confirming to AAMA 2604. The non visible aluminium surfaces shall have minimum chromatizing treatment.
All Material Make / Vendor list / Supplier list shall be as per tender specification.
All shade approval shall be as per Architect's Approval.
The quote rate shall include all Design & shop drawing approval from architect & consultant.
Aluminium framed door system with glass.
Quote rate for complete system as mentioned above under item (E)
Aluminium HMPS Framed Single Swing Doors:- Double Shutter (Size :- 1000mm (W) x 2400mm (H)
Aluminium HMPS Framed Single Swing Doors:- Double Shutter (Size :- 1000mm (W) x 2100mm (H)
Aluminium HMPS Framed Single Swing Doors:- Double Shutter (Size :- 1200mm (W) x 2400mm (H)
Quote rate for complete system as mentioned above under (E) Including 6mm thick (AHPL) aluminium high-pressure laminate of a thick fire-retardant (FR) grade mineral-filled thermoplastic inorganic core of grade B sandwiched between two thin coil PVDF

coated aluminium sheets (Top i.e. face #1 & rear, i.e. face #2) of Alloy Grade 3003 and H-16 temper and minimum thickness of 0.5mm each as specified in the nomenclature of item. The HPL fire retardant core of B grade

Detailed Specifications are as per the item description.

Item No:- 44

Supplying & fixing in position the following type solid core block board flush door shutter (Single/ double leaf) with commercial ply facing / prelamination on both sides conforming to IS 2202 (Part-1) of approved make & brand with external / internal type second class teak wood lipping alround of required width and depth (20 minimum thickness all around) of shutter as per IS/as specified, fixing shutters in position to HMPS door frames/ wooden frames/ granite frame works (door frames shall be paid separately under relevant item) at all floors by cutting/ planning if necessary including labour for fixing of the fittings & fixtures as per drawing with wooden packing pieces if necessary (but excluding the cost of fittings and fixtures with SS screws which shall be paid separately under relevant item), including view panel wherever required as per drawing, finishing as specified all as per specifications, drawings and as directed by Engineer In Charge.

A) 30 mm thick flush door shutter (for shaft doors), With 1.0 mm thick decorative laminate sheet of approved colour, pattern & shade fixed on one face of shutter and 1.0 mm thick white / off white lamination on another face.

Refer specifications from "CPWD vol. 1 & 2" and specifications as per Item description.

Item No:- 45

Providing & fixing Hollow Metal Pressed steel (HMPS) door frames of following profile fabricated out of 1.60 mm thick G.I sheet of coating (Class VIII of zinc coating) 120 gram/sqm, manufactured by Sail / Lloyds/ Jindal or equivalent of profiles / size generally conforming to IS 4351-2003 with suitable one/two set rebates for fixing shutters and also rebate suitable for fixing fixed glazing including hole for self tapping screws wherever shown in the drawing, each frame to contain hinge jamb, lock jamb and head all rigidly fixed together with welded /mechanical joints with back plates /angles to correct shape & angles including providing and fixing base ties with GI channel 50x25mm, 1.25mm thick suitable section to suit floor thickness / angle thresholds with MS angle 25x25x3mm, 6nos. of adjustable lugs per frame, providing and welding of 40x40x5mm,150mm long angle cleats for hinges with necessary tapped holes for fixing counter sunk headed machine screws to suit heavy duty oxidised / stainless steel hinges of size 125mm x 65mm x 2.8mm/125mm x 76mm x 2.80mm/ 100mm x59mm x2.6mm/75mm x 48mm x 2.45mm or shop type welding and self taping screw for fixing hinges/ piano hinges etc. and finishing the same to smooth etc. (but excluding the cost of hinges which shall be paid under the relevant item) including providing each door frame with necessary lock strike plates, mortar guards, buffers, bushes etc. required for tower bolt/ baby latches, tadis, safety chains, aldrops etc including fixing the frame to brickwork/ concrete work with necessary PCCor bolted/ screwed to concrete work, painting a shop coat of polyurethane paint including etching the surface with ETCH primer etc. including painting the exposed surfaces with two coats of synthetic enamel paint of approved make and colour over a coat of red oxide/ zinc chromate primer and painting the unexposed surfaces with two coats of anti corrosive bituminous paint, after rectifying the damaged PU primer due to

transport including filling the hollows of door frame with C.C.1:2:4 using 12 mm size downgraded stone aggregate, curing, finishing etc. all complete as per drawings, specifications and as directed by Engineer in charge.

Note: The quoted rate shall include cost of base tie / angle and all accessories mentioned in the item description except iron mongeries (i.e. fittings and fixtures with wood and machine/ self taped screws as required, which shall be measured and paid separately under relevant item.)

Profile 90mm x 60 mm with single rebate for doors.

Refer specifications from "CPWD vol. 1 & 2" and specifications as per Item description

Item No:- 46

Steel Fire Rated Doors with HMPS Steel Frames. Fire Resistant Door (FRD) assembly having 120 minutes (2 hr) Fire rating, Metallic and conforming to IS 3614:2021 (Single / Double lef Shutter) Providing and fixing factory made Fire rated door assembly of galvanised Iron Steel door frame with metallic single / double leaf door shutter with accessories, the entire door assembly including shutter, frame and fittings shall be confirming to 1200 minutes (2 hr) fire rating as per IS 3614.

Frame:- The door frame shall be made of minimum 1.20 mm thick GI Sheet with minimum 120 GSM coating as per IS:277. The frame shall be of grooved profile of minimum size 90 × 60 mm with inbuilt sealing system to take appropriate fire rated smoke seal. Frame shall be provided with appropriate reinforcement suitable for hardware and flush fixing. Frames shall be provided with stiffener pieces and mitred cut joints (self tab/screwed assembled at site). Fire rated EPDM smoke seal, confirming to IS 3614 : 2021 shall be fixed within the inbuilt groove or stuck with adhesive on the entire perimeter of the frame.

Door frames shall be fixed to all round the opening with minimum 8 mm dia CSK headed fastner of minimum 80 mm long with 8mm dia Polyamide sleeves @ 3 Nos at each side.

Finishing: Frame to be factory finished with polyester powder coating of minimum thickness of 30 microns (500 hrs salt spray test) of approved colour and shade all complete as per manufacturer's Specification and direction of the engineer in charge.

Door Shutter: The factory made fire resistant metallic door leaf shall be minimum 60 mm thick fully flush double skin step design door, insulated with or without vision. Door leaf shall be manufactured from 1.2 mm (18guage) minimum thick galvanised steel sheet. The internal construction of the door should be rigid reinforcement pads for receiving appropriate hardware. The infill material shall not be less than be 120kg/m3 high density mineral wool insulation material. Intumescent seals 15 x 1.5mm to be provided. All ISI labelled doors shall be factory prepped for receiving appropriate hardware and provided with necessary reinforcement for hinges, locks, and door closers panic bar etc. The edges should be interlocked with a bending radius of 1.4mm. For pair of doors integrated astragals has to be provided on the meeting stile for both active and inactive leaf. Vision lite wherever applicable shall be maximum 200 x 450mm with clear borosilicate fire rated glass of 6mm. Glass shall be fixed with suitable gasket and with clip-on arrangement.

The door leaf shall be factory finished with polyester powder coating of minimum thickness of 30 microns (500 hours of salt spray test) of approved colour and shade all complete as per manufacture's Specification and as per the directions of Engineer - in-charge.

Accessories Hardware: Fire door set shall include all accessories like, Fire rated SS 304 grade ball bearing type hinges of minimum size 100 mm ×75 mm × 3 mm one (3 numbers per leaf upto 2100 mm height or as per test evidence), one number fire rated SS mortise lock with handle, fire rated door closer
Installation: Post installation hollow space within door frame shall be filled with fire rated self-extinguishing type polyurethane foam. Rate shall include for supply and installation of complete door assembly, by the manufacturer. (All mechanical and functional hardware like hinges, lever handles, door closers with 120 minutes fire rating are to be used on doors and must conform to relevant IS 3614 : 2021.
all as per manufacturer's specification and providing Fire Resistant certification (manufacturing & installation) as required by local fire statutory authority shall be furnished by manufacturer of Door assembly (Frame, Shutter, fitting) and all cutting/ planning if necessary, labour for fixing the fittings and fixtures with suitable packing if necessary including providing and fixing 120 minutes (2 hr) fire rated approved powder coated steel door set etc. all complete all as per specifications, drawings & as directed by Engineer in charge.

Refer specifications from "CPWD vol. 1 & 2" and specifications as per Item description

Item No:- 47

Providing and fixing aluminium die cast body tubular type universal hydraulic door closer of approved make conforming to IS: 3564 with ISI mark including necessary accessories and screws etc for fixing with alumnium/ wooden/ steel doors with necessary bolts & nuts, labour, scaffolding etc complete all as per specifications and as directed by the Engineer-in-charge.

Providing, fixing & Supplying at site of work approved quality and manufacturer, confirmed & marked with relevant IS (wherever applicable), Stainless steel (SS-304) fittings, fixtures and fastenings along with Stainless steel screws/concealed SS screws, bolts, nuts, washers,wooden packing pieces if necessary etc.and other accessories etc complete all as per specifications and as directed by the Engineer-in-Charge. SS But hinges (Heavy Weight) of size (100 X 75 X 3.0 mm) , ball bearing type, (Two / Three leaf Hinges)

Providing, fixing & Supplying at site of work approved quality and manufacturer, confirmed & marked with relevant IS (wherever applicable), Stainless steel (SS-304) fittings, fixtures and fastenings along with Stainless steel screws/concealed SS screws, bolts, nuts, washers,wooden packing pieces if necessary etc.and other accessories etc complete all as per specifications and as directed by the Engineer-in-Charge. S. S. Tower bolt 300 mm long x 12 mm barrel

Providing, supplying, fixing approved make back to back stainless steel Handle-450 mm long (Set including a pair of handles), of minimum 25 mm dia, including accessories for fixing it to glass, aluminium, wood shutter, brackets etc.complete as directed by EIC. (Note:- Cost is for one set consists of two nos of handles to fix on shutter both side (Inside & Outside))

GRAB HANDLE FOR ADA TOILETS:
Providing & fixing 25 mm diameter (1.5mm thick) SS 304 satin (brush) finish Grab handle for disabled toilet door of 600mm long of approved make with necessary SS 304 grade screws etc. complete as per drawing as sample approved by Engineer-in-charge

Providing & Fixing 6- lever Mortice lock of chromium plated SS-304 parts & body of approved brand & make, 200 mm Mortice latch & lock (without Handle Set) Lock Body CK mortice lock with chromium plated SS screws, with duplicate keys etc. lock shall be fitted as per manufacturer specification and as directed by Engineer in charge.

Providing and fixing Mortise shaft dead bolt with key (Alen Key lock) with 57mm backset and 25mm square for end in stainless steel satin finish of approved make including all labour, material etc complete all as per specifications and as directed by the Engineer-in-Charge.

Providing, supplying, fixing glass to glass 6 lever SS patch lock (Round type) of approved make on glass for doors complete as per drawing. Frameless Swing Doors (Patch Fitting Doors)

Providing and fixing double action hydraulic floor spring of approved brand and manufacture having ISI mark as IS : 6315, having brand logo embossed on the body / plate with double spring mechanism for doors, including cost of cutting floors, embedding in floors as required and making good the same matching to the existing floor finishing and having minimum 1.25 mm thickness stainless steel cover plates with brass pivot and single piece M.S. sheet outer box with slide plate, and other accessories required for the works to facilitate smooth operation of the door shutter etc complete all as per specifications and as directed by the Engineer-in-charge.

Refer specifications from "CPWD vol. 1 & 2" and specifications as per Item description

Item No:- 48
Sliding Windows: Providing, supply, fabrication, installing, fixing, testing, cleaning, protection and handing over the Sliding window system, at all levels, locations, floors as per approved drawings including all labour, material, wastage, transporation, fixing in position, scaffolding etc complete all as per specifications, drawings and as directed by the Engineer-in-Charge.
The Sliding Window system shall with stand the wind pressure of confirming to IS -875 part III. The sliding window system shall have SS-304 grade mesh Net shutter panel, drainage gutter profile at bottom track, wool pile with film for weather protection and complete sir sealing. The shutter engagement shall be minimum of 15 mm at top and bottom track to ensure stability under deflection of vertical mullions. Including providing & fixing ball bearing rollers smooth movement of shutters, flush type lock with manual operation, microwave cured EPDM gasket, non staining weather sealant, SS-304 grade pan head screws etc complete.

Supplying and fixing in position at all floors, levels & locations, aluminium section [extruded] for aluminium sliding windows sliding as per drawing of approved manufactures with extruded sections of Jindal / Indal / Aluminax or other approved eqivalent sections with size and weights as shown in the drawing, for frames and shutters

[including wastages if any] conforming to relevant I.S specifications, with all approved shade & colour anodised aluminium fittings and accessories, locking arrangements, 2 / 3 rollers with ball bearings for sliding shutters of approved quality all as shown in the drawing, including providing and fixing aluminium channel beading / glazing clips fixed with necessary matching anodised screws, grouting the gap with thermocole & polysulphide sealant etc. all complete generally as per drawings, specifications etc., all as directed by Engineer in charge, but excluding the cost of glazing, which will be paid separately. (The aluminium system consist of the extruded aluminium sections of alloy 6063 T5/T6 & tolerances confirming to DIN / EN standards from approved make and manufacturer. The aluminium sections shall have approved shade and colour super durable powder coating with minimum 50 micron thickness. The non visible aluminium sections shall have approved chromatizing treatment. {The weight of extruded aluminium sections only will be measured for payment}). The quoted rate shall be inclusive for providing & fixing built in handle with locking nib/hook, dummy handle, SS locking closure plate (on frame), adjustable single roller, nylon roller, shutter end PVC cap, anti dust plugs, screw hole cap, drain cap, wool pile etc of approved make and design as per drawings.

Providing and fixing following type of approved quality glass panes for aluminium sliding windows, of approved manufacturer and fixing with aluminium frame work including providing and fixing with 2 way EPDM gasketing , to ensure water and air tightness and neoprene cushions/ gasket accommodated in grooves, necessary SS-304 screws etc all complete generally as per drawings specifications and as directed by the Engineer-in-charge.
Note:- Only clear opening of glass shall be measured for payment.
(6 mm thick Single Glass Unit (SGU) using heat strengthened (HS) clear float glass of M/s. Saint Gobain ET/ST series or approved equivalent)

SCOPE OF WORK
The work covered under these specifications consist of supplying, fabrication and installation of Natural shade/ colour anodized glossy/ matt finished aluminium doors, windows, wall span, composite units, glazing etc. strictly in accordance with these specifications and relevant detailed approved shop drawings.

GENERAL
The material, fabrication and hardware shall conform to the IS 1948. The contractor shall submit 6 copies of shops' drawings covering all types/details of work as generally shown in Architectural drawing and envisaged under these specifications before manufacture. The drawing shall show all dimensions, details of construction, installation of fixtures and relation to adjoining and related works. No fabrication work shall be undertaken prior to obtaining approval of the shop drawings from the Engineer-in-Charge.

MATERIALS
Aluminium alloy extruded sections used in the fabrication of extruded door/ window sections shall conform to IS 733 & IS 737(composite unit). The hollow aluminium alloy sections used shall conform to IS 1285 and shall be anodized before incorporating in the work. Anodic coating shall conform to IS 1868. The framework, stiles, mullions, beadings, transoms and handles etc. shall be of aluminium anodized sections as shown in detailed approved drawings. All aluminium sections shall be of JINDAL/HINDALCO or other equivalent make as per drawing. The contractors can also propose nearest alternative sections they manufacture/possess without changing the elevation, structural stability & functional requirement. The Department reserves the right to accept the alternative section or otherwise. The sections shall be structurally suitable to withstand all the loads the members have to

sustain. Counter sunk screws, nuts, bolts, washers, rivets and other miscellaneous fastenings devices shall be of approved brass cadmium plated or stainless as specified in the approved drawing.

FABRICATION

Material, fabrication and dimensions of aluminium doors, windows and ventilators manufactured from extruded aluminium alloy sections of standard sizes and designs complete with fittings, ready for being fixed into the building shall be as per IS 1948.

The frames shall be manufactured square and flat, the corners of the frame being fabricated to true right angle. All the fixed, sliding and opening frames shall be constructed of sections which have been cut to length, mitred, welded and mechanically fixed at the corners. Where hollow sections are used with welded joints, argon-arc welding or flash butt welding shall be employed (Gas welding or brazing not to be done). In case welded joints are used, anodizing shall be done after fabrication as a whole. All welding shall be on unexposed sides in order to prevent pitting/discolorations of other surface imperfections after fixing etc. Necessary allowance shall be made while manufacturing the aluminium door entrances, wall spans and glazing for receiving plaster. No field fabrication of frames is permitted.

Each door leaf shall be prepared to receive glazed panel of required thickness. Glazing shall be done with an approved quality EPDM gasket with snap-in-bevelled anodized matt/glossy finish aluminium metal. glazing stops inside and outside. All doors shall have off- set pivots, double action (180o minimum swing) floor springs with oil check boxes of approved manufacture. All doors shall have 4 lever concealed brass body mortise lock without handles as per manufacturer's design, with concealed flush C.P. brass tower bolts provided at suitable locations. All doors shall have push plates of design shown in the approved drawing as described in the schedule of quantities. All entrances shall be without thresholds. All aluminium surfaces in contact with masonry or concrete shall be given a thick coat of bitumastic paint. After fabrication, aluminium sections shall be protected from construction hazards that may damage their appearance or finish. All exposed surfaces of aluminium door entrance shall be protected by masking tape during transshipment and erection. All sections and hardware shall have anodic film and a cover of minimum thickness of 0.015 mm.

The dimensions shown in the drawing are overall heights and widths to the outside of frames of aluminium windows. The side hung shutters shall have projected friction type hinges of aluminium alloy. Concealed projected hinges having structural stability and of good quality will also be considered only after the inspection of the sample submitted by the tenderer. The necessary pegstays, handles, window fasteners etc. shall be of aluminium. The handle shall be mounted on a handle plate rivetted to the opening frame. The pegstays shall be 300 mm. long or as required complete with peg and locking bracket and shall have holes for keeping the shutter open in three different positions. No field fabrication of frames is permitted. The complete fabricated assembly shall be anodized in approved satin finish with minimum film thickness of 0.015 mm. for the entire surface.

For composite units the door shall be coupled to windows or side- lights by extruded aluminium sections made from aluminium alloy conforming to IS Designation HE9-WP of IS 733.

A thick layer of clear transparent lacquer based on methacrylates or cellulose butyrate shall be applied on the finished sections of the aluminium work by the contractor to protect the surfaces from wet cement, lime, dirts, dust etc. during the construction activities. The size for door, window or ventilator frames shall not vary by more than (±) 1.5 mm.

Finish: Aluminum doors, windows and ventilators may be supplied in either matt, scratch-brush or polished finish. They may, additionally be colour anodized/powder coated as specified in item.

Anodizing: Standard aluminium extrusion sections are manufactured in various sizes and shapes in wide range of solid and hollow profiles with different functional shapes for architectural, structural glazing, curtain walls, doors, window & ventilators and various other purposes. The anodizing of these products is required to be done before the fabrication work by anodizing/electro coating plants which

ensures uniform coating in uniform colour and shades. The extrusions shall be anodized with a minimum average thickness of 15 micron (AC-15) or as specified in approved colors as per IS1868-1996. The anodized extrusions shall be tested regularly under strict quality control adhering to Indian Standard IS 5523-1983.

Powder Coating: The powder used for powder coating shall be Epoxy/polyester powder of make approved by the Engineer-in-Charge. The polyester powder shall be applied by electrostatic powder spray. Before start of powder coating the contractor shall submit detail specification for application of polyester powder from manufacturer of the polyester powder for approval of Engineer-in-Charge. The contractor shall give detailed program for powder coating in advance, to facilitate the inspection by Engineer- in-Charge or his authorized representative. The thickness of the finished polyester powder coating measured by micron meter shall not be less than 50 micron nor more than 120 microns at any point.

A thick layer of clear transparent lacquer based on methacrylates or cellulose butyrate, shall be applied on aluminium doors, windows and ventilators by the supplier to protect the surface from wet cement during installation. This lacquer coating shall be removed after installation is completed.

HARDWARE

All cut outs, recesses, mortising or milling and operations required for fixing the hardware shall be accurately made reinforced with packing plate as required to ensure adequate strength of the connection. All the hardware accessories shall be of best approved type and of anodised finish same as for the frames and other sections. Each lock shall be supplied with two stainless steel keys and each key shall be with number stamped thereon according to the number on doors so installed. All hardware shall be free from defects, which may affect the appearance and serviceability. All hardware shall be fixed after obtaining the prior approval of the Engineer-in-Charge. Approved samples of hardware shall be kept in the custody of the Engineer-in-Charge. Working and moving parts of locksets shall be accurately fitted to smooth, close bearings and shall be free from rattle. The floor springs shall be of heavy-duty type and should allow door operation smoothly and shall conform to IS 6315. The contractor shall furnish a guarantee for all finishing and quality of hardware covered under this section and which shall remain free from defects of any kind, either materials and/or workmanship for a period of one year (unless otherwise specified) from the date of completion/handing over of work. The contractor shall repair or replace any and all defective work and damage caused, at any time or times during that period within 3 days from the written notice. This shall be done without any extra cost to the Department and to the complete satisfaction of the Engineer-in-Charge. In case the same are not replaced immediately after the receipt of the notice to do so, the Department shall do so at the cost of contractors. The cost as certified by the Engineer-in-Charge shall be final and binding on the contractors.

FIXING

Fixing and glazing of doors, windows and ventilators shall conform to IS 1081, unless otherwise specified. The frames shall be accurately fixed in the flooring / brick masonry or R.C.C. works. The fixing of the frame shall be done with cadmium plated brass counter sunk screws driven on to the teak wood rough ground, or fixed to the wall with hold fasts as directed by the Engineer-in-charge, and as shown in approved drawings. All aluminium works shall be fixed in position as per relevant Indian Standard Specifications and code of practice for fixing and glazing of aluminium work. Joints between metal and masonry shall be fully caulked with mastic / polysulphide compound in order to ensure watertight joints as directed by the Engineer-in-Charge. Joints shall be neatly painted with matching cement and excess materials shall be removed. Fixing of aluminium door entrances, hardware etc. shall be done in best workmanship like manner true to line, level, plane, plumb etc. and all as directed by the Engineer-in-Charge. Breaking of floor for providing floor springs and restoration of the floor finishes to the original specification and finishes and minor additions and alterations to the openings shall be deemed to have been included in the quoted rates.

GLASS AND GLAZING

Glass: The glass unless otherwise specified, shall be clear float glass of specified thickness and should

be approved by the Engineer in Charge. It shall be clear, float transparent and free from cracks subject to allowable defects. The float glass shall conform to IS 14900.

Glazing Clips/ Beading: The glazing clips/beading where specified in drawings for aluminium/steel doors and windows shall be anodized aluminium beading of channel section or as specified & as per sizes mentioned in the item and/or shown in the drawing.

The junction of the beadings shall be miter jointed. Holes for glazing clips shall be drilled prior to fabrication and shall not be done at any later stage.
The glass shall be cut to the required sizes of panels where it is to be fitted and it shall be so cut that it fits properly in the frames without rattling. Pre-measurement of each panel prior to the cutting of glass is essential.

The clips/beading shall then be fixed to glass panes and screwed at close intervals not more than 10 cm. from each corner and the intermediate not more than 20 cm. apart. When glass panes are fixed with wooden beadings having mitred joints or aluminium beading, a thin layer of glazier's putty shall be applied covering the area in contact between the glass and sash-bars and beadings. In the case of louvers all the exposed edges of the glass shall be ground properly.

Glazing: The glass panes shall be fixed to the frame as mentioned above with an approved quality EPDM gasket with snap-in-bevelled anodized matt finished aluminium metal glazing stops inside and outside. In the fixed side and transom light, the thickness of glass or panel shall be accommodated by the screw down glazing stops. The glass panels shall be fixed firmly and truly parallel to the plane of frames. All damage or breakages during glazing shall be made good at the contractor's own cost till the work is properly taken over by the Engineer-in-Charge.

All wall spans, doors and windows glazing /fixed glazing etc. shall be tested for water tightness. Any leakage found during testing shall be the responsibility of the contractor to rectify the same without any extra cost.

GENERAL
After the inspection is over and permitted by the Engineer-in-Charge, the glass panes shall be cleaned off any labels, paint smears and spots and shall be washed from both the side and all glazing left clear, perfect and free from rattling. The contractor shall provide all the scaffolding, tools and plants for fixing the glass panes at his own cost. In the case of aluminium/steel doors/windows any hardware if fixed in position shall be removed temporarily before fixing the glass panes and which shall be re-fixed back in position all at the contractor's cost.

MODE OF MEASUREMENT
Aluminium work: The measurement of aluminium sections shall be taken only after the frames along with shutters are fixed in its final finished position in line, level and plumb. Length of each extruded section used for fabrication shall be measured outer to outer of cut length correct two places of decimal of a metre.
The weight of material used shall be calculated on the basis of actual weight of extruded sections used for fabrication and shall be compared with the weights given in the catalogue of the approved manufacturer subject to the condition that the variation in actual weight should not exceed (+ / -) 10% than the approved catalogue weights. The payment shall be made for the actual weight of the extruded section after anodizing. The final weight shall be calculated in kgs upto two places of decimal.

Glazing work: The length and width of opening for glazing inserts shall be measured correctly to a centimeter and area for payment shall be calculated in square metre nearest to 0.01 SqM.

RATE
Unless otherwise specified, fittings and fixtures such as window handles, hinges, peg-stays, friction-

stays, concealed window lock, cleat angles, stiffener plates etc. shall not be measured for payment and rate quoted shall include cost of all such fittings, accessories, and hardware. However, door closer, floor springs shall be measured separately as specified in the item and paid for.

The rate quoted shall include all taxes, duties etc. tools, plants, labour involved in all the operations described above, fixing in final position including submitting shop drawings etc. and all incidental to the job involved.

TESTING
Aluminium sections shall be tested for their unit weight, anodic coating etc. as per relevant IS codes.

GUARANTEE
All materials and workmanship in the above work shall be guaranteed for a period of one year (unless otherwise specified) from the date of handing over the work. Unqualified performance guarantee for smooth operation of the windows, doors, wall spans and precautionary measures against leakages etc. shall be furnished by the contractor on stamped paper, if so, specified in the schedule of quantities. Any defect found during the guarantee period shall be replaced/made good to the original conditions/positions entirely at the cost of the contractor.

Item No:- 49

Providing & fixing stainless steel work for pipe hand rail at staircase, Entrance Ramp and other stainless works such as spool pieces, pipe sleeves etc, at all floors, levels & location conforming to SS-304 grade of steel preferably schedule-10, using SS pipe in horizontal at top, vertical, inclined including solid pipes as per drawing or as per pattern & design approved by EIC and including necessary S.S bend, tees, Embeded plates, nuts, SS bolt,necessary welding, anchoring with SS anchor fastner of M/s Hilti, grinding, buffing, polishing and fixing in concrete / wall with S.S lugs, making pockets, concreting, making good the surfaces etc. as per specifications, drawings and as directed by Engineer-in-Charge. (Note:- For payment purpose only weight of stainless steel members shall be considered excluding fixing accessories such as nuts, bolts, fasteners etc.)

1. **General:**

   1.1. The SS shall be of stainless steel of grade 304.

   1.2. The contractor shall submit sample covering all types of work under these specifications before manufacture. The drawing shall show all dimensions, details of construction, installation relating to the adjoining work.

2. **Materials:**

   2.1. All stainless-steel tube to be 304 or 316 welded stainless steel, ornamental tubing finished with puffing. All fittings to be 304 or 316 stainless steel.

3. **Delivery, Storage, and Handling:**

   3.1. Materials to be delivered to the job site in good condition and adequately protected against damage as railing / handrails are a finished product. Store on site in a location and manner to avoid damage. Stacking should be done in a manner that will prevent bending. Store material in a clean and dry location away from uncured concrete and masonry. Any protection on the railings during transportation should remain until installed. Keep handling on site to a minimum. Exercise caution to avoid damage to finishes of material.

4. Fasteners:

4.1. All mechanical fasteners used shall be manufactured from stainless steel.

5. Fabrication:

5.1. All mitered and welded corners shall be ground smooth to match finish. Make exposed joints butt tight and flush. Interior sleeves shall be used for typical splices. Fasteners are allowed at splice connects. Verify dimensions on site prior to shop fabrication.

6. Execution:

6.1. Preparation:

6.1.1. Coordinate post setting drawings, diagrams, templates, instructions, and directions for installation of anchorages. These include items such as sleeves, concrete inserts, base plate, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete and masonry construction.

6.1.1.1. Coordinate delivery of anchorages to project site.
6.1.1.2. Coordinate that blocking is in place for all mounting fasteners.

6.1.2. Clean debris and dust from surfaces and embed holes thoroughly prior to installation.

Prepare surfaces using the methods recommended by the manufacturer for achieving proper results given the substrate and project conditions.

6.2. Installation:

Install in accordance with manufacturer's drawings and direction. Fit exposed connections accurately together to form tight joints except as necessary for expansion. Perform cutting, drilling, and fitting required for installation of railings / handrails. Accurately set railings / handrails in location, alignment, and elevation, measured from established lines and levels. Set posts plumb within a tolerance of 1/8 inch (3 mm).

When fastening to in-place construction, provide anchorage devices and fittings to properly secure rail to in-place construction. Examples of such devices include threaded fittings (for concrete inserts), toggle bolts and through-bolts. Separate dissimilar materials with bushings, grommets or washers to prevent electrolytic corrosion.

6.3. Welding

This shall be done by electric process with precautions for health and safety. The places to be welded shall be cut angularly so that the welding material does not protrude and the members to be welded join properly. The welds shall be ground clean to give a single piece appearance. The welds shall run around the contact surfaces of two meting sections. Throat thickness shall not be less than 4mm.

6.4. Protection

Upon delivery railing may have protective wrapping. At completion of railing installation, immediately remove any protective wrapping and clean all work for inspection and

approval. After installation, protection of railings is required during the balance work of construction. When cleaning stainless steel surfaces use plain water containing a mild soap or detergent. No abrasive agents or harsh chemicals shall be used.

7. Mode of Mode of Measurement and Payment

Measurements shall be taken on KG. No payment shall be made for weight of screws, bolts, nuts etc. The rate shall be for units of one RMT.

Item No:-50

Frameless Glass Railing

Design, Fabrication, Supply, Installation, Testing, Protection, Cleaning & Handover 1200mm height glass (Above RCC) Railing designed to with stand the wind pressure confirming IS 875 Part III and Live load of 105 Kg/ m uniformly distributed load as per IS 875 Part II.

The system shall be support the glass at bottom continuous U-channel fixed on the finished floor level and vertical glass to glass open joint with top Alum. Rail. 100mm Min. Glass In-build in the U-Channel. The weather sealant of approved make, baker rod, SS 316 grade fasteners & hard setting blocks of EPDM, all in complete required to perform as per specification and drawing in conjunction with BOQ. Complete system shall be warranted for minimum 10 yrs against design & workmanship defects.

The extruded aluminium sections of Alloy 6063 T5 / T6 & tolerances confirming to DIN / EN standard from approved extruder. All visible surfaces shall have Anodized finish with minimum 22 micron.

All Material Make / Vendor list / Supplier list shall be as per tender specification.

All shade approval shall be as per Architect's Approval.

The quote rate shall include all design & shop drawing approval from architect & consultant.

Quote rate for complete system as mentioned above under (C). Including glass For Straight Railing.

RAILING GLASS : 17.52mm Laminated glass (8 mm Clear HS Glass + 1.52mm thk SGP Kuraray Lamination + 8mm thk Clear HS Glass)

Quote rate for complete system as mentioned above under (C). Including glass For Curved Railing.

RAILING GLASS : 17.52mm Laminated glass (8 mm Clear HS Glass + 1.52mm thk SGP Kuraray Lamination + 8mm thk Clear HS Glass)

Detailed Specifications are as per the item description.

Item No:-51

Fabricating, supply and erecting in position Standard Structural steel sections conforming to IS 2062 for all structural steel works using ISMB, ISA, ISMC, MS plate, flat, square bars, pipe, square pipe ,etc. including welding, cutting, wastage, etc. complete. The rate is inclusive of welding road, supply & fixing of correct size nut, bolts, washers, paint, with all contractor's materials, labour, tools & plants, in bolted / welded construction as directed by Engineer-in-Charge. Anticorrosive paint must be applied before applied any paint. The rate shall inclusive of providing and applying Epoxy Coating of approved shade, brand and manufacture on new structural steel work with one coat of 30 micron (DFT) of Epilux 4 Zinc Rich primer of Berger Paint India Ltd or

equivalent as primer and Two coat each of 35 micron (DFT) of Epilux 84 High Gloss CR enamel of Berger Paint India Ltd or equivalent at all levels. (Total DFT is 30+35+35=100 microns). The waste cut pieces shall not be included in the paying quantity. The work shall be done as per drawing and specification. The work shall be carried out as per IS:800, IS:816 with its latest amendments.

1.0 Materials & Workmanship:

1.1 Prior to fabrication, all rolled sections shall be cold straightened and freed from twists, wraps etc. Hot working shall be done only after prior permission of the Engineer-in-charge. The surface of the members to be welded shall even so that temporary fastening alignment should not allow passage of a 0.2mm thick filler gauge more than 20mm deep from the member's edge. All members shall be cut mechanically by saw or shear or by oxyacetylene flame.

1.2 Welding shall generally be done by electric process. Gas welding shall be restored to using oxyacetylene flame with specific approval. Gas welding shall not be permitted for structural steel work.

1.3 The work shall be done as shown in the shop drawings which should clearly indicate various details of the joints to be welded; shop and site welded as well as type of electrodes to be used. Symbol for welding on plans and shop drawing shall be according to I.S. 813-1961. As far as possible every effort shall be made to limit the welding that must be done after improper welding that is likely to be done due to heights and difficult position on scaffolding etc. The welding work shall conform to I.S. 816-1969.

1.4 Preparation of surface: Surfaces which are to be welded together shall be free from loose mill scale, rust, paint, grease or other foreign matter. A coating of boiled linseed oil shall be permitted.

1.5 Assembly for welding: Before welding is commenced, the plates shall be first be brought together and firmly clamped or spot welded at specified distance. The temporary connection in form of tack welding has to be strong enough to hold the plates accurately in place without displacement and shall be done keeping in view the finished dimensions of the structure.

1.6 Precautions: The operations connected with welding and cutting equipment shall conform to safety requirement given in I.S. 818-1968.

The following points shall be borne in mind during the process of welding:

(a) Welds shall be made in flat position wherever practicable.
(b) Arc length, voltage and amperage shall be suited to the thickness of material, type of groove and other circumstances of the work.
(c) The segments of welding shall be such that where possible, the members which offer the greatest resistance to compression are welded first.
(d) Proper care shall be taken while welding, for shrinkage and distortions, as the drawing dimensions are the finished dimensions of the structure.
(e) Cutting of plates shall be profile cut.
(f) Welding rod shall be of approved brand.
(g) The drilling is to be done with power drill or magnetic drill.

1.7 The defective welds which shall be considered harmful to the strength shall cut out and re-welded.

1.8 Finished welds and adjacent part shall be protected with clean boiled linseed oil and after all stag has been removed welds and adjacent parts shall be painted after the same are approved.

1.9 All the members shall be thoroughly cleaned of rust, cakes, dust etc. and given a priming coat of red lead paint before fixing them in position. All fabricated members shall be suitably packed to be protected from any damage while transportation, if any.

1.10 Grinding to the finished level is to be done, if directed by the Architects and Engineer in charge. All exposed weld shall be ground smooth. Welds which have not been ground shall be scrubbed with a 10% solution of Hydrochloric acid which shall be washed of with water before painting unless alkali resistant paint is used.

1.11 Erection in general, of the entire/part structure shall be carried out as per the requirement and approval of the Engineer-in-charge. Positioning and levelling of the structure, alignment and plumbing and fixing every member of the structure shall be in accordance with the relevant drawings and to the complete satisfaction of the Engineer-in-charge.

The following checking and inspection shall be carried out before, during and after erection:

-Damages during transportation

-Accuracy of alignment of structures

-Erection according to drawings and relevant specifications

-Progress and workmanship

1.12 Painting

1.12.1 First priming coat of zinc chromate yellow oxide primer / PU primer is to be applied on the fresh steel arrived at site.

1.12.2 Once the cutting and fabrication is completed second coat of primer and first coat of synthetic enamel / PU paint (as per the manufacturer's recommended process - preferably light shade of the chosen color) is to be applied.

1.12.3 After paint has been already dried, erection is done as specified in the item or as directed by engineer-in-charge.

1.12.4 After the erection final coat or second coat of paint / PU paint is to be applied on the structural steel.

2.0 Mode of Measurement and Payment

2.1 All work shall be measured on the basis of finished dimensions, as fixed on site and measured net unless specified otherwise.

2.2 The weight of steel sections, steel strips in finished works shall be calculated from standard weight on the same basis on which steel is supplied to the Contractor by the Client or those given in relevant IS Codes if steel is arranged by the contractor.

2.3 The weight of steel plates and strips shall be taken from relevant IS Codes, based on 7.85 kg/m² for every mm sheet thickness, if steel is supplied by the Contractor, otherwise, the weight shall be calculated on the basis on which steel is supplied to the Contractor by the Client.

2.4 Unless otherwise specified weight of cleats, brackets, packing pieces, bolts, nuts, washers, distance pieces, separators, diaphragm gusset (taking over all square dimension) fish plates etc. shall be added to the weight of respective items.

2.5 In riveted work, allowance shall be made for weight of rivet heads. No deductions shall be made for rivet or bolt holes excluding holes for anchor or holding down bolts.

2.6 For forged steel and steel castings, weight shall be calculated on the basis of 7850 kg/m3

2.7 Unless otherwise specified an addition of 2.5% of the weight of structure shall be made for shop and site rivet heads in riveted steel structure.

2.8 Dimensions other than cross sections and thickness of plates shall be measured to nearest 0.001m.

2.9 Mill tolerance shall be ignored when weight is determined by calculation.

2.10 Weight of only structural steel is considered and welding will not be considered in measurement.

2.11 The rate shall include cost of all material, labour, erection, hoisting, scaffolding, safety measures and sundry required for proper completion of the item of work, at all heights. This shall also include conveyance and delivery, handling, loading, unloading and storing etc. required for completion the item described above including necessary wastage involved. The rate shall be for one unit of Kg.

General Notes for Façade Vendor to Consider:

1. All facade systems mentioned in the BOQ shall be based on approved concept architectural drawings (Plans, elevations & sections) provided by the project architect and approved concept detail drawings and technical specifications provided by the facade consultant with all relevant Indian & International standards .
2. Facade Contractor shall carryout detailed site survey using total station to understand the profile available for fixing of facade at no additional cost. Contractor shall Engineer the facade system as per the site survey data, concept drawings given by project architect & consultant and the parameters laid in the technical specification and accordingly shall prepare and submit the shop drawings for approval to consultant & architect.
3. Contractor shall do all necessary changes / modifications in Engineering & shop drawings as per the corrections / modifications given by the owner, consultant & architect and shall take approval for the Engineering and shop drawings before proceeding for work.
4. The item rate and scope of the work shall include Design, furnishing, handling, shifting, hoisting and fixing of the facade elements as per specified specification and concept drawings including all associated works like insulations, fire stop, guttering arrangement to drain water; flashings, water proofing membrane, treating junctions with concrete and other materials (Any SS 304/316 grade) including cost of material etc. along with all specified hardware's & accessories,EPDM-(Ethylene Propylene Diene Monomer) gaskets, bracket arrangements , Silicone sealants etc. all complete as per the approved shop drawing details, technical specifications and as directed by the client.
5. No deviations from the tender specifications and base bid concept drawings intent shall be accepted. Façade contractor to quote strictly adhering to the tender specifications and base bid concept drawings intent.
   Note: All unit rates shall be exclusive of GST ,contractor to provide the GST calculations separately
6. All MS structure in the system shall be treated as specified in the technical specification. Refer treat ment to Mild steel.

7. Facade contractor scope shall also includes providing & erecting independent equipment's & machineries, tools & tackles required for the work including shifting & lifting of material, all types of arrangements for necessary safety precautions at site.
8. The Engineering of facade system should be able to withstand all performance requirements as mentioned in the specifications not limited to thermal stresses, seismic forces, wind velocity, rain, atmospheric variations and to cover any other stress occurring from natural or man made factors whatsoever condition etc. with adequate factor of safety to meet relevant IS code and international codal provisions.
9. Prior to start of work contractor shall submit samples of each item such as extruded sections, sample for Powder coating & PVDF (Poly-Vinyli-Dene Fluoride)/ SDF coating showing exact colour, All specified glass samples, Spider fittings, EPDM/ neoprene beading, gaskets, wool pile, backer rod, silicon sealant, all specified hardware's and accessories samples etc. for approval to the Owner, consultant & architect. The material to be procured for the work shall be as per this approved samples.
10. The Facade system installed and material (Like hardware's, stainless steel fittings, Glass and aluminium alloy along with field water test for water leakage) tested as specified shall be guaranteed as mentioned in technical specifications in approved proforma on stamp paper of appropriate value.
11. Mode of Measurement for façade elements shall be only visible elevation areas i.e.. Module centre to centre, End to End for RCC openings, Canopy & Soffit as per plan area, Louvers as per elevation, Beak Element as per perimeter area, All doors shall be paid separate and shall not be included in the overall façade area, All flashings, Soffits and Top roof copings of Aluminium sheet/Any metal panel shall not paid extra as they are considered part of the system. unless & otherwise mentioned in BOQ item.
12. Client/Owner reserves the right to supply the materials (Glass & Aluminium) and delete the same from the Scope of contractor. Client/Owner also reserves the right to operate or delete the quote rate from the Scope of contractor or may get it executed by other agency and no compensation on such account shall be made to the contractor.
13. Facade contractor to provide the Entire Material Take of (MTO)for client supplied items as per Engineer parameters and approved modules which includes:
    a. All required aluminium sections, Aluminium panels spandrel infill, Performance louvers and Extruded aluminium louver profiles etc.
    b. All Glass sizes.
    Note: Facade contractor shall be fully responsible for the MTO.
14. Façade contractor shall carry out and complete the project along with all the Periodic submittals as specified in the technical specification.
15. Façade contractor shall provide certificate for Structural stability, Thermal & acoustics which inline with allowable parameteres.
16. Imp Note :- These quantities are for reference only. Contractor to verify before submission.
17. Nomenclature :- (HS- Heat-Strengthened) ; (FT - Full Tempered) ; (EPDM-Ethylene Propylene Diene Monomer) ; (SDF- Super Durable Finish)
18. Façade system and Support Brakets to be engineered considering load factor & fixing of exterior building signage / retail signages as per design Intent provided by Architect.
19. During the warranty period, Contractor to facilitated any repair or replacement of any façade related components occurred due to any reason at cost to client if it is not due to any defect of the facade system or workmanship.
20. All, Supports, Scaffolding for executing the Facade work is part of façade contractor’s scope.

21. Contractor to provide 10 years Replacement Warranty for Façade performance or defect of any non-performing areas / materials / systems at contractor's cost. (Or specif warranty for individual Materials)
22. Contractor to provide warranty for materials such as - PVDF/ SDF coating, Powder coating, Glass, etc. separately for 20 Years or for the duration as agreed upon with the client.
23. In lue of Retention Money, Contractor shall provide Bank Guaranty for similar ammount for 5 year or for agreed duration with client.
24. Façade contractor is not allowed to subcontract the façade work without written approval of the Architect and Client in advance.
25. Contractor to provide rate analysis having basic material rate of all materials & Systems (If asked by Client).
26. Contractor to provide make list of all accessories to be used in the facade and 1 sets of material boards having all finish materials, Glass, Supporting accessory like Anchor fastener, etc. for Client and Architect's approval in advance.
27. Water tests for different systems needs to performed in executed façade and on Mockup (One test) as required by the client. The testing will be done by third party agency. Cost to be borne by Façade contractor.
28. Contractor to provide Work Schedule and Time line at the time of Tender submission and have to strictly adthre to schedule agreed upon at the time of agreement.
29. Contractor to provide schedule of shop drawings and systems calculations for approvals at time of tender submission.
30. Payment terms will be discussed and finalized at the time of Finalization of Contract.
31. In case of Non Performance, Contract can be terminated by client without providing any reason.
32. Congractor to Mobilize the site withing 15 Days of the signing of agreement, Shop Drawings to be provided within 4 weeks of signing of the agreement.
33. Façade lighting Integration, Coordination and Execution is part of façade contractor's scope. Contractor has to coordinate with the lighting designer & Architect and do modifications & Alteration as per comments received.
34. Maximum Panalty to be 5% of total Contract value based on work completed.
35. In case of introducing new material and make in project after awarding contract – Material Samples, Material Boards and Rate Analysis to be provided for Client and Architect's approval in advance before finalizing or execution of work.
36. No escalation is allowed in any circumstances for any reason during agreed duration of the contract.

Item No:-52

Sleek Curtain wall system With Fins At (Ground To Second Floor)
Design, Fabrication, Supply, Installation, Testing, protection, cleaning & handover of Conventional toggle curtainwall Sleek Blick / Lilli / Reynaers & VS1 system designed to withstand the wind pressure of confirming to IS-875 part III. (The system must pass the proof test at 1.5 times the design wind pressure without any failure). The profile system is based on capped curtainwall design and glass is held all around by mechanical pressure plate and cap with microwave cured EPDM gaskets in all four sides of glazing, with necessary brackets of Aluminium alloy of 6005 T5 / MS with HDG with three dimensional adjustment with serrations and serrated washers to arrest the wind load movement, Anchor Fasteners, screws and fasteners with non staining weather sealant and Aluminium flashing sealed all around parameter inside and outside to seal the gaps between curtain wall and the building structure all complete required to perform as per specification and drawing in conjunction with BOQ.

The system design shall be based on Open joint system & design shall include pressure equalization with minimum 2 barrier gaskets for improved weather performance, drainage at all floor levels, spandrel panel shall have pressure release slots on vertical side of profile system to avoid condensation. Transom shall be overlap with mullion to have proper drainage to mullion. The design to accommodate building movements, thermal expansions & the seismic movements. The system shall be designed considering surface temperatures of 80-90 deg Cel & temperature differential of 25 deg cel without creating excess stress in the system. All metal joints in the wet area shall be small joint sealant applied to ensure water tightness.

The system shall be designed of floor height units spanning between the floors with Dead load & wind load brackets with provision to accommodate movement at all floor levels and at every grid panel horizontally. The system shall lbe designed to accommodate vision/spandrel panel. The system shall accommodate an openable panel as per the architectural requirements in the system. All fixed vision glass and openable shall look similar in the elevation. Aluminium Edge Guard with black Anodised shall be fixed at all vertical & Horizontal grooves. Each glass panel shall be supported for dead load at the bottom of the glass with black anodised glass retainers, two per panel.

Flashing / Trim / Floor Closure at Parapet level, floor level, beam bottom level and required flashings shall be provided continuously with the required GI / Aluminium sheet. Internal & External concelled Flashings shall be 1.0mm thick GI sheet. All exposed flashing shall be 1.5mm thick. Aluminium sheet with SDF coated, matching with external Aluminium profiles.

The extruded aluminium sections of Alloy 6063 T5 / T6 & tolerances confirming to DIN / EN standard from an approved extruder. All the visible surfaces shall have high Durability (Akzonobel) / Super durable (Jotun) Powder coating of 60 - 80 micron confirming to AAMA 2604. The non-visible aluminium surfaces shall have a minimum chromatizing treatment.

All Material Make / Vendor list / Supplier list shall be as per tender specification. .

All shade approval shall be as per Architect's Approval.

The quote rate shall include all design & shop drawing approval from architect & consultant.

a.1 Sleek Curtain wall system

Quote rate for complete system as mentioned above under (A)

Vision Glass Straight: 19mm Thk. Sentry laminated glass providing & fixing the vision glass on the system

8mm Thk. Clear HS Glass +3mm PVB Lamination + 8mm Thk. Reflective ET Series HS Glass (As per Client / Architect Approval sample)

Vision Glass Curved : 19mm Thk. Laminated Glass Providing & fixing the vision glass on the system

8mm Thk. Clear HS Glass + 3mm PVB Lamination + 8mm Thk. Reflective ET Series HS Glass (As per Client / Architect Approval sample)

Operable vent: Extra over a.1

Providing and fixing Top Hung Open Out (operable) vent accessories with heavy-duty self-balancing stainless steel friction hinges with provision to hold open at 250 mm. Vent locking accessories with a cremone lock and handle with a 6-point locking mechanism to keep the vent weather-tight. The vent shall comprise of Aluminium outer frame with drainage provisions and crimped corners, and a shutter frame with Euro grooves and crimped corners; all joints shall be sealed with small joint sealant. The outer frame is fixed to the unitised profile system with necessary SS screws and weather sealant applied at the outside and inside of the profile duly Super Durable Powder coating finish of 60-

80 micron thickness as per the approved shade by the Architect. The stepped glass design vent shall have ceramic frit in black / colour to match the glass at the portion of the stepped unit in case of high light transmission glass to reduce banding effect in the glazing.

Detailed Specifications are as per the item description.

Warranty Details for façade work

- System Warranty 10 Year
- Powder Coating 25 Years Warranty
- PVDF Coating 25 Years Warranty
- Glass Coating warranties as per Glass manufacture.
- Processing warranties Min. 10 Year
- SGP bonding Warranty 10 Year
- Façade Cleaning system warranty 02 year

Item No:- 53

Providing and fixing 5mm thick various size of glass mirror on wall over 6mm thick plywood or plastic fiber base, round up mirror edge and corner from the approved make as per selection of architect and engineer in charge having basic rate as following - (Basic sqmt rate: 1940 Rs.)

(This item shall be procured / provided from selection as per approved make list, data sheet and technical specifications.)

(Selection as per soft furniture data sheet)

Specification as per item description & Manufacturer, Architecture drawing and as interactive engineer in-charge.

Item No:- 54

Providing and fixing at all levels, locations and at all floors, 50 mm thick Reinforced precast Jali in C.C 1:2:4 of approved pattern, design and shape including pointing and proper joining of junctions with ready mix cement mortar including all formwork, reinforcement, finishing the surface, curing, scaffolding, hoisting, erecting & fixing in position etc complete all as per specifications and as directed by EIC.

Materials:

1) Water shall conform to M-l.
2) Cement shall conform to M-3.
3) Sand shall conform to M-6.
4) Mortar shall conform to M-11
5) Aggregates shall conform to M-12
6) Mild steel wire shall conform to M-21
7) Shuttering shall conform to M-26.

Workmanship:

It shall be of cement concrete 1 : 2 : 4 (1 cement: 2 coarse sand; 4 graded stone aggregate 6 mm. nominal size), reinforced with 1.6 mm. dia mild steel wire unless otherwise specified. The thickness of jali shall be as specified in the item.

The jali shall be set in position true to line and level before the jembs silles and soffits of the opening are plastered. It shall then be properly cemented with cement mortar 1 : 3 : (1 cement: 3 sand) and rechecked for levels. Finally the jambs, sills and soffits shall be plastered gripping the Jali uniformly on all sides.

Mode of measurement and payment:

The item shall be measured in square metre.

The rate shall be for 1 unit of one square metre.

Item No:- 55

Providing and installing the speed breaker of PVC material with size of 250x350x50mm and/or 250x450x60mm on the cement concrete surface of the road with labour and all the necessary accessories, hexacore design, oil resistance, chemical resistance, water resistance, UV stabilized, non fading colors, with reflector tape.

Specification as per item description & Manufacturer, Architecture drawing and as interactive engineer in-charge.

Item No:- 56

Providing and fixing shock absorbing rubber corner guard having size 115x115mm, height 1000mm and thickness 10mm, manufactured from flexible high strength rubber, embedded with highly reflective weather resistance reflective material, tamper resistant, with black base and tape color options in yellow, white and lime.

Specification as per item description & Manufacturer, Architecture drawing and as interactive engineer in-charge.

Item No:- 57

Road marking with hot applied thermoplastic paints with reflectorising glass beads on bitumen surface providing and laying a hot applied thermoplastic compound 2.5 mm thick including reflectorising glass beads @ 250gms per sqm area, thickness of 2.5mm is excluding of surface applied glass beds as per IRC:35-2015. The finished surface to be level, uniform and free from streaks and holes. zebra patta /bump patta lane/center line/ edge line/cut patta. The white color marking should provide luminance coefficient on cement road shall be min 130 mcd/m2/lux and Asphalt road shall be min 100 mcd/m2/lux during the service life during the day time. The marking should meet the performance criteria for night time reflectivity, wet reflectivity and skid resistance as mentioned in the section-15 of IRC 35-2015. Warranty for the Retro reflectivity should be two years.

The colour width and layout of road making shall be in accordance with the Code of Practice for Road Markings with paints, IRC: 35, and as specified in the drawings or as directed by the Engineer- in-Charge.

Material

Road markings shall be of ordinary road marking paint (retro-reflective), hot applied thermoplastic compound as specified in the item.

Hot Applied Thermoplastic Road Marking

General

1. The thermoplastic material shall be homogenously composed of aggregate, pigment, resins and glass reflectorizing beads.

2. The thermoplastic compound shall be screeded/extruded on to the pavement surface in a molten state by suitable machine capable of controlled preparation and laying with surface application of glass beads at a specific rate. Upon cooling to ambient pavement temperature, it shall produce an

adherent pavement marking of specified thickness and width and capable of resisting deformation by traffic.

3. The thermoplastic material shall conform to ASTM D36/BS-3262-(Part I).

4. The material shall meet the requirements of these specifications for a period of one year. The thermoplastic material must also melt uniformly with no evidence of skins or unmelted particles for the one-year storage period. Any material not meeting the above requirements shall be replaced by the manufacturer/supplier/Contractor.

5. Marking: Each container of the thermoplastic material shall be clearly and indelibly marked with the following information:

    a. The name, trademark or other means of identification of manufacturer.
    b. Batch number
    c. Date of manufacture
    d. Colour (White or yellow)
    e. Maximum application temperature and maximum safe heating temperature.

6. Sampling and Testing: The thermoplastic material shall be sampled and tested in accordance with the appropriate ASTM/BS method. The Contractor shall furnish to the Engineer-in-Charge a copy of certified test reports from the manufacturers of the thermoplastic material showing results of all tests specified herein and shall certify that the material meets all requirements of this Specification.

Preparation

1. The material shall be melted in accordance with the manufacturer's instructions in a heater fitted with a mechanical stirrer to give a smooth consistency to the thermoplastic material to avoid local overheating. The temperature of the mass shall be within the range specified by the manufacturer and shall on no account be allowed to exceed the maximum temperature stated by the manufacturer. The molten material should be used as expeditiously as possible and for thermoplastic material which has natural binders or is otherwise sensitive to prolonged healing, the material shall not be maintained in a molten condition for more than 4 hours.
2. After transfer to the laying equipment, the material shall be maintained within the temperature range specified by the manufacturer for achieving the desired consistency for laying Properties of Finished Road Marking

    a. The stripe shall not be slippery when wet.
    b. The marking shall not lift from the pavement in freezing weather.
    c. After application and proper drying, the stripe shall show no appreciable deformation or discoloration under traffic and under road temperatures upto 60oC.
    d. The marking shall not deteriorate by contact with sodium chloride, calcium chloride or oil drippings from traffic. The stripe or marking shall maintain its

original dimensions and position. Cold ductility of the material shall be such as to permit normal movement with the road surface without chopping or cracking.

e. The colour of yellow marking shall conform to IS Colour No. 356 as given in IS 164.

Application

Marking shall be done by fully /semi-automatic paint applicator machine fitted with profile shoe, glass beads dispenser, propane tank heater and profile shoe heater, driven by experienced operator as specified in item. For locations where painting cannot be done by machine, approved manual methods shall be used with prior approval of the Engineer-in-charge. The Contractor shall maintain control over traffic while painting operations are in progress so as to cause minimum inconvenience to traffic compatible with protecting the workmen.

The thermoplastic material shall be applied hot either by screeding or extrusion process. After transfer to the laying apparatus, the material shall be laid at a temperature within the range specified by the manufacturer or otherwise directed by the Engineer-in-Charge for the particular method of laying being used. The paint shall be applied using a screed or extrusion machine.

The pavement temperature shall not be less than 10oC during application. All surfaces to be marked shall be thoroughly cleaned of all dust, dirt, grease, oil and all other foreign matter before application of the paint. Thermoplastic paint shall be applied in intermittent or continuous lines of uniform thickness of at least 2.5 mm unless specified otherwise. Where arrows or letters are to be provided, thermoplastic compound may be hand sprayed.

The minimum thickness specified is exclusive of surface applied glass beads.
The finished lines shall be free from ruggedness on sides and ends and be parallel to the general alignment of the carriageway. The upper surface of the lines shall be level, uniform and free from streaks.

Measurements for Payment
The painted markings shall be measured in square metres of actual area marked (excluding the gaps, if any) correct upto the two places of decimal.

Rate
The rate includes the cost of all materials, labour and equipments required in all the above operations.

In case of Discrepancy Refer specifications from “Central Public Work Department Specifications (Vol-2)” Item no 16.51, Page 840.

Item No:- 58

Providing and installing outdoor convex mirror of size 600mm diameter, 130 degree viewing angle, polycarbonate construction, vandal resistant with and without MS pole.

Material, Color and Fixing

It shall be manufactured from polycarbonate which shall be about 200 times stronger than glass and vandal resistant. It shall be of the diameter as mentioned in item description and as per selection and approval of architect and EIC with 130 degree viewing angle. It shall be lightweight and enable secure fixing with brim and back holding plate in metal/FRB as per selection. It shall be pole mounted or wall mounted with brackets as directed by architect and

EIC. The fixing and finishing shall be as per manufacturer's instruction and as supplied for any of the two types of mounting accessories as per requirement. It shall be mounted with vendor supplied brackets and the installation surfaces shall be prepared as per manufacturer requirement. The location of the installation shall be as per drawing and shall be approved by architect & EIC before installation.

Mode of measurement and payment
The rate shall be of nos

Item No:- 59

Supply, Installation, Testing, Commissioning of- Electromechanical boom barrier with a 3-meter boom arm for car and 1.5mtr boom arm for bike lane, And a 0.6-second opening/closing time. Key features include a corrosion-resistant powder-coated cabinet, die-cast aluminium motor with thermal radiating and cooling fan, and 100% duty cycle with an MTBF of 10 million cycles. Safety features include manual release, obstacle reversal, auto-closing, and support for external photocell and vehicle loop detectors. The system operates on 220V/110V at 50/60Hz, with IP54 protection, a motor torque of 300Nm, and a working temperature range of 0°C to 65°C.

BOOM BARRIER=Havey Duty & high Speed Electromechanical boom barrier
Power Supply = 220-240V ~ 50/60Hz (120W Consumption)
Motor Type = 220V AC Servo Motor
Opening Time = 0.6 Seconds
Max. Power = 120 W Max.
Torque = 300 NM
MTBF = Up to 10 Million Operations (100% Duty Cycle)
Backup power = By UPS
Material (Housing) = 2.5 mm thick Mild Steel with polished, phosphatized, and plastic coating
Surface Treatment = pre-hot dip galvanized (20µm) + polyester powder coated
Mechanism = Electro-Mechanical (Automatic)
Control Type = Electronic + Mechanical
Boom Type = Octagonal
Max Boom Length = 3 Meter for car and 1.5 mtr for bike
Boom Weight = 3 Kg
Boom Shape = Straight Arm, Telescopic Type
Operating Temperature = 0°C to +65°C
Humidity Tolerance = 0–90% RH
Protection Class = IP54
Communication Module = RS485
Weight Approx. =48 Kg
Encoder = Incremental, Integrated in the Motor
Electronic Controller Equipment = E614
Declaration Type = Electronic + Mechanical
Certifications = FCC, ISO–9001, CE Certified
Dimensions (Housing) = W 335 mm x D 285 mm x H 925 mm
Dimensions (Boom Arm) =Approx. 4.5 cm x 8 cm
Finish = Corrosion Resistance, Anti-Corrosion Treatment
Applications = Suitable for Indoor & Outdoor Use

Item No: - 60

Supply, Installation, Testing, Commissioning of-Portable Cabin for the pay booth will be a compact, mobile structure with dimensions of 6 feet length, 4 feet width, and 8 feet

height. It will feature a robust MS square pipe frame, sliding aluminium powder-coated windows with tinted glass, and a rainwater protection guard. Insulated with 50mm glass wool for both the ceiling and side walls, the cabin will be electrically equipped with AC 220-240V fittings, including sockets, tube lights, and a wall fan. A wooden counter with locked drawers for storage will be included, along with safety features such as earthing and synthetic primer/epoxy paint finishes. The cabin will also have special lifting hooks, vinyl flooring, along with 1-ton Split Air Conditioning unit fitted (1075 Watt) and all necessary accessories for installation and commissioning.

Portable Cabin
Dimensions (LxWxH) = 6 ft x 4 ft x 8 ft
Frame Material = Robust MS Square Pipe Frame
Windows = Sliding Aluminium Powder-Coated Windows with Tinted Glass
Weather Protection = Rainwater Protection Guard
Insulation = 50mm Glass Wool Insulation (Ceiling & Side Walls)
Electrical Fittings = AC 220-240V including Power Sockets, Tube Lights, and Wall Fan
Counter = Wooden Counter with Locked Drawers for Storage
Safety Features = Earthing, Synthetic Primer, and Epoxy Paint Finish
Flooring = Vinyl Flooring
Air Conditioning = 1-Ton Split AC Unit (1075 Watt) Fitted
Additional Features = Special Lifting Hooks for Mobility
Accessories = Complete Installation & Commissioning Accessories Included
Application = Portable Pay Booth for Parking and Toll Operations

Item No:- 61

Providing and fixing in Stainless steel Floor Mounted Dustbin with dimensions and design as per Architect selection, in SS 316, Dual bins with 50 liters each having Matt / Mirror Finish including required foundation, anchor bolts and fixing details etc. completed as directed by EIC. Including Minimum 2 mockups for approval complete as per instruction of engineer in charge.

Specification as per item description & Manufacturer, Architecture drawing and as interactive Engineer-in-charge.

Item No:-62

SS Support For Green Wall With SS String
Design, Fabrication, Supply, Installation, Testing, Protection, Cleaning & Handover of SS 304 grade provision support for green wall as per design intent. The entire assembly shall be fixed on SS 304 grade Support grid as per design drawings. The brackets shall be SS 304 grade fixed to the building structure with necessary fasteners & anchor bolts in SS 316.
Prefabricated grid SS 304 grade Support are fixed on to the RCC and concrete masonry walls with SS 316 anchor bolts as recommended by approved supplier to support given design loads. The brackets shall have provision movement to accommodate the construction tolerances with + 35mm plumb in case of RCC structure and + 20mm plumb in case of steel structure.
Provision main SS 304 grade support for vertical Garden system shall be installed in line with drawing.
All Material Make - Jacob.

All shade approval shall be as per Architect's & EIC Approval.
The quote rate shall include all design, engineering & shop drawing approval from architect, consultant & EIC.
Rate as mentioned above under above item With 4mm thick. SS 304 grade String Vertical & Horizontal 900 c/c or as mentioned in drawings.

Providing & fixing in position heavy quality FRP bucket (UV resistant) of below mentioned size, at all floors, levels & location having approved colour & shade, including labour, material, fixing arrangements, screw, washer, scaffolding etc complete all as per specifications, drawings & as directed by the Engineer-in-Charge.
1200mm L x 400mm B x 600 mm H, wall thickness minimum 4 mm.

Specification as per item description & Manufacturer, Architecture drawing and as interactive Engineer-in-charge.

Item No:-63
All types of Signage

Specification as per item description & Manufacturer, Architecture drawing and as interactive engineer in-charge.

Item No:-64
Aluminium Louvers (Box Type Louvers) System: Providing, supply, fabrication, installing, fixing, testing, cleaning, protection and handing over the Aluminium box type louvers system, at all levels, locations, floors as per approved drawings including all labour, material, wastage, transportation, fixing in position, scaffolding etc complete all as per specifications, drawings and as directed by the Engineer-in-Charge.
The Aluminium box type louver system shall with stand the wind pressure of confirming to IS -875 part III. The Aluminium box type louver system shall have louvers of size 100 mm X 50 mm X 2 mm thickness vertical box louvers at 100 mm c/c. Including providing & fixing Aluminium frame to support aluminium louvers, Louver profile shall be fixed at an angle (as per drawing) to form a frame, necessary MS brackets with SS-316 fastners, EPDM gasket, non staining weather sealant, SS-304 grade pan head screws etc complete.

Supplying and fixing in position at all floors, levels & locations, aluminium section [extruded] for aluminium box type louver system as per drawing of approved manufactures with extruded sections of Jindal / Indal / Aluminax or other approved eqivalent sections with size and weights as shown in the drawing [including wastages if any] conforming to relevant I.S specifications, including grouting the gap with thermocole & polysulphide sealant, providing & fixing MS brackets etc. all complete generally as per drawings, specifications etc., all as directed by Engineer in charge. (The aluminium system consist of the extruded aluminium sections of alloy 6063 T5/T6 & tolerances confirming to DIN / EN standards from approved make and manufacturer. The aluminium sections shall have approved shade and colour super durable powder coating with minimum 50 micron thickness. The non visible aluminium sections shall have approved chromatizing treatment. {The weight of extruded aluminium sections only will be mesured for payment}).

The Louvers shall comply but not limited to following system requirements:

- Design and shape of the louvers shall be based on the Façade Consultant design or Architect design intent.

- The thickness of the louvers and supporting structure shall be designed as per proper loading conditions.
- Design louver assemblies with a free area as per their requirements.
- Aluminum louver sections to be bend / curved as per the architect intent.
- At no point of time after installation the louvers shall sag or bend.
- No metal rattling sound shall be permitted through the louvers or their components.
- Intermediate aluminum support shall be provided for avoiding sag OR rattling movement as specified by the Facade Consultant

Item no:-65

Providing, supply, fabrication, installing, fixing, testing, cleaning, protection and handing over the Aluminium (Z-Type) louvers system, at all floors, levels & locations, aluminium section [extruded] for aluminium Z type louver system as per drawing of approved manufactures with extruded sections of Jindal / Indal / Aluminax or other approved eqivalent sections with size and weights as shown in the drawing [including wastages if any] conforming to relevant I.S specifications, including grouting the gap with thermocole & polysulphide sealant, providing & fixing MS brackets etc. all complete generally as per drawings, specifications etc., all as directed by Engineer in charge. (The aluminium system consist of the extruded aluminium sections of alloy 6063 T5/T6 & tolerances confirming to DIN / EN standards from approved make and manufacturer. The aluminium sections shall have approved shade and colour super durable powder coating with minimum 50 micron thickness. The non visible aluminium sections shall have approved chromatizing treatment. {The weight of extruded aluminium sections only will be mesured for payment}).

The Aluminium Z type louver system shall with stand the wind pressure of confirming to IS -875 part III. The Aluminium Z type louver system shall have louvers of size as per drawing and thickness of Z shape louvers, fixed at fixed distance (as per drwing) to alumnium frame, louver profile to be fixed on 3 mm thick aluminium flat to form a frame, the louver frame is supported on the aluminium box frame including providing & fixing SS-316 fastners, necessary MS brackets with SS-316 fastners, EPDM gasket, non staining weather sealant, SS-304 grade pan head screws etc complete.

Refer specifications from “CPWD vol. 1 & 2”

Item No:-66

Providing and fixing in position, at all levels & loaction, stainless steel (SS-304) Mosquito Net/ Wire Mesh/ Wire gauze made with 0.5 mm dia wire and 1.4 mm aperture (on both directions) including fixing, cutting, wastage, scaffolding etc. complete all as per specifications and as directed by the Engineer-in-Charge. Note:- 1) For aluminium work with aluminium beading channel. (Aluminium beading channel will paid under relevant item).

Detailed Specifications are as per the item description.

Item No:-67

Supplying, providing, placing, installing and fixing in position in true line and level as per detail drawing approved by EIC, MODULAR TOILET PARTITIONS along with specified brand or approved equivalent of size as per detail drawings, Floor mounted including providing and fixing all accessories, fixtures, fastenings, hinges, anchorages, all

hardware with approved locking arrangement as recommended by manufacturer and as approved by EIC etc. complete as directed, at all levels. Item description:
Cubicle size - 900mm x 1550mm x 2100 mm (height is including 150 mm gap from bottom).
Colour of Boards : As per the Shade card - approved by EIC. Thickness of Compact Sheet : 12mm (min.). Material:Compact Laminate in panels. Made from solid grade compact high-pressure laminate as per IS:2046 and EN438- manufactured under high specific pressure > 5 MPa and temperature 120° C with bunch of kraft papers impregnated with thermosetting phenolic resin and decorative papers made of cellulose fibre impregnated with thermosetting melamine resin which provide superior scratch, abrasion, heat, chemical, impact, graffiti & moisture resistance along with anti-bacterial properties. Panels have a black core that when machined, presents a distinctive black edge. Size of panels to be as per drawing.
Door size - 1750 x 600(H X W)
All doors will be of single colour and made of 12 mm thick HPL compact panel. The doors will have chamfered edges. Each door will be supported by 3 stainless steel made hinges affixed to the pilasters. Stainless steel made coat hook and Lock set (comprised of Thumb turn and occupancy indicator) are provided with each door. All the doors will be routed at the vertical ends and the rubber sponge lining will be incorporated at the routed ends.
Pilaster dimension - 1830 x 300 (H X W).
All pilasters will be made of 12 mm thick HPL compact panel with chamfered edge and completed with stainless steel made thumb turn lock set. Pilasters will be anchored to the floor using stainless steel made adjustable legs. All pilasters will be routed at their vertical ends to facilitate closure of doors. The bottom gap is 150-100 mm.
Dividers - 1775 x 1550 (H X W)
All intermediate partitions or dividers will be made of 12 mm thick HPL compact laminate panels. They are affixed with stainless steel made U-channel at their ends for ultimate stability of the system.
Hardware and Accessories Details : below mentioned all accessories – Stainless Steel - 304 Grade
a) Adjustable Pedestal Footing of base diameter 60 mm made from Stainless steel grade 316 giving an adjustable height of 100mm to 150mm. Surface finish to be matt type.
b) SS U -Channel
c) SS F Channel
d) SS Door Stopper Channel
e) SS Top Rail with circular cross section (Diameter 32mm). Surface finish will be mirror type.
f) SS Coat Hook with rubber stopper made from Stainless steel grade 304. Surface finish to be lacquer type.
g) SS Privacy Thumb turn c/w Occupancy Indicator made from Stainless steel grade 304. Surface finish to be lacquer type.
h) Round Door knob diameter 30 mm with grooves for better hand grip made from Stainless steel grade 304. Surface finish to be matt type.
I) SS Spring Loaded Butt Hinges with Cover
j) Anti-noise rubber padding of thickness 2 mm and width 10 mm
k) Screws & Wall Plugs. Stainless steel grade 304 screws.
l) Tubular panel holder made of stainless steel grade 304. Surface finish will be lacquer type.
m) Corner joinery section made from Stainless steel grade 304. Surface finish to be brush type. A thin plastic film pasted for surface protection. Size to be 35mm x16.4mm x 0.8

mm.
n) Wall joinery section with hamming profile made from Stainless steel grade 304. Surface finish to be brush type. A thin plastic film is pasted for surface protection. Size to be 21mm x 16mm x 0.8 mm.

Supplying, providing, placing, installing and fixing in position in true line and level as per detail drawing and approved EIC, Modular Toilet Urinal partition UMP along with specified brand or approved equivalent of size as per detail drawings, Colour of Boards : As per the Shade card - approved by EIC.
Item description:
The Urinary Panel has a 12 mm thick High Pressure Laminates (HPL) Compact Board, with a recommended panel width dimensions of 400-500 mm. The size of the panel is 500 mm (W-Top) X 400 mm (W-Bottom) X 1200 mm (H), with the overall height of 1200 mm.
Final Size of Partitions : As per drawing given - shop drawings approved by EIC.
Accessories Details : below mentioned all accessories –
Stainless Steel - 304 Grade made 2 brackets used to fix each urinal panels to the walls.

Detailed Specifications are as per the item description.

Item No:-68

FOOD Kiosk Container – Providing, fabricating, supplying and installing in True line & level on specified level as per detailed drawings for Pre-fab Factory Made Portable Container type Food Kiosk Counter in Hot dip Galvanised Structural members and GI Sheet having size of 20' x 8' x 8' with following facilities inside of each compartment as per specifications:
(1) Work table (Type 1) in one number of size 3910 x 600 x 925 mm or as per drawing and provision for 2 nos. under counter refrigerator to be made as per specification
(2) Work table (Type 2) in one number of size 2340 x 600 x 925 mm or as per drawing and to be provided with 250mm height shelf under the counter top with SS supports & partitions.
(3) 2 no's SS Sink unit & bottom pipe shelf as per drawing & 1 no SS pipe shelf mounted above sink unit on wall with SS 316; size: 1370x300 mm at 600mm from top of sink. The unit shall be fabricated with 3 openable shutter as shown in drawing.
(4) All the preparation tables & sink tables should have 16 GA fabrication sheet at the top and the grade of steel used should be SS 316(Jindal Make).
(5) Side wall ventilation (type-1) in one number of size 755 x 158 mm to be provided horizontally as per drawing. Unit to consist of 03 such vents separated by the structural frame of the container as indicated in drawings.
(6) Side wall ventilation (type-2) in two numbers of size 755 x 158 mm with exhaust fan (outer size 158x158mm)of preferred make and model as per drawing.
(7) Back wall ventilation (type -1) in three number of size 1175 x 158 mm to be provided horizontally as per drawing. Vents shall be provided from the center of the wall and separated by the structural frame of the container.
(8) Back wall ventilation (type-2) in two numbers of size 1150 x 158 mm with exhaust fan (outer size 158 X 158 mm)of preferred make and model as per drawing. All vents to be provided from the centre of the wall separated by structural frame of the drawing. Each ventilation opening to have 50 mm wide MS plate frame projecting from the outer surface of the container on all 4 sides.

(9) Two service windows with flap door of size 1360 x 1025 mm at the front longer side on container. Window sill to be at 925 mm height from the container floor finish level.Each window to be fitted with 900mm height flap shutter foldable to 500mm, where the 500 mm portion serves as a counter top when open and the remaining 400 mm folds back anchored to the container. Features include a 125 mm height perforated panel at the top, 03 hooks on the outside for counter anchoring, and 04 nos. hook and stopper for internal closing.
(10)Main Door of size as per specification and drawing. Outside handle to be vertical D Type (minimum 450mm high and 25mm diameter) with the top fixed at 1200mm from the door bottom. Entry shall include 01 No. aldrop installed on the adjoining part and a door closer provided at a level of 900mm from the door bottom. Inside shall be provided with a mortise handle set with lever mortise lock (horizontal lock). Door must be fixed at a proper level to avoid obstruction while closing.
(11) Flooring to be covered with PVC vinyl sheet with proper drainage for water.
(12) Inner wall & ceiling shall be finished with Cement board including painting.
(13) 1 no Waste Bin Trolley below Sink with size of 375mm dia & 650mm Height with wheels.
(14) Three fans of 1200mm dia
(15) Electrification: It is provided with 6 Nos. of LED light (15Watt) & 6 No. 25Amp. Switch & socket & on/off switch for commercial kitchen equipment, Points.
(16) To be provided with 1 no of water tank (Sintex/equivalent Make) made of Plastic having capacity of 500 ltr. All welding joint should be TIG welded. The supplier should have manufacturing set up should be certified with EN-15085 and ISO 9001:2015 from a recognized third party agency.
17) Supply and Fixing of mechanical foam type Fire Extinguisher conforming to IS 15683:2018 as per the required capacity of 6 liters to 9 liters.
Notes: 1) Contractor shall provide 10 years guarantee for container materials & facility inside material & accessories including 1 year defect liabilities period & 4-years M&R scope.
2) Refer Container specifications attached in Specification Volume.
3) Contractor shall connect all water supply and drainage services to the given point in external water and drainage network system as directed by EIC.
4) All the ironmongery shall be as approved by architect.
5) All structural members must be hot dip galvanised.
6) All Furniture shall have edge banding
7) All structural members shall be painted with 300-500 micron of Epoxy paint system with PU top coat of 50-60 micron as per manufacturer specification with 10 years guarantee.
8) Container shall be fire proof & shock proof.

Detailed Specifications are as per the item description.

Item No;-69

Supplying and fixing in position various dia GI pipe for sleeves, using 'B' class (medium duty) GI pipes of any diameter as per requirement and as per drawing for sleeves etc. including cutting, placing in position, bending, welding, in line and level, at all levels & location including painting with one coat of approved zinc chromate primer, scaffolding. labour, wastage etc. complete all as per specifications, drawings and as directed by the Engineer in charge

Detailed Specifications are as per the item description.

Item No:-70

Providing and fixing PVC rungs of Thickness 25mm, Length 170mm, Usage/Application Rungs, Stairs, Standards IS Features. Anchor type fixing at all levels as directed by EIC.

Specifications as per item description.

Item No:-71

Providing, supplying, and fixing modular welded mesh fencing system of approved make comprising of galvanized MS wire mesh panels, pre-galvanized H-profile posts, anchors, and all necessary accessories, complete in all respects.

Panel Material: Galvanised MS wire with min. 40 GSM coating and tensile strength > 65 kg/mm², Panel Coating: Pure Polyester Powder Coating (PPC), thickness > 65 microns, tested for 1000 hrs in salt spray (ASTM B117), Mesh Aperture Tolerance: ± 2 mm, Welding Specification: Electrical Resistance Welding, Weld strength of 4 random welds ≥ 50% of vertical wire tensile strength, Panel Width: 2500 mm, Post C-C Distance: 2515 mm, Post Type: Pre-galvanized MS, H-profile with 80 GSM zinc coating, Post Cap and Anchor Cap: PVC, Anchors: GI anchor bolts M12 × 150 mm, Fixings per Post: 6 fixings for Mini, Regular, Panel Size Options (as per site requirements): Mini: 1260 mm height, Post Lengths: 1300 mm

Installation Details: Posts fixed using M12 × 150 mm anchor bolts over concrete/paved surfaces.

Panels secured using anti-vandal tamper-proof fixings and brackets. Complete system installed plumb, aligned, and in straight lines as per site drawing/layout. Rate to include supply, transportation, all hardware (posts, panels, fasteners, caps, anchors), labour, equipment, layout marking, drilling, surface preparation, fixing, finishing, and disposal of debris, etc., complete as per manufacturer's specification and direction of Engineer-in-Charge.

Specification as per item description & Manufacturer, Architecture drawing and as interactive engineer in-charge.

Item No:-72

Providing and fixing rolling shutters of approved make made of 80 mm wide M.S. laths inter-locked together through their entire length and jointed together at the ends by end locks mounted on specially designed pipe shaft with bracket plates, guide channels and arragements for inside and outside locking with push-pull operation including the cost of hood cover and spring etc. complete.(A)Shutters having width below 3.5 M.

Contractor shall follow detailed drawings provided for the rolling shutters. Following guideline shall referred if sufficient information is not available in the drawings. Shop drawing for the rolling shutters shall be submitted by the contractor and shall be approved prior to ordering and installation. Rolling shutter shall consist of MS laths 1.25mm thick and 80mm wide laths or as specified. The laths shall be machine rolled and straightened with an effective bridge depth of 16mm and shall be interlocked together throughout their entire length and joined together at the end with end locks. These shall be mounted on a specially designed pipe shaft. Each lath section shall be continuous single strip piece without any joint. The springs shall be coiled type. The spring shall be manufactured from high tensile spring steel wire or strip of adequate strength to balance the shutters in all positions. The spring pipe shaft etc. shall be supported on strong mild steel brackets.

Guide Channel
The guide channels shall be of mild steel deep channel section and of rolled, pressed or built-up (fabricated) construction. The thickness of the sheet used shall not be less than 3.15mm. The minimum depths for guide channels shall be as follows:

Clear Width of Shutter	Depth of Guide Channel
Up to 3.5m	60mm
3.5m and above	75mm

The gap between the two legs of the guide channel shall be sufficient to allow the free movement of the curtain and at the same time - close enough to prevent the rattling of the curtain due to wind. Each guide channel shall be provided with a minimum of three fixing elates or supports for attachment to the walls or column by means of bolts or screws. The spacing of cleats shall not exceed 0.75m. Alternatively, the guide channels may also be provided with suitable dowels, hooks or pins for embedding in the walls. The guide channels shall be attached to the jambs, plumb and true, either in the overlapping fashion, projecting fashion or embedded in grooves, depending on the method of fixing. The cover of shaft, spring etc. shall be of the same material as that of lath.

Fixing
Brackets shall be fixed on the lintel or under the lintel as specified with rawl plugs, and screws bolts etc. the shaft along with the spring shall then be fixed on the brackets. The lath portion (shutter) shall be laid on ground and the side guide channels shall be bound with it with ropes etc. the shutter shall then be placed in position and top fixed with pipe shaft with bolts and nuts. The sides guide channels and the cover and frame shall then be fixed to the walls through the plate welded to the guides. These plates and bracket shall be fixed by means of steel screws bolts, and rawl plugs drilled in the wall. The plates and screws bolts shall be concealed in plaster to make their location invisible. Fixing shall be done accurately in a workman like manner that the operation of the shutter is easy and smooth.

Painting
All surfaces are to be painted with primer coat and minimum two coats of enamel paints as per specification, after drying and thoroughly cleaned to remove all loose scale and loose rust. Surfaces not in contact but inaccessible after shop assembling, shall receive the full specified protective treatment before assembling.

Mode of measurement and payment
The measurement shall be done in Sqm. No extra will be paid for things like shutter cover box, edges, etc. The rate shall be inclusive of labour, material, all complete.
Refer specifications from “Central Public Work Department Specifications (Vol-1)” Item no 10.8, Page 487.

Item No: -73

WALL MOUNTED LED - Outdoor
The scope of work includes the design, supply, installation, testing, and commissioning of a wall-mounted digital screen. The exposed surface of the niche excluding the LED display area to be finished in ACP powder coated sheet with necessary ply backing. The work also involves necessary staging, testing of all functionalities, and commissioning to ensure full compliance requirements of Project-In-Charge (PIC).
Finish Fascia:
3mm thick ACP sheet powder coated in black (RAL 9005) with 8mm thick commercial plywood backing WALL MOUNT DIGITAL SCREEN of mentioned size
The video system shall consist of active indoor Direct LED based seamless large screen video wall system with front service access LED technology to reproduce excellent colors(up to 110% NTSC). Contrast ratio Minimum 4000 :1, color processing depth of 24 bit, viewing angle 160°±5 degrees (Horizontal & Vertical) . It will be necessary that the videowall along with controller can reproduce excellent color reproduction with HDR10 and HLG. The LED cabinet/modules to be enclosed with 10mm MS profile powder coated in RAL 9005 (black), LED pixel P3
Adequate number of power/data cables and necessary controllers need to be considered by the vendor for internal looping. Installation of this screen will be on the wall, the fabrication of mounts/ installation etc. shall be in vendor's scope.
WALL MOUNT DIGITAL SCREEN 2M x 2.4M
WALL MOUNT DIGITAL SCREEN 2M x 9M

WALL MOUNTED LED - Indoor
The scope of work includes the design, supply, installation, testing, and commissioning of a wall-mounted digital screen. The exposed surface of the niche excluding the LED display area to be finished in ACP powder coated sheet with necessary ply backing.The work also involves necessary staging, testing of all functionalities, and commissioning to ensure full compliance requirements of Project-In-Charge (PIC).
Finish Fascia:
3mm thick ACP sheet powder coated in black (RAL 9005) with 8mm thick commercial plywood backing WALL MOUNT DIGITAL SCREEN of mentioned size
The video system shall consist of active indoor Direct LED based seamless large screen video wall system with front service access LED technology to reproduce excellent colors(up to 110% NTSC). Contrast ratio Minimum 4000 :1, color processing depth of 24 bit, viewing angle 160°±5 degrees (Horizontal & Vertical) . It will be necessary that the videowall along with controller can reproduce excellent color reproduction with HDR10 and HLG. The LED cabinet/modules to be enclosed with 10mm MS profile powder coated in RAL 9005 (black), LED pixel P3
Adequate number of power/data cables and necessary controllers need to be considered by the vendor for internal looping. Installation of this screen will be on the wall, the fabrication of mounts/ installation etc. shall be in vendor's scope.
WALL MOUNT DIGITAL SCREEN 1.2M x 1.5M

Sanitary Napkin vending machine
Supply and installation of a fully automatic electronic sanitary napkin vending machine

fabricated from a durable stainless steel chassis with a powder-coated finish suitable for wall-mounted applications. The unit shall feature a storage capacity of 50 napkins and utilize a heavy-duty coin-operated mechanism designed to accept multiple denominations for immediate dispensing. The machine, with approximate dimensions of 50cm x 15cm x 30cm and a unit weight of 7kg, shall include an integrated electronic display for user instructions, a secure locking system for coin and stock protection, and a reinforced collection tray. The scope of work involves providing all necessary mounting hardware, wall fixings, and electrical connections to ensure a fully functional and secure installation.

Drinking water fountain
Supply and installation of a wall-mounted drinking fountain manufactured from heavy-duty, corrosion and stain-resistant stainless steel suitable for indoor and outdoor environments. The unit shall feature a 280 mm (11.02") diameter basin with rounded safety edges, a 2.3 kg (5.1 lb.) chassis weight, and a push-button valve for single-finger operation. The installation includes the secure mounting of the 224 mm H x 323 mm W x 356 mm D (8.8" H x 12.7" W x 14" D) unit to the wall structure to ensure a total weight capacity of 45 kg (100 lbs). Work is to be complete with the provision and connection of all necessary plumbing attachments, internal fittings, and hardware required for a fully operational water dispensing system.

60L open top dustbin stainless steel silver 14x24 inch
Supply and placement of a heavy-duty, cylindrical open-top dustbin fabricated from 0.5 mm thick SS202 grade stainless steel with a polished silver finish. The unit shall have a storage capacity of 70 liters and measure approximately 355.6 mm in diameter by 609.6 mm in height (14x24 inch). The design shall feature a reinforced swing-open top for hygienic waste disposal and a durable body suitable for high-traffic indoor and outdoor environments. The scope of work includes the delivery of the finished product to the site, ensuring all units are provided with compatible internal liners and ready for immediate operational use.

35L open top dustbin stainless steel silver 10x28 inch
Supply and placement of a heavy-duty, cylindrical open-top dustbin fabricated from 0.5 mm thick SS202 grade stainless steel with a polished silver finish. The unit shall have a storage capacity of 35 liters and measure approximately 254 mm in diameter by 711.2 mm in height (10x28 inch). The design shall feature a reinforced swing-open top for hygienic waste disposal and a durable body suitable for high-traffic indoor and outdoor environments. The scope of work includes the delivery of the finished product to the site, ensuring all units are provided with compatible internal liners and are ready for immediate operational use.

Specification as per item description & Manufacturer, Architecture drawing and as interactive engineer in-charge.

Item No:-74
Tensile Work
Supplying, Providing, Fabricating, Assembling, hoisting, erecting and placing in position MS Built-up section/Tubular Structure (MS built-up section :-Rolled section & plates confirming to IS 2062 Grade Yst 350,Tubular Structure:- made from Steel hollow sections, ISI marked from SAIL / RINL / TATA/JINDAL, conforming to IS

1161/4923/1239, Minimum Yst 240 thickness upto 10mm) in the profile shape as per drawings with special plate connector, pinion joints, Plates, hollow sections etc. With special plate connectors, pinion joints, plates, hollow sections including Preparation of detailed fabrication and erection drawings of Structural steel work from design drawings issued by Engineer-In-Charge and incorporation of Engineer-In-Charge's comments on same, transportation from fabrication yard, cutting , threading, machining, leads and lifts upto all heights, tools and plants and necessary scaffolding etc. required for all operations involved to make structure of Tensile Membrane shade. The tubular structure system with plate connectors, pinion joints, etc. is to be provided. The structure has to be provided as per conceptual drawings of Tensile fabric profile , including all arch beam, curved lateral beams and bracings, vertical support columns, nodal joints, ,bases of columns and high tensile bolts of grade not less than 10.9 having black phosphate coating. The complete structure to be Hot Dip Galvanized along with one coat of epoxy primer and two coats of Polyurethane paint on steel work at all locations prepared by sand blasting in required minimum 210 micron DFT (dry film thickness) for each coat as specified in particular specification. The work is to be executed as per technical specification and direction of Engineer-In-Charge.

Supply and Installation of membrane shall be PVC, Both side PVDF coating with HT Polyester Yarns of 1100 Dtex . Fabric Type 2 with minimum weight of 950 g/m2, minimum Tensile Strength (Warp/ Weft) - 4200/ 4000 N/5cm, minimum Tear Strength (Warp/ Weft) - 550/500 N. Fabric Flame Retadancy Rating to be Euro Class - Bs2, d0, Micro Organism Resistance and minimum Warranty of 15 years. The design complies with the requirements of BS and, EU Standards. The tensioned membrane structure shall include engineering design of structural members and accessory parts. Membrane system shall include PVC/ PVDF coated Membrane Fabric, Wire Ropes and Cables, Shackles, Rigging Screws, Clamps and tensioning hardware as per specification, drawings and engineers approval. Cost including Scafolding and cranes.Make- Serge Ferrari/Verseidag/Mehler

Design, Supply, Fabrication and Installation of Membrane Panels. Membrane shall be Fiberglass fabric EC 6 filaments and Both sides multi-layer Polytetrafluoroethylene reinforced coating having minimum Weight of 670 g/m2. The Fabric shall have minimum 21% openness porosity for Maximum Light Visibility with minimum Tensile Strength (Warp/ Weft) - 6000/ 6000 N/5cm, minimum Tear Strength (Warp/ Weft) -500/500 N/5 cm. Fabric Flame Retardancy Rating to be Non combustible class A2/DIN 4102 — A2-s1,d0/EN 13501 — ASTM E136 — ASTM E84 — NFPA 701 —Cal T19. Warranty of 10 years and Life span of 35 plus years with proven track record. The applicator to submit the fabric load analysis for approval of fabric. Cost shall include the supply of fabric/SS Cables with end terminals minimum 25mm thickness for main grid and minimum 10mm thickness for edge cable alongwith all the accessories. Fabric Flame Retardancy Rating to be Euro Class - Bs2, d0, Micro Organism Resistance-Degree 0 Excellent – EN ISO 846-A and Warranty of 10 years and Life span of 30 plus years with proven track record. The design complies with the requirements of BS and, EU Standards. The tension membrane structure shall include engineering design of structural members and accessory parts. Membrane systems shall include PVC/ PVDF coated Membrane Fabric, Clamps and tensioning hardware as per specification, drawings and engineers' approval. Vendor to provide an OEM certificate for authorisation. The Mesh must withstand its Self-load and windspeed resistance of up to 180-200kmph. All the accessories like GI Cables, Turnbuckels,Brackets to be fixed to the substructure/Civil work considering the

weathering effects (windspeed/loadbearing capacity/Structural strength). Fabric analysis report shall be provided by vendor to understand the load calculation. Steel consumption to be provided by vendor.The entire system has to be backed up by a structural stability report.MS Built-up section/Tubular Structure (MS built-up section :-Rolled section & plates confirming to IS 2062 Grade Yst 350,Tubular Structure:- made from Steel hollow sections, ISI marked from SAIL / RINL / TATA/JINDAL, conforming to IS 1161/4923/1239, Minimum Yst 240 thickness upto10mm) in the profile shape as per drawings with special plate connector, pinion joints, Plates, hollow sections etc. with special plate connectors, pinion joints, plates, hollow sections including Preparation of detailed fabrication and erection drawings of Structural steel work from design drawings issued by Engineer-In-Charge and incorporation of Engineer-In-Charge's comments on same, ransportation from fabrication yard, cutting , threading, machining, leads and lifts upto all heights, tools and plants and necessary scaffolding etc. required for all operations involved to make structure of Tensile Membrane shade. The tubular structure system with plate connectors, pinion joints, etc. is to be provided. The structure has to be provided as per conceptual drawings of Tensile fabric profile , including all arch beam, curved lateral beams and bracings, vertical support columns, nodal joints, ,bases of columns and high tensile bolts of grade not less than 10.9 having black phosphate coating. The complete structure to be Hot Dip Galvinized along with one coat of epoxy primer and two coats of Polyurethane paint on steel work at all locations prepared by sand blasting in required minimum 210 micron DFT (dry film thickness) for each coat as specified in particular specification. Required detailed shop drawing and sample is needs to get approved from the project Architect before execution on site. Work shall be carried out as directed by the Engineer-In-Charge. Make List-SergeFerrari/Sherfil /Chucko/F.I.T/Fibertech

Detailed Specifications are as per the item description.

Item No:- 75
Landscaping Work

Specification as per item description & Manufacturer, Architecture drawing and as interactive engineer in-charge.

GENERAL NOTES

1. Products with relevant I.S. markings from the B. I.S. Licensed manufacturers, who have been in the market for the last three years with a valid I.S. License, shall be considered for approval.

2. In the event of items where I.S. marked material is not available, the contractor shall procure the same from the following list, subject to prior approval of the Engineer-in-charge. Periodic tests shall be carried out as per contract / specifications at contractor's own cost.

3. In case any new brand other than BIS certified or from a departmental list of manufacturers is proposed, adequate information about the product and manufacturer shall be provided at the tender stage.

4. The Department reserves the right to accept / reject any new brand(s) proposed by the tenderer.

5. Samples of all materials, fittings etc. to be incorporated in the work shall be submitted by the contractor and approved by the Engineer-in-Charge, before supply in bulk at the site of work. Wherever particular make or its equivalent is mentioned in the item schedule, the decision of the Engineer-in-Charge in selection of particular make or its equivalent shall be final and binding on the contractor. The approved samples will be kept in custody of the Engineer-in-Charge till completion of the work. Materials not conforming strictly to the approved samples will be rejected.

SECTION IV

TECHNICAL SPECIFICATIONS

Part B: - Sanskar Kendra Plaza

SPECIFICATIONS OF ITEMS OF B.O.Q.

BIDDERS, PLEASE READ CAREFULLY AND COMPULSORY SIGN. WITH SEAL:

5. This section gives detail specifications for mainly used materials, for other materials refer to Building Specifications.

6. For detailed specifications refer to the R & B Dept. Booklet for General Technical Specification for building works.

7. Proper care has been taken to note down specifications of all the items, but if any item is not found hereby, it shall be executed only as per the guidelines of the consultants, no payment shall be made if the guidelines are not followed.

   a. Samples for all the materials to be used shall be approved before placing the order and then the approved sample shall be deposited with the Project Consultants / SRFDCL locker safely.
   b. In case of non-availability of materials in metric unit, the unit shall be converted by the Project Consultants, for which neither extra cost shall be paid, nor rebate shall be given/ recovered on those items / materials.
   c. The contractor shall submit the original Testing Certificate of the material tested, if in any case, the Consultants find the Tests to be repeated, the contractors shall do the same with no extra cost to be borne by the clients / consultants.
   d. The contractor may also be asked for the originality of the material used; this certificate may be asked for from the vendor / manufacturer from whom the materials have been procured.
   e. For all materials stored on site, the contractors shall be solely responsible for wastage, theft or any other kind of losses.
   f. Wherever in the tender document, two statements or two brands conflicts/ differs, the superior material quality / brand shall be followed, and same for any construction activity such as strength of material / grade of the material / mortar / concrete mix shall be followed the superior one only, any discrepancy in this regard shall be solved by the SRFDCL or Project Consultants and the decision of the Client shall be final and binding to the Contractors without any oppose.

8. We agree and abide to follow the specifications / instructions given to us during the course of execution.

Sign. & Seal of the Bidders

Applicable Standards

For

Civil Work

Section: A - Applicable Standards for Civil work

1	Conversion factors	IS:786
2	Method of Measurement of building works	IS:1200
3	Code of practice for measurement of civil engineering works	IS:3385
4	Materials and workmanship for earthwork and excavation	IS:1200 (PART I)
5	Safety code for blasting and related drilling operations	IS:4081
6	Safety code for excavation work	IS:3764
7	Moisture content in sand for filling	IS:2720
8	Determination of moisture content	IS:2720 (PART II)
9	Determination of moisture content & dry density relation using light compaction	IS: 2720 (PART VIII)
10	Determination of dry density of soils in-place by the sand replacement method	IS:2720(PART XXVIII)
11	Determination of dry density of soils in-place by the core cutter method	IS:2720 (PART XXIX)
12	Anti termite treatment	IS:6313(PARTI TO III)
13	Construction water	IS:456
14	Methods of sampling and test (physical and chemical water used in industry)	IS:3025
15	Ordinary (33 grade)/low heat Portland cement	IS:269
16	Ordinary Portland cement (43 grade)	IS:8112
17	Ordinary Portland cement (53 grade)	IS:12269
18	White Portland cement	IS:8042-E
19	Portland pozzolana cement	IS:1489
20	Rapid hardening Portland cement	IS:8041, IS:269
21	Portland(blast furnace) slag cement	IS:455
22	Hydrophobic cement	IS:8043
23	High alumina cement	IS:6452
24	Super sulphated cement	IS:6909
25	Oil well cement	IS:8229E
26	Standard for testing of cement	IS:650
27	Methods of physical tests for hydraulic cement	IS:4031
28	Specification for standard sand for testing of cement	IS:650
29	Coarse and fine aggregates for concrete	IS:383, IS:515
30	Gradation of coarse aggregates	IS:383(TABLEII)
31	Gradation of fine aggregates	IS:383 (TABLE III)
32	All-in aggregates	IS:383 (TABLE IV)
33	Method of tests for aggregates for concrete	IS:2386 (PART- I to VIII)
34	Methods of determination the maximum qty. of deleterious materials in aggregate	IS:2386 (PART II)
35	Limiting values of the maximum quantities of deleterious materials in aggregate	IS:383 (TABLE I)
36	Flakiness index of aggregates	IS:2396(PART-I),IS:5640
37	Moisture content test for aggregates	IS:2386 (PART III)
38	Specification for mild steel and medium tensile steel bars and hard drawn steel wire for concrete reinforcement.	IS:432 (PART I & II)
39	Specification for plain hard drawn steel wire fabric for cement concrete	IS:1566

40	Specification for cold twisted steel bars for concrete reinforcement	IS:1786
41	Specifications for hot rolled mild steel and medium tensile steel deformed bars	IS:1139, IS:1739
42	Code of practice for bending and fixing of bars for concrete reinforcement	IS:2502
43	Mild steel binding wire	IS:280
44	Code of practice for welding of mild steel bars used for RCC	IS:2751
45	Code of practice for plain and reinforced concrete	IS:456
46	Code of practice for general construction of plain and RCC for dams	IS:457
47	Testing of reinforced cement concrete	IS:516
48	Method of tests for strength of concrete	IS:516
49	Methods of sampling & analysis of concrete	IS:1199
50	Code of practice for concrete structures for storage of liquids	IS:3370 (PART I TO IV)
51	Code of practice for composite construction	IS:3935
52	Code of practice for construction of reinforced concrete shell roof	IS:2204
53	Criteria for the design of RCC shell structures and folded plates	IS:2210
54	Specification for batch type concrete mixers	IS:1791
55	Specification for portable swing weigh batchers for concrete	IS:2722
56	Specification for roller pan mixer	IS:2438
57	Specification for concrete vibrators immersion type	IS:2505
58	Specification for screed board concrete vibrators	IS:2506
59	Specification for concrete vibrating tables	IS:2514
60	Specification for pan vibrators	IS:3366
61	Specification for form vibrators for concrete	IS:4656
62	Code of practice for use of immersion vibrators for consolidated concrete	IS:3558
63	Air entraining agent	ASTM:6260
64	Criteria for design and construction of precast concrete trusses	IS:3201
65	Prestressed concrete	IS:1343
66	Specification for high tensile steel bars used in code of practice for pre-stressed concrete	IS:2090
67	Specification for plain hard drawn steel wire for pre-stressed concrete	IS:1785 (PART I)
68	Specification for plywood for concrete	
69	Shuttering work	IS:4990
70	Code of practice for steel tubular scaffolding	IS:4014 (PART I & II)
71	Specification for steel scaffolding	IS:2750
72	Safety code for scaffolds and ladders	IS:3696
73	Common burnt clay building bricks	IS:1077
74	Classification of burnt clay bricks	IS:3102
75	Burnt clay building bricks, heavy duty	IS:2180
76	Burnt clay facing bricks	IS:2691,IS:1077
77	Method of sampling and testing clay building bricks	IS:3495 (PART I - IV)
78	Mortar for brick work	IS:2250
79	Code of practice for brick work	IS:2221
80	Masonry works	IS:3466

81	Structural safety etc. Of building masonry walls	IS:1905
82	Load bearing hollow concrete blocks	IS:2185
83	Lime - cement - cinder hollow concrete blocks	IS:5498
84	Lime - cement - cinder solid blocks	IS:3115
85	Code of practice for construction of stone masonry	IS:1597 (PART I)
86	Stone tests	IS:1124
87	Code of practice for design and installation of joints in buildings	IS:3414
88	Joint sealing compound	IS:834
89	Pre-moulded bituminous joint filler	IS:1838
90	Timber door, window and ventilator frames	IS:4021
91	Material & workmanship for wood work	IS:883, IS:4021
92	Wooden flush door shutters (solid core type)	IS:2202 (PART I)
93	Timber panelled and glazed shutters	IS:1003 (PART I & II)
94	Method of tests for wooden flush doors, type tests	IS:4020
95	Plywood & tests	IS:303
96	General tests for wood work	IS:1659
97	Red lead for wood knot	IS:103
98	Oil type wood preservative	IS:218
99	Particle board	IS:3087
100	Transparent sheet glass for glazing & framing purposes	IS:1761
101	Resin bonded fiber glass	IS:3144
102	Putty for glazing	IS:420
103	Steel door frames	IS:4351
104	Steel window	IS:1361
105	Steel doors	IS:1038
106	Steel ventilators	IS:1081
107	Rolling shutters	IS:6248
108	Primer for steel doors, windows & ventilators	IS:102
109	Aluminium alloy for door/window frames	DSGN. HEA-WPO IS:733
110	Sections	IS:1948
111	Anodizing	BS:1616
112	Hydraulic lime & storage	IS:712
113	General tests for lime	IS:6932 (PART I TO X)
114	Field tests for lime	IS:1624
115	Lime mortar preparation	IS:1625
116	Slacked lime	IS:1639
117	Surkhi	IS:1344
118	Code of practice for application of lime plaster finish	IS:2394
119	Rough cast plaster	IS:1661(CLAUSE-165)
120	Specification for integral cement water proofing compounds	IS:2645
121	Water proofing asphalt/maxphalt	IS:702
122	Bitumen saturated layer	IS:1322
123	Bitumen felt	IS:1322
124	Bitumen	IS:702
125	Code of practice for laying and finishing of cement concrete flooring tiles	IS:1443
126	Material & workmanship for flooring	IS:1197, IS:1344
127	Code of practice for laying in situ terrazzo floor finish	IS:2114
128	Code of practice for laying in-situ cement concrete flooring	IS:2571
129	Mosaic tiles	IS:1237
130	Glazed earthenware tiles	IS:777
131	Marble chips & marble mosaic terrazzo	IS:2114
132	Plain cement tiles & tests	IS:1237

133	Marble mosaic tiles	IS:1237
134	Marble slab	IS:1130
135	PVC flooring tiles & sheets	IS:3461,IS:3462
136	Broken marble mosaic tiles	IS:1257
137	Oxy-chloride	IS:658
138	Magnesium chloride	IS:657
139	C.I. grid tiles	IS:210
140	Pigment for terrazzo flooring	IS:459
141	Rivets	IS:1148
142	Electrodes for welding	IS:814
143	Code of practice for use of electric arc welding for general construction in steel	IS:813
144	Tests for welding works	IS:1181
145	Welding works	IS:816
146	Bolts and nuts	IS:1367
147	Tests for bolts and nuts	IS:1608
148	Structural steel sections & tests	IS:226
149	Structural steel plates	IS:2062
150	Defects in structural steel	IS:229
151	Dimension & properties of steel section	IS:808
152	Structural steel work	IS:226, IS:4948
154	Expanded metal steel sheet	IS:412
155	Mild steel wire gauze jali	IS:280
156	Welding procedure & edge preparation	IS:823
157	Washers	IS:2016
158	Storage of welding wire & electrodes	IS:816
159	Primer to structural surface for bolts	IS:2074
160	Chequered plates	IS:3502
161	Code of practice for painting of ferrous metal in building and allied finishes	IS:1477 (PART I & II)
162	Distemper and dry color	IS:427
163	Code of practice for painting concrete, masonry and plaster surfaces	IS:2395
164	Distemper and oil emulsion	IS:428
165	Enamel paints	IS:2933
170	Coat of zinc chromate	IS:104
171	French spirit polish	IS:348
172	GI sheets	IS:227
173	Ac sheets	IS:459
174	Ac sheet fixing	IS:730
175	Mangalore pattern tiles	IS:654
176	Fiber glass reinforced polyester	IS:4154
177	Galvanized steel for barbed wire	IS:278
178	Insulation of hot water pipes, tanks & heat exchanger	BS:476
179	GI pipes & MS tubes	IS:1239 (PART I)
180	Screw down bib cocks & stop cocks	IS:781
181	Vitreous sanitary fixtures(general)	IS:2556 (PART I)
182	Gun metal wheel, globe, check, gate & non return valves	IS:778
183	Wash basin	IS:2556(PART IV), IS:771
184	European W.C.	IS:2556, IS:771
185	Solid plastic seat & cover	IS:2548
186	Orissa pan W.C.	IS:2556 (PART III)
187	Squatting pans & traps	IS:2556 (PART III)

188	Indian W.C. (wash down W.C.)	IS:2556(PART II), IS:771
189	Urinals	IS:2556 (PART VI)
190	Half round channels	IS:2556 (PART VII)
191	Specific requirements of siphonic wash down W.C.	IS:2556 (PART VIII)
192	Ss sink/C.I./flushing tank brackets	IS:775
193	C.I. siphonic flushing cistern	IS:774
194	Lead pipes	IS:404 (PART I)
195	Sand cast pipes & fittings	IS:1729
196	C.I. spun soil pipes & fittings	IS:3939
197	Gully trap	IS:651
198	Glazed stone ware pipes & fittings	IS:651
199	Ac pipe	IS:1626,IS:1626(PART I)
200	High pressure/crydon ball valve	IS:1703
201	C.I. sluice valve	IS:780
202	Capstan head	IS:1795
203	Malleable iron fittings	IS:1879 (PART I TO X)
204	C.I. pipes	IS:1536, IS:1537
205	Molten (pig)lead	IS:782
206	C.I. manhole frames & covers	IS:1726
207	Concrete pipes	IS:458
208	Threads for screwed pipes	IS:554
209	Lead jointing	IS:718
210	Carbon steel for pipes	IS:9161
211	Low level ceramic cistern	IS:774
212	Bowl pattern flat back urinals	IS:2556 (PART IV)
213	Showers	IS:2064
214	Heavy C.I. pipes	IS:1729
215	Concrete mix design	IS:10262
216	Code of practice for construction of floor and roof with joists and filler blocks	IS:6061 (PART I)
217	Code of practice for construction of light weight concrete block masonry	IS:6042
218	Specification for load bearing light weight concrete blocks	IS:3590
219	Code of practice for construction of hollow concrete block masonry	IS:2572
220	Specification for concrete masonry units (hollow and solid concrete blocks)	IS:2185 (PART I)
221	Chemical composition of ordinary Portland cement	IS:4032
222	Sulphate resistant cement	BS:4027 & ASTMC-150 TYPE II
223	Specifications for circular hollow sections	IS:1161
224	Properties of rectangular & square hollow sections	IS:4923
225	Cold formed welded & seamless carbon steel structural tubing	ASTMA 500
226	Cold but not formed welded & seamless carbon steel structural tubing	ASTMA 501
227	Hot formed welded & seamless high strength low alloy tubing	ASTMA 618
228	Hot rolled structural steel hollow section	BS:4848/
229	(Part 1) Code of Practice for design and construction of pile foundation concrete piles cast-in-situ bored piles.	IS : 2911
230	Recommendation for detailing of Reinforcement in Reinforced Concrete Works.	IS : 5525
231	Guidelines for dewatering during construction	IS: 9759 : 1981

Note:

For the reference of all Codes and Standards, the latest version of the above specified Standards shall be followed, Wherever, such Standards are not specified for the construction materials, equipment and method, the relevant Indian Standard Codes of Practice shall be followed, in the absence of Indian Standards corresponding British Standard Codes of Practice or relevant American Standards shall be followed.

List of Approved Makes
For
Civil Work

Section B - List of Approved Make for Civil Works

1.	Ordinary Portland Cement	Ultratech, Ambuja, Birla Cement, ACC, J.K.Laxmi, Sanghi, Nuvoc vistus pvt. ltd.
2.	White Cement	Birla white, J.K.
3.	Reinforcement Steel	Tata, RINL (VIZAG), SAIL
4.	Structural Steel sections	Tata, SAIL, RINL, Jindal, JSW steel, JSPL
5.	Structural Hollow steel sections	Tata, Asian, Jindal, Surya, Apollo
6.	Coarse Aggregates (machine cut) 6mm to 40mm sizes (Hard black trap stone)	Approved quarry from Sevalia, Bayad, Vadagam & Vatrak
7.	Stone /Rubbles & Gravels (Hard black trap stone)	Approved quarry from Sevalia, Bayad, Vadagam & Vatrak
9	Shuttering plywood	Kit ply, green ply, Archid ply, Duroply, Century,India plywood, sylvan ply
10	Precast Paver block	Vyara, Super,basant batons , Winner Conmat
11.	Precast Kerbing, and other elements	Vyara, Super,basant batons , Winner Conmat, Fuji , Sachi.
12.	Rolling shutter	Sona, Gandhi Automation
13.	Ceramic tiles, Vitrified tiles	Johnson, Somani, AGL, Simpolo
14.	Admixtures	BASF, Sika, Fosroc, MapeiCico, Fairmate, Pidilite, MYK Arment
15.	Water proofing coating, Chemical Water proofing & Integral water proofing compound	Pidilite, Mapei, Asian, MYK Arment
	Crystalline water proofing	Penetron, Kryton, Xypex
16.	PVC Water stop/Water bar	Penetron, Kryton, Xypex, Pidilite, Mapei, Asian, MYK Arment, Jyoti polyvinyl , kanta polyvinyl.
17.	Silicon sealant	Wacker, Dow corning, GE, Soudal, Bostik, Mapei, Pidilite
	Polysulphide sealant	Pidilite, Chawksey, Mapei, Fosroc, Fairmat
18.	P.U sealant/ Fire rated PU	Sikka (Exterior grade - UV resistant)
19.	Paint, primer, putty	Asian paint, Nerolac, Berger, Birla (putty), JK (Putty)
20.	Tile adhesives & grouting material	Laticrete, Kerakoll, Pidilite, Mapei
21.	Anchor Fasteners	Hilti, Fischer, Mungo, Wurth
22.	Non-shrink general purpose grout	Fosroc, BASF, Sikka, Mapei, Pidilite
23.	Anchoring chemical for rebar dowel bar, Core cutting	Hilti, Fischer, Wurth
24.	Expansion joint pre-moulded filler board	BridgeWY, Migua
25.	Road marking paint	Kataline, Asian, Automark, Berger, STP

26.	Mold release agent	Fosroc, Pidilite, BASF, Fairmate, Sika
27.	Silicone paint (water repellant coating)	Wacker, Dow corning, Killick guard Specialty, Akemi, MYK Laticrete, Ardex Endura
28.	Colour admixture for colour concrete	Lanxess, Bomanite
29.	Water Stops - Hydrophilic Swellable rubber strip (Not bentonite type)	Penetron, Kryton, Xypex, Pidilite, Mapei, MYK Arment, Jyoti Polyvinyl, Kanta Polyvinyl.
30.	Modular Signage	Cosign, Vista
32.	Vinyl Sticker and lamination for signage	3M
33.	FRP Manhole cover & tree pit cover	Fibrocast, HP strong drain, Thermodrain, Everlast
34.	Metal recessed manhole cover	Lidco, ACO, Weimar
35.	Structural Steel Paints	Asian, Nerolac, Jotun, Berger
36.	Anti-Termite Treatment Chemistry Agency	Central Insecticide Board approved (ISI Marked) Chemical
		M/s Paragon; M/s PECOPP; M/s Pest Control India Ltd; M/s Express pesticide corporation or as approved. Specialized agency shall be a Member of IPCA (Indian Pest Control Association)
37.	BRICK	Compressive strength Avg. 35 KG. Per sq.CM.
38.	AAC blocks	Aerocon, Ascolite, Magicrete, Biltech, Litecone, Ecolite, Xtralite, Anjani, Globconmake (autoclaved aerated block) or Equivalent as Approved by EIC
39.	Synthetic Enamel Paint for steel	Asian, Nerolac, Jotun, Berger, Sunanda, MYK Arment
40.	PU paint & Spar Varnish	Asian, Nerolac, Jotun, Berger, Sunanda, MYK Arment
41.	Modular Toilet Partition	Marino, Greenlam
42.	Metal / Wooden Fire Doors	M/s Shakti Hormann, M/s Navier, M/s J C, M/s Signum Fire Door, M/s Bajaj Fire Door
43.	Plain Glass	M/s Modi Guard; M/s Saint Gobain, M/s Indo-Asah Glass
44.	Reflective Glass	M/s Saint Gobain, M/s Indo-Asahi Glass, M/s Glaverbel (Europe); M/s Pilkington (USA, UK).
45.	Flush Door Shutter	M/s Kalpatru, M/s Kutty Flush Door, M/s Century, M/s Kitply, M/s Sylvan Ply, Kolkata

46.	Plywood	M/s Century, M/s Kitply, M/s India Plywood, M/s Green Ply, M/s Sylvan Ply, Kolkata
47.	Fire rated hardware & system	Dormakaba, Hafele, Geze, Hormann, Becker
48.	Veneers	M/s Century, M/s Kitply, M/s India Plywood, M/s Green Ply, M/s Timex, M/s Merino
49.	Laminate	M/s Formica, M/s Greenlam, M/s Century Ply, M/s Merino, M/s Timex, M/s Royal Touche
50.	Fire rated hardware & system	Dormakaba, Assa Abloy (Yale), Hafele, Geze, Hormann, Becker
51.	Automated Sliding door	Dorma, Geze, Hafele, Kitch, Ozone
52.	Fire seal, fire smoke seal	3M, Hilti, Dormakaba, Sealz, Lorient, Kelargo, Raven, Athmer
53.	Acoustic Seal/ Door seal	Athmer, Lorient, Raven, Dormakaba, 3M, Kelargo, Reddiplex
54.	Wood Adhesive	Speedex Fevicol, Araldite, kerakol, Astral
55.	Door Fittings & Fixtures (MS, Al, SS, Brass)	M/s Ebco, M/s Guardian, M/s Hafele, M/s Hettich, M/s Ozone, Dorma Kaba
56.	Decorative High SS Finish Fittings and Fixtures	M/s Guardian, M/s Hafele, M/s Hettich, M/s Ozone, M/s Dorma Kaba
57.	Mortise Locks, Night Latch	M/s Godrej, M/s Guardian, Hettich, Hafele, Dorma
58.	Door Closer	M/s Hardwyn, M/s Godrej, M/s. Garnish, M/s Dorma
59.	Floor Spring	M/s Hardwyn, M/s Godrej, M/s. Garnish, M/s Dorma M/s Hafele
60.	Glass patch Fittings	M/s Dorma, M/s Ozone
61.	Gypsum Based False Ceiling	M/s Saint Gobain Gyproc India Ltd, USG Boral
62.	Cement board false ceiling	M/S Everest industries
63.	Tensile Fabric	Serge Ferrari/ Sherfil/ Chucko /F.I. T / Fiber tech
64.	Water Cooler	Voltas, Blue Star
65.	Corner Guards	As Per Architect Selection
66.	PVC Speed Breaker	
67.	Safety Convex Mirror	

68.	Drinking water fountain	
69.	Stainless steel dustbin	
70.	Sculpture (Note: These images are for reference purposes only.)	

Note:

All the Materials/ Makes listed above and other than as specified above shall be used after obtaining prior approval from the Architect & Engineer-in-charge.

Cement Consumption

Section C - Cement Consumption

No.	Item	Ratio/ Grade	Consumption per Unit	
A.	**CEMENT CONCRETE (OPC 53 grade Cement)**			
	BBCC (Volumetric)	1:5:10	2.60	Bags/m^3.
		1:4:8	3.40	Bags/m^3.
	PCC (Volumetric)	1:6:12	2.30	Bags/m^3.
		1:5:10	2.60	Bags/m^3.
		1:4:8	3.40	Bags/m^3.
		1:3:6	4.30	Bags/m^3.
	PCC (Controlled concrete)	M7.5	3.40	Bags/ m^3.
	PCC (Controlled concrete)	M10	4.70	Bags/m^3
	PCC (Controlled concrete)	M15	5.50	Bags/ m^3.
	RCC (Controlled concrete Minimum cement content	M15	5.70 (285 Kg)	Bags/m^3.
		M20	6.0 (300 Kg)	Bags/m^3.
		M25	6.5 (325 Kg)	Bags/m^3.
		M30	7.0 (350 Kg)	Bags/m^3.
		M35	7.5 (375 Kg)	Bags/m^3.
	Minimum cement content for exposed finish wall shall be	M25	7.6 (380 Kg)	Bags/m^3.
B.	**MORTARS**			
	Cement and Sand mortar			
		1:1	20.4	Bags/m^3.
		1:2	13.6	Bags/m^3.
		1:3	10.2	Bags/m^3.
		1:4	7.60	Bags/m^3.
		1:5	6.2	Bags/m^3.
		1:6	5.0	Bags/m^3.
		1:8	3.83	Bags/m^3.
C.	**MASONRY WORK**			
	Brickwork in Cement sand mortar **(Conventional)**			
		1:3	2.55	Bags/m3.
		1:4	1.90	Bags/m3.
		1:5	1.56	Bags/m^3.
		1:6	1.27	Bags/m^3.
		1:8	0.95	Bags/m^3.
	Stone masonry, Coursed			
		1:3	3.06	Bags/m^3.

		1:4	2.28	Bags/m^3.
		1:6	1.50	Bags/m^3.
		1:8	1.18	Bags/m^3.
	Stone masonry Uncoursed			Bags/m^3.
		1:5	2.04	Bags/m^3.
		1:6	1.65	Bags/m^3.
	Half Brick work **(Conventional)**	1:3	0.29	Bags/m^2.
		1:4	0.21	Bags/m^2.
		1:5	0.17	Bags/m^2.
D.	**PLASTERING**			
	10 mm. thick plaster in Cement mortar, on ceiling & soffit of stair, chajjas etc.			
		1:3	0.12	Bags/m^2.
		1:4	0.1	Bags/m^2.
	15 mm. thick single coat plaster in on walls			
		1:3	0.17	Bags/m^2.
		1:4	0.13	Bags/m^2.
	20 mm. thick plaster in Cement mortar, on unfair side of brick in single coat			
		1:3	0.23	Bags/m^2.
		1:4	0.17	Bags/m^2.
	20 mm. thick plaster in Cement mortar, on unfair side of brick in double coat (First coat 15mm in 1:4 and second coat of 5mm in1:3)		0.18	Bags/m^2.
	20 mm. thick Sand Face plaster (First coat 15mm in 1:4 and second coat of 5mm in 1:2)		0.22	Bags/m^2.
	15mm. thick Water Proof plaster in 1:3 Cement mortar		0.21	Bags/m^2.
	Neat Cement finishing		0.044	Bags/m^2.
E.	**POINTING**			
	Flush, Grooved or Struck in Cement Brick masonry			
		1:1	0.092	Bags/m^2.
		1:2	0.046	Bags/m^2.
		1:3	0.03	Bags/m^2.
		1:4	0.023	Bags/m^2.
	Flush, Grooved or Struck in Cement Random Stone masonry			
		1:3	0.023	Bags/m^2.
F.	**FLOORING**			
	Precast Mosaic Tiles of 40mm		0.30	Bags/m^2.

	thk. in cement mortar 1:6			
	20mm thk. Green Kotah/Granite Stone in flooring, skirting & dado of 50mm thk. in cement mortar 1:6		0.50	Bags/m².
	20 mm thick. Green Kotah/ Granite Stone in Risers and Treads		0.50	Bags/m².
	20 mm thick. Double Polished Kotah/Granite Stone		0.50	Bags/m².
	25mm thick. Rough Kotah, Dholpur, Red Mandana, Bansipahadpur stone etc. in flooring, skirting & dado of 50mm thk. in cement mortar 1:6		0.50	Bags/m².
	Glazed Tiles, Ceramic tiles, vitrified tiles flooring in 25 mm thick. Bedding of C:M 1:6		0.20	Bags/m².
	Glazed Tiles, Ceramic tiles, vitrified tiles dado in C:M 1:1		0.20	Bags/m².
	China mosaic with 25 mm bedding mortar in C:M 1:6		0.22	Bags/m².
	18-20mm Marble, Granite, Jesalmer Slab with avg. 50mm bedding mortar in cement mortar 1:6		0.50	Bags/m².
	I.P.S.	40 mm. thick	0.35	Bags/m².
		50 mm. thick	0.40	Bags/m².
		75mm. thick	0.55	Bags/m².
	115mm water proofing plaster		0.40	Bags/m².
	Brick-on-edge		0.12	Bags/m².
	Wet stone cladding in C:M 1:2		0.2	Bags/m².
	Chemical water proofing 3 coats		0.05	Bags/m².
	Sandwich platform		0.5	Bags/m².
G.	**MISCELLANEOUS**			
	Filling Zaris with			
	C.M.	1:3	5.0	Bags/ 100 m.
	C.C	1:2:4	3.2	Bags/100 m.
H.	**ROADWORK**			
	Precast exposed Curbs M20	1:2:4	35	Bags/100 m.
		230 mm. dia.	1.8	Bags/100 m.

Note:

For the items not covered in above list, CPWD co-efficient shall be followed or proportionate from CPWD co-efficient or actual consumption shall be checked in the beginning, during execution of item in consultation with EIC.

GENERAL TECHNICAL SPECIFICATIONS FOR BUILDING WORK

GENERAL

29. In the specifications, "as directed"/"Approved" shall be taken to mean, "as directed"/approved" by the Engineer-in-charge.

30. Wherever a reference to any Indian Standard appears in the specifications, it shall be taken to mean as a reference to the latest edition of the same in force on the date of agreement.

31. In "Mode of Measurement" in the specifications wherever a dispute arises in the absence of specific mention of a particular point or aspect, the provisions on these particular points, or aspects in the relevant Indian Standards shall be referred to.

32. All measurements and computations, unless otherwise specified, shall be carried out nearest to the following limits:

32.1 Length, width and depth (height)-------0.01 Meter.
32.2 Areas -----0.01 Sq. Mt.
32.3 Cubic Contents ------0.01 Cu.Mt.

33. The distance, which constitutes lead, shall be determined along the shortest practical route and not necessarily the route actually taken. The decision of the Engineer-in-charge in this regard shall be taken as final.

34. Where no lead is specified, it shall mean "all leads"

35. Lift shall be measured from plinth level.

36. Upto "floor two level" means actual height of floor (Maxi. 4 M.) up to 3 Mt. above plinth level.

37. Definite particulars covered in the items of work, though not mentioned or elucidated in it, specifications should be deemed to be included there.

38. Reference to specifications of materials as made in the detailed specification of the items of work is in the form of a designation containing the number of the specifications of the material and prefix 'M' e.g. 'M-5'.

39. Approval of the samples of various materials given by the Engineer-in-charge shall not absolve the contractor from the responsibility of replacing defective material brought on site or materials used in the work found defective at a later date.

40. The contract rate of the item of work shall be for the work completed in all respects.

41. No collection of materials shall be made before it is got approved from the Engineer-in-charge.

42. Collection of approved materials shall be done at the site of work in a systematic manner. Materials shall be done at the site of work in a systematic manner. Materials shall be stored in such a manner as to prevent damage, deterioration or intrusion of foreign matters and to ensure the preservation of their quality and fitness for the work.

43. Materials, if and when rejected by the Engineer-in-charge, shall be immediately removed from the site of work.

44. No materials shall be stored prior to, during and after execution shall be kept in sufficient numbers and in good working conditions on the site of the work.

45. All works shall be carried out in a workmanlike manner per the best techniques for the particular item.

46. All tools, templates, machinery and equipment for correct execution of the work as well as for checking lines, levels, and alignment of the works during execution shall be kept in sufficient numbers and in good working condition on the site of the work.

47. The mode, procedure and manner of execution shall be such that it does not cause damage or overloading of the various components of the structure during execution or after completion of the structure.

48. Special modes of construction not adopted in general Engineering practice, if proposed to be adopted by the Contractor, shall be considered only if the contractor provides satisfactory evidence that such a special mode of construction is safe, sound and helps in speedy construction and completion of work to the required strength and quality. Acceptance of the same by the Engineer-in-Charge shall not, however, absolve the contractor of the responsibility of any adverse effects and consequences of adopting the same in the course of execution of completion of the work.

49. All installations pertaining to the water supply and fixtures thereof as well as drainage lines and sanitary fittings shall be deemed to be completed only after giving satisfactory tests by the Contractor.

50. The contractor shall be responsible for observing the rules and regulations imposed under the “Minor Minerals Act", and such other laws and rules prescribed by the Government from time to time.

51. All necessary safety measures and precaution (including those laid down in the various relevant Indian Standards) shall be taken to ensure the safety of men, materials and machinery on the works as also of the work itself.

52. The testing charges of all materials shall be borne by the Contractor unless a recovery at one percent towards testing charges is separately made.

53. Approval of any of the executed items for the work does not in any way relieve the contractor of his responsibility for the correctness, soundness and strength of the structure as per the drawings and specifications.

54. Contractor shall set up testing laboratory on site. Laboratory shall be equipped with minimum following equipments / instruments.

54.1 Beaker-Measuring Cylinder
54.2 Flakiness Index
54.3 Elongation Index
54.4 Aggregate Impact Value
54.5 Oven
54.6 Slump Cone
54.7 Concrete cube testing Machine
54.8 Concrete Test Cubes
54.9 Vicat Apparatus
54.10 90 micron Sieve
54.11 Mortar Cube Mould
54.12 Plate Vibrator
54.13 Micrometer Screw
54.14 Varner Calipers
54.15 Thermometer
54.16 5 kg- Weigh Scale /Balance
54.17 Electronics Balance – 20 kg
54.18 300 kg- Weigh Scale /Balance
54.19 Core cutter set
54.20 Mortar Mixture
54.21 Casgranade Apparatus
54.22 Welding gauge
54.23 Dye penetration material-set
54.24 Pycnometer
54.25 Proctor mould
54.26 GI tray/ Ceramic tray
54.27 Distilled Water
54.28 Wire basket
54.29 PH meter
54.30 TDS meter
54.31 IS 1852
54.32 Electronic vernier
54.33 Welding gauge
54.34 Theodolite
54.35 Auto Level/ Staff

55. In case of any discrepancy or contradiction if any in the provision of above specification the order of the precedence shall be followed.

55.1 Technical Specification in this Volume IS Provisions
55.2 MORTH and CPWD Specification IRC Provisions
55.3 Sound Engineering Practice
55.4 Manufacture specification for special items

56. Unacceptable work

All defective works are liable to be demolished, rebuilt and defective materials replaced by the contractor at his own cost. In the event of such works being accepted by carrying out repairs etc. as specified by the engineer in charge, the cost of repairs will be borne by the contractor and will be paid for the works actually carried out by him at reduced rates of the tendered rates, as may be considered reasonable by the engineer in charge, in the preparation of final or on account bills.

SPECIFICATIONS OF MATERIALS

M-1. Water:

1.1 Water shall not be salty or brackish and shall be clean, reasonably clear and free objectionable quantities of silt and traces of oil and injurious alkalis, salts, organic matter and other deleterious material which will either weaken the mortar or concrete or cause efflorescence or attack the steel in R.C.C Container for transport, storage and handling of water shall be clean. Water shall conform to the standards specified in I.S.456-1978.

1.2 If required by the Engineer-in-charge it shall be tested by comparison with distilled water. A comparison shall be made by means of standard cement tests for soundness, time of setting and mortar strength as specified in I.S.269-1976. Any indication of unsoundness, change in time of setting by 30 minutes or more or decrease of more than 10 per cent in strength of mortar prepared with water sample when compared with the results obtained with mortar prepared with distilled water shall be sufficient cause for rejection of water under test.

1.3 Water for curing mortar, concrete or masonry should not be too acidic or too alkaline. It shall be free of elements which significantly affect the hydration reaction or otherwise interfere with the hardening of concrete during curing or those which produce objectionable stains or other unsightly deposits on concrete or mortar surfaces.

1.4 Hard and bitter water shall not be used for curing.

1.5 Portable water will be generally found suitable for curing mortar or concrete.

M-2. Lime:

2.1. Lime shall be hydraulic lime as per I.S. 712-1973. The necessary test shall be carried out as per I.S. 6932 (Parts I to X), 1973.

2.2. The following field tests for limes are to be carried out:

(1) A very rough idea can be formed about the type of lime by its visual examination, i.e. fat lime bears pure white colour, lime in form of porous lumps of dirty while colour indicates quick lime, and solid lumps are the unburnt limestone.

(2) Acid tests for determining the carbonate content in lime, Excessive number of impurities and rough determination of class of lime.

2.3. Storage shall comply with I.S. 712-1973. The slaked lime, if stored, shall be kept in a weatherproof and damp-proof shed with impervious floor and sides to protect it against rain, moisture, weather and extraneous materials mixing with it. All lime that has been damaged in any way shall be rejected and all rejected materials shall be removed from site of work.

2.4. Field testing shall be done according to I.S. 1624-1974 to show the acceptability of materials.

M-3. Cement:

3.1 Cement shall be ordinary Portland slag cement as per I.S. 269-1976 or Portland slag cement as per I.S. 455-1976.

M-4. White Cement:

4.1 The white cement shall conform to I.S. 80412-E 1978.

M-5. Coloured Cement:

5.1 Coloured cement shall be with white or gray Portland cement as specified in the item of the work.

5.2 The pigments used for coloured cement shall be of approved quality and shall not exceed 10% of cement used in the Mix. The mixture of pigment shall be properly grounded to have a uniform colour and shade. The pigments shall have such properties to provide durability under exposure to sunlight and weather.

5.3 The pigment shall have the property such that it is neither by the cement nor detrimental to it.

M-6. Sand:

6.1. Sand shall be natural sand, clean, well graded, hard strong durable and gritty particle free from injurious amounts of dust clay, kankar nodules, soft or flaky particles shale, alkali, salts organic matter, loam, mica or another deleterious substance and shall be got approved from the Engineer-in-charge. The sand shall not contain more than 8 percent silt as determined by field test. If necessary, the sand shall be washed to make it clean.

6.2. Coarse Sand: The fineness modulus of coarse sand shall not be less than 2.5 and shall not exceed 3,0.
The sieve analysis of course shall be as under:

I.S. Sieve	**Percentage by weight**	**I.S. Sieve**	**Percentage by weight**
Designation	Passing Sieve	Designation	Passing Sieve
4.75 mm.	100	600 Micron	30-100
2.36 mm.	90 to 100	300 Micron	5-70
1.18 mm.	70-100	150 Micron	0-50

6.4 Fine Sand:

The fineness modulus shall not exceed 1.0. The sieve analysis of fine sand shall be as below:

I.S. Sieve	**Percentage by weight**	**I.S. Sieve**	**Percentage by weight**
Designation	Passing Sieve	Designation	Passing Sieve
4.75 mm.	100	600 Micron	40-85
2.36 mm.	100	300 Micron	5-50
1.18 mm.	70-100	150 Micron	0-10

M-7. Stone Dust:

7.1. This shall be obtained from crushing hard black traps or equivalent. It shall not contain more than 8% silt as determined by field test with measuring cylinder. The method of determining silt contents by field test is given as under:

7.2. A sample of stone dust to be tested shall be placed without drying in a 200 mm. measuring cylinder. The quantity of the sample shall be such that it fills the cylinder upto100 mm. mark. The clean water shall be added up to the 150 mm. mark. The mixture shall be stiff vigorously, and the content allowed to settle for 3 hours.

7.3. The height of silt visible as settled layer above the stone dust shall be expressed as percentage of the height of the stone dust below. The stone dust containing more than 8% silt shall be washed so as to lower the silt content within the allowable limit.

7.4. The fineness modulus of stone dust shall not be less than 1.80.

M-8. Stone Grit:

8.1. Grit shall consist of crushed or broken stone and be hard strong, dense, durable, clean, of proper gradation and free from skin or coating likely to prevent adhesion of mortar Grit shall generally be cubical in shape and as far as possible flaky elongated pieces shall be avoided. It shall generally comply with the provisions of I.S. 383-1970. Unless special stone of particular quarries is mentioned, grit shall be obtained from the best black trap or equivalent hard stone as approved by the Engineer-in-charge. The grit shall have no deleterious reaction with cement.

8.2. The grit shall conform to the following gradation as per sieve analysis:

I.S. Sieve	**Percentage by weight**	**I.S. Sieve**	**Percentage by weight**
Designation	through Sieve	Designation	through Sieve
12.50 mm.	100%	4.75 mm.	0-20%
10.00 mm.	85-100%	2.36 mm.	0-25%

8.3. The crushing strength of grit will be such as to allow the concrete in which it is used to build up the specified strength of concrete.

8.4. The necessary tests for grit shall be carried out as per the requirements of I.S.2386(Parts I to VII) 1963, as per instructions of the Engineer-in-charge. The necessity of the test will be decided by the Engineer-in-charge. The necessity of the test will be decided by the Engineer-in-charge.

M-9. Cinder:

9.1 Cinder is well burnt furnace residue, which has been fused or sintered into lumps of varying sizes.

9.2 Cinder aggregates shall be well burnt furnace residue obtained from furnace using coal fuel only. it shall sound like cleaning free from clay, dirt ash or other deleterious matter.

9.3 The average grading for cinder aggregates shall be as mentioned below:

I.S. Sieve Designation	**Percentage passing**	**I.S. Sieve Designation**	**Percentage passing**
20 mm.	100	4.75 mm.	70
10 mm.	86	2.36 mm.	52

M-10. Lime Mortar:

10.1. Lime shall confirm to specification M-2 Water shall conform to specification M-1.

Sand: Sand Shall conform to specification M-6.

10.2. Proportion of Mix: 10.2.1. Mortar shall consist of such proportions of slaked lime and sand as may be specified in the item. The slaked lime and sand be measured by volume.

10.3. Preparation for Mortar:

10.3.1. Lime mortar shall be prepared by wet process as per I.S. 1625-1971. Power driven mills shall be used for preparation of lime mortar. The slake of lime shall be placed in the mill in an even layer and ground for the 180 revolutions with sufficient water. Water shall be added as required during grinding (care being taken not to add more water) that will bring the mixed material to a consistency of stiff paste. Thoroughly wet sand shall then be added evenly and the mixture ground for another 180 revolutions.

10.4. Storage:

10.4.1 Mortar shall always be kept damp, protected from summer and rain till used up, covering it by tarpaulin or open sheds.

10.5. Use:

10.5.1 All mortars shall be used as soon as possible after grinding and it should be used on the day on which it is prepared. But in no case mortar made earlier than 36 hours shall be permitted for use.

M-11. Cement Mortar:

11.1 Water shall conform to specification M –1. Cement: Cement shall conform to specification M- 3. Sand: Sand shall conform to M-6.

11.2 Preparation of Mix :11.2.1 Cement and shall be mixed to specified proportion, sand being measured by measuring boxes. The proportion of cement will be by volume on the basis of 50 kg / Bag of cement being equal to 0.0342 Cu.m. The mortar may be hand mixed, or machine mixed as directed.

11.3 Preparation of mortar : 11.3.1 In hand mixed mortar cement and sand in the specified proportions shall be thoroughly mixed dry on a clean impervious platform by turning over at least 3 times or more till a homogenous mixture of uniform colour is obtained., Mixing platform shall be so arranged that no delirious extraneous material shall get mixed with mortar or mortar shall be gradually added and thoroughly mixed to form a stiff plastic mass of uniform colour so that each particle of sand shall be completely covered with a film of wet cement. The water cement ratio shall be adopted as directed.

11.3.1 The mortar so prepared shall be used within 30 minutes of adding water. Only such quantity of mortar shall be prepared as can be used within 30 minutes.

M-12 Stone Coarse Aggregate for Nominal Mix Concrete:

12.1 Coarse aggregate shall be machine crushed stone of black trap or equivalent and be hard, strong m dense, durable clean and free form skin and coating likely to prevent proper adhesion for mortar.

12.2 The aggregate shall generally be cubical in shape. Unless special stones of particular quarries are mentioned, aggregates shall be machine crushed from the best black trap or equivalent hard stone as approved. Aggregate shall have no deleterious reaction with cement. The size of the coarse aggregate for plain cement concrete and ordinary reinforced cement concrete shall generally be as per the table given below. However, in case of reinforced cement concrete the maximum limit may be restricted to 6 mm. less than the minimum lateral clear distance between bars or 6 mm. less than the cover, whichever is smaller.

TABLE

l.s. sieve	percentage passing for single sized aggregates of nominal size			I.S. Sieve Designation sized	Percentage passing for single aggregates of Nominal size		
80 mm.	--	--	--	12.5 mm.	--	--	--
63 mm.	100	--	--	10 mm.	0.5	0.02	0.30
40 mm.	85-100	100	--	4.75 mm	--	0.5	0.5
20 mm.	0-20	85-100	100 mm.	2.35	--	--	--
15 mm.	--	--	85-100				

NOTE: This percentage may be carried somewhat by Engineer-in-charge when considered necessary for obtaining better density and strength of concrete.

12.3. The grading test shall be taken in the beginning and at the change of source of materials. The necessary test indicated in I.S. 383-1970 and I.S. 456-1978 shall have to be carried out to ensure the acceptability. The aggregates shall be stored separately and handled in such a manner as to prevent the intermixing of different aggregates. If the aggregate. are covered with dust; they shall be washed with water to make them clean.

M-13. Black Trap or Equivalent Hard Stone Coarse:

13.1 Aggregate For Design Mix Concrete: Coarse aggregate shall be of machine crushed stone of black traps or equivalent hard stone and be hard strong dense, durable clean and free skin and coating likely to prevent proper adhesion of mortar.

13.2 The aggregates shall generally be cubical in shape. Unless special stones of particular quarries are mentioned, aggregates shall be machine crushed from the best, black trap or equivalent hard stones as approved. Aggregate shall have no deleterious reaction with cement.

13.3 The necessary tests indicated in I.S. 383-1970 and I.S. 456-1978 shall have to be carried out to ensure the acceptability of the material.

13.4 If the aggregate is covered with dust, it shall be washed with water to make it clean.

M-14. Brick Bats Aggregate:

14.1 Brick bat aggregate shall be broken from well burnt or slightly over burnt and dies brick. It shall be homogeneous in texture, roughly cubical shape, clean and free from dirt of any other foreign material. The brick bats shall be 40 mm. to 50 mm. in size unless otherwise specified in the item. The unburnt or over burnt brick bats shall not be allowed.

14.3 The brick bats shall be measured by volume by suitable boxes or as directed.

M-15 Bricks:

15.1 The bricks shall be hand or machine moulded and made from suitable soil and kiln burnt. They shall be free from crack and nodules of free lime. They shall have smooth rectangular faces with sharp corners and shall be of uniform colour. The bricks shall be moulded with a frog of 100 mm. X 40 mm. and 10 mm. to 20 mm. deep on one of its flat sides. The bricks shall not break when thrown on the ground from a height of 600 mm.

15.2 The size of modular bricks shall be 190 mm. X 90 mm. X 90 mm. X 90 mm.

15.3 The size of the conventional bricks shall be as under: (9”x$4\frac{3}{8}$” x $2\frac{3}{4}$”) 225 x 110 x 75 mm.

15.4 Only bricks of one standard size shall be used on one work. The following tolerances shall be permitted in the conventional size adopted in a particular work. Length: 1.8 (3.0 mm.) Width: 1/6 “(1.51 mm.) Height: 1/6” 1.50 mm.)

15.5 The crushing strength of the bricks shall not be less than 35 Kg. /Sq.Cm. The average water abscriptics shall not be more than 20 prevent by weight. Necessary tests for crushing strength and water absorption etc. shall be carried out as per I.S. .3493 (Part-I to IV) 1976.

M-16 Stone:

16.1 The stone shall be of a specified variety such as Granite/Trap Stone. Quartzite or any other type of good hard stones. The stones shall be obtained only from the approved quarry and shall be hard, sound, durable and free from defects like cavities, cracks, sand holes, flaws, injurious veins, patches of loose or soft materials etc. and weathered

portions and other structural defects or imperfections tending to affect their soundness and strength. The stone with round surface shall not be used. The percentage of water absorption shall not be more than 5% of dry weight, when tested in accordance with I.S. 1134-1974. The minimum crushing strength of the stone shall be 200 kg. /Sq. Cm. unless otherwise specified.

16.2 The samples of the stone to be used shall be approved before the work is started.

16.3 The Khanki facing stone shall be dressed by chisel as specified in the item for khanki facing in required shape and size. The face of stone shall be so dressed that the bushing on the exposed ace shall not project by more than 40 mm. from the general wall surface and on face to be plastered it shall not project by more than 19 mm. nor shall it have depressions more than 10 mm. from the average wall surface.

M-17. Laterite Stone:

17.1 Laterite stone shall be obtained from the approved quarry. It shall be compacted in texture, sound, durable and free from soft patches. It shall have a minimum crushing strength of 100 K.G/S.q. Cm. in its dry condition. It shall not absorb water more than 20% of its own weight, when immersed for 24 hours in water. After quarrying the stone shall be allowed to weather for some time before use in work.

17.2 The stone shall be dressed into regular rectangular blocks so that all faces are free from waviness and unevenness, edges true and square.

17.3 Those types of stone in which white clay occur should not be used.

17.4 Special cornerstones should be provided where so directed.

M-18. Mild Steel Bars:

18.1 Mild-steel bars reinforcement for R.C.C. work shall conform to I.S. 432(Part-II) 1966 and shall be tested quality. It shall also comply with the relevant part of I.S. 456-1978.

18.2 All the reinforcement shall be clean and free from dirt, paint, grease, mile scale or loose or thick rust at the time of placing.

18.3 For the purpose of payment, the bar shall be measured correctly up to 100 mm. length and weight payable worked out at the rate specified below:

1.6mm x 0.22 Kg. /Rmt	8. 20mm.2.47 Kg. /Rmt
2.8mm x 0.39 Kg. /Rmt.	9. 22mm.2.98 Kg. /Rmt
3.10mm x 0.62 Kg. /Rmt	10. 25mm. 3.85 Kg. /Rmt
4.12mm x 0.89 Kg. /Rmt	11. 28mm. 4.83 Kg. /Rmt
5.14mm x 1.21 Kg. /Rmt	12. 32mm. 6.31 Kg. /Rmt
6.16mm x 1.58 Kg. /Rmt	13. 36mm.7.99 Kg. /Rmt
7.18mm x 3.00 Kg. /Rmt	14. 40mm9.86 Kg. /Rmt.

M-19. High yield Strength Steel Deformed Bars:

19.1 High yield strength steel deformed bars are either cold twisted or hot rolled, which shall conform to I.S. 1739-1966 and I.S.1139-1966 respectively.

19.2 Other provisions and requirements shall conform to specification NO. M-18 for Mild Steel Bars.

M-20. High Tensile Steel Wire:

20.1 The high-tensile wires for use in prestressed concrete work shall conform to I.S. 2090-1962.

20.2 The tensile strength of the high tensile steel bars shall be as specified in the item. In absence of the given strength, the minimum strength shall be taken as per para 6.1 of I.S. 1785-1962. Testing shall be done as per I.S. requirements.

20.3 The high tensile steel shall be free from loose mill scale, rust oil, grease, or any other harmful matter, Cleaning of steel bars may be carried out by immersion in solvent solution, wire brushing or passing through a pressure box containing carborundum.

20.4 The high tensile wire shall be obtained from manufactures in coil having diameter not less than 350 times the diameter of wire itself so that wire springs back straight back straight on being uncoiled.

M-21. Mild Steel Binding Wire:

21.1. The mild steel wire shall be of 1.63 mm or 1.22 mm. (16 or 18 gauge) diameter and shall conform to I.S. 280-197.

21.2. The use of black wire be permitted for binding reinforcement bars. It shall be free from rust, Oil paint, grease, looser mile scale or any other undesirable coating which may prevent adhesion of cement mortar.

M-22. Structural Steel:

22.1. All structural steel shall conform to I.S. 226-1965. The steel shall be free from the defects mentioned in I.S. 226-1975 and shall have a smooth finish. The material shall have a smooth finish. The material shall be free from loose mile scale, rust pits or other defects affecting strength and durability. Rivet bars shall conform to I.S. 1148-1973.

22.2. When the steel is supplied by the Contractor test certificates of the manufactures shall be obtained according to I.S. 226-1975 and other relevant Indian Standards.

M-23. Galvanized Iron Sheets:

23.1 The galvanized iron sheets shall be plain or corrugated sheets specified in item. The G.I. sheets shall conform it I.S. 217-1977. The sheets shall be undamaged in carriage and handling either by rubbing off of zinc coating or otherwise they shall have clean and bright surface and shall be as directed as per site condition.

23.2 The length and width of the G.I. sheet shall be as directed as per site condition.

M-23 (A) G.I Valleys gutter ridges:

23.A.1. The G.I.ridges and hips shall be plain galvanized sheets, class-3 of the thickness as specified in the item. These shall be 600 mm. in width and properly bent up to shape without damage to the sheets in the process of bending.

23.A.2. Valleys gutters and flashings shall also be galvanized sheet of thickness as specified in item. Valleys shall be 900 mm. Wide overall, and flashing shall be 380 mm. wide overall. They shall be bent to the required shape without damaging the sheet in the process of bending.

M-24. Asbestos Cement Sheets:

24.1. Asbestos cement sheets plain, corrugated or semi corrugated shall conform to I.S. 459-1970.

24.2. Ridges & Hips :

24.2.1 Ridges and hips shall be the same thickness as that of A.C. sheets. The types of ridges are suitable for the type of sheets and locations.

24.2.2 Other accessories to be used in the roof such as flashing pieces, caves filler pieces valley gutters, north light and ventilator curves, barge boards etc. shall be standard manufacture and shall be suitable for the type of sheets and location.

M-25. Mangalore Pattern Roof Tiles:

1.6 The Mangalore pattern tiles shall conform to I.S. 654-1972 for Class AA or Class "A" type as specified in item. Samples of the tiles to be provided shall be got approved by the Engineer-in-charge. Necessary tests shall be carried out as directed.

M-26. Shuttering:

26.1. The shuttering shall be either of widen planking of 30 mm. minimum thickness with or without steel lining roof steel plates stiffened by steel angles. The shuttering shall be supported on battens and beams and props of vertical ballies properly cross braced together so as to make the centering rigid. In places of bully props, brick pillar of adequate section built in mud mortar may be used.

26.2. The form work shall be sufficiently strong and shall have camber, so that it assumes correct shape after deposition of the concrete and shall be able to resist forces caused by vibration of live load of men working over it and other incidental loads associated with it. The shuttering shall have smooth and even surface and its joints shall not permit leakage of cement grout.

26.3. If at any stage of work during or after placing concrete in the structure, the form work sags or bulges out beyond the required shape of the structure, the concrete shall be removed and work redone with fresh concrete and adequately rigid form work. The completion of the work shall be inspected by and got approved by the engineer-in-charge, before the reinforcement bars are placed in position.

26.4. The props shall consist of bullies having 100 mm. minimum diameter measured at mixed length and 80 mm, at thin end and shall be placed as per design requirement. These shall rest squarely on wooden sole plates 40 mm. thick and minimum bearing area if 0-10 sq. m. laid on sufficiently hard base.

26.5. Double wedges shall further be provided between the sole plate and the wooden props so as to facilitate tightening and easing of shuttering without jerking the concrete.

26.6. The timber used in shuttering shall not be so dry as to absorb water from concrete and swell or bulge nor so green or wet as to shrink after erection. The timber shall be properly sawn and planted on the sides and surface coming in contact with concrete. Wooden from work with metal sheet lining or steel plates stiffened by steel angles shall be permitted.

26.7. As far as practicable, clamps shall be used to hold the forms together and avoid nails and spikes being avoided.

26.8. The surface of timber shuttering that would come in contact with concrete shall be well wet and coated with soap solutions before the concrete is done. Alternatively, a coat of raw linseed oil or oil of approved manufacturer may be applied in place of soap solution. In case of steel shuttering either soap solution or raw linseed oil shall be applied after thoroughly cleaning the surface. Under no circumstances shall black or burnt oil be permitted.

26.9. The shuttering for beams and slabs shall have camber of 4 mm. per meter (1 to 250) or as directed by the Engineer-in-charge so as to offset the subsequent deflection. For cantilevers, The camber at free end shall be 1/50 of the projected length or as directed by the Engineer-in-charge.

M-27. Expansion joints-pre-moulded filter:

27.1 The item provides for expansion joints in R.C.C frame structures for internal joints, as well as exposed joints, with the use of pre moulded bituminous joint filler.

27.2 Pre moulded bituminous joint filler, i.e. performed strip of expansion joint filler shall not get deformed or broken by twisting, bending or other handling when exposed to atmospheric condition. Pieces of joint filler that have been damaged shall be rejected.

27.3 Thickness of the pre-moulded joint filler shall otherwise be specified.

27.4 Pre moulded bituminous joint filler shall conform to I.S. 1838-1961.

M-28 Expansion joints-Copper strips & hold fasts:

28.1 The item provides for expansion joints in R.C.C frame structure for internal joints as well as for exposed joints with the use of necessary copper strip and hold fasts.

28.2 The copper sheet shall be 1.25 mm. thick and 1.25 mm. width when the 'U' shape in middle. Copper strips shall have held fast of 3 mm. diameter copper rod fixed to the plate soldered on strip at intervals of about 30 cm. or as shown in the drawing or as directed. The width of each flange (horizontal side) of the copper plate to be embedded in the concrete work shall be 25 mm. Depth of 'U' to be provided in the expansion joint, in the copper plate shall be of 25 mm.

M-29. Teak wood:

29.1 The teak wood shall be of good quality as required for the item to be executed. When the kind of wood is not specifically mentioned, good Indian teak wood as approved shall be used.

29.2 Teak wood shall generally be free from large, loose, dead or cluster knots, flaws, shakes, warps, twists bends or any other defects. It shall generally be uniform in substance and of straight fibers as far as possible. It shall be free from rot, decay, harmful fungi and other defects of harmful nature which will affect the strength durability of its usefulness for the purpose for which it is required. The colour shall be uniform as far as possible. Any effort like painting, using any adhesive or resins materials made to hide the defects shall render the pieces liable to rejection by the Engineer-in-charge.

29.3 All scantlings, planks etc. shall be sawn in straight lines and planes in the direction of grains and of uniform thickness.

29.4 The tolerances in the dimensions shall be allowed at the rate of 1.5 mm. per face to be planed.

29.5 **First class teak wood: 29.5.1.** First class teak wood shall have no individual hard and sound knots, more than 6 sq. cm. size and the aggregate area of such knots shall not be more than 1% of area of piece. The timber shall be closed grained.

29.6 **Second Class Teak Wood: 29.6.1.** No individual hard and sound knots shall be more than 15 Sq. cms. in size and aggregate area of such knots shall not-exceed 2% of the area of piece.

M-29. (A) Non-teak wood:

The non-teak wood shall be chemically treated, seasoned as per IS Specifications and of good quality. The type of wood shall be approved before collecting the same on site. Fabrication of wooden members shall be started only after approval.

For this purpose, wood of Bio, Kalali, Siras, Behda, Jamun, and Sisoo will be used for door frames whereas only Kalali, Siras, Halda, Kalam etc. will be permitted for shutters after proper seasoning and chemical treatment.

The non-teak wood shall be free from large, loose, dead cluster knots, flows, shakes warps bends or any other defect. It shall be uniform in substance and of straight fibers as far as possible. It shall be free rots, decay, harmful fungi and other defects of nature which affect strength, durability or its usefulness for the purpose for which it is required. The colour of wood should be uniform as far as possible. The scantlings plank etc. shall be sawn in straight lines and planes in the direction of grain and uniform thickness.

The department will use the Agency to produce certificates from forest Department in event of Disputes and the decision of the Department shall be final and binding to the contractor. The tolerance in the dimension shall be allowed as 1.5 mm. per face to be planned.

M-30. Wooden flush door shutters (solid core) :

30.1 The solid core type flush door shutters shall be decorative or non-decorative as specified in the drawing. The size and thickness of the shutter shall be as specified in drawings or as directed. The timber species for core shall be used as per I.S. 2202- (Part-I) 1980. The timber shall be free from decay and insect attack. Knots and knot holes are less than half the width of cross-section of the members in which they occur may be permitted. Pitch pockets, Pitch streaks and harmless pin holes shall be permissible except in the exposed edges of the core members. The commercial Plywood cross-bands shall conform to I.S. 303-1275.

30.2 The face panel of the shutters shall be formed by gluing by the hot press process on both faces of the core with either plywood or cross-bands and face veneers. The hopping rebating opening of glazing, Venetian etc. shall be provided if specified in the drawing.

30.3 All edges of the door shutters shall be square. The shutters shall be free twist or warp in its plane. Both faces of the shutters shall be sand papered to smooth even texture.

30.4 The shutters shall be tested for

(1) End immersion test: The test shall be carried out as per I.S. 2202 (part-I) 1980. There shall be no delamination at the end of the test.

(2) Knife test: The face panel, when tested in accordance with I.S. 1659-1979, shall pass the test.

(3) Glue adhesion Test: The flush door shall be tested for glue adhesive test in accordance with I.S. 2202 (Part-I) 1980. The shutters shall be considered to have passed the test if no delamination occurs in the glue lines in the plywood and if no single delamination more than 80 mm. in length and more than 3 mm. in depth has occurred in the assembly glue lines between the plywood face and the style and rail. Delamination at the corner shall be measured continuously around the corner. Delamination at the knots, knots holes and other permissible wood defects shall not be considered in assessing the sample.

30.5 The tolerance in size of solid core type flush door shall be as below:
In Normal thickness + 1.2 mm. In Normal height + 3 mm.

30.6 The thick of the shutters shall be uniform throughout with a permissible variation of not more than 0.8 mm. when measured at any two points.

M-31. Aluminum doors, Windows, Ventilators.

31.1 Aluminum alloy used in the manufacture of extruded window sections shall conform to I.S. designation HEA-WP of I.S. :733-1975 and also to I.S. Designation WVG-WP of I.S. 1285-1975. The Section shall be as specified in the drawing and design. The fabrication shall be done as directed.

31.2 The hinges shall be cast or extruded aluminum hinges of same type as in windows but of large size.

31.3 The hinges shall normally be of 50 mm. projecting type. Non-projecting types of hinges may also be used if directed. The handles of the door shall be specified in the drawing and design. The fabrication shall be done as directed.

M-32. Rolling Shutters:

1 The rolling shutter shall conform to I.S. 6248-1979. Rolling shutters shall be supplied of specified types with accessories. The size of the rolling shutters shall be specified in the drawings. The shutters shall be constructed with interlocking lath sections formed from cold rolled steel strips not less than 0.9 mm. thick and 80 mm. wide for shutters up to 3.5 mm., width not less than 1.25 mm. thick and 80 mm. wide for shutters 3.5 mm in width and above unless otherwise specified.

2 Guide channels shall be of mild steel deep channel section and of rolled pressed or built up (fabricated) jointures construction. The thickness of sheet used shall not be less than 3.15 mm.

3 Hood covers shall be made of M.S. Sheets not less than 0.92 mm. thickness for shutters having width 3.5 Meter and above the thickness of M.S. Sheet for the hood cover shall be not less than 1.25 mm.

4 The spring shall be of the best quality and shall be manufactured from tested high tensile spring steel wire or strip of adequate strength to balance the shutters in all positions. The spring pipe shaft etc. shall be supported on strong M.S. or malleable C.I. brackets. The brackets shall be fixed on or under the lintel as specified with raw plugs and screws bolts etc.

5 The rolling shutters shall be of self-rolling type up to 8 Sq.m. clear area without ball bearing and p to 12 Sq.m. clear area with ball bearing. If the rolling shutters are larger, then gear operated type shutters shall be used.

6 The locking arrangement shall be provided at the bottom of the shutter at both ends. The shutters shall be opened from outside.

7 The shutters shall be completed with door suspension shafts, locking arrangements pulling hooks, handles and other accessories.

M-33. Collapsible Steel Gate:

33.1 The collapsible steel gate shall be in one or two leaves and size as per approved drawings or as specified. The gate shall be fabricated from best- quality mild steel channels, flats etc. Either steel pulleys or ball bearings shall be provided in every double channel. Unless otherwise specified the particulars of collapsible gate shall be as under:

(e) Pickets: These shall be of 20 mm. M.S., channels of heavy sections unless otherwise shown on drawings. The distance from center to center of pickets shall be 12 cms. with an opening of 10 CMS.

(f) Pivoted M.S. flats shall be 20 mm x 6 mm.

(g) Top and bottom guides shall be from tee or flat iron of approved size.

(h) The fittings like stoppers, fixing hold fasts, locking cleats, brass handles and cast-iron rollers shall be of approved design and size.

M-34. Welded Steel Wire Fabric:

34.1. Welded steel wire fabric for general purpose shall be manufactures from cold drawn steel wire “as drawn” or galvanized steel conforming to I.S. 226-1975 with longitudinal and transverse wire securw4ely connected at every intersection by a process of electrical resistance welding and conforming to I.S. 4948-1974. It shall be fabricated

and finished in workmanlike manner and shall be free from injurious defects and shall be rust proof. The type of mesh shall be oblong or square as directed. The mesh sizes and size of wire for square as well as oblong welded steel wire fabric shall be as directed. The steel wire fabric in panels shall be in one whole piece in each panel as far as stock size permits.

M-35. Expanded Metal Sheets:

35.1. The expanded metal sheets shall be free from flaws, joints, broken strands, laminations and other harmful surface Expanded metal steel sheet shall conform to I.S. 412-1975, Except that blank sheets need not be with guaranteed mechanical properties. The size of the diamond mesh of expended metal and dimensions of strands (width and thickness) shall be as specified. The tolerance in nominal weight of expended metal sheets shall be of + 10 percent.

35.2. Expanded metal in panels shall be in one whole piece panel each as far as stock size permit. The expanded metal sheets shall be coated with suitable protective coating to prevent corrosion.

M-36. Mild Steel Wire (Wire Gauze Jali):

36.1 Mild steel wire may be galvanized, as indicated All finished steel wires shall be well cleanly drawn to the dimensions and size of wire as specified in item. The wire shall be sound, free from splits, surface flaws, rough jagged and imperfect edges and other harmful surface defects and shall conform to I.S. 280-1978.

M-37. Plywood:

37.1 The plywood for general purposes shall conform I.S. 303-1975. Plywood is made by cementing together thin boards or sheets of wood into panels. There are always an odd number of layers 3,5,7,9 ply etc. The plies are placed so that the grain of each layer is right angle to the grain in the adjacent layer.

37.2 The Chief advantages of plywood over a signal board of the same thickness is the more uniform strength of the plywood, along the length and width of the plywood and grater resistance to cracking and splitting with change in moisture content.

37.3 Usually, synthetic resins are used for gluing, phenolic resins are usually cured in a hot press which compresses and simultaneously heats the piles between hot plates which maintain a temperature of 90 degrees C. to 140 degrees C. and a pressure of 11 to 14 kg/sq.cm. on the woods. The heating time may be anything from 2 to 69 minutes depending upon thickness.

37.4 When water glue are used, the wood absorbs so much water that the finished plywood must be dried carefully. When synthetic resins are used as adhesive finished by plywood, they must be exposed to an atmosphere of controlled humidity until the proper amount of moisture has been absorbed.

37.5 According to I.S. 303-1975 the plywood for general purpose shall be of three grades **BWR, WWR** and **CWR,** depending upon the adhesives used for bonding and veneers, and it will be further classified into six types namely AA,AB,AC,BB,BC and CC based on the quality of the two faces, each face being of three kinds namely, A,B and C, After pressing, the finished plywood should be reconditioned to a moisture content not less than 8 percent and not more than 16 percent.

37.6 Thickness of Plywood Boards:

TABLE

Board	Thickness	Board	Thickness	Board	Thickness	Board	Thickness
3 ply	3 mm.	5 ply	5 mm.	7 ply.	9 mm.	9 ply.	16 mm.
	4 mm.		6 mm.		13 mm.		19 mm.
	5 mm.		8 mm.		16 mm.	11 ply.	19 mm.
	6 mm.		9 mm.	9 ply.	13 mm.		22 mm.
							25 mm.

M-38. Glass:

38.1 All glass shall be of the best quality free from specks, bubbles, smoke, veins, air holes, blisters and other defects. The king of glass to be used shall be mentioned in the item or specification or in the special provisions or as shown in detailed drawings. The thickness of glass panes shall be uniform. The specifications or different kinds of glass shall be as below.

38.2 Sheet Glass:

38.2.1 In absence of any specified thickness or weight in the item or detailed specifications of the item of work, sheet glass shall be weighing 7.5 Kg/Sq.m. for panes up to 600 mm x 600 mm.

38.2.2 For panes larger than 600 mm. x 600 mm. and up to 800 m. x 800 mm. the glass weighing not less than 8.75 Kg/Sq.m. shall be used. For bigger panes up to 900 mm. x 900 mm. glass weighing not less than 11.25 Kg/Sq.m. shall be used.

38.2.3 Sheet glass shall be patent flattened glass of the best quality and for glazing and framing purposes shall conform to I.S.: 1761-1960. Sheet glass of the specified colors shall be used, if so, shown on detailed drawings or so specified. For important buildings and for panes with any dimension over 900 mm. plate glass of specified thickness shall be used.

38.3. Plate Glass. 38.3.1. When plate glass is specified, it shall be 'Polished patent plate glass' of best quality. It shall have both the surface ground flat and parallel and polished to obtain clear undisturbed vision and reflection. The plate glass shall be of the thickness mentioned in the item or as shown in the detailed drawing or as specified. In absence of any specified thickness and type of glass shall be as per details on drawings or as specified or as directed.

38.4 Obscured Glass: 38.4.1. This type of glass transmits light so that vision is Partially or almost completely obscured. Glass shall be plain rolled, figured, ribbed or fluted or frosted glass as may be specified as required. The thickness and type of glass shall be as per details on drawings or as specified or as directed.

38.6. Wired Glass: 38.5.1 Glass shall be with wire netting embedded in a sheet of plate glass electrically welded 13 mm. Georgian square mesh may be used. The thickness of glass shall not be less than 6 mm. Wired glass shall be of type and thickness as specified.

M-39. Acrylic Sheets:

39.1. Acrylic sheets be of thickness as specified in the item and of a specified shape and size as the case may be. Panels may be flat or curved. It should be light in weight. It shall be colorless or coloured or opaque as specified in the item. Colorless sheets shall be as transparent as the finest optical glass. Its light transmission rate shall be about 95%. Transparency shall not be affected by sheets of larger thickness. It shall be extremely resistant to sunlight, weather and low temperatures. It shall not show any significant yellowing or change in physical properties or loss of light transmission over a longer period of use. The sheet shall be impact resistant also. Sheets should be available in a complete range of standard transparent, translucent and opaque colors. Sheets shall be

of such quality that they can be cut, bent and joined as desired. The solution for the joints shall be used as per the requirement of the manufacturer.

M-40. Particle board:

40.1. The particle boards used for face panels shall be of the best quality free from any defects. The particle boards shall be made with phenol aldehyde adhesive. The particle boards shall conform to I.S. 3087-1965. "Specification for wood particle board for general purpose". The size and the thickness shall be as indicated.

M-41. Expanded polystyrene of framed stopper slabs:

41.1 The expanded polystyrene ceiling boards and tiles shall be approved make and shall be of size, thickness, finish and colour as indicated. It shall be of high density and suitable for use as insulating material. The insulating material shall be like slab of Thermocol etc.

M-42. Resin bonded fiber glass:

42.1 The resin bonded fiber glass tiles, or rolls shall be of approved make and shall be of sizes, thickness and finish as indicated.

42.2. For the test of Mineral wool thermal insulation Blanket I.S.: 3144?1965 shall be followed.

42.3. Insulation wool blanket shall be with following coverings on one or both sides as indicated.

(4) Bituminized hessain Kraft paper for keeping out dust.

(5) Hessian cloth or Kraft paper for keeping out dust.

(6) G.I. wire netting, suitable for the surface to be plastered over.

M-43. Fixtures and fastenings:

43.1. General

43.1.1 The fixtures and fastenings, that is, butt, hinges, tee and strap hinges sliding door bolts, tower bolts, door latch, bathroom latch, handles, door stoppers, casement window fasteners and ventilators catch shall be made of the metal as specified in the item or its specifications.

43.1.2 They shall be of iron, brass, aluminum, chromium plated iron chromium plated brass, copper oxidized iron, copper oxidized brass or anodized aluminum as specified.

43.1.3 The fixtures shall be heavy, Medium or light type. The fixtures and fastenings shall be finished smoothly and shall be such as will ensure ease of operation.

43.1.4 The samples of fixtures and fastenings shall be approved as regards quality and shape before providing them in position.

43.1.5 Brass and anodized aluminum fixtures and fastenings shall be bright finished.

43.2. Holdfasts:

43.2.1. Holdfasts shall be made from mild steel flat 30 cm. length and one of the holdfasts shall be bent at right angle and two nos. of 6 mm. diameter holes shall be made in it for fixing it to the frame with screws. At the other end. The holdfast shall be forked and bent at right angles in opposite directions.

43.3. Butt hinges:

43.3.1. Railway standard heavy type butt hinges shall be used when so specified.

43.3.2. The strap hinges shall be manufactured from M. S. Sheet.

43.4 Siding door bold (AL drops): 43 The AL drops as specified in the item shall be used and shall be got be got approved.

43.5 Tower bolts (Barrel Type):43.5.1: Tower bolts as specified in the item shall be used as shall be used and shall be got approved.

43.6 Door Latch:**43.7.1** The size of door latch shall be taken as the length of latch.

43.7 Bathroom Latch :43.5.1 Bathroom latch shall be similar to tower bolt.

43.8 Handle: The size of the handles shall be determined by the inside grip length of the handles. Handles shall have a base plate of length 50 mm more than the size of the handle.

43.9 Door Stopper: 43.9.1 door stoppers shall be either floor door stopper type or door catch type floor stopper shall be of overall size as specified as shall have rubber cushion.

43.10 Door Catch :43.10.1 Door catch shall be fixed as height of about 900 mm from the floor level so that one part of the catch is fitted on the inside of the shutter and the other part is fixed in the wall with necessary wooden plug arrangements for appropriate fixate. The catch shall be fixed 20 mimesed the face of the door for easy operation of catch.

43.11 Wooden Door stops with highs:

43.11.1wooden doors stop of size 100mm X 60 mm X 40 mm shall be fixed on the door frame with a height of 75 mm size at high of 900 mm from the floor level the wooden doorstop shall be provided with 3 coats of approve oil paint.

43.12 Case meant window fastener: Casement window fastener for single leaf window shutter shall be left or right handled as directed.

43.13 Casement stays (straight peg stay):

43.13.1 The stays shall be made from a channel section having three holes at appropriate position so that the window can be opened either fully or partially as directed as directed. size of the stay shall be 250 mm to 300 mm as directed.

43.14 Ventilators catch:

43.14.1 The pattern and shape of the catch shall be as approved.

43.15 Pivot:

43.15.1 The base and socket plate shall be made from minimum 3 mm thick plate and projected pivot shall not be less than 12 mm length and shall be firmly riveted to the base plate in case of brass pivot.

M-44. Paints:

44.1 (A) Oil Paints:

44.1.1. Oil Paints shall be of the specified colour and shade, and as approved. The ready mixed paints shall only be used. However, if ready mixed paint or specific shade or tint is not available, white ready mixed paint with approved stainer will be allowed. In such a case, the contractor shall ensure that the shade of the paint so allowed shall be uniform.

44.1.2. All the paints shall meet the following general requirements:

(v) Paint shall not show excessive setting in a freshly opened full can and shall easily be redispersed with a paddle to a smooth homogeneous state. The paint shall show no curing, levering, caking or colour separation and shall be free from lumps and skins.

(vi) The paint as received shall brush easily, possess good levelling properties and show no running or sagging tendencies.

(vii) The paint shall not skin within 48 hours in three quarters filled with closed container.

(viii) The paint shall dry to a smooth uniform finish free from roughness, grit, unevenness and other imperfections.

44.1.3. Ready mixed paint shall be used exactly as received from the manufacturers and generally according to their instructions and without any admixtures whatsoever.

(B) Enamel Paints:

44.2.1. Enamel paint shall satisfy in general requirements as mentioned in specification of oil paints. Enamel paint shall conform to I.S. 2933-1975.

M-45 French polish:

45.1. The French polish of requirement and shape shall be prepared with the below mentioned ingredients and other necessary materials:

(I) Denatured spirit of approved quality (ii) Chandras (iii) Shellac (iv) Pigment.

45.2. The French polish so prepared shall conform to I.S.: 348-1968.

M-46 Marble chips for marble mosaic terrazzo:

46.1. The marble chips shall be of approved quality and shades. It shall be hard, sound, dense and homogenous in texture with crystalline and coarse grains. It shall be uniform in colour and free from stains, cracks, decay and weather.

46.2. The size of various colors of marble chips of approved quality and colors only as per grading as decided by the Engineer-in-charge shall be used for marble mosaic tiles or works.

46.3. The marble chips shall be machine crushed. They shall be free from foreign matters, dust etc. Except as above, the chips shall conform to I.S. : 2114-1962.

M-47. Flooring Tiles:

47.1. (A) Plain Cement tiles:

47.1.1. The plain cement tiles shall be general purpose type. These are the tiles in the manufacturer of which no pigments are used Cement used in the manufacturer of tiles shall be as per Indian Standards.

47.1.2. The tiles shall be manufactured from a mixture of cement and natural aggregates by pressure process. During manufacture, the tiles shall be subjected to a pressure of not less than 140 Kg/Sq. Cm. The proportion of cement to aggregate in the backing of the tiles shall be not less than 1:3 by weight. The wearing face through the tiles are of plain cement, shall be provided with stone chips of 1 to 2 mm. Size. The proportions of cement to the marble chips aggregate in the wearing layer of the tiles shall be three parts of cement to one-part chips by weight. The minimum thickness of the wearing layer shall be 3 mm. The colour and texture of the layer shall be uniform throughout its face and thickness. On removal from mould, the tiles shall be kept in moist conditions continuously for at least seven days and subsequently, if necessary, for such long period as would ensure their conformity to requirements of I.S.: 1237-1980 regarding strength resistance to wear and water absorption.

47.1.3. The wearing face of the tiles shall be plain, free from projections, depressions and cracks and shall be reasonably parallel to the back face of the title. All angles shall be right, and all edges shall be sharp and true.

47.1.4. The size of tiles shall generally be square shape 24.85 Cm. x 24.85 Cm. or 25 Cm. x25 Cm. The thickness of tiles shall be 20 mm.

47.1.5. Tolerance of length and breadth shall be plus or minus one millimeter, Tolerance or thickness shall be plus 5 mm.

47.1.6. The tiles shall satisfy the tests as regards transverse strength, resistance to wear and water absorption as per I.S.:1237-1980.

47.2. (B) Plain Coloured Tiles:

47.2.1. These tiles shall have the same specification as per plain cement tiles as per (A) above except that they shall have a plain wearing surface where pigments are used. They shall conform to I.S. 1237-1980.

47.2.2. The pigment used for coloring cement shall not exceed 10 percent by the weight of cement used in the mix. The pigments, synthetic or otherwise, used for coloring tiles shall have permanent colour and shall not contain materials detrimental to concrete.

47.2.3. The colour of the tiles shall be specified in the item or as directed.

47.3. (C) Marble mosaic tiles:

47.3.1. These tiles have the same specifications as per plain cement tiles except for the requirements as stated below:

47.3.2. The marble mosaic tiles shall conform to I.S. 1237-1980. The wearing face of the tiles shall be mechanical ground and filled. The wearing of tiles shall be free from projections, depressions and cracks and shall be reasonably parallel to the back face of the tiles. All angles shall be right angles, and all edges shall be sharp and true.

47.3.3. Chips used in the tiles be from smallest up to 20 mm. size. The minimum thickness of wearing layer of tiles shall of 6 mm. For the pattern of chips to be used on the wearing face, a few samples with or without their full-size photographs as directed shall be presented to the Engineer-in-charge for approval.

47.3.4. Any particular samples, if found suitable, shall be approved by the Engineer-in-charge, or he may ask for a few more samples to be prepared, indicating roughly the particular sized chips to be more or less in the samples presented. The samples have to be made by the contractor till a suitable sample is finally approved for use in the work.

The Contractor shall ensure that the tiles supplied for the work shall be in conformity with the approved sample only, in terms of its dimensions, thickness of backing layer and wearing surface, materials, ingredients, colour shade, chips, distribution etc. required.

47.3.5. The tiles shall be prepared from cement conforming to Indian Standards or coloured Portland cement generally depending upon the colour of tiles to be used or as directed.

47.4. (D) Chequered Tiles:

47.4.1. Chequered tiles shall be plain cement tiles or marble mosaic tiles. The former shall have the same specification as per (A) above and the letter as per marble mosaic tiles as per (C) except as mentioned below :

47.4.2. The tiles shall be of nominal size of 250 mm. x 250 mm. or as specified. The center-to-center distance of chequered shall not be less than 25 mm. and not more than 50 mm. The overall thickness of the tile shall be 22 mm.

47.4.3. The grooves in the chequered shall be uniform and straight. The depth of the grooves shall not be less than 3 mm. The chequered shall be plain, coloured or mosaic as specified. The thickness of the upper layer measured from the top of the chequered shall not be less than 6 mm. The tiles shall be given the first grinding with machine before delivery to site.

47.4.4. Tiles shall conform to relevant I.S. 1237-1980.

47.5 (E) Chequered Tiles for Staircases:

47.5.1. The requirements of these tiles shall be the same as chequered as per (D) above except in following respects.

(1) The length of a tile including nose shall be 330 mm.

(2) The minimum thickness shall be 28 mm.

(3) The noise should have also the same wearing layer as at the top.
(4) The nosing edge shall be rounded.
(5) The front portion of the tile for a minimum length of 75 mm. from and including the nosing shall grooves running parallel to noisily and at center not exceeding 25 mm. Beyond that the tiles shall have normal chequered pattern.

M-48. Rough Kotah Stone:

48.1. The kotah stones shall be hard, even, sound, and regular in shape and generally be green. Brown colour stones shall not be allowed for use. They shall be without any soft veins, cracks or flows.

48.2. The size of the stones to be used for flooring shall be of size 600 mm x 600 mm and/or size 600 mm x 450 mm, as directed. However smaller sizes will be allowed to be used to the extent of maintaining the required pattern. Thickness shall be as specified.

48.3. Tolerance of minus 30 mm. on account of chisel dressing of edges shall be permitted for length as well as breadth. Tolerance in thickness shall be + 3 mm.

48.4. The edges of stones shall be truly chiseled and tables rubbed with coarse sand before paving. All angles and edges of the stone shall be true, Square and free from chipping and the surface shall be true and plain.

48.5. When machine cut edges are specified, the exposed edges and the edges at joints shall be machine cut. The thickness of the exposed machine cut edges shall be uniform.

M-49. Polished Kotah Stones

49.1. Polished kotah stone shall have same specifications as per rough kotah stone except as mentioned below:

49.2. The stones shall have machine polished smooth surface. When brought on site, the stones shall be single polished or double polished depending upon its use. The stones for paving shall generally be single polished. The stones to be used for dedo, skirting, platforms, sink, veneering, sills, steps, etc. Where machine polishing after the stones are fixed in situ is not possible, it should be double polished.

M-50. Dholpur Stone Slab:

50.1. The Dholpur stone slab shall be of the best quality as approved by the Engineer-in-charge The stone slab shall be even, sound and durable, regular in shape and of uniform colour.

50.2. The size of the stone shall be specified in the item or detailed drawings or as approved by the Engineer-in-charge. The thickness of the stone shall be as specified in the item of work with the permissible tolerance of plus or minus 2 mm. The provisions in respect of polishing as for polished Kotah stone shall apply to polished Dholpur stone also. All angles and edges of the face of the stone slab shall be fine chiseled or polished as specified in the item of work and all the four edges shall be machine cut. All angles and edges of the stone slab shall be true and plane.

50.3. The sample of stone shall be got approved from the Engineer-in-charge for shade and tint for a particular work. It shall be ensured that stones to be used in a particular work shall not differ much in shade or tint from the approved sample.

M-51. Marble Slab:

51.1. The marble slab shall be white or of another colour and of best quality as approved by the Engineer-in-charge

51.2. Slabs shall be hard, uniform and homogeneous in texture. They shall have even crystalline grain and free from defects and cracks. The surface shall be machine

polished to an even and perfectly plant surface and edges machine cut true and square. The rear face shall be rough to provide key for the mortar.

51.3. Marble slabs with natural veins, if selected shall have to be laid as per the pattern given by the Engineer-in-charge. The size of the slab shall be a minimum of 450mm x 450mm. and preferably 300 mm x 600 mm. However, smaller sizes will be allowed to be used to maintain the required pattern.

51.4. The slab shall not be thinner than the specified thickness at its thinnest part. A few specimens of the finished slab to be used shall be deposited by the Contractor in the office for reference.

51.5. Except as above, the marble slabs shall conform to I.S. 1130-1969.

M-52 Granite Stone Slab:

52.1 Granite shall be of approved colour and quality. The stone shall be hard, even, sound regular in shape and generally uniform in colour. It shall be without any soft veins, cracks of flow.

52.2 The thickness of the stone shall be as specified in items.

52.3 All exposed faces shall be double polished to tender truly smooth and the even reflecting surface. The exposed edges and corners shall be rounded off as directed. The exposed edges shall be machine cut and shall have uniform thickness.

M-53 P.V.C. Flooring:

53.1 P.V.C sheets for P.V.C. floor covering shall be homogenous flexible type, conforming to I.S. 3452-1966. The P.V.C covering shall neither develop any toxic effect while put to use nor shall give off any disagreeable order.

53.2 The thickness of flexible type covering tiles shall be as specified in the description of the item.

53.3 The flexible type shall be backed with Hussein or other woven fabric. The following tolerances shall be applicable on the nominal dimension of the sheet rolls or tiles :

(c) Thickness + 0.15 mm

(d) Length or Width:

1. 300 mm. square tiles+ 0.20 mm.
2. 600 mm. square tiles+ 0.40 mm.
3. 9.00 mm. square tiles+0.30 mm.
4. Sheets and rolls+0.10 percent

53.4 Adhesive:

53.4.1 The adhesive for PVC flooring shall be of the type and recommended by the manufacturers of PVC sheets/tiles.

M-54. Facing tiles:

54.1. The facing tiles (burnt clay facing bricks) shall be free from cracks, flaws and nodules of free lime. They shall be thoroughly burnt and shall have plane rectangular faces with parallel sides and sharp straight right edged faces. The texture of the finished surface that will be exposed when in place, shall conform to an approved sample consisting not less than four stretcher bricks each representing the texture desired. The facing tiles shall have a pleasing appearance, sufficient resistance to penetration by rain and greater durability than common bricks. The tiles shall conform to I.S. 2691-1972.

54.2. The standard size of facing brick tiles shall be 19 x 9 x 4 cms. The facing brick tiles shall be provided with frog which shall conform to I.S. 1077-1976.

54.3. The permissible tolerance in dimensions specified above shall be as follows:

	Size Tolerance for	
	1st class Brick	2nd class Brick
19 cm.	+ 6 mm.	+ 10 mm.
9 cm.	+3 mm.	+ 7 mm.
4 cm.	+1.5mm	+ 3 mm.

54.4 The tolerance for distortion or war page of face or edges of individual brick from a plane surface and from a straight line respectively shall be as follows:
Facing dimensions Permissible tolerance
Max. below 19 cms. Max. 2.5 mm.
-do- above 19 cm. Max 3.0 mm.

54.5 The average compressive strength obtained as a sample of five tiles when tested in accordance with the procedure laid as per I.S. 1077-1976 shall be not less than 175 Kg. /Sq. Cm. The average compressive strength of any individual bricks shall be not less than 160 Kg/Sq.Cm.

54.6 The average water absorption for five bricks tiles shall not exceed 12 percent of the average weight of brick before testing.
The absorption for each individual brick shall not exceed 25 percent.

54.7 The brick tiles when tested in accordance with I.S. 1077-1976, the rate of efflorescence shall not be more than 'Slightly effloresced.

M-55. White glazed tiles:

55.1 The tiles shall be of the best quality as approved by the Engineer-in-charge. They shall be flat and true to shape. They shall be free from cracks, crazing, spots chipped edges and corners. The glazing shall be of uniform shade.

55.2 The tiles shall be nominal size of 150 mm x 150 mm. unless otherwise specified. The maximum variation from the stated sizes, other than the thickness of tile, shall be plus or minus 1.5 mm. The thickness of tile shall be 6 mm. Except as above the tiles shall conform to I.S. 777-1970.

M-56. Galvanized iron pipes and fittings:

56.1. The galvanized iron pipe shall be of the medium type and of required diameter and shall comply with I.S. 1239-1979. The specified diameter of the pipes shall refer to the inside diameter of the bore, Clamps, screw and all galvanized iron fittings shall be of the standard 'R' or equivalent make.

M-57. Bib cock and stop cock:

57.1 A bib cock is a draw off tap with a horizontal inlet and free outlet. A stop cock is a valve with a suitable means of connection for insertion in a pipeline for controlling or stopping the flow.

57.2 They shall be of screw down type and of brass chromium plated and of diameter as specified in the description of the item. They shall conform to I.S. 781-1977 and they shall be of best Indian make. They shall be polished brightly.

57.3 The minimum finished weight of bib cock and stop cock shall be as given below:

Diameter	Bib cock	Stop cock
8 mm.	0.25 Kg.	0.25 Kg.
15 mm.	0.40 Kg.	0.40 Kg.
10 mm.	0.30 Kg.	0.35 Kg.
20 mm.	0.75 Kg.	0.75 Kg.

M-58. Gun metal wheel valve:

58.1. The gun metal wheel valve be of approved quality. These shall be gun metal fitted with wheel and shall be of gate valve opening full way and of the size as specified. These shall conform to I.S. 778-1971.

M-59. White glazed porcelain wash basin:

59.1. Wash basin shall be of white porcelain first quality best Indian make, and it shall conform it I.S. 2556 (Part-IV) 1972 and I.S. 771-1979.
The size of the wash basin shall be as specified in the item, Wash basin shall be of one-piece construction with continued over-flow arrangements. All internal angles shall be designed so as to facilitate cleaning. The wash basin shall have a single tap hole, or two holes as specified. Each basin shall have a circular waste hole which is either rebated or beveled internally with 65 mm. diameter at top and 10 mm. depth to suit the waste fitting. The necessary stud slot to receive the bracket on the underside of the basin shall be provided. Basin shall have an internal soap holder recess which shall fully drain into the bowl.

59.2. White glazed pedestal of the quality and colour as that of the basin shall be provided where specified in the item. it shall be completely recessed at the back for reception of supply and wash pipe. It shall be capable of supporting the basin rigidly and adequately and shall be so designed as to make the height from floor to top of basin 750mm. to 800 mm. as directed.

M-60. European type water closet/with low level flushing :

60.1. The European type of water closet shall be white glazed porcelain first quality and shall be of wash down type conforming to I.S. 2556-1973 and I.S. 771-1979.

60.2. 'S' trap shall be provided as required with water seal not less than 50 mm. The solid plastic seat and cover shall be of the best Indian make conforming to I.S. 2548-1980. They shall be made of moulded syntactic materials which shall be tough and hard with high resistance to solvents and shall be free from blisters and other surface defects and shall have chromium plated brass hinges and rubber buffer of suitable size.

M-61. Orissa type water closet:

61.1. The specification of Orissa type white glazed water closet of first quality shall conform to I.S. 2556 (Part-III) 1981 and relevant specification of Indian type water closet except that pan will be with the integral squatting pan of size 580 mm x 440 mm. with raised footrest.

M-62. Indian type water closet:

62.1. The Indian type of white glazed water closet of first quality shall be of size as specified in the item and conforming to I.S. 771-1979 and I.S. 2556 (Part-II) 1981. Each pan shall have an integral flushing ring of suitable type with an adequate number of holes alroung as directed to have satisfactory flushing. It should also have an inlet at back or front connecting flush pipe as directed. The inside of the bottom of the pan shall have sufficient slope from the front towards the outlet and the surface shall be uniform and smooth.
Pan shall be provided with 100 mm. diameter 'P' or 'S' traps with approximately 50 mm. water seal and 50 mm. diameter vent horn.

M-62. (A) Footrests:

62-A-1 A pair of white glazed earthenware rectangular footrests of minimum size 250 mm. x 130 mm 20 mm. shall be provided with water closet.

M-63. Glazed Earthen Ware Sink:

63.1. The glazed earthen-ware sink shall be specified size, colour and quality. The sink shall conform to I.S. 771 Part-II-1979, waste coupling of standard pattern with brass chain and rubber plug shall be provided with sink.

63.2. The pipes shall conform to I.S. 1239-Part-I 1973 and I.S. 404-1962 for steel and lead pipes respectively 32 mm. brass waste coupling of standard pattern with brass chain and rubber plug shall be provided with sink.

M-64. Glazed earthen ware Lipped type flat back urinal/corner type urinal:

64.1 The lipped type of urinal shall be flat back or corner type as specified in the item and shall conform to I.S. 771-1979. It shall be of best Indian make and size as specified and approved by the Engineer-in-charge. The flat back or corer type urinal must be 1st quality free from any defects, cracks, etc.

M-65. Low level enamel flushing tank:

65.1. The low-level flushing tank shall be of 15 liters capacity. It shall conform to I.S. 774-1971. The flushing vaster shall be of the best quality and free from any defects. The flushing tank shall have an outlet of 32 mm. diameter. The outlet shall be connected with W.C. Pan by lean pipe or P.V.C. pipe as specified. The flushing tank shall be provided with an inlet and outlet for fixing G.I. inlet pipes and over-flow pipes. The flushing castern shall be provided with chromium plated handle for flushing. The flushing tank shall be provided with brackets of cast iron so that it can be fixed on the wall at a specified height. The brackets shall Conform to I.S. 775-1970.

M-66. Cast iron flushing cistern:

66.1. The cast iron flushing cistern shall be of 15 liters capacity. It shall conform to I.S. 774-1971. The flushing cistern shall be of the best quality free from any defects. The flushing cistern shall have an outlet of 32 mm. diameter. The outlets shall be connected to lead pipes of 32 mm. diameter. The lead pipe shall conform to I.S. 404 (Part-I) 1962. For fixing G.I. inlet pipes and overflow pipes 20 mm. diameter. an inlet and outlet shall be provided. The flushing cistern shall be provided with galvanized iron chain and pull of sufficient length and shall be got approved from the Engineer-in-charge. The cast iron flushing cistern shall be painted with one coat of anticorrosive paint and two coats of paint. The flushing cistern shall be fixed on two C.I. brackets. The C.I. brackets shall conform to I.S. 775-1970.

M-67. Flush cock:

67.1. Half turn flash cock (Heavy Weight) shall be of gun metal chromium plated of diameter as specified in the description of the item. The flush cock shall conform to relevant Indian Standard.

M-68. Cast iron pipes and fittings:

68.1. All soil waster, vent and anti-siphonage pipes and fittings shall conform to I.S. 1729-1964. The pipe shall have spigot, and socket ends with head on spigot end. The pipes and fittings shall be true to shape, smooth, cylindrical, their inner and outlet surfaces being as nearly as practicable concentric. They shall be sound and nicely cast and shall

be free from cracks, laps, pinholes or other imperfections and shall be neatly dressed and carefully fettled.

68.2. The end of pipes and fittings shall be of reasonable square to their axis.

68.3. The sand cast iron pipes shall be of the diameter as specified in the description and shall be in lengths of 1.5 M, 1.8 M. and 2 M. including socket ends of the pipe unless shorter lengths are either specified or required at junctions etc. The pipes and fittings shall be supplied without ears unless specified or directed otherwise.

68.4. Tolerance.

68.4.4. The Standard weights and thickness of pipes shall be as shown in the following table: A tolerance up to minus 10 percent may however be against these standard weights.

Sr. no.	Nominal	Thickness	Overall, Weight of pipe excluding ears		
			1.5 m. long	1.8m. long	2.m. long
1.	75 mm.	50 mm.	12.83 Kg.	16.52 Kg.	18.37 Kg.
2.	100 mm.	5.0 mm.	18.14 Kg.	21.67 Kg.	24.15 Kg.

68.4.5. A tolerance upto minus 15 percent in thickness and 20 mm. in length will be allowed. For fittings, tolerance in lengths shall be plus 15 mm. and minus 10 mm.

68.4.6. The thickness of fittings and their socket and spigot dimensions shall conform to the thickness and dimensions specified for the corresponding sizes of straight pipes. The tolerances in weights and thickness shall be the same as for straight pipes.

M-69. Nahni Trap:

69.1. Nahni trap shall be of cast iron and shall be sound and free from porosity or other defects which affect serviceability The thickness of the base metal shall not be less than 6.5 mm. The surface shall be smooth and free from craze, ships and other flaws or any other kind of defects which affect serviceability. The size of nahni trap shall be as specified and shall be of self-cleaning design.

69.2. The Nahni trap shall be of quality approved by the Engineer-in-charge and shall generally conform to the relevant Indian Standards.

69.3. The Nahni trap provided shall be with deep seal, minimum 50 mm, except at places where trap with deep seal cannot be accommodated. The cover shall be cast iron. The performed cover shall be provided on the trap of appropriate size.

M-70. Gully Trap:

70.1 Gully Trap shall conform to I.S. 651-1980. It shall be sound, free defects such as fire cracks. The glaze of the traps shall be free from crazing. They shall give a sharp clear note when struck with a light hammer. There shall be no broken blisters.

70.2 The size of the gully trap shall be as specified in the item.

70.3 Each gully trap shall have one C.I. gratings of square size corresponding to the dimensions of inlet of gully trap, It will also have a water tight. C.I. cover with frame inside dimensions 300 mm. x 300 mm., cover with frame inside dimensions, 300 mm. 300 mm., the cover weighing not less than 4:53 Kg. and the frame is not less than 2.72 Kg. The grating cover and frame shall be of sound and good casting and shall have truly square machined seating faces.

M-71. Glaze Stone Ware Pipe and Fitting:

71.1. The pipes and fittings shall be of the best quality as approved by the Engineer-in-charge. The pipe shall be of best quality manufactured from stoneware of fire clay, salt glazed thoroughly burnt through the whole thickness, of a close even texture, shall be smooth and perfectly glazed. The pipe shall be capable of withstanding pressure of 1.5 mm.

lead without showing sign of leakage. The thickness of the wall shall not be less than 1/12th of the internal dia. The depth of the socket shall not be less than 38 mm. The socket shall be sufficiently large to allow a joint of 1 mm. around the pipe.

71.2. The pipes shall generally conform to relevant I.S. 651-1980.

M-72. Wall Peg Rail:

72.1. The aluminum wall peg rail shall have three aluminum pegs of approved quality and size. It shall be fixed on teakwood plant of size 450 mm. x 75 mm. x 20 mm. The teakwood shall be French polished, or oil painted as specified.

M-73. G.I. Water Spot:

73.1. The G.I. pipes of 40 mm. Dia shall be of medium quality and specials shall be of 'R' brand or equivalent brand of best approved quality.

73.2. The pipe shall have length as required for the thickness of wall in which it is fixed. and at the outside end tee and bend cut at half the length shall be provided and at other end coupling shall be provided to have better fixing. The waterspout shall be provided as per detailed drawings or as directed.

M-74. Asbestos Cement Pipe (A.C. Pipe):

74.1. The asbestos cement pipe of diameter as specified in the description of the item shall conform to I.S. 1626-1980. Specials like bends, shoes cowls, etc. shall conform to relevant Indian Standards. The interior of pipe shall have a smooth finish, regular surface and regular, internal diameter. The tolerance in all dimensions shall be as per I.S. 1626-Part-I 1980.

M-75. Crydon Ball valve:

75.1. Ball valve of screwed type including polyethylene float and necessary lever etc. shall be of the size as mentioned in the description of item and shall conform to I.S. 1703-1977.

M-76. Bitumen Felt for Water Proofing And Damp Proofing:

76.1 Bitumen felt shall be on the fiber bases and shall be type 2, self-finished grade-2 and shall conform to I.S. 1322-1970.

M-77 Selected Earth:

77.1. The selected earth shall be hat obtained from excavated material or shall have to be brought from outside as indicated in the item. If item does not indicate anything, the selected earth shall have to be brought from outside.

77.2. The selected earth shall be good yellow soil and shall be got approved from the Engineer-in-charge. In no case black cotton soil or similar expansive and suitable soil shall be used. It shall be clean and free of all rubbish and perishable materials, stones or brick bats. The clods shall be broken to a size of 50. mm or less, Contractor shall make his own arrangement at his own cost for land for borrowing selected earth. The stacking of material shall be done as directed by the Engineer-in-charge in such a way as not to interfere with any construction activities and in proper stacks.

77.3. When the excavated material is to be used, only selected stuff got approved form the Engineer-In-Charge shall be used. It shall be stacked separately and shall comply with all the requirements of selected earth mentioned above :

M-78. Barbed Wire:

78.1. The barbed wire shall be of galvanized steel, and it shall generally conform to I.S. 278-1978. The barbed wire shall be type-I whose nominal diameter for line wire shall be 2.5 mm. and point wire 2.24 mm. The nominal distance between two bars shall be 75 mm. Unless otherwise specified in the item. The barbed wire shall be formed by twisting together two-line wires, one containing the barbs. The size of the line and point wires and barb spacings shall be as specified above. The permissible deviation from the nominal diameter of the line wore and point wire shall not exceed + 0.08 mm.

78.2. The barbs shall carry four points shall be formed by twisting two-point wires each two turns, lightly round one line wire, making altogether four complete turns. The barbs shall be so finished that the four points are set and locked at right angles to each other. The barbs shall have a length of not less than 13 mm. and not more than 13 mm. and not more18 MM. The points shall be sharp and cut at an angle not greater than 35 degrees of the axis of the wire forming the barbs.

78.3. The lind and point wire shall be circular section free from scale and other defects and shall be uniformly galvanized. The line wire shall be in continuous length and shall not contain any weld other than those in the rod before it is drawn. The distance between two successive splices shall not be less than 15 meters.

78.4. The lengths per 100 Kg. of barbed wire I.S. type I shall be as under
Nominal 1000 meters Minimum 834 Meter Maximum 1066 Meter.

TECHNICAL SPECIFICATIONS FOR CIVIL ITEMS

Item Specifications for Civil Works

CONSTRUCTION OF RIVERSIDE SAVORIES I.E. BUILDING WITH UNDERGROUND ROAD BETWEEN NEHRU BRIDGE AND ELLISBRIDGE AND CONSTRUCTION OF PUBLIC PLAZA AND UNDERGROUND PARKING FACILITY AT SANSKAR KENDRA - TAGORE HALL CAMPUS CONNECTING RIVERFRONT ON WESTBANK FOR SRFDCL.
(A) A printed Booklet for GENERAL TECHNICAL SPECIFICATION FOR BUILDING WORK (B) A printed Booklet for VOLUME "B1" LIST OF THE APPROVED PRODUCTS SCHEDULE OF RATES (GOVT.OF GUJARAT, ROADS AND BUILDINGS DEPARTMENT, ELECTRICAL WING) (C) A Printed Booklet for TENDER FOR PLUMBING & FIRE PROTECTION WORK for Roads and Building Department Government of Gujarat. (D) A Printed Booklet for TENDER FOR ELECTRICAL & ELV WORK for Roads and Building Department Government of Gujarat. (E) A Printed Booklet for TENDER FOR HVAC WORK for Roads and Building Department Government of Gujarat. (F) A Printed Booklet for TENDER FOR ELEVATOR / LIFT WORK for Roads and Building Department Government of Gujarat.
The above may be referred to in the printed Booklet of PWD which may also be available from Gujarat Book Stores, Sector-21, Gandhinagar - 382 021. Note: 01. The work shall be carried out in accordance with the relevant specifications contained in PWD Handbook Vol. I & II with the correction slips from time or the latest addition. 02. The references as indicated with page Nos. are as per the above referred Booklets

Item No:-1

Clearing and grubbing road land including uprooting rank vegetation grass bushes, Shrubs, sapling and trees girth up to 300 mm removal of stumps of trees cut earlier and disposal of unserviceable materials. (C) By mechanical means in area of light jungle

Jungle Clearence

Jungle clearance shall comprise uprooting of rank vegetation, grass, brushwood, shrubs, stumps, trees and saplings of girth up to 30 cm measured at a height of one meter above the ground level. Where only clearance of grass is involved, it shall be measured and paid for separately.

Uprooting of Vegetations

The roots of trees and saplings shall be removed to a depth of 60 cm below ground level or 30 cm below formation level or 15 cm below sub-grade level, whichever is lower. All holes or hollows formed due to removal of roots shall be filled up with earth rammed and levelled. Trees, shrubs, poles, fences, signs, monuments, pipelines, cable etc., within or adjacent to the area which are not required to be disturbed during jungle clearance shall be properly protected by the contractor at his own cost and nothing extra shall be payable.

Stacking and Disposal

All useful materials obtained from clearing and grubbing operation shall be stacked in the manner as directed by the Engineer -in-Charge. Trunks and branches of trees shall be cleared of limbs and tops

and stacked neatly at places indicated by the Engineer-in- Charge. The materials shall be the property of the Government. All unserviceable materials which, in the opinion of the Engineer-in-Charge cannot be used or auctioned shall be removed up to a distance of 50 m outside the periphery of the area under clearance. It shall be ensured by the contractor that unserviceable materials are disposed of in such a manner that there is no likelihood of getting mixed up with the materials meant for construction.

Clearance of Grass
Clearing and grubbing operations involving only the clearance of grass shall be measured and paid for separately and shall include removal of rubbish up to a distance of 50 m outside the periphery of the area under clearance.

Measurements
The length and breadth shall be measured correctly to the nearest cm and area worked out in square metres correctly to two places of decimal.

Rates
The rate includes the cost of all the operations described above.

Item NO: -2

Cutting and felling trees of girth as specified below (measured at a height of 1 m above ground level) including cutting of trunks and branches, removing the roots and stacking of serviceable material and disposal of unserviceable materials within campus at directed place etc complete all as per specifications and as directed by the Engineer-in-charge
Girth beyond 30 cm, up to and including 60 cm girth.
Girth beyond 60 cm, up to and including 120 cm girth.

Felling
While clearing jungle, growth trees above 30 cm girth (measured at a height of one metre above ground level) to be cut, shall be approved by the Engineer-in-Charge and then marked at site. Felling trees shall include taking out roots up to 60 cm below ground level or 30 cm below formation level or 15 cm below sub-grade level, whichever is lower.

All excavation below general ground level arising out of the removal of trees, stumps etc. shall be filled with suitable material in 20 cm layers and compacted thoroughly so that the surfaces at these points conform to the surrounding area. The trunks and branches of trees shall be cleared of limbs and tops and cut into suitable pieces as directed by the Engineer-in-Charge.

Stacking and Disposal
Wood, branches, twigs of trees and other useful materials shall be the property of the Government. The serviceable materials shall be stacked in the manner as directed by the Engineer-in-Charge upto a lead of 50m.

All unserviceable material, which in the opinion of Engineer-in-Charge cannot be used or auctioned shall be removed from the area and disposed of as per the directions of the Engineer-in-Charge. Care shall be taken to see that unsuitable waste materials are disposed of in such a manner that there is no likelihood of these getting mixed up with the materials meant for construction.

Measurements
Cutting of trees above 30 cm in girth (measured at a height of one meter above level) shall be measured in numbers according to the sizes given below:
(a) Beyond 30 cm girth, up to and including 60cm girth.
(b) Beyond 60 cm girth, up to and including 120 cm girth.
(c) Beyond 120 cm girth, up to and including 240 cm girth.
(d) Above 240 cm girth.

Rate
The rate includes the cost involved in all the operations described above. The contract unit rate for cutting trees above 30 cm in girth shall include removal of stumps as well.

Item No:-3
Excavation for foundation up to 1.5 m DEPTH including sorting out and stacking of useful material sand disposing off the excavated stuff upto 50 Meter lead. (A) Loose or soft soil

General:

Any soil which generally yields to the application of pickaxes and shovels, spades, rakes or any such ordinary excavating implement or organic soil, gravel, silt, sand turf loam, clay, peat etc. falls under this category. For materials and workmanship for earthwork and excavation, relevant specifications of IS: 1200 (Part I) and IS: 3764 shall be followed.

The depth of the excavation shall be as per the item description

Clearing the Site:

The site on which the structure is to be built shall be cleared and all obstructions, loose stones, materials and rubbish of all kinds, bush, and wood shall be removed, as directed. The materials so obtained shall be the property of the Client and shall be conveyed and stacked as directed, within 50m lead. The roots of the trees coming in the sides of the trenches shall be cut and coated with hot asphalt.

All types of trees, woods etc. which require prior permission of the Govt. / Forest Authority, before cutting shall be cut after obtaining such permission from them. It shall be the Contractor's responsibility to obtain such permission from the respective authorities.

The rate of site clearance is deemed to be included in the rate of earthwork, for which no extra will be paid.

Setting out: After cleaning the site, the centerlines will be given by the Architect and Engineer-in-charge. The Contractor shall assume full responsibility for alignment, elevation and dimension of each and all parts of the work. Contractor shall supply labours, materials, etc. required for setting out the reference marks and benchmarks made of MS angle iron and embedded in 1:2:4 C.C. They shall maintain the same as long as required and directed.

Excavation:

The excavation in the foundation shall be carried out either manually or by mechanical means, in true line and level and shall have the width and depth, as shown in the drawings or as directed. The Contractor shall do the necessary shoring and strutting or shall provide necessary slopes to a safe angle or steps, as required or directed, at his own cost. No extra payment shall be made for such precautionary measures taken. The bottom of the excavated area shall be leveled both longitudinally and transversely, as directed, by removing excess soil and watering, as required. No earth filling will be allowed for bringing it to level, if by mistake or any other reason, excavation is made deeper or wider than shown on the drawings or as directed. The extra depth or width shall be made up of concrete of the same proportion, as specified for the foundation concrete, at the cost of the Contractor.

The Contractor shall at his own expense and without extra charge make provision of supporting all utility services, lighting the trenches, separating and stacking serviceable materials neatly, shoring, timbering, strutting, bailing out water either sub-soil or rainwater, including pumping at any stage of the work. Trenches shall be kept free of water while masonry or concrete works are in progress and till

the Architect and Engineer-in-charge considers it necessary, i.e. till the concrete is sufficiently set.

Disposal of the Excavated Stuff:

The excavated stuff of the selected type shall be used in filling the trenches and plinth or leveling the ground in layers, including ramming and watering etc. complete.

The Contractor shall remove the balance of the excavated quantity from the site of work to a place, as directed, within a lead up to 50m measured from the outer face of the building / work under consideration and for all lift.

The lead is the shortest practical route and not necessarily the route actually taken. The decision of Engineer-In charge shall be final in this regard.

Mode of Measurement and Payment:

The measurement of excavation in trenches for foundation shall be made according to the sections of trenches shown on the drawing or as per sections given by the Architect and Engineer-in-charge. No payment shall be made for surplus excavation made in excess of the above requirements or due to stepping and sloping back as found necessary, on account of conditions of soil and requirements of safety.

The rate shall include clearing the site, surface dressing, making layout of the building, fixing permanent grid points with MS iron posts, embedded in C.C. 1:2:4, placed sufficiently away from the building and establishing benchmarks etc. The rates shall include necessary shoring, timbering and strutting for protection of sides of the excavated trenches and pits, pumping out rain or surface water at any stage of construction so as to keep the trenches/pits dry, to the satisfaction of the Architect / Engineer-in-charge.

The rate shall include leveling and ramming the bottoms of excavations to receive concrete, etc. including trimming to slope wherever necessary etc. complete. The rate shall be for a unit of one Cubic meter.

Item No:-4

Excavation for foundation up to 1.5 m TO 3.0M DEPTH including sorting out and stacking of useful material sand disposing off the excavated stuff upto 50 Meter lead.(A) Loose or soft soil

Workmanship:

2) The relevant specifications of item No.3 shall be followed except that the excavation work shall be carried out in loose or soft soil with lift 1.5 M. to 3.0 M.

Mode of measurement and payment:

4) The relevant specification of item No.3 shall be followed.
5) The excavation work of lift 1.5 M. to 3.0 M. shall be measured under this item.
6) The rate shall be for a unit of one cubic meter.

Item No:- 5

Excavation for foundation for depth from 3.0 m to 5.0 m including sorting out and stacking of useful materials and disposing off the excavated stuff upto 50 Meter lead.(A) Loose or soft soil

Workmanship :

2) The relevant specifications of item No.3 shall be followed except that the excavation work shall be carried out from 3.0 M. to 5.0 M. lift in loose of soft soil.

Mode of measurement and payment:

4) The relevant specifications of item No. 3 shall be followed.
5) The excavation work from 3.0 M. to 5.0 M, lift shall be measured under this item.
6) The rate shall be for a unit of one cubic meter.

Item No:-6

Extra for additional depth more than 5.0 m for excavation for foundation including sorting out and stacking of useful materials and disposing of the excavated stuff upto 50 m lead.(A) Loose or soft soil

Workmanship:

3) The relevant specifications of item No. 3 shall be followed except that the excavation work Shall be carried out from more than 5.0 M. lift in loose or soft soil.

Mode of measurement and payment:

7) The relevant specifications of item No. 3 shall be followed.
8) The rate shall be paid extra over and above the rate of No. 3 for carrying out excavation work for additional depth from 5.0 M. and above.
9) The rate shall be for a unit of one cubic metre per meter**.**

Item No:-7

Uncoursed Rubble Masonry with hard stone of approved quality in foundations and plinth in Cement Mortar 1:6 (1-cement : 6-coarse sand including levelling up etc. complete.

1. Materials:

a. The cement mortar shall conform to M-l1. Stones shall conform to M-16.

2. Workmanship:

a. Dressing of stones: Stone used for uncoursed rubble masonry work shall be hammer dressed on the sides, and beds in such a way as to close up with the adjacent stone in the masonry work as strongly as possible. The face, stones shall be dressed in such amanner as to give a specified Pattern such as Blygonal tucing etc. The tace of the stones shall be so dressed that busing on the exposed face shall not project by more than 40 mm. from the general wall surface and on the face to be plastered. It shall not project by more than 19 mm. nor shall have depressions more than 10 mm. from the average wall surface.

b. Laying : All the stone shall be sufficiently wetted before laying to prevent absorption of water from mortar. The wall shall be built true to plumb (or true to required batter when so specified). All connected walls in a structures shall normally be raised up uniformly and regularly. However if for any specific reason, one part of masonry is required to be left behind, the wall shall be racked back at an angle not steeper than 45 . Vertical Toothed joints in masonry shall not be allowed. The work shall be carried out regularly and masonry of any day will not be raised by more than 1 metre in height.

c. The stone shall be laid in an uncoursed fashion or randon facing etc. However the masonry is required to be brought to level at various stages viz. plinth level, window still level, roof level and any other level specifically shown inthe drawings. This may be done by first by adjusting the laying or stones to one level and then by providing levelling coarse of cement concrete 1: 6 : 12 (1 cement: 6 sand : 12 graded stone aggregate 20 mm. nominal size) or as otherwise specified.

d. Proper bonding shall be achieved by closely filling in adjacent stones as well as by using bond stones or through stones as described herein below. Face stones shall extend back sufficiently and bond well with the masonry. The stone shall be carefully set so as to break joints and avoid formation of vertical joints. The depth of stone from the face of wall inwards shall not be less than weight or breadth at the face. The hearting or interior filling of the wall shall consist of rubble stones which may be of any shape. Neither the face stone nor the hearting stone shall be so small to pass through circular ring of 150 mm. internal diameter in any direction nor shall any of them shall have minimum thickness 100 mm.

e. All stone shall be carefully laid, hammered down by a wooden mallet into position and solidly embedded in mortar, chips and spawls of stone may be used wherever necessary to avoid thick mortar beds or joints at the same time ensuring that no hollow space is left anywhere in the masonry. The chips used shall not be more than 20% by volume of masonry. The hearting shall be laid nearly level with face stones except that at about one metre intervals vertical bond stone or plums projecting about 150 to 200 mm. shall be firmly embedded to form vertical bonding in masonry.

f. Quoins: The quoins or corners stone shall be selected stone nearly dressed with hammer and/or chisel to form the required corner angle and laid header and stretcher alternatively. The bed and top surface of quoins shall be chiselled dressed to give horizontal joints. The quoins shall have a uniform chisel draft of at least 25 mm. width at four edges of each exposed face, all the edges of the same face being in one plane. No quoins stone shall be smaller than 0.025 Cum. in volume.

g. Bond stones : Bond stones or through stones running right across the thickness of .the wall shall be provided in walls upto 600 mm. thick. In thicker walls two stones overlaping each other by atleast 150 mm. shall be provided across the thickness of the wall to form bond stones. There shall be atleast one bond stone for every 0.5 Sq. M. of wall surface. The bond stone shall be marked by a distinguishing letter during construction for subsequent verification and shall be laid staggered in subsequent layers.

h. Jamb Stones: The jamb stone shall be made with stone specified for quoins, except that the stone provided on the jambs shall have their length equal to thickness of wall upto 600 mm. and a line of headers shall be provided for walls thicker than 600 mm. as specified for bond.

i. Joints: All the joints shall be completely filled with mortar and their width shall not exceed 25 mm. When plastering or pointing is not required to be done, the joints shall be struck flush and finished simultaneously while laying the stone. Otherwise the joints shall bo racked to a minimum depth of 20 mm. by a racking tools, during progress of laying while the mortar is still green.

j. Scaffolding : Single or double scaffolding -ha!' be used. The scaffolding shall be strong and sound. The holes left in masonry for supporting scaffolding shall be filled And made good before plastering.

k. Curing: Gree work shall be projected from rains by suitably covering the same. Masonry shall be kept constantly moist on all the faces for a period of atleast 7 days. The top of masonry shall be flooded at the close of the day.

3. Mode of measurement & payment:

a. All work shall be measured on the basis of finished dimensions and measured net except where otherwise specified. Only specified dimensions shall be allowed. Anything extra shall be ignored. The masonry work in foundation and plinth shall be measured under this item. No deduction shall be made nor extra payment made for the following :

- **i.** Ends of joints, beams, posts, girders, rafters, purlins, trusses, corbels, etc. each upto 500 Sq. cm. in section.
- **ii.** Opening each upto 0.1 sq. m.
- **iii.** Wall plates and bed plates bearings of chhaja and like upto 10 cm. depth (bearing of floor and roof slabs shall be deducted from masonry).
- **iv.** Drain holes and recesses for cement concrete blocks to embed hole fasts for doors windows.
- **v.** Building in the masonry iron fixtures pipes upto 300-mm. dia. hold fasts of doors and windows.
- **vi.** Forming cheses in masonry upto section of 350 Sq. Cm.

b. The rate shall be for a unit of one cubic metre.

Item No:-8

Filling available excavated earth (excluding rock) in trenches. plinth, sides of foundations etc. in layers not exceeding 20cm. In depth consolidating each disposited layer by ramming and watering.

Workmanship:

The earth to be used for filling shall be free from salts, organic or other foreign matter. All clouds of earth shall be broken to a size not bigger than 50mm.

As soon as the work in foundation has been completed and measured, the sides of foundation shall be cleared of all debris, brick bats, mortar droppings etc. and filled with earth in layers not exceeding 20cm. Each layer shall be adequately watered, rammed well and consolidated before the succeeding layer is laid. The earth shall be crammed with mechanical rammer of different capacity as per site condition.

The plinth shall be similarly filled with earth in layers not exceeding 20cm, adequately watered and consolidated by ramming with iron rammers/ mechanical rollers. When filling reaches the finished level, the surface shall be flooded with water for at least 24 hours and allowed to dry and then rammed and consolidated.

The finished level of filling shall be kept shaping and gradient, intended to receive any floor finish.

In case of large heavy-duty flooring like factory flooring, the consolidation may be done by power rollers, where so specified or as directed. The extent of consolidation required shall also be as specified or as directed.

The excavated stuff of the selected type only shall be allowed to be used for filling the trenches and plinths. Under no circumstances, black cotton soil shall be used for filling the plinths.

The soil used for backfilling shall have optimum moisture content (OMC).The compaction shall be carried out to achieve Proctor density of 95%. The procedure for OMC and proctor density shall be carried out as per relevant IS codes. The samples for the test shall be as per the relevant IS codes.

Mode of Measurements and Payment:
The payment shall be made for filling in plinth and sides of foundations. No deductions shall be made for shrinkage or voids, if considered as instructed above.

5) The rate includes the cost of mechanical compactions by compactors.
6) The rate shall be for a unit of one m3.
7) Only consolidated measurements of the fill shall be measured and paid for under this item.
8) Foundation filling shall be measured and paid only if the excavation item is without backfilling.

Item No:-9

Filling in plinth with sand under floors including watering, ramming consolidating and dressing etc. complete.

1. **Materials:**
   a. Sand shall conform to M. 6.

2. **Workmanship:**
   a. The relevant specifications of item No.8 shall be followed except that sand shall be filled in undo, floors, including watering, ramming, consolidating and dressing etc. complete.

3. **Mode of measurement and payment:**
   a. The relevant specifications of item No.8 shall be followed.
   b. The rate includes cost of collecting carting sand with all lead and labour for filling the same in plinth under floors.
   c. The rate shall be for a unit of one cubic metre.

Item No:-10

Carring out plinth treatment to pre or post construction / existing structure by spraying chemical solution for termite control treatment including labour and material consistment with I.S.I specification. Using Chlordene and Chiorpurfiles 20 EC. As Per 6131_paret-II Consentration Weight one percent is recommended i.e one litre 20 EC chemical emulsion with 19 liter give 1 % concrentration inclusive of one litre chemical emulsion appication at the rate of 5 Litre chemical / Sqm of surface is recommended as per I.S and as per directions of Clerk-of-Work. For all levels and leads.

Providing and injecting Chemical emulsions for pre-construction anti-termite & Fungal treatment and creating continuous chemical barrier under and all around the columns pits, wall trenches, basement excavation, top surface of plinth filling, junctions of wall & floors, along the external perimeter of building, Expansion joints, over the top surface of the consolidated earth on which plinth protection is to be laid, surrounding pipes and conduits etc. complete. in first stage of work, & furniture, & necessary floors in second stage of construction work in accordance with IS: 6313 (Part-II) with using Chlorpyriphos Emulsifiable concentrate 1.00%. (IS.: 8944-1978), Lindens 1.00% (IS.: 632), Imidacloprid 0.075% with relevant IS: code (Rates are Incl. proposed Furniture & Plinth area of the

building at ground floor level shall Only be measured.)

Anti –termite specification

Chemicals used during treatment

Imidacloprid 30.5% SC

Chlorpyriphos 2% EC

Providing & injecting emulisifiable concentrate imidacloprid 30.5 SC with (0.075%) concentration chemical emulsion by Avitus India Pest Management Pvt. Ltd. for anti – termite & Fungal treatment & creating chemical barrier under & around the column pits, wall trenches, basement, excavation, top surface of plinth filling junction of wall & floor along the external perimeter of the building expansion joints surrounding of pipes conduits etc., in the first stage of work and using Chlorpyriphos Emulsifiable concentrate 1.00%. (IS.: 8944-1978) for wooden fixed furniture (Wooden frames and doors). Complete plinth area of the building shall be measured in square mtr. (m^2) on the basis of the basement area of the building.

METHOD OF TREATMENT FOR TERMITE CONTROL

AVITUS INDIA PEST MANAGEMENT PVT. LTD. is using a New Generation Insecticide for Termite Control that contains IMIDACLOPRID as active ingredient. It is an appropriate insecticide for the control of Termites in building and premises, which can be used both for PRE-& POST construction treatments.

Mode of Action

We create a non–detectable treated zone that function not as a repellent barrier, but as a "killing field" whose effects may be transmissible to other Termites and leads to eradication of the colony. It acts by interfering with the transmission in the nervous system and resulting in their death.

We are injecting concentrated Chemical Emulsion for Anti – Termite treatment for creating chemical barrier under & around column pits, wall trenches, basement, excavation, top surface of plinth filling junction of wall and floor along external perimeter of the building, expansion joints, surrounding of pipes conduits etc.

PRE-CONSTRUCTION TREATMENT

6. Bottom surface and side pits up to a height of 30cm will be treated 05 (Five) Ltr. Chemical Emulsion per Sq. Mtr. of surface area.
7. Back fill earth in immediate contact with the foundation structure will be treated 7.5 Ltr. per Sq. Mtr. of the vertical surface of substructure of each side.
8. Treatment of RCC foundations: Treatment should start at depth of 50cm below ground level 7.5 Ltr. per Sq. Mtr.
9. Treatment of top surface of plinth filling: The top surface of the earth consolidated within plinths wall shall be treated with Chemical Emulsion 05 (Five) Ltr. per Sq. Mtr. of the surface before the sand bed or sub grade is laid.
10. Soil treatment along the external perimeter of building: Earth along the external walls of the building should be treated at an interval of 15cm and to a depth of 30cm exposing the wall surface. Chemical Emulsion will be poured along the wall 7.5 Ltr. per Sq. Mtr of vertical surface.

POST CONSTRUCTION TREATMENT

The treatment comprises drilling holes at the wall and floor junction level and filling it after pumping in sufficient quantity of chemical.

This ensures a continuous chemical barrier for termites to make an entry and protect the treated structure.

f) Treatment to wall and floor junction:
Holes of diameter 12mm (1/2" approx.) are drilled at approximately 30cm (12 inches) intervals along the inner junction of wall and floor in the entire premise. Water based chemicals will be injected under pressure into these holes, to create a barrier against termite.

g) Treatment to soil under floor:
If the subject premises on the ground floor and if cracks are noticed on the floor because of construction joints, expansion joints or shrinkage, the soil below floor needs to be treated. Holes of 12mm (1/2" approx.) dia. 30cm apart will be drilled along the cracks and water-based chemicals will be injected under pressure into these holes.

h) Treatment to wooden fixtures:
Holes of diameter 12mm (1/2" approx.) will be drilled at the base of wooden works such as window frames; door frames etc. insect in the flooring and chemical will be injected. An oil-based chemical will be sprayed on all the wooden work infected by termites within the premises.

i) Treatment to termite tubes:
Visible shelter mud tubes will be removed and the infested area treated with Waterbase chemical.

j) All the drilled holes will be sealed and made good using cement In the case Soil Treatment along External Perimeter of a Building is done.

MODE OF MEASUREMENT: -

The rates of the Anti-Termite treatment shall be on the basis of area in sq.mt. Measurements shall be based on the actual plinth area and payment will be made accordingly.

Guarantee:
The treatment against termite infestation shall remain fully effective for a period of not less than ten years from the date of issue of final certificate of completion of the work. If at any time during this period, if any defects in the treatment are revealed on any evidence of infestation in any part of the building or structure is noticed, the Contractor shall have to rectify the defects within fifteen (15) days of receipt of the notice from the Owner / Architects / Consultants. On the Contractor's failure to do so, the Owner / Architects / Consultants may get the same rectified through any other agency at the Contractor's risk and cost and the decision of the Owner / Architects / Consultants. As to the cost payable by the Contractor for the same shall be final and binding on the Contractor.

A Guarantee Bond on appropriately stamped paper(s) shall be given by the Contractor to the Owner In the manner and form as prescribed below.

Form of Guarantee Bond

"I / we . . . . . (Name of Contractor) hereby guarantee that the work will remain unaffected and will not be in any way damaged by termites (white ants) or any other germs of similar type for a period of ten (10) years after completion of the work of anti-termite treatment as per the terms and conditions of the contract and the Contractor hereby indemnifies and agrees to save harmless the Owner, ... from any loss and/or damage that might be caused on account of termites (white ants) and or other similar type of germs and hereby guarantees to make good any loss or damages suffered by the Owner,

.....……. and further guarantees to redo the defective work without claiming any extra cost.

This guarantee shall remain in force for the period of ten (10) years from the completion of the work under the contract and it shall remain binding to the Contractor for the said period of ten (10) years.

The deposit in the form of Bank Guarantee at the rate of 5 per cent of the cost of this item from the running and final bills shall be recovered and shall be refunded only after the completion of the guarantee period.

Item No:-11

Demolition and disposal of unserviceable materials with all lead and lift. (I) Cement concrete.

Workmanship:

The demolition shall consist of demolition of one or more parts of the building as specified or shown in the drawings. Demolition implies taking up or down or breaking up. This shall consist of demolishing whole or part of work including all relevant item as specified or shown in the drawings.

The demolition shall always be planned before hand and shall be done in reverse order of the one in which the structure was constructed. This scheme shall be got approved from the Engineer- in-charge before starting the work. This however will not absolve the Contractor from the responsibility of proper and safe demolition.

Necessary dropping, shoring and under pinning shall be provided for the safety of the adjoining work or property, which is to be left intact, before dismantling and demolishing is taken up and the work shall be carried out in such a way that no damages is caused to the adjoining property.

Wherever required, temporary enclosures or partitions shall also be provider. Necessary precautions shall be taken to keep the dust nuisance down as and where necessary.

Dismantling shall be commenced in a systematic manner. All materials which are likely to be damaged by dropping from a height or demolishing roof, masonry etc. shall be carefully dismantled first. The dismantled articles shall be properly stacked as directed.

AH materials obtained from demolition shall be the property o. Government unless otherwise specified and shall be kept in safe custody until handed over to the Engineer-in-charge.

Any serviceable materials, obtained during dismantling or demolition shall be separated out and stacked properly as directed, with all lead and lift. All unserviceable materials, rubbish etc. shall be slacked as directed by the Engineer-in- charge.

On completion of work, the site shall be cleared of all debris rubbish and cleaned as directed.

Mode of measurements & payment:

Measurements of all work except hidden work shall be taken before demolition or dismantling and no allowance for increase in bulk shall be allowed. The demolition of Cement concrete shall be measured under this item. Specification for deduction for voids, openings etc. shall be on same basis as that employed for construction of work.

All work shall be measured in decimal system as fixed in its place subject to the following limits, unless otherwise slated hereinafter:

(a) Dimensions shall be measured to the nearest 0.01 mt.

(b) Area shall be worked out to the nearest 0.01 sq. mt.

(c) Cubical connection shall be worked out to the nearest 0.01 Cu. m.

The rate shall include cost of all labour involved and tools used in demolishing and dismantling

including scaffolding. The rate shall also include the charges far separating out and stacking the serviceable materials properly and disposing the unserviceable materials with all lead and lift. The rate also includes for temporary storing for the safety of the portion not required to be pulled down or of adjoining property and providing temporary enclosures or partitions where considered necessary.

The rate shall be for a unit of one cubic meter.

Item No:-12

Demolition including stacking of serviceable materials and disposal of unserviceable materials with all lead and lift. (I) R.C.C. work

Workmanship:

The relevant specifications of item No.11 shall be followed except that demolition of R.C.C. work is to be done.

Mode of measurements & payment

1) The relevant specifications of item No.11 shall be followed except that the demolition of reinforced concrete structure. The unserviceable materials shall be disposed of at all leads and lifts. The rate excludes scraping straightening of reinforcement but includes cutting of reinforcement.
2) The rate shall be for a unit of one cubic metre.

Item No:-13

Dismantling barbed wire in fencing including making rolls and also including dismentling fencing posts including all earth work concrete in base and making good the disturbed ground stacking useful materials as directed and disposing as directed and disposing of the unserviceable materials with all lead and lift.

Workmanship :

The relevant specifications of item No. 11 shall ho followed except that the dismantling of barbed wire fencing shall be carried out.

Mode of measurements & payment:

1) The relevant specifications of item No.11 shall be followed.
2) The rate includes making rolls of dismantled wires and including dismantling fencing posts, concrete work, in case and making good the disturbed ground etc. complete.
3) The serviceable materials shall be stacked as and where directed and the unserviceable materials shall be disposed with all leads and lifts.
4) The rate shall be for a unit of one running meter.

Item No:-14

Demolition of Brick work and stone masonry including stacking of serviceable materilas and disposal of unserviceable materials with all lead and lift.(ii) In Cement Mortar.

Workmanship :

The relevant specifications of item No.11 shall be followed except demolition of brick or stone masonry in cement mortar is to be done

Mode of measurements & payment:

1) The relevant specifications of item No.11 shall be followed. The unserviceable materials shall be stacked as directed by Engineer-in-charge with all leads and lifts.

Item No:-15

Dismentaling steel work including dismembering and stacking the materials with all lead and lifts.

Materials:

The relevant specifications of item No.11 shall be followed except the dismantling of steel work shall be carried out.

Mode of measurements & payment:

1) The relevant specifications of item No.11 shall be followed.
2) The weight of the member shall be computed from standard tables unless the actual weight can be readily determined.
3) Riveted works where rivets are required to be cut, the same shall be carried out under this item and nothing extra shall be paid.
4) In farmed steel gate, the weight of any covering materials or filling such as iron sheets and expanded metal shall be added to the weight of the main articles if such covering is not ordered to be taken out separately.
5) The rate includes stacking the materials as and where directed with all leads and lifts.
6) The rate shall be for a unit of one kg.

Item NO: -16 to 19

Dismantling and stacking within 50 metres lead, fencing posts or struts including all earth work and dismantling of concrete etc. in base of : T' or 'L' iron or pipe

Scarifying gravelled macadam or bitumen macadam surface 6cm to 10cm .depth including stacking useful materials on roadside and disposing off remaining stuff.

Dismantling kerb stone by manual means and disposal of dismantled material with all lifts and up to a lead of 1000 metre as per MoRT&H specification clause 202.

Removing rough/ smooth finished interlocking paver blocks of 60/80 mm thickness for pavement in footpath / parking at required loactions including cleaning the surface, stacking and storing serviceale materials at directed place within campus and disposing off the debris at directed place within campus etc. complete all as per specification and as directed by the Engineer- in- Charge.

Refer Specification from CPWD Specification Vol 1 & Vol 2.

Item No:-20

Providing and laying cement concrete 1:2:4 (1-Cement:2-Coarse sand:4-graded stone aggregates 20mm nominal size) and curing complete excluding cost of formwork in (A) Foundation and Plinth

Materials:

Water shall conform to M-l. Cement shall conform to M-3. Sand shall conform to M-6. Grit shall conform to M-8. Graded stone aggregate 20 mm. nominal size shall conform to M-12.

General:

The concrete mix is not required to be designed by preliminary tests. The proportion of the concrete mix shall be 1: 2:4 (1 cement: 2 coarse sands; 4 graded stone aggregate 10 mm. nominal size) by volume. Concrete work shall have exposed concrete surface or as specified in the item.

The designation ordinary M-100, M-150, M-200, M-250 specified as per. I.S. Corresponding approximately to 1:3: 6, 1: 2: 4, 1:1 1/2:3 and 1:1:2 nominal mix of ordinary concrete by volume respectively.

The ingredients required for ordinary concrete containing one beg of cement of 50 Kg. by weight (0.0342 Cu. M.) for different proportions of mix shall be as under:

Grade of Concrete	Total quantity of dry aggregate by volume per 50Kgs of cement to be taken as the sum of individual volume of fine and coarse aggregates, Maximum	Proportion of fine aggregate to coarse aggregate	Quantity of water per 50 Kgs of cement Maximum
M100(1:3:6)	300 Liters	Generally, 1:2 for fine aggregate	34 Liters

M150(1:2:4)	220 Liters	To coarse aggregate by volume	32 Liters
M200(1:1.5:3)	160 Liters	But subject to and upper limit	30 Liters
M250(1:1:2)	100 Liters	Of 1:1.5 and lower limit 1:3	27 Liters

The water cewment ratios shall not more than those specified in the above table. The cement content of the mix specified in the Table shall be increased if the quantity of water in a mix has to be increased to overcome the difficulties of placement and compaction so that the water-cement-ratio specified in the Table is not exceeded.

Workability of the concrete shall be controlled by maintaining a water-cement-ratio that is bound to give a concrete mix which is just sufficiently wet to be placed and compacted without difficulty with the means available.

The maximum size of coarse aggregate shall be as large as possible within the limits specified but in no case greater than one fourth of the minimum thickness of the member, provided that the concrete can be placed without difficulty so as to surround all reinforcement thoroughly and to fill the comers of the form.

For reinforced concrete work, coarse aggregates having a nominal size of 20 mm. are generally considered satisfactory. For heavily reinforced concrete members as in the case of ribs of main beams, the nominal maximum size of coarse aggregate should usually be restricted to 5 mm. less than the minimum, clear distance between the main bars, or 5 mm. less than the minimum cover to the reinforcement whichever is smaller.

Where the reinforcement is widely spaced as in solid slabs, limitations of size of the aggregate may not be important and the nominal maximum size may sometimes be as great as OF greater than the minimum cover.

Admixture may be used in concrete only with approval of Engineer-in-charge based upon the evidence that with the passage of time, neither the compressive strength of concrete is reduced nor are other requisite qualities of concrete and steel impaired by the use of such admixtures.

Workmanship:

Proportioning: Proportioning shall be done by volume, except cement which shall be measured in terms of bags of 50 Kg. weight. The volume of one such bag being taken as 0.0342 Cu. meter. Boxes of suitable sizes shall be used for measuring sand aggregate. The size of the boxes (internal) shall be 35 cms. x 25 cms. and 40 Cms. deep. While measuring the aggregate and sand, the box shall be filled without shaking ramming or hammering. The proportioning of sand shall be on the basis of its dry volume and in case of damp sand, allowances for bulkage shall be made.

Mixing:

For all work, concrete shall “be mixed in a mechanical mixer which alongwith other aecessories shall be kept in first class working condition and so maintained throughout the construction. Measured quantity of aggregate, sand, cement required for each batch shall be poured into the drum of the mechanical mixer while it is continuously running. After about half a minute of dry mixing, measured quantity of water required for each batch of concrete mix shall be added gradually and mixing continued for another one and a half minute. Mixing shall be. continued till materials are uniformly distributed and uniform colour of the entire mass is obtained and each individual particle of the coarse aggregate shows complete coating of mortar containing its proportionate amount of cement. In no case shall the

mixing be done for less than 2 minutes after all ingredients have been put into the mixer.

When hand mixing is permitted by the Engineer-in-charge for small jobs or for certain other reasons, it shall be done on the smooth watertight platform large enough to allow efficient turning over the ingredients of concrete before and after adding water. Mixing platform shall be so arranged that no foreign material gets mixed with concrete nor does the mixing water flow out. Cement in required number of bags shall be placed in a uniform layer on top of the measured quantity of fine and coarse aggregate, which shall also be spread in a layer of uniform thickness on the mixing platform. Dry coarse and fine aggregate arid cement shall then be mixed thoroughly by turning over to get a mixture to uniform colour. Specified quantity of water shall then be added gradually through a rose-can and the mass turned over till a mix of required consistency is obtained. In hand mixing, quantity of cement shall be increased by 10 percent above that specified.

Mixers which have been out of use for more than 30 minutes shall be throughly cleaned before putting in a new batch. Unless otherwise agreed to by the Engineer-in-charge the first batch of concrete from the mixture shall contain only two thirds of normal quantity of coarse aggregate. Mixing plant shall be thoroughly cleaned before changing from one type of cement to another.
Consistency: The degree of consistency which shall depend upon the nature of the work and methods of vibration of concrete, shall be determined by regular slump tests in accordance with I.S. 1199-1959. The slump of 10 mm. to 25 mm. shall be-adopted when vibrators are used and 80 mm. when vibrators are not used.

Inspection:

Contractor shall give the Engineer-in-charge due notice before placing any concrete in the forms to permit him to inspect and accept the false work and forms as to their strength, alignment, and general fitness but such inspection shall not relieve the contractor of his responsibility for the safety of men, machinery, materials and for results obtained. Immediately before concreting, all forms shall be thoroughly cleaned.

Centering design and its erection shall be approved by the Engineer-in-charge. One carpenter with a helper shall invariably be kept present throughout the period of concrete. Movement of labour and other people shall be totally prohibited for reinforcement laid in position. For access to different parts, suitable mobile platforms should be provided so that steel reinforcement in position is not disturbed. For ensuring proper cover, mortar blocks of suitable size shim be cast and tied to the reinforcement. Timber, kapachi or metal pieces shall not be used for this purpose.

Transporting and laying:

The method of transporting and placing concrete shall be as approved. Concrete shall be so transported and placed that no contemination segregation or loss of its constituent material takes place.

All form work shall be cleaned and made free from standing water, dust, shower or ice immediately before placing concrete. No concrete shall he, placed in any part of the structure until the approval of the Engineer-in-charge has been obtained.

Concreting shall proceed continuously over the area between construction joints. Fresh concrete shall not be placed against concrete which has been in position for more than 30 minutes unless a proper construction joint is formed. Concrete shall be compacted in its final position within 30 minutes of its discharge from the mixer. Except where otherwise agreed to by the Engineer-in-charge concrete shall be deposited in horizontal layers to a compacted depth of not more than 0.45 metre when internal vibrators are used and not exceeding 0.30 metre in all other cases.

Unless otherwise agreed to by the Engineer-in-charge, concrete shall not be dropped into place from a height exceeding 2 metres. When trucking or chutes arc used, they shall be kept close and used in such a way as to avoid segregation. When concrete has to be resumed on a surface which has hardened, it

shall be roughened, swept clean, thoroughly wet and covered with a 13 mm. thick layer of mortar composed of cement and sand in the same ratio as in the concrete mix itself. This 13 mm. layer of mortar shall be freshly mixed and placed immediately before placing new concrete. Where concrete has not fully hardened, all laitance shall be removed by scrubbing the wet surface with wire or bristle brushes, care being taken to avoid dislodgement of any panicles of coarse aggregate. The surface shall then be thoroughly wet, all free water removed and then coated with neat cement grout. The first layer of concrete to be placed on this surface shall not exceed 150 mm. in thickness and shall be well rammed against old work, particular attention being given to corners and close spots. 3.5.4. All concrete shall be compacted to produce a dense homogeneous mass with the assistance of vibrators unless, otherwise permitted by the Engineer-in-charge for exceptional cases, such as concreting under water, where vibrators cannot be used. Sufficient vibrators in serviceable condition shall be kept at site so that spare equipment is always available in the event of breakdowns.

Concrete shall be judged to be compacted when the mortar fills the spaces between the coarse aggregate and begins to cream up to form an even surface. Compaction shall be completed before the initial setting starts i.e. within 30 minutes of addition of wafer to dry mixture. During compaction, it shall be observed that needle vibrators are not applied on reinforcement which is likely to destroy the bond between concrete and reinforcement.

Curing: Immediately after compaction, concrete shall be protected from weather, including rain, running water, shocks, vibration, traffic, rapid temperature changes, frost and drying out process. It shall be covered with wet sacking, hassain or other similar absorbant material approved, soon after the initial set and shall be kept continuously wet for a period of not less than 14 days from the date of placement. Masonry work over foundation concrete may be started after 48 hours of its laying but curing of concrete shall be continued for a minimum period of 14 days.

Sampling and testing of concrete:

Samples from fresh concrete shall be taken as per I.S. 1199-1959 and cubes shall be made, cured and tested at 7 days or 28 days as per requirements in accordance with I.S. 516-1959. A random sampling procedure shall be adopted to ensure that each concrete batch shall have a reasonable chance of being tested i.e. the sampling should be spread over the entire period of concrete and cover all mixing units. The minimum frequency of sampling of concrete of each grade shall be in accordance with the following:

Quantity of concrete in the work	No. of samples	Quantity of concrete in the works	No. of samples
1-5Cmt.	1	16-30Cmt.	3
6-15Cmt.	2	31-50	4

51 and above 4 + one additional for each additional 50 M. or part thereof.

NOTE : At least one sample shall be taken from each shift. Ten test specimens shall be made from each sample, five for testing at 7 days and the remaining five at 28 days. The samples of concrete shall be taken on each day of the concreting as per above frequency. The number *of* specimens may be suitably increased as deemed necessary by the Engineer-in-charge when procedure of tests given above reveals a poor quality of concrete and in other special cases.

The average tire strength of the group of cubes cast for each day shall not be less than the specified cube strength of 150 Kg/Cm at 28 days. 20% of the cubes cast for each day may have value less than the specified strength provided the lowest value is not less than 85% of the specified strength. If the concrete made in accordance with the proportions given for a particular grade docs not yield the specified strength, such concrete shall be classified as belonging to the appropriate lower, grade concrete made in accordance with the proportions given for a particular grade shall not, however, be placed in a higher grade on the ground that the test strength are higher than the minimum specified.

Stripping:
The Engineer-in charge shall be informed in advance by the contractor of his intention lo strike the form work. While fixing the time for removal of form work, due consideration shall be given to local conditions, character of the structure, the weather and other conditions that influence the setting of concrete and pf the materials used in the mix. In normal circumstances (generally where temperatures are above 20 ° C) and where ordinary concrete is used, forms may be struck after expiry of periods specified in respective item of form work.

All form work shall be removed without causing any shock or vibration as would damage the concrete. Before the soffit and struts are removed, the concrete surface shall be exposed, where necessary in order to ascertain that the concrete has sufficiently hardened. Centring shall be gradually and uniformly lowered in such manner as to permit the concrete to take stresses due to its own weight uniformly and gradually. Where internal metal ties are permitted, they or their removable parts shall be extracted without causing any damage to the concrete and remaining holes filled with mortar. No permanently embedded metal part shall have less than 25 mm. cover to the finished concrete surface. Where it is intended to re-use the form work, it shall be cleaned and made good to the satisfaction of the Engineer-in- charge. After removal of form work and shuttering, the Executive Engineer shall inspect the work and be satisfied by random checks that concrete produced is of good quality.

Immediately after the removal of forms, all exposed bolts etc., passing through the cement concrete member and used for shuttering or any other purpose shall be cut inside the cement concrete member to a depth of at least 25 mm. below the surface of the concrete and the resulting holes be filled by cement mortar. All fine caused by form joints, all cavities produced by the removal of form ties and all other holes and depressions honeycomb spots, broken edges or corners and other defects shall be thoroughly cleaned, saturated with water and carefully pointed and rendered true with mortar of cement and fine aggregate mixed in the proportions used in the grade of concrete that is-being finished and of as dry consistency as is possible to use. Considerable pressure shall be applied in filling and pointing to ensure thorough Riling in all voids. Surfaces which are pointed shall be kept moist for a period of 24 hours.

If rock pockets/honeycombs in the opinion of the Engineer in- charge are of such an extent or character to affect the strength of the structure materially or to endanger the life of the steel reinforcement, he may declare the concrete defective and require the removal and replacement of the portions of the structure affected.

Mode of measurement and payment:
The consolidated cubical contents of concrete work as specified in item shall be measured. The concrete laid in excess of section shown on drawings or as directed shall not be measured. No deduction shall be made for

(c) Ends of dissimilar materials such as joist, beams, posts, girders, rafters, purlins trusses, corbels and steps etc up to 500 Sq. Cm. in section.
(d) Opening up to 0.1 Sq. M.

The rate includes cost of all materials, labour, tools and plant required for mixing, placing, position, vibrating and compacting, finishing, as directed, curing and all other incidental expenses for producing concrete lied strength. The rate excludes the cost of form work.
The rate shall be for a unit of one cubic meter.

Item NO:-21

Bored cast-in-situ M30 grade R.C.C. pile excluding reinforcement complete as per drawing and technical specifications and removal of excavated earth with all lifts and lead upto 1000 m. (Pile diameter- 750 mm)
Refer Specification from CPWD Specification Vol 1 & Vol 2.

Item No. 22

Providing and laying in position M- 250 grade concrete for reinforced cement concrete work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transporting the concrete from Plant to point of laying, excluding the cost of centering shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash.

Providing and laying in position M-300 grade concrete for reinforced cement concrete work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transporting the concrete from Plant to point of laying, excluding the cost of centering shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash.

Materials & Workmanship:

The relevant specification of item no. 11 shall be followed except that the work shall be carried out for reinforced concrete work and grade of concrete shall be as specified in the item.

In addition, the following stipulations shall be followed :
The bars shall be kept in position by the following methods:

In case of beam, slab, wall and column, sufficient number of PVC block or precast cover block in cement mortar 1:2 (1 cement: 2 coarse sand) about 4cm x 4cm round or square section and of thickness equal to as specified in the drawing shall be placed between the bar and shuttering to maintain the requisite cover in the concrete member. In case of cantilevered or doubly reinforced beams/slabs, the top main reinforcing bars shall be held in position by introducing chair of appropriate bar spacers or supports bar at 1.0 to 1.2m centers.

The bars shall be tied with GI binding wires as per the instructions given by Architect or Engineer-in-charge.

In case of columns and walls, the vertical bars shall be kept at the top of the mould in position by means of timber / steel templates with slots accurately cut out in them. The templates shall be removed after concrete has been done below it. The bars may also be suitably tied by means of annealed GI wires to the shuttering to maintain their position during concreting. The GI wire shall be tied in such a way that they shall not get embedded in the concrete.

All dowel bars projecting from columns, columns beams, slabs, etc., to which other bars and concrete are to be attached or bounded to later on, shall be protected with a coat of thin neat cement grout, if the bars are not likely to be incorporated with succeeding mass of concrete within the following 10 days. This coat of thin neat cement shall be removed before concreting. All dowels to be kept in position by tying stirrups or a bar.

The cost of the reinforcement and formwork shall be included or excluded as per the item description.

The concrete shall be placed at all heights and for all shapes.

General:
The relevant specifications of item no. 2.01 shall be followed except that the concrete mix shall be designed from preliminary tests the proportioning of cement and aggregates shall be done by weight, and necessary precautions shall be taken in the production to ensure that the required work cube strength is attained and maintained. The controlled concrete shall be in grades of M-20, M-25, M-30, M-35 and M-40, with prefix controlled added to it. The letter "M" refers to mix, and numbers specify 28 days works cube compressive strength of 150mm cubes of the mix expressed in N/mm2.

Before quoting the rate, the contractor shall confirm the exposure condition for the design of concrete. Mix design shall be carried out for environmental exposure conditions as given in IS 456:2000.
All concrete work shall have fair finish concrete surface unless otherwise specified in the drawing.

For exposed concrete element specified in the drawing fair finish steel shuttering made out of MS sheet not less than 14 gauge / laminated plywood and supporting framework shall be of steel. Proper care shall be taken in MS shuttering at the time of concreting during monsoon to achieve rust free concrete surface. The concrete surface shall be rendered if required to give fair finish.

For other concrete shuttering material shall be as follows:
Columns: Moulds from marine ply with wooden battens.
Straight walls / Curved wall in plan: Marine plywood with wooden battens / Acro make or equivalent make plates and soldiers.
Beam: Bottom - timber / steel plates, Sides - Steel plates / marine ply with battens.

The concrete shall be designed as per relevant IS code- IS 10262 and SP 23, with or without chemical admixture to provide the grade of concrete having required workability and characteristic strength as per IS 456:2000. The proportion of cement, sand and coarse aggregates shall be determined by weight. The weight batch machine shall be used for maintaining proper control over the proportion of aggregates as per mix design. The design mix shall be got approved by the Engineer in-charge before starting the concrete work. The minimum cement content shall depend on the exposure condition of the concrete. The minimum cement content given in table (IS 456:2000, table 5) shall be adopted irrespective of whether the contractor achieves the desired strength with less quantity of cement. The strength requirements of different grades of concrete shall be as below:

Grade of Concrete	Compressive strength of 15 cm. cubes in N/mm2 at 7 and 28 days conducted in accordance with IS: 516-1959.		
	At 7 days	At 28 days	Max size of agg. in mm
M-10	7	10	20
M-15	10	15	20
M-20	13.5	20	20
M-25	17	25	20
M-30	21	30	20
M-35	24	35	20

M-40	28	40	20

In all cases, the 28 days compressive strength specified in the above table is the criteria for acceptance or rejection of the concrete.
Where the strength of a concrete mix as indicated by tests lies in between the strength of any two grades specified in the above table, such concrete shall be classified in for all purposes as concrete belonging to the lower of the two grades between which its strength lies.

The Contractor shall take necessary care to avoid sand streaks, air holes, honey combining etc., on finished concrete surface.

Workmanship:

Proportioning
The proportions for ingredients chosen shall be such that concrete has adequate workability for conditions prevailing on the work in question and can be properly compacted with means available except where it can be shown to the satisfaction of the Architect and Engineer-in-charge that the supply of properly graded aggregate of uniform quality can be maintained till the completion of work. Grading of aggregate shall be controlled by obtaining the coarse aggregate, indifferent sizes and blending them in the right proportions as required. Aggregate of different sizes shall be stocked in separate stockpiles. The required quantity of material shall be stockpiled for several hours, preferably a day before use. The grading of course and find aggregate shall be checked as frequently as possible, the frequency for a given job being determined by the Architect and Engineer-in-charge to ensure that the suppliers are maintaining the uniform grading, as approved for samples used in the preliminary tests.

In proportioning concrete, the quantity of both cement and aggregate shall be determined by weight. Where the weight of cement is determined by accepting the maker's weight per bag a reasonable number of bags shall be weighed separately, to check the net weight, where cement is weighed from bulk stocks at site and not by bags. It shall be weighed separately from the aggregates. Water shall either be measured by volume in calibrated tanks or weighed. All measuring equipment should be maintained in clean and serviceable condition. Their accuracy shall be periodically checked and calibrated in a standard laboratory.

Mixing, consistency, inspection, transportation and laying, formwork for concrete, sampling & testing of concrete and stripping time for the form works: These shall be same as item no. 2.01 The compressive strength and slump test shall be performed by third party or outside laboratory is required.

It is most important to keep the specified water cement ratio constant and at its correct value. To this end, moisture content in both fine and coarse aggregates shall be determined by the Architect and Engineer-in-charge, according to the weather conditions. The amount of mixing water shall then be adjusted to compensate for variations in the moisture content. For the determination of moisture content in the aggregates, IS: 2386 (Part III) shall be referred to. Suitable adjustments shall also be made in the weights of aggregates due to variation in their moisture content.

All RCC works shall be carried out as per the detailed drawings and direction of Architects and Engineer-in-charge. The concrete shall be placed at all heights, levels and for all shapes.

Mode of Measurements and Payment:

The relevant specifications item no. 2.01 shall be followed except that the controlled concrete RCC work for work as specified in item shall be measured under this item. The rate shall exclude or include the cost of formwork and reinforcement as per the item description.
The volume occupied by reinforcement shall not be deducted from RCC work.

The rate shall be for a unit of one m3.

The rate shall be inclusive of chemical admixture like plasticizers etc. No additional payment shall be made on this account. The rate includes placing the concrete at all heights, levels and shapes.

Item No:-23

Providing TMT Bar FE 550D reinforcement for R.C.C. work including bending, binding and placing in position complete upto floor two level.

Extra for additional lift of reinforcing steel for all R.C.C. work above floor two level.

Materials:
Binding wires shall be confirmed to M-18. TMT (FE-550D) shall be confirmed to M-17.

Workmanship:
The work shall consist of furnishing and placing reinforcement to the shape and dimensions, as shown on the drawings or as directed.
The type of reinforcement shall be as per the item description. The contractor shall submit the test certificate from steel manufacturer as and when required. The test results shall be verified, if required in any reputed laboratory.

Steel shall be clean and free from rust and loose mill scale, at the time of fixing in position and subsequent concreting.

A bar bending schedule shall be made by the contractor before starting the work. The payment shall be done based on the quantity worked out in bar bending schedule. The bar bending schedule shall be prepared as per SP 34.

TMT bars
Reinforcing steel shall conform accurately to the dimensions given in the bar bending schedules shown on relevant drawings. Bars shall be bent cold to specified shape and dimensions or as directed using a proper bar bender, operated by hand or power to attain proper radius of bends. Bars shall not be bent or straightened in a manner that will injure the material. Bars bent during transportation or handling shall be straightened before being used on work. They should not be heated to facilitate bending. Unless otherwise specified, a 'U' type hook at the end of each bar shall invariably be provided to main reinforcement. The radius of the bend shall not be less than twice the diameter of the round bar and the length of straight part of the bar beyond the end of the curve shall be at least 4 times the diameter of the round bar. In case of bars which are not round and incase of deformed bars, the diameter shall be taken as the diameter of circle having an equivalent effective area. The hooks shall be suitably encased to prevent any splitting of the concrete. The bars shall be used with or without hooks at the end. Deformed bars without hooks shall comply with relevant anchorage requirements.

All the reinforcement bars shall be accurately placed in exact position shown on the drawings and shall be securely held in position with 16 Gauge GI binding wire of size not less than 1mm as approved by Engineer-in-charge or Architect. The re-bars shall be placed with stay blocks or metal chair spacers, metal hangers, supporting wires or other approved devices at sufficiently close intervals. Bars shall not be allowed to sag between support or displaced during concreting or any other operations of the work. All devices used for positioning shall be of non-corrodible material. Wooden and metal supports shall not extend to the surface of concrete, except where shown on drawing. Placing bars on layers of freshly laid concrete as the work progresses for adjusting bar spacing shall not allowed. Pieces of broken stone or brick and wooden blocks shall not be used. Layers of bars shall be separated by spacer bars; Precast mortar blocks or PVC cover blocks shall be used to maintain the cover of the concrete members as directed by Engineer In-charge or Architect. Reinforcement after being placed in position shall be

maintained in a clean condition until completely embedded in concrete. Special care shall be exercised to prevent any displacement of reinforcement in concrete already placed. To prevent reinforcement from corrosion, concrete cover shall be provided as indicated on drawing. All the bars projecting from concrete and to which other bars are to be spliced and which are likely to be exposed for a period exceeding 10 days shall be protected by a thick coat of neat cement grout.

Bars crossing each other where required shall be secured by 16-gauge GI binding wires (annealed) of size not less than 1mm, in such manner that they do not slip over each other at the time of fixing and concreting.

As far as possible, bars of full length shall be used. In case this is not possible, overlapping of bars shall be done as directed. Where directed, where practicable, overlapping bars shall not touch each other, but be kept apart by 25mm or 1.25 times the maximum size of the coarse aggregate, whichever is greater by concrete between them. Where not feasible, overlapping bars shall be bound with annealed wires not less than 1mm thick, twisted tight. The overlaps shall be staggered for different bars and located at points along the span where neither shear nor bending movement is maximum in beam and slab.

Whenever indicated on the drawings or desired by the Architect and Engineer-in-charge, bars shall be joined by couplings which shall have a cross section sufficient to transmit the full stresses of bars. The ends of the bars that are joined by coupling shall be upset for sufficient length so that the effective cross sectional the base of threads is not less than normal cross section of the bar. Threads shall be standard threads. Steel coupling shall conform to IS: 226.

When permitted or specified on the drawings, joints of reinforcement bars shall be welded with appropriate welding rod as per the instructions given by Structural Engineer. The type of welding, size of fillet etc. shall be as approved by Structural Engineer. Welded joints shall preferably be located at points when steel will not be subject to more than 75% of the maximum permissible stress and welds so staggered that any one section not more than 20% of the rods are welded. Only electric arc welding using a process which excludes air from the molten metal and conforms to any or all other special provisions for the work shall be accepted. Suitable means shall be provided for holding bars securely in position during welding. It shall be ensured that no voids are left in welding and when welding is done in 2 or 3 stages, the previous surface shall be cleaned properly. The ends of the bars shall be cleaned of all loose scale, rust, grease paint and other foreign matter before welding. Only competent welders shall be employed on the work. The M.S electrodes used for welding shall conform to IS: 814. Welded pieces of reinforcement shall be tested. Specimen shall be taken from the actual site, and their number and frequency of test shall be as directed.

At the time of concrete, a bar fitter shall remain at site to keep the reinforcement in position.

Rolling margin shall be checked for each lot of steel received at site. This rolling margin shall be considered for reconciliation of steel at the end of the project or after the end of each month as per the decision of engineer –in-charge. Allowable wastage and rolling margin for the reconciliation of reinforcement steel shall be applicable.

Mode of Measurements and Payment:
Reinforcement shall be measured in length including overlaps, separately for different diameters as actually used in the work. Where welding or coupling is resorted to in place of lap joints, such joints shall be measured for payment as equivalent length of overlap as per design requirement. From the length so measured, the weight of reinforcement shall be calculated in tones by using standard IS co-efficient. Length shall include hooks at the ends. The waste of steel and binding wires shall not be measured, and the cost of these items shall need to be included in the rate for reinforcement. The rolling margin of steel shall not be paid extra.

The rate for reinforcement includes cost of GI binding wires. Cutting, bending, placing, binding and fixing in position as shown on the drawings and as directed. It shall also include all devices like chairs,

pins etc. for keeping reinforcement in approved position, cost of joining as per approved method and all wastage, covers –PVC or Cement mortar and spacer bars.

The rate shall be for a unit of one Kg.

Item No:- 24

Formwork:

Providing, erecting, fixing, in position, striking/removing and cleaning shuttering & centering for formwork of with Sheathing Steel sheets or Plywood Sheets (Using Minimum 12 mm thick Shuttering Plywood, conforming to IS:4990) so as to give a Fair Exposed F3 finish including centering shuttering strutting and propping etc. Height of propping and centering below supporting floor to ceiling not exceeding 4 M. and removal of the same for in situ reinforced concrete and plain concrete work in.

(A) Foundation, Footings, Bases of columns etc. and Mass Concrete.

(B) Flat Surfaces such as soffits of suspended floors slabs landings and the like (1) Floors etc. up to 200mm in thickness

(C) Vertical surface such as walls (any thickness) partitions and the like including attached buttresses & string course & the like

(G) Columns Pillars Posts and Struts. (1) Square, Rectangular or polygonal in plan.

(H) Sides and Soffits of Beams

PLEASE NOTE:

FOR COLUMNS, SHUTTERING PLATES WITH NUT AND BOLT SHALL BE USED AND CONVENTIONAL SHUTTERING SHALL NOT BE ALLOWED.

Materials:

The shuttering to be provided shall be of ordinary timber planks and shall conform to M-26 The dimensions of scantlings and battens shall conform to the design. The strength of the wood shall not be less than that assumed in the design.

Workmanship:

The form work shall conform to the shape lines and dimensions on the plans and be so constructed as to remain sufficiently rigid during the placing and compacting of the concrete. Adequate arrangements shall be made by the contractor or safeguard against any settlement of the form work during the course of concreting and after concreting. The form work of shuttering, concreting, scaffolding bracing etc shall be as per design.

Cleaning & Treatment of forms:

All rubbish, particularly chippings shaving and saw dust shall be removed from the interior of the form before the concrete is placed and the form work in contact with concrete shall be cleaned and thoroughly wet or treated. The surface shall be then coated with soap solution applied before concreting is done. Soap solutions for the purpose shall be prepared by dissolving yellow soap in water to get consistency of paint. Alternatively, a coat of raw linseed oil or form oil of approved manufacture may be applied in case steel shuttering is used. Soap solution or raw linseed oil shall be applied after thoroughly cleaning the surface. Care shall be taken that the coating does not get construction joint surface and reinforcement bars.

Stripping time:

In normal circumstances and where ordinary cement is used forms may be struck after expiry of the following periods:

(a) Sides of walls columns and vertical faces of beam - 24 to 48 hours.

(b) Beams soffits (props left under) - 7 days.

(c) Removal of props slabs

(1) Slabs spanning up to 4.5 m - 7 days.

(2) Spanning over 4.5 mm - 7 days.

(d) Removal of props to beams and arches

(1) Spanning up to 6 m - 14 days.

(2) Spanning over 6 m - 14 days.

However, this period may be increased or decreased at the discretion of Engineer-in-charge. Special care shall be taken while striking the centering of cantilevered slab canopies, portal frames, folded plate construction and period of striking centering shall be as determined by the Engineer-in- charge.

Procedure when removing the form work:

All formworks shall be removed without such shock or vibration as would damage the reinforcement of concrete surface. Before the soffits form work and struts are removed, the soffits and the concrete surface shall be exposed where necessary in order to ascertain that the concrete has sufficiently hardened.

Centering:

The centering to be provided shall be got approved. It shall be sufficiently strong to ensure absolute safety of the form work and concrete work before, during and after pouring concrete. Watch should be kept seeing that behavior of centering and form work is satisfactory during concrete. Erection should also be such that it would allow removal of forms in proper sequence without damaging either the concrete or the forms to be removed.

The props of centering shall be provided on firm foundation or base sufficient strength to carry the loads without any settlement.

The centering and form work shall be inspected and approved by the Engineer-in-charge before entering. But this will not relieve the contractor of his responsibility for strength, adequacy and safety from work and centering. If there is a failure of work or centering, contractor shall be responsible for the work, injury to life and language to property.

Scaffolding:

All scaffolding, hoisting arrangements and ladders etc required for the facilitation of concrete shall be provided and removed on completion at his own expense. The scaffolding, hoisting arrangements and ladders etc. shall be strong enough to withstand all live, dead and impact loads expected to act and shall be subject to the approval of the Engineer-in-charge. However, contractors shall be solely responsible for the safety of the hoisting arrangements and ladders shall allow easy approaches etc. The scaffolding hoisting arrangement and ladders shall allow easy approach to the work spot and afford easy inspection.

The rate is applicable to all conditions of working and height up to 4 mts. The rate shall include the cost of materials and labour for various operations involved such as:

(a) Splayed edges, notching, allowance for overlaps and passing at angles, battens centering, shuttering propping, bolting, nailing, easing, striking and removal.

(b) Filleting to from stop chamfered edges or splayed external angles not exceeding 20 mm width to beams, columns and the like.

(c) Temporary openings in the forms for pouring concrete, if required, removing rubbish etc.

(d) Dressing with oil to prevent adhesion of concrete with shuttering, and

(e) Raking or circular cutting.

Re-use:

Before re-use all forms shall be inspected by the Engineer-in-charge and their suitability ascertained. The forms shall be scarred, cleaned, and joints gone over, repaired where required, inside surface shall be retreated to prevent adhesion of concrete.

Measurements & payment:

From work shall be measured as the area in square meters of shuttering in contract with concrete except in the case of inclined member and portion of curved profile and upper side in which case only area of underside shall be measured for payment.

From work to secondary beams shall be measured up to the side of main beams but no deduction shall be made from the work of the main beam at the inter section point.

No, deduction shall be made from the formwork of a column a inter section of beams. The rate is for the completed item.

The rate shall be for a unit of one Sq. meter or as per the B.O.Q.

For Exposed Finish

Material – Sheathing of steel sheets, and plates of steel or plywood instead of ordinary timber plank to obtain a desired smooth exposed finish of surface. The Surface shall be presentable without further treatment.

Item No:- 25

Earthwork for embankment including breaking clods, dressing with all lead and lift and including watering rolling and consolidation of subgrade in layers at O.M.C. to required dry density including filling the depression which occur during the process using power roller 8T to 10T.(E) From Borrow area within 3.0KM. lead

7. In the case of earth work consolidated under optimum moisture conditions each layer of earth shall be carefully moistened to give field moisture content of about +1% to -2% of the optimum moisture content (OMC). The OMC shall be determined according to IS 2720 (Pt.VIII) Methods of Tests for Soils. Each layer shall then be compacted by rolling with 8 to 10 tonnes power road roller and a sheep foot roller if required. The required amount of water shall be added during consolidation to keep the moisture content of the soil at the optimum as per test. The density to be achieved for each layer of the material shall not be less than 95% of the density obtained in the laboratory (Proctor Method).

8. Each compacted layer shall be tested in the field for density and accepted before the operations for next layer are begun.

9. Control on compaction in the field shall be exercised through frequent moisture content and density determinations. A systematic record of these shall be maintained. At all times during construction the top of the embankment shall be maintained at such cross fall as will shed water and prevent ponding.

10. Density Measurement and Acceptance Criteria

a. One measurement of density shall be made for each 500 sqm of compacted area or for a smaller area as decided by the Engineer-in-Charge. Each measurement shall consist of at least 5 density determinations tests and the average of these 5 determinations shall be treated as the field density achieved. The determination of density shall be as per IS 2720 (Pt. XXVIII).

b. In general the control at the top 40 cm thickness of the formation shall be more strict with density measurements being done at the rate of one measurement for 250 sqm of compacted area. Further for the determination of the mean density the number of tests in one measurement shall not be less than 10 and the work will be accepted if the mean dry density equals or exceeds the specified density.

c. When density measurements reveal any soft areas in the embankment, the Engineer-in-Charge shall direct that these be compacted further. If in-spite of that the specified compaction is not achieved the material in the soft areas shall be removed and replaced by approved materials and compacted to the satisfaction of the Engineer-in-Charge.

d. Control Tests on Borrow Material

Soil suitable for consolidation under O.M.C. conditions should preferably have the following characteristics:

i. Minimum percentage of clay-10%
ii. Liquid limit-14
iii. Plasticity index-4
iv. Percentage of silt should not exceed-50%
v. Peat, muck and organic soils are unsuitable.

e. The Engineer-in-Charge may, however, relax these requirements taking into account availability of materials, cost of transportation and other relevant factors.

f. Various test required to be conducted on the borrow material with their recommended frequency are indicated below. All the test need not be stipulated on every project. Depending upon site condition etc. only some may be found necessary at a particular project. The frequency of testing indicated refers generally to the minimum number of tests to be conducted. The rate of testing must be stepped up as found necessary depending upon the variability of the materials and compaction methods employed at a project.

i. Gradation: At least one test for each kind of soil. Usual rate of testing 1 to 2 tests per 8000 cum of soil.
ii. Plasticity: At least one test for each kind of soil. Usual rate of testing 1 to 2 tests per 8000 cum of soil.
iii. Proctor Tests: At the rate of 1 to 2 tests per 8000 cum of soil.
iv. Deleterious Contents: As required.
v. Moisture contents: One test for every 250 cum of soil.

11. Measurements :

The filling shall be measured and quantity of earth work computed from cross sections of filling or the embankment. No deduction shall be made for voids.

12. Rate : Rate shall include the cost of all operations described above including operation mentioned in 49 to the extent applicable.

Item No:-26

Construction of 300mm (as per IRC 37) Thick Grannular sub base(GSB-I) by providing coarse graded material using B.T Metal 53 mm to 26.50 mm @ 35 % ,26.50 mm to 4.75mm 45% & Coarse sand below 2.36 mm 20 % in uniform layer with motor grader on prepared surface mixing by mix in place method with vibratory roller to achieve the desired density complete as per close 401

Construction of granular sub-base (Grade - I) by providing coarse graded material, spreading in uniform layers with motor grader on prepared surface, mixing by mix in place method with rotavator at OMC, and compacting with vibratory roller to achieve the desired density, complete as per MoRTH clause 401. The rate shall be for a unit of one Cubic Meter.

Item No:-27

Construction of Dry Lean Cement Concrete Sub-base over a prepared sub-grade with coarse and fine aggregate conforming to IS: 383, the size of coarse aggregate not exceeding 25 mm, aggregate cement ratio not to exceed 15:1, aggregate gradation after blending to be as per table 600-1, cement content not to be less than 150 kg/ cum, optimum moisture content to be determined during trial length construction, concrete strength not to be less than 10 Mpa at 7 days, mixed in a batching plant, transported to site, laid with a paver with electronic sensor, compacting with 8-10 tonnes vibratory roller, finishing and curing.

WIDTH AND THICKNESS OF DLC SUB-BASE The DLC

Sub-base shall extend beyond the pavement edges by 500 mm to facilitate further construction operations and provide an adequate support for the concrete slab.

The extra width facilitates the movement of paver tracks on the extended DLC. The offset will be 200 mm in case of semi mechanized or manual construction.

Although the actual thickness will be governed by the design considerations, a thickness of minimum 150 mm is recommended for all major projects of State Highways and National Highways. When DLC is adopted as subbase in case of roads other than the above roads its thickness of 100 mm is recommended. For further details, IRC:62 'Guidelines for Design and Construction of Low Volume Roads', may be referred, where in different combinations of constructing other type of subbases involving cement treated bases have also been provided.

Materials

Cement

Any of the following types of cement may be used with the approval of the Engineer.

ii) Ordinary Portland Cement (OPC-53) IS:8112, IS:12269

If the subgrade soil contains soluble sulphates in a concentration more than 0.5 percent, the cement used shall be sulphate resisting Portland cement conforming to IS: 12330 or Portland slag cement with slag content upto 50 percent.

Aggregates

Aggregates for dry lean concrete shall be natural aggregate complying with IS:383. The aggregates shall not be alkali reactive. The deleterious materials content shall not exceed the limits as per IS:383. In case the aggregates are not free from dirt, the same may be washed and water drained out at least 72

hours before batching.

Coarse aggregate shall consist of clean, hard, strong, dense and non-porous pieces of crushed stone or gravel and shall not consist of disintegrated stone, soft, flaky, elongated, very angular or splintery pieces. The maximum size of the coarse aggregate shall be 26.5 mm. The water absorption of the aggregates shall not exceed 3 percent.

The fine aggregate shall consist of clean, natural sand or crushed stone sand or a combination of the two and shall conform to IS:383.

The fine aggregate shall be free from soft particles, clay, seashell, loam, cemented particles, mica, organic and other foreign matter in accordance with IS:383. Aggregates which have water absorption of more than 3 percent, shall not be used.

Grading of aggregates

The grading of fine aggregate shall conform to grading zones I, II, III or IV as given in IRC:15 or IS:383. The grading of combined aggregate shall conform to

Table 1 Table 1 Grading of Aggregates

Sieve Designation (mm)	Percentage passing (by weight)
26.50 mm	100
19.00mm	75-95
9.50mm	50-70
4.75mm	30-55
2.36mm	17-42
600 micron	8-22
300 micron	7-17
150 micron	2-12
75 micron	0-10

Water

Water used for mixing and curing of concrete shall be clean and free from injurious amounts of oil, salt, acid, alkali, sugar, vegetable matter or other substances harmful to concrete. Water shall meet the requirements of IS:456. Potable water is generally considered satisfactory for mixing and curing. The pH value of water for mixing and curing upto 9 shall be permitted.

Mineral Admixtures

Fly ash, 15-30 percent or Ground Granulated Blast Furnace Slag (GBFS), 25-50 percent by weight of cementitious material may be used in concrete as part replacement of Ordinary Portland cement, and in such case, the Ordinary Portland cement content shall not be less than 1 00 kg/m^ of concrete. The fly ash shall conform to IS 381 2 (Part 1), and granulated blast furnace slag shall conform to 18:12089. Site mixing of fly ash or GBFS shall be permitted only after ensuring availability of the equipment at site for uniform blending through a specific mechanized facility with automated process control like batching and mixing plant.

All materials shall be stored in proper places so as to prevent their deterioration or contamination by foreign matter to ensure their satisfactory quality and fitness for use in the work.

Concrete Mix Proportions

The concrete mix shall be proportioned with a maximum aggregate cement ratio of 14:1 where ORG is used and 12:1 where PPC or PSC is used. The minimum cementitious materials content shall not be less than 140 kg/cum of concrete. If this minimum cementitious materials content is not sufficient to produce the concrete of the specified strength, it shall be increased as necessary. The fly ash or GBFS content shall be 15-30 percent or 25-50 percent by weight of cementitious materials respectively, as given in Clause 3.4. The concrete mix proportions are based on Central Road Research Institute (CRRI) test results.

The optimum water content shall be decided so as to ensure full compaction under rolling. Too much water will cause the concrete to be heaving up before the wheels and to be picked up on the wheels of the roller. Too little water will lead to inadequate compaction and segregation, a low in-situ strength and an open textured surface. Trial mixes of dry lean concrete shall be prepared with water content of 5.0, 5.5, 6.0, 6.5 and 7.0 percent of the total weight of material. Optimum moisture and density shall be established by preparing cubes with varying moisture contents, and moisture-density curve shall be drawn. Special vibratory hammer shall be used for compacting the specimens. While laying sub-base in main carriageway; the DLC may have 1 percent higher moisture content, to compensate evaporation loss during transport.

DRAINAGE LAYER

To facilitate quick disposal of water that is likely to enter the subgrade, a drainage layer (GSB) shall be provided below the sub-base throughout the road width. For further details on the drainage layer, IRC:58 may be consulted.

SUBGRADE

The subgrade shall conform to the grades and cross-sections on the drawings and shall be uniformly compacted to the modified Proctor density not less than 97 percent, that is normally specified. Reference may be made to IS:2720 (Part 8) for this. The lean concrete sub-base shall not be laid on a subgrade softened by rain after its final preparation, surface trenches and soft spots, if any, must be properly backfilled and compacted to avoid any weak spot. As far as possible, the construction traffic shall be avoided on the prepared subgrade. A day before placing of the sub-base, the subgrade surface shall be given a fine spray of water and rolled with one or two passes of a smooth wheeled roller after a lapse of 2-3 hours in order to stabilise loose surface. If found necessary, another fine spray of water may be applied just before placing the sub-base.

CONSTRUCTION

Trial Mixes

Trial mixes of dry lean concrete shall be prepared with moisture contents of 5.0, 5.5, 6.0, 6.5 and 7.0 percent using cement content requirement of aggregate-cement ratio specified in para 4.2. Optimum moisture and density shall be established by preparing cubes with varying moisture contents. Compaction of the mix shall be done in three layers with vibratory hammer fitted with a square or rectangular foot. After establishing the optimum moisture, a set of six cubes shall be cast at that moisture for the determination of compressive strength at 3 and 7 days. Trial mixes shall be repeated if the strength is not satisfactory either by increasing cement content or using higher grade of cement.

If during the construction of the trial length, the optimum moisture content determined as above is unsatisfactory, suitable changes may be made in the moisture content to achieve a satisfactory mix. The cube specimens prepared with the changed moisture content should satisfy the strength requirement. Before production of the mix, natural moisture content of the aggregate should be determined on a day-to-day basis, so that the moisture content could be adjusted. The mix finally designed should neither

stick to the rollers nor become too dry resulting in ravelling of surface.

General

The pace and programme of the lean concrete sub-base construction shall be matching suitably with the programme of construction of the cement concrete pavement over it. The sub-base shall be overlaid with Paving Quality Concrete (PQC) pavement not before 7 days after the sub-base construction.

Batching and Mixing

The batching plant shall be capable of separately proportioning each type of material by weight. The capacity of batching and mixing plant shall be at least 25 percent higher than the proposed capacity for the laying arrangements. The batching and mixing shall be carried out preferably in a forced action central batching and mixing plant having necessary automatic controls to ensure accurate proportioning and mixing. Calibration of the batching and mixing plant shall be carried out at regular intervals, normally every month. Other types of mixers shall be permitted subject to demonstration of their satisfactory performance during the trial length construction.

Transporting

Plant mixed lean concrete shall be discharged immediately from the mixer, transported directly to the point where it is to be laid and protected from the weather by covering with tarpaulin during transit. The concrete shall be transported by tipping trucks, sufficient in number to ensure a continuous supply of material to feed the laying equipment to work at a uniform speed and in an uninterrupted manner. The lead of the batching plant to the paving site shall be such that the travel time available from mixing to paving as specified in a para 7.6.2 will be adhered to.

Placing

Lean concrete shall be laid by a hydrostatic paver. The equipment shall be capable of laying the material in one layer in an even manner without segregation, so that, after compaction the total thickness achieved is as specified. The paving machine shall have high amplitude ramping bars to give good initial compaction to the sub-base. For more details, IRC:SP:86 'Guidelines for Selection, Operation, and Maintenance of Paver Finishers' may be referred. The laying of the two-lane road sub-base shall be done in full width. For a pavement more than two-lanes, the operation may be carried out by two pavers in echelon separated by appropriate distance (15-20 m). Transverse and longitudinal construction joints shall be staggered by 500-1000 mm and 200-400 mm respectively from the corresponding joints in the overlaying joints in the overlaying concrete slabs.

Compaction

The compaction shall be carried out immediately after the material is laid and levelled. In order to ensure thorough compaction, rolling shall be continued on the full width till there is no further visible movement under the roller and the surface is closed. The dry density obtained (from the average of density obtained from three density holes of 200 mm dia.) shall not be less than 97 percent of that achieved during the trial length construction. The densities achieved at the edges i.e., 0.5 m from the edge shall not be less than 95 percent of that achieved during the trial construction as per para 7.9. Rolling shall commence on the lower edge of camber/one side slope and proceed towards centre/outer edge. The spreading, compacting and finishing of the lean concrete shall be carried out as rapidly as possible and the operation shall be arranged so as to ensure that the time between mixing of the first batch of concrete in any transverse section of the layer and the compaction and final finishing of the same shall not exceed 90 minutes, when the concrete temperature is between 25 and 30°C and 120 minutes, if less than 25°C. This period may be reviewed in the light of the results of the trial length but, in no case shall it exceed 2 hours. Work shall not proceed when the temperature of the concrete exceeds 30°C. If necessary, chilled water or addition of ice may be resorted to for bringing down the

temperature. It is desirable to stop concreting when the ambient temperature is above 35°C. After compaction has been completed, roller shall not stand on the compacted surface for the duration of the curing period except during commencement of next day's work near the location where work was terminated the previous day.

Double Drum smooth-wheeled vibratory rollers of minimum 80 to 100 KN static weight are considered to be suitable for rolling dry lean concrete. In case, any other roller is proposed, the same will be used after establishing its performance. The number of passes required to obtain maximum compaction depends on the thickness of the lean concrete, compactibility of the mix, and the weight and type of the roller etc. and the same as well as the total requirement of rollers for the job shall be determined during trial run by measuring the in-situ density and the scale of the work to be undertaken.

In addition to the number of passes required for compaction there shall be a preliminary pass without vibration to bed the lean concrete down and again a final pass without vibration to remove roller marks and to smoothen the surface. Special care shall be exercised during compaction near joints, kerbs, channels, side forms and around gullies and manholes. In case adequate compaction is not achieved by the roller at these points, use of plate vibrator will be permitted.

The final lean concrete surface on completion of compaction and immediately before overlaying, shall be well closed, free from movement under roller and free from ridges, cracks, loose material, potholes, ruts or other defects. The final surface shall be inspected immediately on completion and all loose, segregated or defective areas shall be corrected by using fresh lean concrete material laid and compacted. For repairing honeycombed surface, fresh concrete of the grade of parent concrete, with aggregates of size 10 mm and below, shall be spread and compacted. It is necessary to check the level of the rolled surface for compliance. Any level deficiency should be corrected after applying concrete with aggregate of size 10 mm and below, after roughening the surface, when the concrete is still green.

Similarly, the surface regularity also should be checked with 3 m straight edge. The deficiency should be made up with concrete with aggregates of size 1 0 mm and below. At the end of the day's work/stoppage of work due to breakdown of any machinery, in the chain, the work shall be finished straight by placing a channel at the end and placing concrete in slope beyond the channel. On the next day the channel is removed and minor cutting to obtain vertical face as per para 7.7 may be needed.

Segregation of concrete in the dumpers shall be controlled by moving the dumper back and forth while discharging the mix into it and by other means. Even paving operation shall be such that the mix does not segregate.

Joints

Day's work shall be stopped by vertical joints. The edge of the compacted material shall be cut back to a vertical face, when work starts next day.

Curing

As soon as the lean concrete surface is completed, curing shall commence. a) Curing shall be done by covering the surface by hessian cloth in two layers which shall be kept continuously moist for 7 days by sprinkling water. b) If water-curing is not possible, the curing shall be done by spraying with liquid curing compound. The curing compound shall be white pigmented type with water retention index of minimum 90 percent, when tested in accordance with the test method given in Annexure-A. To check the efficiency of the curing compound, the supplier shall be required to provide the test certificate from a recognized laboratory. Curing compound shall be sprayed immediately after rolling is complete. As soon as the curing compound has lost its tackiness, the surface shall be covered with wet hessian for three days.

Trial Length Construction

The trial length shall be constructed (in two days), at least 14 days in advance of the proposed date of commencement of work. The length of trial construction shall be a minimum of 60 m length and for full width of the pavement. The trial length shall contain the construction of at least one transverse construction joint involving hardened concrete and sub-base to be laid subsequently, so as to demonstrate the soundness of the procedure. In one day, trial length of not more than 30 m shall be laid.

In order to determine and demonstrate the optimum moisture content which results in the maximum dry density of the mix compacted by the rolling equipment and the minimum cement content that is necessary to achieve the strength stipulated, trial mixes shall be prepared as per para 7.1

After the construction of the trial length, the in-situ density of the freshly laid material shall be determined by sand replacement method (as per IS:2720 part-8) with 200 mm dia density hole. Three density holes shall be made at locations equally spaced along a diagonal that bisect the trial length; average of these densities shall be determined. These main density holes shall not be made in the strip 500 mm from the edge. The average density obtained from the three samples collected shall be the reference density and is considered as 100 percent. The field density of regular work will be compared with this reference density in accordance with para 7.6.1. A few cores may be cut so as to check segregation or any other deficiency and also to ascertain strength.

The hardened concrete shall be cut over 3 m width and reversed to inspect the bottom surface for any segregation taking place. The trial length shall be constructed after making necessary changes in the grading of aggregates and the mix to eliminate any segregation of the mix. The lower surface shall not have honeycombing and the aggregates shall not be held loosely at the edges.

The trial length shall be outside the main works. After the approval of the trial length construction has been given, the materials, mix proportions, moisture content, mixing, laying, compaction, plant, construction procedures shall not be changed.

Control of Thickness, Density and Strength

The tolerances for thickness shall be ± 10 mm. The dry density of the laid material shall be determined from density holes at locations equally spaced along a diagonal that bisects each 2000 sq.m or part thereof, of material laid each day. The control of strength shall be exercised by taking samples of dry lean concrete for making cubes at the rate of 3 samples for each 1000 sq.m or part thereof laid each day. The cube samples shall be compacted, cured and tested in accordance with IS:51 6.

Opening to Traffic

No heavy commercial vehicles like trucks and buses shall be permitted on the lean concrete sub-base after its construction. Light vehicles if unavoidable may, however, be allowed after 7 days of its construction with prior approval of the Engineer.

MODE OF MEASUREMENTS

In cu mt.

Item No:-28

Construction of reinforced, dowel jointed, plain cement concrete of M40, pavement over a prepared sub base with Ordinary Portland Cement @ 400 kg per cum, coarse and fine aggregate conforming to IS 383, maximum size of coarse aggregate not exceeding 25 mm, mixed in a batching and mixing plant as per approved mix design, transported to site, laid with a fixed form or slip form paver, spread, compacted and finished in a continuous operation including provision of contraction, expansion, construction and longitudinal joints, joint filler, separation membrane, sealant primer, joint sealant, debonding strip,

dowel bar, tie rod, admixtures as approved, curing compound, finishing to lines and grades as per drawing.
Refer Specification from CPWD Specification Vol 1 & Vol 2.

Item No:- 29

Applying and providing Expansion joint sealing System on 100 mm vide joint including cleaning of expansion joint by mechanical means provision of adhesive and flexible membrane with required bond length as per menufracturer specification and 4mm thick alluminium strip covering with one side sloted and bolted with suitable system, inclusive of all manpower, machinery and material as per specification and as directed.

Specifications as per item description.

Item No:- 30

Masonry work using Aerated light weight concrete block having crushing strength not less than 35 kg/sqcm for Basement to floor two level in cement mortar 1:5 (1 cement : 5 fine sand) complete as per Technical Specification.

Brick work using common burnt clay building bricks having crushing strength not less than 35 kg./Sq.Cm. in Super Structure above plinth level in Cement Mortar 1:5. (1-Cement : 5 -fine sand)(A) Modular

Materials: Water shall conform to M-1, Cement to M-3, Sand to M-6, Brick to M-15 and Cement mortar to M-11.

Workmanship:
Proportion:
The proportion of the CM shall be as mentioned in the item description (cement: medium sand), by volume.

Soaking of bricks:
The bricks required for masonry shall be thoroughly wetted with clean water for about 24 hours before use or as directed. The cessation of bubbles, when the bricks are wetted with water is an indication of thorough wetting of bricks.

Laying:
Bricks shall be laid in English bond unless directed otherwise. Half or cut bricks shall not be used except when necessary to complete the bond; closer and in such case, it shall be cut to required size and used near the ends of walls.

A layer of mortar shall be spread on full width for suitable length of the lower course. Each brick shall first be properly bedded and set home by gently tapping with the handle of the trowel or wooden mallet. Its inside face shall be flushed with mortar before the next brick is laid and pressed against it. On completion of the course, the vertical joints shall be fully filled from the top, with mortar.

The walls shall be taken up truly in plumb. All courses shall be laid truly horizontal and all vertical joint shall be truly vertical. Vertical joints in alternate courses shall generally be in one vertical plane. The thickness of brick course shall be kept uniform.
The bricks shall be laid with the frog facing upwards. A set of tools comprising of wooden straight

edges, mason's spirit level, square half meter rub (right angle), pins, string, level pipe and plumb shall be kept on the site of work for frequent checking during the progress of work.

Both the faces of walls, having thickness greater than 23cm shall be kept in proper plumb. All the connected brickwork shall be kept not more than 1m over the rest of the work. Where this is not possible, the work shall be raked back according to bond (and not left toothed) at an angle not steeper than 45 degrees. In a day brick work shall not be laid more than 1m or 10 courses in height.

All the fixtures, pipe outlets of water, etc. which are required to be built in the wall shall be embedded in CM, as per the drawings or as directed. The frames of doors, windows, cupboards, etc. shall be housed into the brick work at the correct location and level, as directed. The heavy steel doors, windows frames, etc. shall be built in with brick work, but for ordinary steel doors and windows, required opening for frames, hold-fasts, etc. shall be left in the wall and frames shall be embedded later on in order to avoid damage to the frames.

Necessary scaffolding shall be provided by the Contractor. The supports of the scaffolding shall be sound and strong, tied together with horizontal pieces over which the scaffolding planks shall be fixed. Normally simple scaffolding only shall be allowed. In this case horizontal pieces of the scaffolding shall rest in the holes, made in the header course only. The Contractor is responsible for providing and maintaining sufficiently strong scaffolding so as to withstand all loads likely to come upon it.

No through holes shall be left in brickwork to support the scaffolding. Only double scaffolding shall be erected. In case the holes are left in the brickwork, it shall be filled with 1:4:8 PCC.

Joints:
Bricks shall be so laid that all joints are quite flush with mortar. Thickness of joints shall not exceed 12 mm. The face joints shall be raked out as directed by raking tools daily, during the progress of work, when the mortar is still green so as to provide key for plaster or pointing to be done, subsequently.

The face of bricks shall be cleaned every day on which the brick work is laid and all mortar dropping shall be removed.

At the end of the day's work or on holidays the top of unfinished masonry shall be kept wet. If the mortar becomes dry, white or powdery, for want of curing, work shall be pulled down and re-built at Contractor's expense.

Curing: Fresh work shall be protected from rain suitably. Masonry work shall be kept moist on all the faces for minimum period of 7 days. The top of masonry work shall be kept well wetted at the end of the day's work.

Preparation of foundation bed:
If the foundation is to be laid directly on the excavated bed, the bed shall be leveled, cleared off of all loose materials, cleaned and wetted before starting masonry work. If masonry is to be laid on concrete footing, the top of concrete shall be roughened, cleaned and moistened. The Contractor shall obtain approval of the Engineer-in-charge for the foundation bed before foundation masonry is started. When pucca flooring is to be provided flush with the top of the plinth, the inside of the plinth wall shall be lowered down having an offset of the same thickness of the flooring with respect to the outside plinth wall top or as directed.

Mode of Measurements and Payment:
The measurement of this item shall be taken for the brick masonry fully completed in foundation up to plinth or above plinth for all levels, heights, shapes and locations as per the item description. The limiting dimensions not exceeding those shown on the drawings or as directed shall be final. Battered, tapered and curved portions shall be measured net.

No deduction shall be made from the quantity of brick work, nor shall any extra payment be made for embedding in masonry or making holes in respect of following items:

(1) End of joists beams, posts, girders, rafters, purlins, trusses, corbel, steps etc. where cross sectional area does not exceed 500 cm2.
(2) Architectural openings in walls, parapet and compound walls, not exceeding 1.0 m2 area.
(3) Wall plates and bed plates, bearing of slabs, chhajjas and the like whose thickness does not exceed 10cm and the bearing does not extend to the full thickness of wall.
(4) Drainage holes, recesses for cement concrete blocks to embed hold fasts for doors, windows etc., forming toothings, grooves etc. and providing cramps for holding stone lining.
(5) Iron fixtures, pipes up to 300mm dia.; holdfasts and doors and windows built into masonry and sanitary and water supply pipes, etc., for concealed electrical wiring and any other fixtures or inserts.
(6) Forming chases of section not exceeding 350cm2 in masonry.

Apertures for fireplaces shall not be deducted nor shall extra labour required to make splaying of jambs, throating and making arches over the aperture be paid for separately. The rate shall include for work of any shape e.g. pillars of any size and shape, curved or tapered walls, drip courses, projections, parapets, load bearing walls, sills, ottas, steps, tank walls, platforms and counter walls, ducts, channels and architectural mouldings like corbelling, pattas, etc.

The rate shall be for a unit of one m3.

Item No:- 31

Providing 15 mm. thick cement plaster in single coat on fair side of brick wall for interior plastering upto floor two level finished even and smooth in [II] Cement mortar 1:4 (1 cement : 4 fine sand) For all levels, hights and leads of works. etc, complete for all floor heights as directed. Rate shall be inclusive of hexagonal chickenmesh at junction of concrete and brick work. Minimum width of the chicken mesh shall be 150 mm covering the brick / concrete surface equally, as directed by EIC.

Materials:
Water shall conform to M-1 and cement mortar of proportion 1:4 shall conform to M-11.

Workmanship:

Scaffolding:
Wooden ballies, bamboo, planks, trestles and other Steel scaffolding shall be sound. These shall be properly examined before erection and use. Stage scaffolding shall be provided for ceiling plaster, which shall be independent of the walls. The sample shall be approved by the architect or engineer-in charge before starting the work.

Preparation of background:

The surface shall be cleaned of all dust, loose mortar droppings, traces of algae, efflorescence and other foreign matter by water or by brushing. Smooth surface shall be roughened by wire brushing if it is not hard and by dense hacking if it is concrete. In case of concrete surface, if a chemical retarder or shuttering oil has been applied to the form work, the surface shall be roughened by wire brushing and all the resulting dust and loose particles shall be cleaned off and care shall be taken that none of the retarder is left on the surface. Trimming of projections on brick / concrete surface wherever necessary shall be carried out to get an even surface.

Raking of joints in case of masonry wherever necessary shall be allowed to dry out for sufficient period before carrying out the plasterwork.

Scaffolding for carrying out plastering work shall be double scaffolding having two sets of vertical supports so that the scaffolding is independent of the walls.

Preparation of Surface:

All putlog holes in brickwork and junction between concrete and brickwork shall be properly filled in advance. Joints in brick work shall be raked about 10mm and concrete surface shall be hacked to provide grip to the plaster. Projecting burrs of mortars formed due to gaps at joints in shuttering shall be removed. The surface shall be scrubbed clean with wire brush / coir brush to remove dirt, dust etc., and the surface thoroughly washed with clean water to remove efflorescence, grease and oil etc., and shall be kept wet for a minimum of two hours before application of plaster.

For external plaster, the plastering operation shall be started from the top floor and carried downwards. For internal plaster, the plastering operations may be started wherever the building frame and cladding work are ready and the temporary supporting ceiling resting on the wall of the floor have been removed. Ceiling plaster shall be completed before starting plaster to walls.

Applications of Plaster:

The plaster about 5cm x 5cm shall be first applied horizontally and vertically at not more than 2m intervals over the entire surface to serve as gauge. The surfaces of these gauges shall be truly in plane of the finished plastered surface. The mortar shall then be applied in uniform surface slightly more than the specified thickness, and then brought to a true surface by working a wooden straight edge reaching across the gauges with small upwards and sideways movements at a time. Finally, the surface shall be finished off true with a trowel or wooden float according to the texture, smooth or sandy granular, as may be required. Excessive Troweling or over working the float shall be avoided. All corners, arises, angles and junctions etc. shall be carried out with proper templates to the size required. The surface shall be finished smooth using neat cement at the ratio of 2.2 kg/m^2.

Cement mortar shall be used within half an hour after addition of water. Any mortar or plaster which is partially set shall be rejected and removed from the site.

In suspending the work at the end of the day, the plaster shall be left out, clean to line both horizontally and vertically. While recommencing the plaster, the edges of the old work shall be scrapped clean and wetted with cement putty before plaster is applied to the adjacent areas to enable the two to properly join together. Plastering work shall be closed at the end of the day on the body of the wall and shall not be nearer than 15cm to any corners or arises. Horizontal joints in plasterwork shall not also occur on parapet tops and copings as these invariably lead to leakage. No portion of the surface shall be left out initially to be patched up later on.

Each coat shall be kept damp continuously till the next coat is applied or for a minimum period of 7 days. Moistening shall commence as soon as plaster is hardened sufficiently. Soaking of walls shall be avoided and only as much water as can be readily absorbed shall be used, excessive evaporation on the sunny or windward side of building in hot air or dry weather shall be prevented by hanging mats or gunny bags on the outside of the plaster and by keeping them wet.

Mode of Measurements & Payment:

The rates shall include for work at any height, position, and floor and for all necessary scaffolding, etc. as may be required. The rates shall also include for hacking and/or bush hammering to form key for plaster and for spatter dash treatment, as specified, as and where necessary. The rates shall also include for all work in narrow width, arises, rounded angles, chamfered external angles, drip moulds, grooves

and for making good after all trades. The rate shall also include for groove with cement finish up to 12mm x 6mm to be formed in plaster at junction of slab and beam and slab and brick without any extra charge. The rate shall also include for similar grooves in plaster at the junction of masonry and wood or steel door/window/ventilator frame or at bottom of beam/lintels as drip moulds without extra charge.

All plastering shall be measured in m^2, unless otherwise specified. Length, breadth or height shall be measured correct to a centimeter.

Thickness of the plaster shall be exclusive of the thickness of the key i.e. grooved or open joints in brick work, stonework, etc. or space between laths. **Thickness of plaster shall be average thickness with minimum 15mm, at any point on the surface.**

The measurement of wall plastering shall be taken between the walls or partitions (dimensions before plastering being taken) for length and from the top of floor or skirting to ceiling for height. Depth of cover of cornices if any shall be deducted. Soffits of stairs shall be measured as plastering on ceilings. Flowing/folding soffits shall be measured separately.

For jambs, soffits, sills, etc., openings exceeding 0.5sqm and not exceeding 3.0sqm, area deductions and additions shall be made in the following manner: -

(c) No deductions shall be made for end joints, beams, posts, etc. for openings not exceeding 0.5sqm each and no addition shall be made for reels, jambs, soffits, sills, etc. of these opening for finish to plaster around ends of joints, beams, posts, etc.

(d) Deduction for openings exceeds 0.5sqm but not exceeding 3.0sqm each shall be made as follows and no addition shall be made for reveals, jambs, soffits, sills, etc. of these openings.

a. When both faces of any wall are plastered with same plaster, deduction shall be made for one face only.
b. When two faces of any wall are plastered with different types of plasters or if one faces is plastered and the other pointed, deductions shall be made from the plaster or pointing on the side of frame for door, windows, etc. on which width of reveals is less than that on the other side but no deductions shall be made on the other side. Where widths of reveals on both faces are equal, deductions of 50% of area of opening on each face shall be made from area of plaster and/or pointing as the case may be.

For openings having door frames equal to projection beyond the thickness of wall, full deduction for opening shall be made from each plastered face of the wall. Jambs, soffits and sills shall be measured separately and paid for.

In case of openings having area above $3.0m^2$ each, full deduction shall be made for the opening but jambs, soffits, and sills shall be measured additionally.

The rate shall be for a unit of one m^2.

Item No:- 32

Providing and laying average 20 mm. thick double coat Sand face/Mala cement plaster on external walls upto any height above ground level and for all shapes consisting of average 14 mm. thick backing coat of CM 1:3 (1 cement: 3 coarse sand) and average 6 mm. thick uniform grained textured finish coat using wooden Gutka, in CM 1:1 (1

cement: 1 sand),with line , level & plumb, including scaffolding, forming grooves, drip moulds, pattas, hacking RCC surface, curing etc. complete. as directed by EIC. Rate shall be inclusive of hexagonal chickenmesh at junction of concrete and brick work. Minimum width of the chicken mesh shall be 150 mm covering the brick / concrete surface equally.

Materials:
Water shall conform to M-12. Cement mortar shall conform to M-11.

Workmanship:
The work shall be carried out in the coats: The backing coat (base coat) shall be 14 mm. thick in C. M. 1:3. The relevant specifications of item No. 60 shall be followed except that the thickness of back coat shall be 14 mm. average. Before the first coat hardens its surface shall be beaten up by edges of wooden tappers and close dents shall be made on the surface.

The subsequent coat shall be applied after this coat has been allowed to set for 3 to 5 days depending upon the weather conditions. The surface shall not be allowed to dry during this period.AaAQ

The second coat shall be completed to 8 mm. thickness in C. M. 1:1 as described above, including raising sand facing by bushing. The sample of sand face shall be got approved before the work is started. The whole work shall be carried out uniformly as per sample approved.
Curing : The curing shall be started overnight after finishing of plaster. The plaster shall be kept wet for a period of 7 days. During this period, it shall be protected from all damages.

Mode of measurements & payment:

The relevant specifications of item No. 60 shall be followed except that the sand face plaster on outside upto m. above ground level shall be measured under this item.

The rate shall be for a unit of one sq. meter.

Item No:- 33

Providing 10mm thick cement plaster in single coat on ceiling upto floor two level and finished even and smooth in (ii) Cement mortar 1:4 (1-cement :4-sand)

Materials & Workmanship :

The relevant specifications of item No. 60 shall be followed except that the thickness of plastering shall be 10mm and this work is for ceiling and soffits of stairs, upto two floor level instead of plaster on walls.

The smooth concrete surface shall be suitably roughened to provide necessary bond before plastering.

Mode of measurements & payment:

The payment shall be made for a unit of one sq. meter of work done, extra over and above the payment plaster work on wall surfaces.

The rate shall be for a unit of one sq. meter.

Item No: - 34

Applying two coats of acrylic putty & two coats of primer of approved brand and manufacture on new wall surface to give an even shade including thoroughly brushing the surface free from mortar dropping and other foreign matter and sand papered smooth.

Providing and painting internal walls with two coats of plastic emulsion paint of approved make & of shade. The rate shall include for all ladders, scaffolding and supports and including complete surface preparation, including scraping the surface off existing surface paint, loose particles and cleaning and applying primer and putty as necessary to achieve a surface in perfect line and level. Wherever necessary, POP punning or cement plastering needs to be done as per site condition, if the plastered surface has chipped off. The final finished surface should be smooth and in perfect line and level without undulations on surface. etc. complete as directed by EIC.

Providing, applying and finishing wall with weather proof exterior emulsion paint on wall surface (two coats) to give an required shape even shade after thoroughly brushing the surface to remove all dirt, and remains of loose powdered materials.etc complete. as directed by EIC.

Refer detailed specifications from "CPWD vol. 2"

Material

The paint shall be (Textured exterior paint/Acrylic smooth exterior paint/premium acrylic smooth exterior paint/100% premium acrylic emulsion paint) of an approved brand and manufacturer.

This paint shall be brought to the site of work by the contractor in its original containers in sealed condition. The material shall be brought in at a time in adequate quantities to suffice for the whole work or at least a fortnight's work. The materials shall be kept in the joint custody of the contractor and the Engineer-in- Charge. The empty containers shall not be removed from the site of work till the relevant item of work has been completed and permission obtained from the Engineer-in-Charge.

Preparation of Surface

For new work, the surface shall be thoroughly cleaned off all mortar dropping, dirt dust, algae, fungus or moth, grease and other foreign matter of brushing and washing, pitting in plaster shall make good, surface imperfections such as cracks, holes etc. should be repaired using white cement. The prepared surface shall have received the approval of the Engineer in charge after inspection before painting commenced.

Application

Base coat of water proofing cement paint

All specifications in respect of base coat of water proofing cement paint shall be as described under cement paint section in CPWD Vol. 2.
Before pouring into smaller containers for use, the paint shall be stirred thoroughly in its container, when applying also the paint shall be continuously stirred in the smaller containers so that its consistency is kept uniform. Dilution ratio of paint with potable water can be altered taking into consideration the nature of surface climate and as per recommended dilution given by manufacturer. In all cases, the manufacturer's instructions & directions of the Engineer-in-charge shall be followed

meticulously.
The lids of paint drums shall be kept tightly closed when not in use as by exposure to atmosphere the paint may thicken and also be kept safe from dust.
Paint shall be applied with a brush on the cleaned and smooth surface. Horizontal strokes shall be given, First and vertical strokes shall be applied immediately afterwards. This entire operation will constitute one coat. The surface shall be finished as uniformly as possible leaving no brush marks.
The specifications in respect of scaffolding, protective measures, measurements and rate shall be as described under 13.14 in cpwd vol. 2.

DELUXE MULTI SURFACE PAINT FOR INTERIORS AND EXTERIORS

Material

The paint shall be (Deluxe multi surface paint for interiors and exteriors) of approved brand and manufacture.
This paint shall be brought to the site of work by the contractor in its original containers in sealed condition. The material shall be brought in at a time in adequate quantities to suffice for the whole work or at least a fortnight's work. The materials shall be kept in the joint custody of the contractor and the Engineer-in- Charge. The empty containers shall not be removed from the site of work till the relevant item of work has been completed and permission obtained from the Engineer-in-Charge.

Preparation of Surface

For new work, the surface shall be thoroughly cleaned off all mortar dropping, dirt dust, algae, fungus or moth, grease and other foreign matter of brushing and washing, pitting in plaster shall make good, surface imperfections such as cracks, holes etc. should be repaired using white cement. The prepared surface shall have received the approval of the Engineer in charge after inspection before painting commenced.

Application

Base coat of special primer of same manufacturer shall be used.
All specifications in respect of base coat of water proofing cement paint shall be as described under 13.21.
Before pouring into smaller containers for use, the paint shall be stirred thoroughly in its container, when applying also the paint shall be continuously stirred in the smaller containers so that its consistency is kept uniform. Dilution ratio of paint with potable water can be altered taking into consideration the nature of surface climate and as per recommended dilution given by manufacturer. In all cases, the manufacturer's instructions & directions of the Engineer-in-charge shall be followed meticulously.
The lids of paint drums shall be kept tightly closed when not in use as by exposure to atmosphere the paint may thicken and also be kept safe from dust.
Paint shall be applied with a brush on the cleaned and smooth surface. Horizontal strokes shall be given, First and vertical strokes shall be applied immediately afterwards. This entire operation will constitute one coat. The surface shall be finished as uniformly as possible leaving no brush marks.
The specifications in respect of scaffolding, protective measures, measurements and rate shall be as described under 13.14.

Refer specifications from "CPWD vol. 2

Mode of measurement & payment

The rate shall include the cost of all materials, labour and scaffolding etc. involved in the operations described under workmanship. The rate shall be for a unit of One sq. meter.

Item No:- 35

Providing & laying broken white china mosaic flooring for plain and curved surfaces, comprising of 12 to 20 mm. size broken pieces of white glazed tiles laid over water proofing using cement mortar 1:3 bedding, The flooring shall be tampered to bring the mortar cream up to the surface, including rounding of the junctions and extending them upto 30 cm. along the parapet wall. The rate shall include bands, if different colour is used, any pattern or design as per drawing and direction, curing, cleaning with water and oxalic acid, etc. complete. as directed by EIC.

Materials:
Water shall conform to M-1, Cement mortar shall conform to M-11, China mosaic shall be from white glazed tiles of rejected quality or from broken pieces of white glazed tiles. White cement shall conform to relevant standards.

Workmanship:

1) The size of the broken pieces of white glazed tiles shall not be more than 20-25mm.

2) Triangular China mosaic pieces shall not be used. Rectangular or square pieces shall only be used.

3) The broken pieces shall be soaked in water for 24hrs. before using.

4) The sub-grade shall be cleaned, wetted and mopped. The cement slurry @ 2.75kg/sqm (with waterproofing compound) shall be applied on the sub-grade evenly. The bedding (average 25mm) shall then be laid evenly over the surface in CM 1:3 in the desired slope as mentioned in the drawing. The bedding shall be tamped and corrected to the desired level with wooden patti. The bedding shall be allowed to harden enough to offer a rigid cushion to the tile pieces and to enable the mason to place wooden planks across and squat on it.

5) The broken china pieces are laid manually as close as possible over the specified bedding (before it sets/ gets hard), which shall be laid to the required slope and gradient.

6) While laying the broken glazed tiles, neat cement paste shall be applied over the bedding.

7)After china mosaic is arranged, the entire surface shall be tampered by wooden piece with a wooden mallet so that tile pieces are properly embedded and leveled in the mortar and slurry starts oozing from the joints.

8) Vata shall be done along with the floor, keeping machine cut edges at the top end of the vata.

9) At the end of day's work, the entire work shall be cleaned with the minimum quantity of water and moped with cotton cloth.

10) The joints shall be grouted firmly with white cement paste with the help of steel trowel.

11) The entire work shall be cured for 7 days by ponding.

12) After curing period is over, china mosaic shall be cleaned with water & rubbing by plastic brush to remove the dirt, excess cement etc.

13) The surface shall then be cleaned with water and very-very mild oxalic acid.

Mode of measurement and payment:
The rate shall be for a unit of one sqm and shall be measured wall to wall in plan. No extra measurement shall be given for rounding off up to 30cm.

Materials:
Cinder shall be of the best quality and shall conform to latest relevant IS specifications. The material specification shall be as per M9.

The rate shall be for a unit of one cum.

Materials:
Water shall conform to M-1, Cement shall conform to M-3, Sand shall conform to M-6, Stone grit shall conform to M-8, Brickbats shall conform to M-14, and Cement mortar shall conform to M-11. Approved polymer based waterproofing compound shall be added in cement mortar as per manufacturer's specification.

Workmanship:

Unless otherwise specified, proprietary waterproofing treatment shall be executed through an approved specialized waterproofing agency. The contractor shall furnish a guarantee of 10 years on stamp paper to the employer directly and the tender rate shall be inclusive of the same. A guaranteed bond on appropriate stamp paper shall be given by the contractor to the client in the manner prescribed below:

Providing and laying integral cement based waterproofing treatment of the agency approved by department, including preparation of surface as required for treatment of roofs, terraces etc mixing with waterproofing compound as per IS:2645, with average thickness of 115mm and minimum thickness at drain point as 65 mm. Following works are included in above item

F) Applying and grouting a slurry coat of neat cement using 2.75 kg/sqm. of cement admixed with proprietary water proofing compound over the RCC slab including cleaning the surface before treatment.

G) Laying cement concrete using broken bricks/brick bats 25 mm to 100 mm size with 50% of cement mortar 1:4 (1 cement : 4 coarse sand) using Ready mix mortar admixed with proprietary water proofing compound over 20 mm thick layer of cement mortar of mix 1:4 (1 cement : 4 coarse sand) using Ready mix mortar admixed with proprietary water proofing compound to required slope and treating similarly the adjoining walls up to 300 mm height including rounding of junctions of walls and slabs.

H) After two days of proper curing applying a second coat of cement slurry admixed with proprietary waterproofing compound.

I) Finishing the surfaces with 20 mm thick jointless cement mortar of mix 1:4 (1 cement : 4 coarse sand) using Ready mix mortar admixed with proprietary water proofing compound and finally finishing the surface to receive the China Mosaic waterproofing treatment.

J) The whole terrace so finished shall be flooded with water for a minimum period of two weeks for curing and for final test. All above operations to be done in order and as directed and specified by the Engineer in Charge.

Providing and applying single component, solvent based liquid applied elastomeric seamless bitumen / tar free high solids polyurethane Membrane, of approved brand with necessary guaranttee bonds for 10 years, by roller / squeegee with a total consumption of

2.3 kg /m2 to form a total system DFT of 1.5 mm thickness (Conforming to ASTM C 836). The membrane shall be applied on horizontal surfaces and on verticals up to 300mm height above the FFL, self-curing for 4 days, including application of one coat of single component polyurethane primer approved brand @ 0.20-0.25 lit/ m2 including cleaning and making necessary surface preparation to remove any dust and laitance etc., chasing open the construction joints, cracks and sealing the same to form a U shaped groove of approx. 5 mm width and 8 mm depth, using Epoxy mortar of approved make, carrying out injection grouting at the construction joints, honeycombs, etc, by injecting cement slurry grout admixed with expandable grout additive @ 330 gms per 50 kg bag of cement to full saturation wherever necessary, making wall and floor junction detailing with PU flashing reinforced with 40 gsm polyester scrim embedded between the two coats of polyurethane membrane, etc, complete.
The Polyurethane membrane shall have following minimum properties:
1. Solids > 85%,
2. Elongation > 600% as per ASTM D412,
3. Shore A Hardness > 40 as per ASTM D2240,
4. Crack bridging upto 3 mm as per ASTM C836,
5. Adhesion to primed concrete > 2 Mpa as per ASTM D 4541,
6. Tensile strength > 2 Mpa as per ASTM D412,
7. Hydrostatic head resistance NIL upto 50 M as per BS EN 12390-8 / DIN 1048 standard

WET Areas - Sunk Slab, Bathroom, Kitchen, Podium, Terrace, OHT & UGT Water Proofing

(Cleaning and Preparation of surface with help of wire brush or grinder, wash the slab with clean water. Remove all loose concrete, grease, oil using wire brush and scrubber. Repair and fill all cracks, joints and annular space is included)

Supply and application of 2mm thick with a covergae of 3.2kg/sqm in 2 coats two-component, high flexible, elastic cementitious mortar made from cementitious binders, fine-grained selected aggregates, special admixtures and synthetic polymers in water dispersion with an elongation of 120% (DIN 53504), Static crack bridging ability of >2.5mm (EN 1062-7), Permeability to water vapour sD = 3.6 m, μ = 1800 (EN ISO 7783-1), Impermeability to water < 0.05kg/m²·h0.5 (EN 1062-3), Permeability to CO_2 sDCO2 >50m (EN 1062-6), Reaction to fire (Euroclass): E (EN 13501-1), adhesion to concrete after 28 days: 1.3N/mm² (EN 1542) when applied @ 2mm thickness (in 2 coats) on the surface prepared for waterproofing to be carried out to ensure the mechanical properties of the product with Mapenet 150. The application of the product shall be carried out after the thorough preparation of the surface which includes cleaning, crack treatment, corner joint treatment, grouting and priming primer having Colour: opalescent Speci c gravity (kg/l): 1.01 Dry solids content (%): 15 Brook field Viscosity # 1, rpm 10 (mPa·s): 20 in dilution with water {1:1}.

Addionally apply fiber net for reinforcing the waterproofing membrane and with Mapenet 150 tensile strength should be complied minimum 3.2 MPa after curing.

1. Tensile Strength : 3.2 Mpa

2. Crack Bridging: 2.8 mm

Providing and laying at all levels, floors & location an elastic (300%), pasty, solvent-free and UV resistant synthetic Waterproofing system with excellent bonding to the substrate manufactured by approved manufacturer, the waterproofing system is brush applied in

two coats, reinforced with Glass Fiber Mesh between each coat, which forms a highly flexible, water-tight and water permeable coating. including treating the joints such as construction joint and separation joint with High Strength Polymer Modified Mortar, cleaning etc to ensure an un-interrupted and even coating of waterproofing application, testing the water tightness by ponding water for 7 days etc complete all as per specifications and as directed by the Engineer-In-Charge. Note: No extra payment shall be made for arrangement of water for carrying out necessary water tightness test.

Water Proofing (Retaining wall)

(Cleaning and Preparation of surface with help of wire brush or grinder, wash the slab with clean water. Remove all loose concrete, grease, oil using wire brush and scrubber. Repair and fill all cracks, joints and annular space is included)

Supplying and installing of 1.2 mm thick polyurethane single-component with coverage of 1.8kg/sqm having solid content > 87%, VOC: 190g/L: Tensile Strength > 12 Mpa, Elongation: 550%; Tear Strength; >40 N/mm; Flexibility at Low Temperature: -35°C, No crack; Water Impermeability (0.3MPa,120min) - Water Impermeability; Adhesion Strength Hardness : ≥ 2.8.0MPa, The cleaning and preparation of the substrate to which the pure polyurea is applied must be carried out thoroughly to leave a sound base for the application. Concrete and other cementitious substrates must have a minimum pull off strength of 2 N/mm2. Any laitance present on the surface must be removed mechanically. Release oil and other contaminants which may impair adhesion must be removed prior to the application of the primer, the system shall consist of filler epoxy based primer consumption of 350 grams with quartz sand broadcast for mechanical grip having density 1500 kg/m3, viscosity - 1100 MPa·s):,Covering this with a dimple board of around 8mm with closed cell.

Refer Specification from CPWD Specification Vol 1 & Vol 2.

FORM OF GUARANTEE BOND

"I/We .....(Contractor) hereby guarantee that work will remain unaffected and will not be inany way damaged by water or any other form of humid condition, for a period of 10 years after completion of the work of waterproofing as per the terms and conditions of the contract and the Contractor hereby indemnifies and agrees to save the Client from any loss and or damage that might be caused on account of water and or other similar form of humid conditions and hereby guarantees to make good any loss or damage suffered by the Client and further guarantees to redo the affected work without claiming any extra cost."

19. This guarantee shall remain in force for a period of 10 years from the completion of the work under the contract and it shall remain binding to the Contractor for period of 10 years.

20. While tendering the contractors should clearly stipulate the type of treatment proposed to be provided by them and the name and particulars of firm through whom they propose to carry out the treatment.

21. The surface shall be cleaned of foreign matter such as fungus, moss, dirt and dust by wire brushing and dusting. Any cracks which may allow leakage of water shall be identified by ponding before starting the treatment. The slab surface shall be washed with water and cement slurry with waterproofing compound @ 2.75kg / m^2.

22. Cement mortar 1:3 shall be laid on the slab with waterproofing compound. The dosage of the waterproofing compound shall be as per the manufacturer's specification.

23. The surface to be treated shall have a minimum slope of 1 in 120.The brickbats of varying size as per requirement shall be arranged in proper gradient using cement mortar 1:3 according to the desired slope. Suitable waterproofing chemical shall be added to make the CM water tight and then cement mortar 1:3 shall again be provided on top of the brickbats, including the waterproofing compound which shall be added in the CM and finishing on top with neat cement @ 2.75kg/m^2. The top surface shall be finished rough surface as per the direction so as to receive the next finishing item.

24. The testing shall be done by ponding for at least 48 hours.

25. Well defined cracks other than hair cracks in the treated structure shall be cut to `V' section cleaned and then filled up flush with 1:1 cement sand mortar with polymer based waterproofing compound.

26. The surface under treatment, part of parapet (in case of balcony or terrace) and gutters, drain mouths etc. over which the water proofing treatment is to be applied, shall be cleaned of all foreign matter such as fungus, moss and dust by wire brushing and dusting.

27. Drain outlet shall be suitably placed with respect to the surface gradient to ensure rapid drainage and prevention of local accumulation of water on the treated surface. Masonry drain mouth shall be widened sufficiently and rounded with cement mortar.

28. For cast iron drain outlets, a groove shall be cut all around to touch the treatment.

29. When a pipe passes through a roof on which water proofing treatment is to be laid, a cement concrete angle fillet shall be built round it and the water proofing treatment shall be taken over the fillet.

30. In case of masonry parapet wall over 450mm in height, for tucking in the water proofing treatment, a horizontal groove 75mm wide and 65mm deep at minimum height of 300mm above terrace level shall be left in the vertical face at the time of construction, the horizontal face of the groove shall be shaped with cement mortar 1:4.

31. In case of low parapet where the height does not exceed 450mm, no groove shall be provided and the waterproofing treatment shall be carried right over the top.

32. In case of existing R.C.C. and stone wall cutting the chase for tucking in the water proofing treatment is not recommended.

33. At the junction between the terrace slab and vertical face of the parapet wall, a fillet 75-100mm in radius shall be constructed.

34. At the drain mouths the fillet shall be suitably cut back and rounded off for each application of waterproofing treatment for easy flow of water.

35. Outlet at every low dividing wall about less than 300mm in height shall be rounded smooth and corners rounded off for easy application of water proofing treatment.

36. The top surface shall be kept wired finish to receive the china mosaic. In case china mosaic is not to be provided, the surface shall be kept cement finished @ 2.75kg / m^2 and marked with 300 x 300mm false square (with string).

Mode of Measurements and Payment:

6. The rate shall include providing water proof cement concrete terracing of adequate thickness to give desired slope for drainage of rain water from terraces.

7. The measurements for this item shall be taken as under:

   a. Water proofing of roof shall be measured in m^2, plan area of treated surface shall be measured correct to a centimeter.

   b. Measurement shall be taken for the plan area of roofing / terrace. Flashing treatment including flashing over the parapet wall up to 300mm from terrace. Low dividing walls and expansion joints and at the pipe projections etc. Overlapping and tucking into flashing grooves shall not be measured extra and paid for.

   c. In measurements, no deduction shall be made for either openings or recess for chimney stacks, roof lights etc. having areas up to 0.4m^2 Deduction shall be made in measurements for full opening but nothing extra shall be paid for extra labour and materials in forming such openings.

8. The rate includes cost of all materials and labour required to carry the works as per the above specifications. The rate also includes cleaning and hacking the RCC parapet and inverted beam surface and treating the cracks shall not be paid separately. Cutting of horizontal grooves in parapet walls for tucking in water proofing treatment shall not be measured or paid separately.

9. Measurements shall be based on the drawings or as executed on site, the lesser of the two shall be given. No extra payment shall be made for rounding and vata at the junction of slab & parapet. A deposit at the rate of 50% of the cost of this item from the running and final bills shall be recovered and retained for the first one year after completion of the work and 10% of the same or equivalent bank guarantee shall be retained for the balance of the guarantee period and shall be refunded only after the completion of the guarantee period.

10. This item shall be measured and paid for in m^2

Item No: -36

Providing & laying machine cut & Leather finish 30 mm thick Granite Stone of Steel Grey / Sadarhalli / Brown or other approved colour at all floor & location in necessary cement mortar bedding /backing, close jointed & grouted with matching cement slurry

and rounding of edges, finished to line, level,curing etc. as required, including cutting of stone slab, wastage, making cut outs, grooves wherever required, machine polishing/ hand polishing (where machine cannot have access) etc. complete all as per specifications, drawings and as directed by the Engineer in charge. Note: Top exposed surface on plan &exposed vertical finished face shall be measured for payment in Sqm.

In flooring with Leather finished Granite stone of size 800mm x 800mm/ 1000mm x 1000mm / (and any other size and pattern as per drawing) laid over & including 20mm thick cement mortar1:4 (1 cement : 4 coarse sand) bedding. including cement slirry at 4.40 Kg/Sqm over bedding and matching slurry with white cement at 2.20 Kg/Sqm for grouting the joints..

Providing & laying machine cut & Leather Finish 18mm - 20mm thick Granite Stone of Steel Grey /Sadarhalli / Z Brown / Brown or other approved colour at all floor & location in necessary cement mortar bedding /backing, close jointed & grouted with matching cement slurry and rounding of edges, finished to line, level,curing etc. as required, including cutting of stone slab, wastage, making cut outs, grooves wherever required, machine polishing/ hand polishing (where machine cannot have access) etc. complete all as per specifications, drawings and as directed by the Engineer in charge. Note: Top exposed surface on plan &exposed vertical finished face shall be measured for payment in Sqm.

In flooring with machine Leather Finish Granite stone of size 800mm x 800mm/ 1000mm x 1000mm / (and any other size and pattern as per drawing) laid over & including 20mm thick cement mortar1:4 (1 cement : 4 coarse sand) bedding. (Using ready mix mortar) including cement slirry at 4.40 Kg/Sqm over bedding and matching slurry with white cement at 2.20 Kg/Sqm for grouting the joints.

Providing and laying Riverwash finish Dark grey / Steel Grey /Adhunik/ Any other approved color Granite stone flooring / Coping in required size, design and patterns, in linear as well as curvilinear portions all complete as per the architectural drawings with 30 mm thick stone slab over 20 mm (average) thick base of cement mortar 1:4 (1 cement : 4 Coarse sand), portions butt jointed or with 5-8 mm gap as per design and drawing in 1:2 (cement : fine sand) and pointing full depth (flushed) or struck pointed as per design and drawing with white cement slurry admixed with pigment of matching shade including rubbing, pointing, curing, polishing, moulding/ champhering at edges and final scrubbing using mechanical/ manual means to achieve clean surface etc. all complete as specified and as directed by the Engineer-in-Charge. Including Minimum 2 mockups for approval, complete for finished item of work. Wax polishing is strictly not allowed.

18 mm thick one side Leather finished granite stone of approved colour, shade and surface finish for dado/skirting/Tread/Riser stone slabs of various sizes in pattern including 12 mm thick 1:4 cement mortar (Using ready mix mortar) backing.

Providing & laying machine cut & machine polished (mirror finish) 25mm thick Granite Stone of Steel Grey /Sadarhalli / Z Brown / Brown or other approved colour at all floor & location in necessary cement mortar bedding /backing, close jointed & grouted with matching cement slurry and rounding of edges, finished to line,

level,curing etc. as required, including cutting of stone slab, wastage, making cut outs, grooves wherever required, machine polishing/ hand polishing (where machine cannot have access) etc. complete all as per specifications, drawings and as directed by the Engineer in charge. Note: Top exposed surface on plan &exposed vertical finished face shall be measured for payment in Sqm.

18mm thick one side machine polished granite stone of approved colour, shade and surface finish for door and window jamb /Facia/Top Ledge /Window sill with stone slabs of various sizes in pattern including 12 mm thick 1:4 cement mortar (Using ready mix mortar) backing, fixing of 6mm (approx.) size angular stone chips to the backside of granite after applying araldite to the unpolished surface of the granite to create a surface suitable for proper bond with backing and filling the space between granite and backing with cement slurry including adequate curing etc. complete as directed and including rounding & polishing all exposed edges in semicircle / chamfering / or as per drawing & as ditected.

For top of dwarf walls, parapets, seat wall, planter wall etc using machine polished Granite stone of approved colour, shade & size as per drawing laid over & including 20mm thick cement mortar1:4 (1 cement : 4 coarse sand) bedding. (Using ready mix mortar) including cement slirry at 4.40 Kg/Sqm over bedding and matching slurry with white cement at 2.20 Kg/Sqm for grouting the joints. including half round / semi circle / camfering moulding & polishing of exposed face etc complete.

Providing & laying machine cut machine polished natural stones as mentioned for the followings for kitchen / Basin platform topping, counter topping and facia over and including necessary cement mortar for backing / bedding, close jointed and grouted with matching cement slurry and finished to line, slope, level, plumb, curing etc, as required including cutting of stone slabs, wastages, making cut outs wherever required etc all as per specifications and as directed by the Engineer in charge. Notes : 1) Verticals, shelves, platform shall be embedded minimum 25 mm in wall/ flooring. 2) Top exposed surface on plan & exposed vertical finished face shall be measured for payment in sqm.

For kitchen / Basin platform top, Vertical support for Counter, upto 750 mm wide and maximum length upto 1.80 m in single piece consisting machine cut machine polished 35 mm thick cuddappah stone at bottom and mirror polished machine cut 18mm thick Jet black/ approved Granite stone at top fixed with 47 mm thick 1:3 cement mortar (Using ready mix mortar), between two stone slabs (Double stone slab sandwitch type) including providing cut out if any, moulding and polishing the edges etc complete.

For kitchen platform horizontal & vertical facia upto100 mm wide machine cut machine polished on one side 18 mm thick Jet black/ approved Granite stone fixed with epoxy resin base (Araldite adhesive or equivalent) including round moulding and polishing the edges etc complete.

Refer Specification from CPWD Specification Vol 1 & Vol 2.

Item No:-37

Providing and fixing cobble stone of size 100 x 100 x 100 mm thick, in approved pattern and approved colour & shade, including providing & laying 20 mm thick bedding of cement mortar (using ready mix mortar having cement: sand, 1:4) finishing to line, level and slope, finally filling the joints with matching cement mortar and cleaning the surface etc. complete all as per specification and as directed by the Engineer- in- Charge.

Measurement & Rates

- Area provided with cobble to be measured in sqm. correct up to two places of decimal. The rate include the cost of the material, labour, tools etc. required in all the operations described above.
- Mode of measurement shall be in sqm.
- Refer Specification from CPWD Specification Vol 1 & Vol 2.

Item No: -38

Providing and laying C.C. pavement of mix M-25 with batch mixed concrete from batching plant. The concrete shall be casted in panel and finished with screed board vibrator, vacuum dewatering (VDF) process and finally finished by floating, brooming with machine. Grooves to be made of size 5mm wide and one third of thickness of concrete within 48 Hours of concreting to form bay of 4 x 4 meters using heavy duty cutting machine with diamond cutting wheel and filling of the groove with appropriate sealant etc. complete as per specifications and as directed by the EIC. If trimix concrete shall be laid over on existing concrete surface, bonding agent shall be applied before laying of concrete at all basements floors. Reinforcement if required shall be paid in relevant tender item.

1. Material and Workmanship:

1.1. General

1.1.1. The Contractor shall improve the quality of all concrete floor slabs by placing the concrete according to the Trimix system as indicated on the drawings and as specified herein.

1.2. Technical Assistance/Training of Labour

1.2.1. During the placement of concrete, the Contractor shall have a minimum of one person present at all times who has been adequately trained by a representative of the equipment manufacturer. This person shall be experienced in the vacuum dewatering process, and in the operation of all related equipment and shall direct all concrete dewatering work performed. The Contractor shall provide the services of a representative from the manufacturer of the vacuum dewatering equipment on site for a period of time of at least eight (8) hours. The manufacturer's representative shall prove technical assistance for the vacuum dewatering process on the initial day of operation.

1.3. Equipment for compacting, placing, vacuum processing and finishing of slab

1.3.1. All process equipment to be used shall be of a design representative of the state of the art and shall be subject to the approved of the engineer. Equipment shall be Trimix or approved equal. The system shall have a demonstrated five-year history of performing

such work. The vacuum pumps shall be able to generate a minimum vacuum of 609mm (24 inches) of mercury (0.80 atmospheres) in actual operation using the maximum number and size of suction mats required for this work. The Contractor shall have at the job site sufficient equipment (vacuum pumps, mats, fitter pads and accessories) to ensure that the vacuum dewatering process continues uninterrupted to completion. Stand by equipment is sometimes required.

1.4. Mix Design

1.4.1. The Contractor is responsible for the mix designs of the class as called for on the drawings and must submit the mix proposed for use in the contract before any work is started. All mix parameters must conform to the values specified in Trimix recommendations and design mix report. The Contractors shall utilize a knowledgeable and experienced concrete technician for the design and production of mix (mixes) meeting all the requirements of the specifications. Do not deliver any concrete to the construction site until all the approvals have been obtained.

1.5. Quality Control

1.5.1. The Contractor has the responsibility for achieving the quality of concrete specified by controlling the concrete mixes, placing, vacuum process finishing and curing. The concrete technician in charge must be present at the site when work is in progress.

1.5.2. The Contractor shall be responsible for mix adjustments, performing necessary tests, correcting deficiencies and trouble shooting in general.

1.5.3. The Contractor shall be required to maintain control charts showing individual test results for aggregate gradation, slump, air content, cement content and compressive strength.

1.6. Planning of Placing

1.6.1. The Contractors shall submit for review shop drawings for floor slabs detailing the location of all construction joints and the sequence of the slab placement and manufacturer's literature describing the equipment to be used. In addition to the shop drawings, the Contractor shall indicate the quantity of each piece of dewatering equipment that will be located at the construction site and shall include the dimensions of all suction mats. Before concreting is started the work should be planned with a view to determine areas to be placed daily, the required amount of equipment, size of vacuum mats, length of vacuum hoses, arrangement of rails, if any, or screeds etc. Crew required for the vacuum process is two men to handle the mats and the pump. Note that placing, vibration, vacuum treatment and floating follow immediately behind each other. Check position of vacuum pump in relation to vacuum mat location to find whether extra vacuum hoses are required or not.

1.7. Concrete Materials

1.7.1. Note: All concrete mix designs shall meet the requirements of this section and section TRIMIX concrete mix design recommendations.

1.8. Cement

1.8.1. Portland cement of normal grinding fineness, which corresponds to a specific surface of 2600-3500cm2 /g, is required. Cement of higher grinding fineness, e.g. rapid-hardened

Portland cement of larger specific surfaces shall be avoided especially in concrete mixes with a cement content 590 LB/sq.yd. Recommended content is 421 to 590 LB/sq.yd.

1.9. Equipment Specification Trimix System

- Poker vibrator with high frequency preferably 335 hz. (20000 vibr./min) dia. 1 to 1 1/2".
- Surface vibrators type double beam with beam spacing 12".
- Preferably one-piece beam in full length exceeding bay width 8" to 24". Beam should easily be adjusted to absolute straightness and controlled every morning before placing of concrete starts.
- Suction mat type RM 60. 100% tight plastic material weight 650 gram/m2 . Width same as bay size and length 20' for capacity and flexibility.
- Filter Pad type RD 12 weight 600 g/m2 , width 4' length-bay width-minus 8".
- Vacuum Pump P 4001 8 with 10 HP engine and specially designed pump unit with heavy duty chrome housing and sealing. Adjustable vacuum by valve on top of tank for ease of operation with different mix designs.
- Skim floater type G 900/G 700 with disc which allows direct floating of dewatered concrete. Weight maximum 90kg (200 pounds) for 40"(W.disc.) Finishing is done with G 900, using blades only and is normally done with 30minutes intervals between passes.
- The above equipment specified should be used for the production of quality concrete floors according to the Trimix System. Inter-changeability of equipment is not recommended.

2. Execution Trimix System

2.1. General

2.1.1. The work shall be planned and executed so that there is no delay between the placement, screeding, dewatering and floating of the concrete. Concrete to be vacuum dewatered shall be handled and placed so as to prevent segregation. The concrete shall be internally vibrated prior to screeding.

2.2. Levelling

2.2.1. Immediately following placement, the concrete shall be levelled with a vibrating screeding running on a true surface, set at the proper elevation required to provide the specified finished elevation. The concrete surface shall be screeded high by 2% of the slab's thickness to compensation for the compaction caused by the vacuum dewatering process. (Slabs to have an aggregate hardener shall have compensation made to maintain elevation). The vibrating screed shall be moved forward as rapidly as proper consolidation allows. The proper surcharge of concrete must be maintained in front of the leading edge of the screed.

2.3. Vacuum

2.3.1. Immediately after levelling, the concrete shall be covered with filter pads and suction mats in strict accordance with the recommendation of the manufacturer to have the slab

fully dewatered. The suction mat shall extend 4inches beyond the edge of the filter pad on all sides. The pads shall extend to within 4" of the edge of concrete slab, and the mats shall cover entire slab. Before connecting the hose on the suction mat to the vacuum pump, the edges of the mat shall be smoothed to enable an airtight seal to be created. A vacuum shall then be applied to the mat. After a minute the gauge on the vacuum pump should indicate a minimum vacuum of 0.70atmospheres (24.0 in. Hg) and if not, the mat must be checked for leakage. For concrete that dewaters readily the vacuum should then be maintained a wt. 0.70-0.80 atmospheres (24.0-25.5 in. Hg.) For concrete which dewaters less efficiently (e.g. air-entrained concrete) the vacuum shall then be reduced to 0.50-0.60atmospheres (15.0-18.0 in. Hg). After approximately 10 minutes the vacuum can then be increased to 0.80 atmospheres.

2.3.2. The vacuum shall be maintained for at least 3 minutes per inch of concrete thickness at 0.80 atmospheres. (Where aggregate hardeners are specified, sufficient moisture shall be maintained to meet manufacturer's requirements). The suction mats and filter pads shall then be removed and moved to the next section in leapfrog manner.

2.3.3. Stop the vacuum dewatering when light footprints only are left in the concrete when stepped upon. A suitable suction time can also be checked with a Proctor-apparatus, which should show 1.5-2 kp/cm2 .

2.4. Floating

2.4.1. Upon removal of the suction mats and filter pads the concrete surface shall be power-floated without delay until all imprints from the vacuum process are removed. If crusting occurs, the floating operation must be delayed till the concrete carries the machine.

2.4.2. The higher speed is recommended for the floating operation. Two passes with the floating disc should be made in the junction of two mats in order to avoid risk for cracking.

2.5. Finishing

2.5.1. The waiting time after the floating operation depends on concrete temperature and humidity and varies from 10minutes to 2 hours.

2.5.2. The troweling operation cannot take place before the concrete has hardened enough to carry the machine, i.e. the troweling blades will not leave any marks on the concrete. Repeated troweling. With intervals between the passes, which are adapted to the setting of the concrete, greatly improves the surface characteristics. The surface will be more wear resistant and less dusty.

2.5.3. At least two passes are recommended for floors, which are not to be covered.

2.6. Curing

2.6.1. Vacuum dewatered concrete should be cured like any other quality concrete in order to achieve a good final result with ponding.

2.7. Mode of measurement:

2.7.1. The item shall be measured and paid in sqm excluding cost of concrete & steel. The cost of steel & concrete shall be measured & paid separately under relevant items. Rate of

shuttering with MS channels & cutting of grooves filling Polysulphide Sealant is inclusive. The cost of Joint filler shall include in the rate.

Item No:- 39

Providing & laying at all floors & locations Homogeneous Full body Vitrified tile/ Glazed vitrified tile/ Anti Skid Vitrified tile double charge/ multi charge (Glossy /Matt/ Satin)/ approved manufacturers of sizes 600 mm X 600mm / 800mm X 800mm / 1000 mm X 1000 mm size or as per approved size and having minimum thickness 8.5 mm or as specified by approved manufacturer tiles conforming to IS:15622 having water absorption less than or equal to 0.08% (Group B I a), in flooring/ skirting/ dado/ cladding / staircase tread/ riser at all floors and location, heights/ levels and lead in approved pattern and colour, shade laid over cement mortar bedding/ backing/ adhesive backing, including cleaning and preparing the surface for bedding/backing, spreading the neat cement slurry, close jointed and grouted with matching coloured readymade cement grout and approved pigment as per manufacturer's specifications, finished to level, line, slope and plumb, cutting of tiles, wastage, making openings / cut out if necessary, final cleaning of surfaces, curing etc. all as per drawings, specifications & as directed by Engineer in charge.

In flooring using Anti Skid Finish tiles of size 600 mm X 600 mm laid over 20 mm thick cement mortar1:4 bedding (using ready mix mortar) and spreading neat cement slurry by using minimum cement about 2 kg/sqm prior to bedding and spreading cement paste using minimum cement of about 4.50 kg/sqm over bedding,, and including Providing and laying Durafloor protector XF 3 mm thick sheet of approved make and brand over the whole vitrified tile / stone flooring area along with removing and cleaning the same before handing over without damaging the finished surface & making good the damages, if any etc and including Providing in flooring & skirting 3 mm thick and 8.5 mm deep grout line using PVC spacers for creating true alignment and gap between vitrified tile work, if shown in the drawing & the 3 mm spacer joints filled with approved cement based tile grout including all labour material, wastage complete.

In dodo / skirting / cladding / sloped skirting laid over 12 mm thick CM 1:4 (1 cement : 4 sand, using ready mix mortar) backing, including providing grooves as per drawing on top of skirting. (Using Antiskid vitrified tiles or Double charge vitrified tiles)

4. Materials:

Water shall conform to M-1, Cement mortar shall conform to M-11. Vitrified floor tiles shall confirm to M-41 from the list of approved make and of first quality.

5. Workmanship:

5.1. Bedding:

5.1.1. The sub-grade shall be cleaned, wetted and mopped. The bedding shall then be laid evenly over the surface, as described above, tamped and corrected to desired level and allowed to

harden enough to offer a rigid cushion to tiles and to enable the mason to place wooden planks across and squat on it.

5.1.2. The white/coloured vitrified/ceramic tiles shall then be laid on the cement mortar bedding of an average 30-35mm thickness, in CM 1:4. The mortar shall have sufficient plasticity for laying and there shall be no hard lumps that would interfere with the evenness of the bedding. The base shall be cleaned and well wetted, before laying. The mortar shall then be spread in thickness not less than 18mm at any place and average 30-35 mm. thick. The proportion of the cement mortar shall be as specified in the item.

5.2. Fixing tiles:

5.2.1. The tiles before laying shall be soaked in water for at least two hours. Neat grey cement grout at 3.3 Kg cement/m^2 of honey-like consistency shall be spread over the mortar bedding as directed. The edges of the tiles shall be smeared with neat cement slurry. The tiles shall then be well pressed and gently tapped with a wooden mallet till they are properly bedded and in level with the adjoining tiles. There shall be no hollows in bed or joints. The joints between the tiles shall be as thin as possible in straight line or as per pattern.

5.2.2. The tiles shall not have staggered joints. The Nahni trap coming in the flooring shall be so positioned that its grating shall replace only one tile as far as possible. Where full size tiles cannot be fixed, they shall be cut (Sawn) to the required size and the edges rubbed smooth to ensure straight and true joints. The outlets for drainage shall be marked as per drawing and tile fixing shall be carried out accordingly after laying and testing the drainage lines. After the tiles are laid, the joints shall be cleaned of grey cement grout with a wire brush to a depth of about 5mm and then grouted with white cement / polymer-based grouting of approved make like BAL with or without pigment to match the shade of the topping of tiles. The same cement slurry shall then be spread over the whole surface in a thin coat to protect the surface from abrasive damage and to fill up pinholes that may exist on the surface. White cement with or without matching pigment shall be used for pointing the joints. After fixing the tile finally in an even plane the flooring shall be kept wet and allowed to cure undisturbed for 7 days.

5.2.3. While laying, any chiseling which may be required for making the skirting or dado flush with the plaster and / or other finishes shall be done. Necessary grooves of required size in cm, between plaster and / or other finishes, dado or skirting (if required) shall be provided. Forming machine-cut / rounded edges, gutters, sills, platforms, channels, curbing, etc. if any, if required shall be provided as per the drawing and design.

5.2.4. All necessary slopes, gradients and levels shall be truly maintained as required and directed by the Architect and Engineer-in-charge.

5.3. Cleaning:

5.3.1. The surplus cement grout that may have come out of the joints shall be cleared off before it sets. Once the floor has set, it shall be carefully washed and cleaned by oxalic acid and dried. Proper precautions and measures shall be taken to ensure that the tiles are not damaged in any way till the completion of the construction.

5.3.2. If any tile is disturbed or damaged it shall be refitted or replaced, properly jointed and polished.

6. Mode of Measurements and Payment:

6.1. The work done shall be measured in m^2 for the visible area of work done in floor. The length and width of the flooring shall be measured between the faces of skirting or dados or plastered face of walls as the case may be. The paving under dado or skirting shall not be measured. No deduction shall be made or extra paid for any opening in the floor of area up to $0.1m^2$ nothing extra shall be paid for laying the floors at different levels in the same room. The dado will be measured from the finish floor level to the top of tile fixed.

6.2. The rate shall include the cost of all materials (inclusive of all taxes, levies, and delivery at site), labour & sundry involved in all the operations, curing etc. complete, at all floors, at any height and level, as described above. It shall also include for breakage and wastage. Floating materials and margin of profit shall also be included. All material samples shall be approved by the Architect/Engineer-in-charge before placing orders.

6.3. No extra shall be paid for any small quantities like narrow widths, mitered& returned ends, rounds & cutting, fixing and making good up to & around pipes, fittings and fixtures etc.

6.4. The rate shall include for fixing the flooring in composite pattern as per the drawings, using different materials and sizes. The measurements of the different materials shall be taken category-wise separately and paid accordingly.

6.5. The basic rate, if at all provided or agreed upon includes cost of material, all taxes, levies & cost of delivery at site.

6.6. Rate shall be inclusive for the protection of the tiles by laying plastic sheet & Plaster of Paris until the handing over. The plastic sheet & Plaster of Paris shall be removed & flooring shall be cleaned at the time of handing over the sheets.

6.7. The rate shall be for a unit of one m^2.

Item No:- 40

Providing and laying machine cut Leather Finish Kotah stone flooring, skirting, riser, treads at all floors, levels & location including cement mortar (using ready mix mortar) bedding / backing, close jointed & grouted with matching cement slurry and finished to line, level, curing etc. as required, including cutting of stone slab, wastage, making cut outs, wherever required, and including providing and laying 6 mm thick POP during construction period etc. complete all as per specifications, drawings and as directed by the Engineer in charge.

In flooring with 25 mm minimum thickness Leather Finish kotah stone slab of size 600mm x 600mm / 575mm x 575mm / (and any other size and pattern as per

drawing) laid over bedding of 20 mm Ready mix mortar having Cement: Sand (1:4)

For top of dwarf walls, parapets, seat wall, planter wall, Coping etc using Leather Finish Kotah stone of approved colour, shade & size as per drawing laid over & including 20mm thick cement mortar1:4 (1 cement : 4 coarse sand) bedding. (Using ready mix mortar) including cement slurry at 4.40 Kg/Sqm over bedding and matching slurry with white cement at 2.20 Kg/Sqm for grouting the joints. including half round / semi circle / camfering moulding & polishing of exposed face etc complete.

4. Materials:

4.1. Water shall conform to M-1. Lime mortar shall conform to M-10. Cement mortar shall conform to M-11 polished Kota stone shall conform to M-49.

5. Workmanship:

5.1. Each slab shall be cut to the required size and shape and fine chisel dressed at all the edges. The sides thus dressed shall have a full contact if a straight edge is laid along. The sides shall be table rubbed with coarse sand before paving. All angles and edges of the slabs shall be true square and free form chippings and giving plain surface. The thickness shall be 35 mm. (Average) as specified in the item but not less than 30 mm. at any place of the slab.

5.2. Bedding for the kota stone slabs shall be cement mortar 1:6 (1 cement : 6 coarse sand) of average thickness 20 mm. as given in the description of the item. Sub grade shall be cleaned, wetted and mopped. Mortar of the specified mix and thickness shall be then be spread on an area sufficient to receive one kota stone slab. The slab shall be washed clean before laying. It shall be laid on top pressed, tapped gently to bring it in level with the other slabs. It shall be lifted and laid aside. Top surface of the mortar shall then be corrected by adding fresh mortar at hollows or depressions. The mortar shall then be allowed to harden bit. Over this surface, cement slurry of honey like consistency shall be applied. The slab shall then be gently place in position and tapped with wooden mallet till it is properly pedded in level with and close to the adjoining slab. The joint shall be as fine as possible. The slabs fixed in the floor adjoining the wall shall enter not less then 10 mm. under the plaster skirting or dado. The junction between the wall floor shall be finished neatly. The finished surface shall be true to levels and slopes as directed.

5.3. The floor shall be kept wet for a minimum period of 7 days. So that bedding and joints set properly.

5.4. Polishing shall normally commenced after 14 days of laying the stone slab. First polishing shall be done with ear borundum stones of 120 grade grit fitted in the heavy machine and then second polishing shall be done with carborundum stone of 220 of 350 grade grit fitted in heavy machine. Water shall be properly used during polishing. The stone shall then be washed clean with water. When directed by the Engineer-in-charge wax polish of approved quality shall be applied on the surface with the help of soft cloth over a clean and dry surface. Then the polish machine fitted with bobs shall be run over it.

5.5. The holes required for Nahni traps, pipes any other fittings shall be made without any extra cost.

6. Mode of measurements & payment:

6.1. The rate shall include the cost of all materials and labour involved in all the operations described above. The Kota stone flooring shall be measured in square metres correct to two places of decimal, length and breadth shall be measured correct to a centimeter and between the finished face of skirting dado or wall plaster and no deduction shall be made nor extra paid for any opening in floor of area upto 0.1 sq. mt.

6.2. The rate shall be for a unit of one sq. meter.

Item No:- 41

Providing and fixing Pre cast Kerb blocks of various types (Half Batter, Bull nose, Flat, offlet, Transition, Dropper, etc,.) and size of 600x450x150mm steel mould Vacuum wet pressed for connecting roads, pathway-prominade area and other area with true line & level, including grading, geometrical shapes in curves, circles etc. at respective finish level etc. completed as specified in drawing and specification. It shall be of CC- M25 grade of concrete and fitted and jointed in C:M 1:1 with throughly curing, rendering with cement slurry, cleaning the joints neatly etc. completed as directed by EIC. It allows to satisfy respective IS-codes for materials, manufacturing process and test results.

NOTE : Contractor shall provide integrated shop drawings which include all necessary details with dimensions as provided drawings by Architect along with submission of satisfactory documents for all material, proportions, methods/ workmanship, preparations, joining and fixing, management schedule to execute the same with Preceding and succeeding activities, site visits, factory visits (if any) etc. completed as per relevant IS codes with detailed specifications in Stipulated time to furnish the job for approval purpose before starting of the work. It allows one finished mock-up (free of cost) till the level of satisfaction as per EIC. All detailed specifications shall be followed by CPWD/ R&B (Govt. of Gujarat) for given item descriptions to satisfy designed Structural stability (with test results for all) with desired look & fill for Mock-up and entire product.

Parameters

Sr. No.	Parameters	Minimum Requirements
1	Percentage Water Absorption	Not Over 8%
2	Tolerance in size (Length + Breadth)	±1.5 mm
3	Tolerance in thickness of blocks	±4 mm

The face of the kerb shall not exhibit defects such as cracking or flaking when examined.

For kerb if produced with facing layer, the facing layer shall have a minimum thickness of 4 mm over that area claimed by the manufacturer to be faced. For faces described as flat and edges described as straight, the permissible deviations on flatness and straightness are given in Table.1

Length of Gauge (mm)	Permissible deviation in flatness and Straightness (mm)
300	±1.5
400	±2.0
500	±2.5
800	±4.0

Bending characteristic of kerb as per Table below. Table 2

Characteristics Bending Strength (Mpa)	Minimum Bending Strength (Mpa)
2.5	2.0

General Quality

The quality of materials method and control of manufacture and transportation of all concrete work in respect of mix, were reinforced or otherwise, shall conform to the applicable portions of these specifications.

The Engineer-in-charge shall have the right to inspect the sources of materials, the layout and operation of procurement and storage of materials, the concrete batching and mixing equipment's and the quality control system. Such an inspection shall be arranged by the contractor and the Engineer-in charge's approval shall be obtained prior to starting the concrete work.

Delivery, Storage, and Handling Kerb stone units are to be delivered on site in suitable packaging free from cracks, chippings, or discolorations of the material. Store materials on elevated platforms, under cover, and in a dry location. Do not use materials that have become damp.

Store all accessories, including metal items, to prevent corrosion and accumulation of dirt and oil. Contractor to be responsible for the safekeeping of all materials delivered to site and replacement at own cost as required.

Technical specification of Kerb

Manufacturer: from Suppliers Schedule provided or equivalent approved.
Application: For all typical edges with level drop of 150mm average.
Concrete type: Manufactured by using M-25 or above grade as specified of concrete using vibrocompaction process using jointless moulds.
Size (width x length x height): Refer the Relevant Drawings & Schedule
Special shapes: Refer the Relevant Drawings & Schedule
Finish: Smooth
Plan dimension deviation class: ± 2mm.
Diagonal deviation class: ± 2mm.
Thickness deviation class: ± 2mm.
Colour: Refer the Relevant Drawings & Schedule. Bedding: approved Kerb stone is to be laid onto a concrete base/ footing. The base should typically be as per structure consultant advice. It should be composed of compacted semi-dry concrete. A minimum of one-third of the unit must be fully bedded into the mortar mix. Joints: 5mm wide joint, Mortar colour to match edge Color.

Sealant movement joints: Refer to relevant Indian standards and updated CPWD specification.

400	±2.0
500	±2.5
800	±4.0

Fixing of the kerb and any structural related details to specification.
Contractor to reject any kerb units that do not comply with the above requirements. Engineer-in Charge to reserve the right to reject products that do not comply to specifications.

Flares

The flared sides of kerb ramps provide a graded transition between the ramp and the surrounding sidewalk. Flares are not considered an accessible path of travel because they are generally steeper than the ramp and often feature significant cross-slopes with excessive rate of change of cross-slope. If the landing width is less than 1.220 m, then the slope of the flares at the kerb face should not exceed 8.33 percent. If the landing width is greater than 1.220 m, a 10 percent slope is acceptable. If the kerb ramp is located where a pedestrian might normally walk, flares are useful indicators to people with visual disabilities. Flares may be replaced with returned kerbs if the kerb ramp is located where a pedestrian does not have to walk across the ramp or if the sides are protected by guardrails or handrails.

Laying

The unit must be laid directly onto a suitable pavement surface which should extend to width to fully support the units and any other haunching. The unit are bonded to the surface using a suitable mortar having cement sand ratio 1:1 respectively. Kerbs are generally laid with unfilled, close joints with a minimum joint width of 2 mm, The mortar is freshly mixed, consisting of 1:1cement sand ratio. Where mortar joints are used it should be properly filled and fully compacted. Joints should be extended to through the line of the units at the joint and continue through the kerb race.

Units are set out to line and level using a string line between pegs or steel pins. The line and level of the laid units should then be checked, and any necessary adjustments made. Allowances should be made on curves, as the string line will be made up of series of straight line. Kerbs should normally be laid so that the water check is 25 mm above the surface of the road. At vehicle crossing points kerbs should be 25 mm above final road surface unless otherwise stated or instruction given by the Engineer-In Charge.

At pedestrian crossing points dropped kerbs should be laid 6 mm above the final road surface on the lower side of the road and level with the surface on the higher side to aid drainage or as per provided detailed drawing. For ease of wheelchair use, the upstand should be between 0- and 6-mm or as per instruction given by the Engineer-In-Charge. joints on the dropper units may need adjustment to achieve this. The long kerb should not be cut to less than 300 mm in length, with smaller units not being cut to less than 1/3 of their original length (and a minimum of 50 mm)

Mortar

The mix and type of fine aggregate specified in the description of the item shall be used for the respective coats. Also, same should be applied for the cement. It must be in a proportion of 1:1 (Cement: Sand ratio) having bedding thickness specified in a drawing or instruction given by Engineer-In-Charge. It must be prepared in the presence of Engineer-In-Charge and instructed by the Engineer-In-Charge.

Mode of measurement and payment

The rate shall be for a unit of RMT.

In case of discrepancy Refer specifications from “Central Public Works Department Vol.2” Item no 16.58, Page no 844.

Item No:- 42

Paver Block

Providing and fixing 80 mm thick (min.) factory made paver blocks of specified finish (shot blasted), approved make and colour, shade, size, shape laid in pattern manufactured with cement concrete grade not less than M-40 and conforming to IS:15658, including providing & laying 20 mm thick bedding of cement mortar (using ready mix mortar having cement: sand, 1:4) finishing to line, level and slope, finally filling the joints with matching cement mortar and cleaning the surface etc. complete all as per specification and as directed by the Engineer- in- Charge.

Base

Shot blasted paver block to be fixed on the bed 20 mm or specified otherwise thick 1:4 (Cement: Sand) mortar of approved specification and filling the joints with the sand of approved type and quality or as specified and as directed by Engineer-in-charge.

Shot blasted Paver Block

Factory made precast shot blasted steel mould concrete paver block of M-350 or otherwise specified grade, Confirming to IS 15658: 2006 to be used. Paver blocks to be of approved brand and manufacturer and of approved quality. Minimum strength as prescribed by manufacturer and as per direction of Engineer-in-Charge for the grade specified to be tested as per method mentioned in specification of subhead cement concrete of CPWD Specification 2019 Vol. I. Size of paver will be as approved by EIC/ Design consultant. 1:4 cement mortar shall be used for filling the joint.

Measurement & Rates

Area provided with paver block to be measured in sqm. correct up to two places of decimal. The rate includes the cost of the material, labour, tools etc. required in all the operations described above.

Refer specifications from “Central Public Works Department Vol.2” Item no 16.57 Page no 844.

Item No:- 43

Providing and fixing tiled false ceiling of size (600x600)mm in true horizontal level suspended on inter locking metal grid of hot dipped galvanized steel sections. It consists of main "T" runner of size 24x32x0.3x3600mm, cross "T" of size 24x25x0.3x1200mm, secondary cross "T" of size 24x25x0.3x600mm and PPGI wall angle of size 24x24x0.4x3000mm. Bottom exposed capping of width 24 mm of all T-sections shall be of 0.25mm thick PPGI. PPGI wall angle 24x24x0.4x3000mm {Material-GI(IS513), YS-280Mpa, Finish-Galvanised 90GSM (IS277)} is fixed along the perimeter of the ceiling to Walls, partitions or columns etc., with wooden screws at 300mm centers or Hilti HPS 6x40mm placed at 600 mm c/c. soffit cleat 27x37x25x1.6mm {GI(IS513) YS-260Mpa, Finish-Galvanised 120GSM (IS277)} is fixed with Rawl Plug- Ø8x45mm {Material-IS 513 CR1 grade, Zinc coating (7 to 8 microns) pull out load- 6.8kN for M30 concrete grade} creating (1200x1200)mm grid. Main-T runners 24x32x0.3x3600mm are then suspended at 1200mm c/c from ceiling using 4mm zinc electroplated butterfly level clips of size 85x30x0.8mm spaced at maximum 1200mm center to center along main T and not more

than 150mm from spliced joints. The last hanger at the end of each main runner should not be greater than 600mm from the adjacent wall. 24x25x0.3x1200mm cross T {Material- GI(IS513),YS-280Mpa, Finish-Galvanised 90GSM (IS277)} is interlocked between the main T at 600mm center to center to form a grid of 1200x600 mm and then secondary cross "T" 24x25x0.3x600mm {Material-GI(IS513), YS-280Mpa, Finish-Galvanised 90GSM(IS277)} is then interlocked at middle of the (1200x600)mm grid to form grids of (600x600)mm. Cross Tees at the ends having length more than 600mm are to be supported independently. Finally 12.5mm thick square edge Gypsum tile (meets requirement of specification mentioned under DAR no. 12.52.3 in Delhi Schedule of rates (DSR)), of size 595x595mm, made of Gypsum plasterboard, manufactured from natural gypsum as per IS 2095 part I and laminated with white 0.16mm thick fire retardant PVC film on the face side and 12micron metalized polyester on the back side with all edges sealed with the face side PVC film which goes around and wraps the edges and is bonded to the edges, so as to make the tile a completely sealed unit, is placed in the grid.

Detailed Specifications are as per item description.

DOORS AND DOOR ACCESSORIES

Item No:- 44

Supplying & fixing in position the following type solid core block board flush door shutter (Single/ double leaf) with commercial ply facing / prelamination on both sides conforming to IS 2202 (Part-1) of approved make & brand with external / internal type second class teak wood lipping alround of required width and depth (20 minimum thickness all around) of shutter as per IS/as specified, fixing shutters in position to HMPS door frames/ wooden frames/ granite frame works (door frames shall be paid separately under relevant item) at all floors by cutting/ planing if necessary including labour for fixing of the fittings & fixtures as per drawing with wooden packing pieces if necessary (but excluding the cost of fittings and fixtures with SS screws which shall be paid separately under relevant item), including view panel wherever required as per drawing, finishing as specified all as per specifications, drawings and as directed by Engineer In Charge.

B) 30 mm thick flush door shutter (for shaft doors), With 1.0 mm thick decorative laminate sheet of approved colour, pattern & shade fixed on one face of shutter and 1.0 mm thick white / off white lamination on another face.

C) 35 mm thick flush door shutter, With 1.0 mm thick decorative laminate sheet of approved colour, pattern & shade fixed on both faces of shutter

Refer specifications from "CPWD vol. 1 & 2" and specifications as per Item description.

Item No:- 45

Providing & fixing Hollow Metal Pressed steel (HMPS) door frames of following profile fabricated out of 1.60 mm thick G.I sheet of coating (Class VIII of zinc coating) 120 gram/sqm, manufactured by Sail / Lloyds/ Jindal or equivalent of profiles / size generally conforming to IS 4351-2003 with suitable one/two set rebates for fixing shutters and also rebate suitable for fixing fixed glazing including hole for self tapping screws wherever shown in the drawing, each frame to contain hinge jamb, lock jamb and head all rigidly fixed together with welded /mechanical joints with back plates /angles to correct shape &

angles including providing and fixing base ties with GI channel 50x25mm, 1.25mm thick suitable section to suit floor thickness / angle thresholds with MS angle 25x25x3mm, 6nos. of adjustable lugs per frame, providing and welding of 40x40x5mm,150mm long angle cleats for hinges with necessary tapped holes for fixing counter sunk headed machine screws to suit heavy duty oxidised / stainless steel hinges of size 125mm x 65mm x 2.8mm/125mm x 76mm x 2.80mm/ 100mm x59mm x2.6mm/75mm x 48mm x 2.45mm or shop type welding and self taping screw for fixing hinges/ piano hinges etc. and finishing the same to smooth etc. (but excluding the cost of hinges which shall be paid under the relevant item) including providing each door frame with necessary lock strike plates, mortar guards, buffers, bushes etc. required for tower bolt/ baby latches, tadis, safety chains, aldrops etc including fixing the frame to brickwork/ concrete work with necessary PCC or bolted/ screwed to concrete work, painting a shop coat of polyurethane paint including etching the surface with ETCH primer etc. including painting the exposed surfaces with two coats of synthetic enamel paint of approved make and colour over a coat of red oxide/ zinc chromate primer and painting the unexposed surfaces with two coats of anti corrosive bituminous paint, after rectifying the damaged PU primer due to transport including filling the hollows of door frame with C.C.1:2:4 using 12 mm size downgraded stone aggregate, curing, finishing etc. all complete as per drawings, specifications and as directed by Engineer in charge.

Note: The quoted rate shall include cost of base tie / angle and all accessories mentioned in the item description except iron mongeries (i.e. fittings and fixtures with wood and machine/ self taped screws as required, which shall be measured and paid separately under relevant item.)

Profile 90mm x 60 mm with single rebate for doors.

Refer specifications from "CPWD vol. 1 & 2" and specifications as per Item description

Item No:- 46

Steel Fire Rated Doors with HMPS Steel Frames. Fire Resistant Door (FRD) assembly having 120 minutes (2 hr) Fire rating, Metallic and conforming to IS 3614:2021 (Single / Double lef Shutter) Providing and fixing factory made Fire rated door assembly of galvanised Iron Steel door frame with metallic single / double leaf door shutter with accessories, the entire door assembly including shutter, frame and fittings shall be confirming to 1200 minutes (2 hr) fire rating as per IS 3614.

Frame:- The door frame shall be made of minimum 1.20 mm thick GI Sheet with minimum 120 GSM coating as per IS:277. The frame shall be of grooved profile of minimum size 90 × 60 mm with inbuilt sealing system to take appropriate fire rated smoke seal. Frame shall be provided with appropriate reinforcement suitable for hardware and flush fixing. Frames shall be provided with stiffener pieces and mitred cut joints (self tab/screwed assembled at site). Fire rated EPDM smoke seal, confirming to IS 3614 : 2021 shall be fixed within the inbuilt groove or stuck with adhesive on the entire perimeter of the frame.

Door frames shall be fixed to all round the opening with minimum 8 mm dia CSK headed fastner of minimum 80 mm long with 8mm dia Polyamide sleeves @ 3 Nos at each side.

Finishing: Frame to be factory finished with polyester powder coating of minimum thickness of 30 microns (500 hrs salt spray test) of approved colour and shade all complete as per manufacturer's Specification and direction of the engineer in charge.

Door Shutter: The factory made fire resistant metallic door leaf shall be minimum 60 mm thick fully flush double skin step design door, insulated with or without vision. Door leaf shall be manufactured from 1.2 mm (18guage) minimum thick galvanised steel sheet. The internal construction of the door should be rigid reinforcement pads for receiving appropriate hardware. The infill material shall not be less than be 120kg/m3 high density mineral wool insulation material. Intumescent seals 15 x 1.5mm to be provided. All ISI labelled doors shall be factory prepped for receiving appropriate hardware and provided with necessary reinforcement for hinges, locks, and door closers panic bar etc. The edges should be interlocked with a bending radius of 1.4mm. For pair of doors integrated astragals has to be provided on the meeting stile for both active and inactive leaf. Vision lite wherever applicable shall be maximum 200 x 450mm with clear borosilicate fire rated glass of 6mm. Glass shall be fixed with suitable gasket and with clip-on arrangement.
The door leaf shall be factory finished with polyester powder coating of minimum thickness of 30 microns (500 hours of salt spray test) of approved colour and shade all complete as per manufacture's Specification and as per the directions of Engineer - in-charge.
Accessories Hardware: Fire door set shall include all accessories like, Fire rated SS 304 grade ball bearing type hinges of minimum size 100 mm ×75 mm × 3 mm one (3 numbers per leaf upto 2100 mm height or as per test evidence), one number fire rated SS mortise lock with handle, fire rated door closer
Installation: Post installation hollow space within door frame shall be filled with fire rated self-extinguishing type polyurethane foam. Rate shall include for supply and installation of complete door assembly, by the manufacturer. (All mechanical and functional hardware like hinges, lever handles, door closers with 120 minutes fire rating are to be used on doors and must conform to relevant IS 3614 : 2021.
all as per manufacturer's specification and providing Fire Resistant certification (manufacturing & installation) as required by local fire statutory authority shall be furnished by manufacturer of Door assembly (Frame, Shutter, fitting) and all cutting/ planning if necessary, labour for fixing the fittings and fixtures with suitable packing if necessary including providing and fixing 120 minutes (2 hr) fire rated approved powder coated steel door set etc. all complete all as per specifications, drawings & as directed by Engineer in charge.

Refer specifications from "CPWD vol. 1 & 2" and specifications as per Item description

Item No:- 47

Providing and fixing aluminium die cast body tubular type universal hydraulic door closer of approved make conforming to IS: 3564 with ISI mark including necessary accessories and screws etc for fixing with alumnium/ wooden/ steel doors with necessary bolts & nuts, labour, scaffolding etc complete all as per specifications and as directed by the Engineer-in-charge.

Providing, fixing & Supplying at site of work approved quality and manufacturer, confirmed & marked with relevant IS (wherever applicable), Stainless steel (SS-304) fittings, fixtures and fastenings along with Stainless steel screws/concealed SS screws, bolts, nuts, washers,wooden packing pieces if necessary etc.and other accessories etc

complete all as per specifications and as directed by the Engineer-in-Charge. SS But hinges (Heavy Weight) of size (100 X 75 X 3.0 mm) , ball bearing type, (Two / Three leaf Hinges)

Providing, fixing & Supplying at site of work approved quality and manufacturer, confirmed & marked with relevant IS (wherever applicable), Stainless steel (SS-304) fittings, fixtures and fastenings along with Stainless steel screws/concealed SS screws, bolts, nuts, washers,wooden packing pieces if necessary etc.and other accessories etc complete all as per specifications and as directed by the Engineer-in-Charge. S. S. Tower bolt 300 mm long x 12 mm barrel

Providing, supplying, fixing approved make back to back stainless steel Handle-450 mm long (Set including a pair of handles), of minimum 25 mm dia, including accessories for fixing it to glass, aluminium, wood shutter, brackets etc.complete as directed by EIC. (Note:- Cost is for one set consists of two nos of handles to fix on shutter both side (Inside & Outside))

GRAB HANDLE FOR ADA TOILETS:
Providing & fixing 25 mm diameter (1.5mm thick) SS 304 satin (brush) finish Grab handle for disabled toilet door of 600mm long of approved make with necessary SS 304 grade screws etc. complete as per drawing as sample approved by Engineer-in-charge

Providing & Fixing 6- lever Mortice lock of chromium plated SS-304 parts & body of approved brand & make, 200 mm Mortice latch & lock (without Handle Set) Lock Body CK mortice lock with chromium plated SS screws, with duplicate keys etc. lock shall be fitted as per manufacturer specification and as directed by Engineer in charge.

Providing and fixing Mortise shaft dead bolt with key (Alen Key lock) with 57mm backset and 25mm square for end in stainless steel satin finish of approved make including all labour, material etc complete all as per specifications and as directed by the Engineer-in-Charge.

Providing, supplying, fixing glass to glass 6 lever SS patch lock (Round type) of approved make on glass for doors complete as per drawing. Frameless Swing Doors (Patch Fitting Doors)

Providing and fixing double action hydraulic floor spring of approved brand and manufacture having ISI mark as IS : 6315, having brand logo embossed on the body / plate with double spring mechanism for doors, including cost of cutting floors, embedding in floors as required and making good the same matching to the existing floor finishing and having minimum 1.25 mm thickness stainless steel cover plates with brass pivot and single piece M.S. sheet outer box with slide plate, and other accessories required for the works to facilitate smooth operation of the door shutter etc complete all as per specifications and as directed by the Engineer-in-charge.

Refer specifications from “CPWD vol. 1 & 2” and specifications as per Item description

Item No:-48

Side Hung / Casement Aluminium Windows: Providing, supply, fabrication, installing, fixing, testing, cleaning, protection and handing over the Side Hung / Casement Aluminium window system, at all levels, locations, floors as per approved drawings including all labour, material, wastage, transportation, fixing in position, scaffolding etc complete all as per specifications, drawings and as directed by the Engineer-in-Charge. The Side Hung / Casement Aluminium Window system shall with stand the wind pressure of confirming to IS -875 part III. The Side Hung / Casement window system shall have heavy duty self balancing pivot hinges, three point locking with handle, friction hinges (250 mm) microwave cured EPDM gasket, non staining weather sealant, SS-304 grade pan head screws etc complete.

Providing and fixing following type of approved quality glass panes for aluminium sliding windows, of approved manufacturer and fixing with aluminium frame work including providing and fixing with 2 way EPDM gasketing , to ensure water and air tightness and neoprene cushions/ gasket accommodated in grooves, necessary SS-304 screws etc all complete generally as per drawings specifications and as directed by the Engineer-in-charge.

Note:- Only clear opening of glass shall be measured for payment.

(6 mm thick Single Glass Unit (SGU) using heat strengthened (HS) clear float glass of M/s. Saint Gobain ET/ST series or approved equivalent)

Supplying and fixing in position at all floors, levels & locations, aluminium section [extruded] for aluminium Side Hung / Casement windows sliding as per drawing of approved manufactures with extruded sections of Jindal / Indal / Aluminax or other approved eqivalent sections with size and weights as shown in the drawing, for frames and shutters [including wastages if any] conforming to relevant I.S specifications, with all approved shade & colour anodised aluminium fittings and accessories, including providing and fixing & grouting the gap with polysulphide sealant etc. all complete generally as per drawings, specifications etc., all as directed by Engineer in charge, but excluding the cost of glazing, which will be paid separately. (The aluminium system consist of the extruded aluminium sections of alloy 6063 T5/T6 & tolerances confirming to DIN / EN standards from approved make and manufacturer. The aluminium sections shall have approved shade and colour super durable powder coating with minimum 50 micron thickness.

The non visible aluminium sections shall have approved chromatizing treatment. {The weight of extruded aluminium sections only will be mesured for payment}). The quoted rate shall be inclusive for providing & fixing heavy duty self balancing pivot hinges, three point locking with handle, friction hinges (250 mm) microwave cured EPDM gasket, non staining weather sealant, SS-304 grade pan head screws etc complete. etc of approved make and design as per drawings.

Refer specifications from "CPWD vol. 1 & 2" and specifications as per Item description.

Item No:- 49

Sliding Windows: Providing, supply, fabrication, installing, fixing, testing, cleaning, protection and handing over the Sliding window system, at all levels, locations, floors as per approved drawings including all labour, material, wastage, transportation, fixing in position, scaffolding etc complete all as per specifications, drawings and as directed by the Engineer-in-Charge.

The Sliding Window system shall with stand the wind pressure of confirming to IS -875 part III. The sliding window system shall have SS-304 grade mesh Net shutter panel, drainage gutter profile at bottom track, wool pile with film for weather protection and complete sir sealing. The shutter engagement shall be minimum of 15 mm at top and bottom track to ensure stability under deflection of vertical mullions. Including providing & fixing ball bearing rollers smooth movement of shutters, flush type lock with manual operation, microwave cured EPDM gasket, non staining weather sealant, SS-304 grade pan head screws etc complete.

Supplying and fixing in position at all floors, levels & locations, aluminium section [extruded] for aluminium sliding windows sliding as per drawing of approved manufactures with extruded sections of Jindal / Indal / Aluminax or other approved eqivalent sections with size and weights as shown in the drawing, for frames and shutters [including wastages if any] conforming to relevant I.S specifications, with all approved shade & colour anodised aluminium fittings and accessories, locking arrangements, 2 / 3 rollers with ball bearings for sliding shutters of approved quality all as shown in the drawing, including providing and fixing aluminium channel beading / glazing clips fixed with necessary matching anodised screws, grouting the gap with thermocole & polysulphide sealant etc. all complete generally as per drawings, specifications etc., all as directed by Engineer in charge, but excluding the cost of glazing, which will be paid separately. (The aluminium system consist of the extruded aluminium sections of alloy 6063 T5/T6 & tolerances confirming to DIN / EN standards from approved make and manufacturer. The aluminium sections shall have approved shade and colour super durable powder coating with minimum 50 micron thickness. The non visible aluminium sections shall have approved chromatizing treatment. {The weight of extruded aluminium sections only will be mesured for payment}). The quoted rate shall be inclusive for providing & fixing built in handle with locking nib/hook, dummy handle, SS locking closure plate (on frame), adjustable single roller, nylon roller, shutter end PVC cap, anti dust plugs, screw hole cap, drain cap, wool pile etc of approved make and design as per drawings.

Providing and fixing following type of approved quality glass panes for aluminium sliding windows, of approved manufacturer and fixing with aluminium frame work including providing and fixing with 2 way EPDM gasketing , to ensure water and air tightness and neoprene cushions/ gasket accommodated in grooves, necessary SS-304 screws etc all complete generally as per drawings specifications and as directed by the Engineer-in-charge.
Note:- Only clear opening of glass shall be measured for payment.
(6 mm thick Single Glass Unit (SGU) using heat strengthened (HS) clear float glass of M/s. Saint Gobain ET/ST series or approved equivalent)

SCOPE OF WORK
The work covered under these specifications consist of supplying, fabrication and installation of Natural shade/ colour anodized glossy/ matt finished aluminium doors, windows, wall span, composite units, glazing etc. strictly in accordance with these specifications and relevant detailed approved shop drawings.

GENERAL
The material, fabrication and hardware shall conform to the IS 1948. The contractor shall submit 6 copies of shops' drawings covering all types/details of work as generally shown in Architectural drawing and envisaged under these specifications before manufacture. The drawing shall show all

dimensions, details of construction, installation of fixtures and relation to adjoining and related works. No fabrication work shall be undertaken prior to obtaining approval of the shop drawings from the Engineer-in-Charge.

MATERIALS

Aluminium alloy extruded sections used in the fabrication of extruded door/ window sections shall conform to IS 733 & IS 737(composite unit). The hollow aluminium alloy sections used shall conform to IS 1285 and shall be anodized before incorporating in the work. Anodic coating shall conform to IS 1868. The framework, stiles, mullions, beadings, transoms and handles etc. shall be of aluminium anodized sections as shown in detailed approved drawings. All aluminium sections shall be of JINDAL/HINDALCO or other equivalent make as per drawing. The contractors can also propose nearest alternative sections they manufacture/possess without changing the elevation, structural stability & functional requirement. The Department reserves the right to accept the alternative section or otherwise. The sections shall be structurally suitable to withstand all the loads the members have to sustain. Counter sunk screws, nuts, bolts, washers, rivets and other miscellaneous fastenings devices shall be of approved brass cadmium plated or stainless as specified in the approved drawing.

FABRICATION

Material, fabrication and dimensions of aluminium doors, windows and ventilators manufactured from extruded aluminium alloy sections of standard sizes and designs complete with fittings, ready for being fixed into the building shall be as per IS 1948.

The frames shall be manufactured square and flat, the corners of the frame being fabricated to true right angle. All the fixed, sliding and opening frames shall be constructed of sections which have been cut to length, mitred, welded and mechanically fixed at the corners. Where hollow sections are used with welded joints, argon-arc welding or flash butt welding shall be employed (Gas welding or brazing not to be done). In case welded joints are used, anodizing shall be done after fabrication as a whole. All welding shall be on unexposed sides in order to prevent pitting/discolorations of other surface imperfections after fixing etc. Necessary allowance shall be made while manufacturing the aluminium door entrances, wall spans and glazing for receiving plaster. No field fabrication of frames is permitted.

Each door leaf shall be prepared to receive glazed panel of required thickness. Glazing shall be done with an approved quality EPDM gasket with snap-in-bevelled anodized matt/glossy finish aluminium metal. glazing stops inside and outside. All doors shall have off- set pivots, double action (180o minimum swing) floor springs with oil check boxes of approved manufacture. All doors shall have 4 lever concealed brass body mortise lock without handles as per manufacturer's design, with concealed flush C.P. brass tower bolts provided at suitable locations. All doors shall have push plates of design shown in the approved drawing as described in the schedule of quantities. All entrances shall be without thresholds. All aluminium surfaces in contact with masonry or concrete shall be given a thick coat of bitumastic paint. After fabrication, aluminium sections shall be protected from construction hazards that may damage their appearance or finish. All exposed surfaces of aluminium door entrance shall be protected by masking tape during transshipment and erection. All sections and hardware shall have anodic film and a cover of minimum thickness of 0.015 mm.

The dimensions shown in the drawing are overall heights and widths to the outside of frames of aluminium windows. The side hung shutters shall have projected friction type hinges of aluminium alloy. Concealed projected hinges having structural stability and of good quality will also be considered only after the inspection of the sample submitted by the tenderer. The necessary pegstays, handles, window fasteners etc. shall be of aluminium. The handle shall be mounted on a handle plate rivetted to the opening frame. The pegstays shall be 300 mm. long or as required complete with peg and locking bracket and shall have holes for keeping the shutter open in three different positions. No field fabrication of frames is permitted. The complete fabricated assembly shall be anodized in approved satin finish with minimum film thickness of 0.015 mm. for the entire surface.

For composite units the door shall be coupled to windows or side- lights by extruded aluminium sections

made from aluminium alloy conforming to IS Designation HE9-WP of IS 733.

A thick layer of clear transparent lacquer based on methacrylates or cellulose butyrate shall be applied on the finished sections of the aluminium work by the contractor to protect the surfaces from wet cement, lime, dirts, dust etc. during the construction activities. The size for door, window or ventilator frames shall not vary by more than (±) 1.5 mm.

Finish: Aluminum doors, windows and ventilators may be supplied in either matt, scratch-brush or polished finish. They may, additionally be colour anodized/powder coated as specified in item.

Anodizing: Standard aluminium extrusion sections are manufactured in various sizes and shapes in wide range of solid and hollow profiles with different functional shapes for architectural, structural glazing, curtain walls, doors, window & ventilators and various other purposes. The anodizing of these products is required to be done before the fabrication work by anodizing/electro coating plants which ensures uniform coating in uniform colour and shades. The extrusions shall be anodized with a minimum average thickness of 15 micron (AC-15) or as specified in approved colors as per IS1868-1996. The anodized extrusions shall be tested regularly under strict quality control adhering to Indian Standard IS 5523-1983.

Powder Coating: The powder used for powder coating shall be Epoxy/polyester powder of make approved by the Engineer-in-Charge. The polyester powder shall be applied by electrostatic powder spray. Before start of powder coating the contractor shall submit detail specification for application of polyester powder from manufacturer of the polyester powder for approval of Engineer-in-Charge. The contractor shall give detailed program for powder coating in advance, to facilitate the inspection by Engineer- in-Charge or his authorized representative. The thickness of the finished polyester powder coating measured by micron meter shall not be less than 50 micron nor more than 120 microns at any point.

A thick layer of clear transparent lacquer based on methacrylates or cellulose butyrate, shall be applied on aluminium doors, windows and ventilators by the supplier to protect the surface from wet cement during installation. This lacquer coating shall be removed after installation is completed.

HARDWARE

All cut outs, recesses, mortising or milling and operations required for fixing the hardware shall be accurately made reinforced with packing plate as required to ensure adequate strength of the connection. All the hardware accessories shall be of best approved type and of anodised finish same as for the frames and other sections. Each lock shall be supplied with two stainless steel keys and each key shall be with number stamped thereon according to the number on doors so installed. All hardware shall be free from defects, which may affect the appearance and serviceability. All hardware shall be fixed after obtaining the prior approval of the Engineer-in-Charge. Approved samples of hardware shall be kept in the custody of the Engineer-in-Charge. Working and moving parts of locksets shall be accurately fitted to smooth, close bearings and shall be free from rattle. The floor springs shall be of heavy-duty type and should allow door operation smoothly and shall conform to IS 6315. The contractor shall furnish a guarantee for all finishing and quality of hardware covered under this section and which shall remain free from defects of any kind, either materials and/or workmanship for a period of one year (unless otherwise specified) from the date of completion/handing over of work. The contractor shall repair or replace any and all defective work and damage caused, at any time or times during that period within 3 days from the written notice. This shall be done without any extra cost to the Department and to the complete satisfaction of the Engineer-in-Charge. In case the same are not replaced immediately after the receipt of the notice to do so, the Department shall do so at the cost of contractors. The cost as certified by the Engineer-in-Charge shall be final and binding on the contractors.

FIXING

Fixing and glazing of doors, windows and ventilators shall conform to IS 1081, unless otherwise specified. The frames shall be accurately fixed in the flooring / brick masonry or R.C.C. works. The

fixing of the frame shall be done with cadmium plated brass counter sunk screws driven on to the teak wood rough ground, or fixed to the wall with hold fasts as directed by the Engineer-in-charge, and as shown in approved drawings. All aluminium works shall be fixed in position as per relevant Indian Standard Specifications and code of practice for fixing and glazing of aluminium work. Joints between metal and masonry shall be fully caulked with mastic / polysulphide compound in order to ensure watertight joints as directed by the Engineer-in-Charge. Joints shall be neatly painted with matching cement and excess materials shall be removed. Fixing of aluminium door entrances, hardware etc. shall be done in best workmanship like manner true to line, level, plane, plumb etc. and all as directed by the Engineer-in-Charge. Breaking of floor for providing floor springs and restoration of the floor finishes to the original specification and finishes and minor additions and alterations to the openings shall be deemed to have been included in the quoted rates.

GLASS AND GLAZING

Glass: The glass unless otherwise specified, shall be clear float glass of specified thickness and should be approved by the Engineer in Charge. It shall be clear, float transparent and free from cracks subject to allowable defects. The float glass shall conform to IS 14900.

Glazing Clips/ Beading: The glazing clips/beading where specified in drawings for aluminium/steel doors and windows shall be anodized aluminium beading of channel section or as specified & as per sizes mentioned in the item and/or shown in the drawing.

The junction of the beadings shall be miter jointed. Holes for glazing clips shall be drilled prior to fabrication and shall not be done at any later stage.
The glass shall be cut to the required sizes of panels where it is to be fitted and it shall be so cut that it fits properly in the frames without rattling. Pre-measurement of each panel prior to the cutting of glass is essential.

The clips/beading shall then be fixed to glass panes and screwed at close intervals not more than 10 cm. from each corner and the intermediate not more than 20 cm. apart. When glass panes are fixed with wooden beadings having mitred joints or aluminium beading, a thin layer of glazier's putty shall be applied covering the area in contact between the glass and sash-bars and beadings. In the case of louvers all the exposed edges of the glass shall be ground properly.

Glazing: The glass panes shall be fixed to the frame as mentioned above with an approved quality EPDM gasket with snap-in-bevelled anodized matt finished aluminium metal glazing stops inside and outside. In the fixed side and transom light, the thickness of glass or panel shall be accommodated by the screw down glazing stops. The glass panels shall be fixed firmly and truly parallel to the plane of frames. All damage or breakages during glazing shall be made good at the contractor's own cost till the work is properly taken over by the Engineer-in-Charge.

All wall spans, doors and windows glazing /fixed glazing etc. shall be tested for water tightness. Any leakage found during testing shall be the responsibility of the contractor to rectify the same without any extra cost.

GENERAL

After the inspection is over and permitted by the Engineer-in-Charge, the glass panes shall be cleaned off any labels, paint smears and spots and shall be washed from both the side and all glazing left clear, perfect and free from rattling. The contractor shall provide all the scaffolding, tools and plants for fixing the glass panes at his own cost. In the case of aluminium/steel doors/windows any hardware if fixed in position shall be removed temporarily before fixing the glass panes and which shall be re-fixed back in position all at the contractor's cost.

MODE OF MEASUREMENT

Aluminium work: The measurement of aluminium sections shall be taken only after the frames along

with shutters are fixed in its final finished position in line, level and plumb. Length of each extruded section used for fabrication shall be measured outer to outer of cut length correct two places of decimal of a meter.
The weight of material used shall be calculated on the basis of actual weight of extruded sections used for fabrication and shall be compared with the weights given in the catalogue of the approved manufacturer subject to the condition that the variation in actual weight should not exceed (+ / -) 10% than the approved catalogue weights. The payment shall be made for the actual weight of the extruded section after anodizing. The final weight shall be calculated in kgs upto two places of decimal.

Glazing work: The length and width of opening for glazing inserts shall be measured correctly to a centimeter and area for payment shall be calculated in square meter nearest to 0.01 SqM.

RATE
Unless otherwise specified, fittings and fixtures such as window handles, hinges, peg-stays, friction-stays, concealed window lock, cleat angles, stiffener plates etc. shall not be measured for payment and rate quoted shall include cost of all such fittings, accessories, and hardware. However, door closer, floor springs shall be measured separately as specified in the item and paid for.

The rate quoted shall include all taxes, duties etc. tools, plants, labour involved in all the operations described above, fixing in final position including submitting shop drawings etc. and all incidental to the job involved.

TESTING
Aluminium sections shall be tested for their unit weight, anodic coating etc. as per relevant IS codes.

GUARANTEE
All materials and workmanship in the above work shall be guaranteed for a period of one year (unless otherwise specified) from the date of handing over the work. Unqualified performance guarantee for smooth operation of the windows, doors, wall spans and precautionary measures against leakages etc. shall be furnished by the contractor on stamped paper, if so, specified in the schedule of quantities. Any defect found during the guarantee period shall be replaced/made good to the original conditions/positions entirely at the cost of the contractor.

Item No:- 50

Providing & fixing stainless steel work for pipe hand rail at staircase, Entrance Ramp and other stainless works such as spool pieces, pipe sleeves etc, at all floors, levels & location conforming to SS-304 grade of steel preferably schedule-10, using SS pipe in horizontal at top, vertical, inclined including solid pipes as per drawing or as per pattern & design approved by EIC and including necessary S.S bend, tees, Embeded plates, nuts, SS bolt,necessary welding, anchoring with SS anchor fastner of M/s Hilti, grinding, buffing, polishing and fixing in concrete / wall with S.S lugs, making pockets, concreting, making good the surfaces etc. as per specifications, drawings and as directed by Engineer-in-Charge. (Note:- For payment purpose only weight of stainless steel members shall be considered excluding fixing accessories such as nuts, bolts, fasteners etc.)

8. General:

8.1. The SS shall be of stainless steel of grade 304.
8.2. The contractor shall submit sample covering all types of work under these specifications before manufacture. The drawing shall show all dimensions, details of construction, installation relating to the adjoining work.

9. Materials:

9.1. All stainless-steel tube to be 304 or 316 welded stainless steel, ornamental tubing finished with puffing. All fittings to be 304 or 316 stainless steel.

10. Delivery, Storage, and Handling:

10.1. Materials to be delivered to the job site in good condition and adequately protected against damage as railing / handrails are a finished product. Store on site in a location and manner to avoid damage. Stacking should be done in a manner that will prevent bending. Store material in a clean and dry location away from uncured concrete and masonry. Any protection on the railings during transportation should remain until installed. Keep handling on site to a minimum. Exercise caution to avoid damage to finishes of material.

11. Fasteners:

11.1. All mechanical fasteners used shall be manufactured from stainless steel.

12. Fabrication:

12.1. All mitered and welded corners shall be ground smooth to match finish. Make exposed joints butt tight and flush. Interior sleeves shall be used for typical splices. Fasteners are allowed at splice connects. Verify dimensions on site prior to shop fabrication.

13. Execution:

13.1. Preparation:

13.1.1. Coordinate post setting drawings, diagrams, templates, instructions, and directions for installation of anchorages. These include items such as sleeves, concrete inserts, base plate, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete and masonry construction.

13.1.1.1. Coordinate delivery of anchorages to project site.
13.1.1.2. Coordinate that blocking is in place for all mounting fasteners.

13.1.2. Clean debris and dust from surfaces and embed holes thoroughly prior to installation.

Prepare surfaces using the methods recommended by the manufacturer for achieving proper results given the substrate and project conditions.

13.2. Installation:

Install in accordance with manufacturer's drawings and direction. Fit exposed connections accurately together to form tight joints except as necessary for expansion. Perform cutting, drilling, and fitting required for installation of railings / handrails. Accurately set railings / handrails in location, alignment, and elevation, measured from established lines and levels. Set posts plumb within a tolerance of 1/8 inch (3 mm).

When fastening to in-place construction, provide anchorage devices and fittings to properly secure rail to in-place construction. Examples of such devices include threaded fittings (for concrete inserts), toggle bolts and through-bolts. Separate dissimilar materials with bushings, grommets or washers to prevent electrolytic corrosion.

13.3. Welding

This shall be done by electric process with precautions for health and safety. The places to be welded shall be cut angularly so that the welding material does not protrude and the members to be welded join properly. The welds shall be ground clean to give a single piece appearance. The welds shall run around the contact surfaces of two meting sections. Throat thickness shall not be less than 4mm.

13.4. Protection

Upon delivery railing may have protective wrapping. At completion of railing installation, immediately remove any protective wrapping and clean all work for inspection and approval. After installation, protection of railings is required during the balance work of construction. When cleaning stainless steel surfaces use plain water containing a mild soap or detergent. No abrasive agents or harsh chemicals shall be used.

14. Mode of Mode of Measurement and Payment

Measurements shall be taken on KG. No payment shall be made for weight of screws, bolts, nuts etc. The rate shall be for units of one RMT.

Item No:-51

Fabricating, supply and erecting in position Standard Structural steel sections conforming to IS 2062 for all structural steel works using ISMB, ISA, ISMC, MS plate, flat, square bars, pipe, square pipe ,etc. including welding, cutting, wastage, etc. complete. The rate is inclusive of welding road, supply & fixing of correct size nut, bolts, washers, paint, with all contractor's materials, labour, tools & plants, in bolted / welded construction as directed by Engineer-in-Charge. Anticorrosive paint must be applied before applied any paint. The rate shall inclusive of providing and applying Epoxy Coating of approved shade, brand and manufacture on new structural steel work with one coat of 30 micron (DFT) of Epilux 4 Zinc Rich primer of Berger Paint India Ltd or equivalent as primer and Two coat each of 35 micron (DFT) of Epilux 84 High Gloss CR enamel of Berger Paint India Ltd or equivalent at all levels. (Total DFT is 30+35+35=100 microns). The waste cut pieces shall not be included in the paying quantity. The work shall be done as per drawing and specification. The work shall be carried out as per IS:800, IS:816 with its latest amendments.

3.0 Materials & Workmanship:

3.1 Prior to fabrication, all rolled sections shall be cold straightened and freed from twists, wraps etc. Hot working shall be done only after prior permission of the Engineer-in-charge. The surface of the members to be welded shall even so that temporary fastening alignment should not allow passage of a 0.2mm thick filler gauge more than 20mm deep from the member's edge. All members shall be cut mechanically by saw or shear or by oxyacetylene flame.

3.2 Welding shall generally be done by electric process. Gas welding shall be restored to using oxyacetylene flame with specific approval. Gas welding shall not be permitted for structural steel work.

3.3 The work shall be done as shown in the shop drawings which should clearly indicate various details of the joints to be welded; shop and site welded as well as type of electrodes to be used. Symbol for welding on plans and shop drawing shall be according to I.S. 813-1961. As far as possible every effort shall be made to limit the welding that must be done after improper welding that is likely to be done due to heights and difficult position on scaffolding etc. The welding work shall conform to I.S. 816-1969.

3.4 Preparation of surface: Surfaces which are to be welded together shall be free from loose mill scale, rust, paint, grease or other foreign matter. A coating of boiled linseed oil shall be permitted.

3.5 Assembly for welding: Before welding is commenced, the plates shall be first be brought together and firmly clamped or spot welded at specified distance. The temporary connection in form of tack welding has to be strong enough to hold the plates accurately in place without displacement and shall be done keeping in view the finished dimensions of the structure.

3.6 Precautions: The operations connected with welding and cutting equipment shall conform to safety requirement given in I.S. 818-1968.

The following points shall be borne in mind during the process of welding:

(h) Welds shall be made in flat position wherever practicable.
(i) Arc length, voltage and amperage shall be suited to the thickness of material, type of groove and other circumstances of the work.
(j) The segments of welding shall be such that where possible, the members which offer the greatest resistance to compression are welded first.
(k) Proper care shall be taken while welding, for shrinkage and distortions, as the drawing dimensions are the finished dimensions of the structure.
(l) Cutting of plates shall be profile cut.
(m) Welding rod shall be of approved brand.
(n) The drilling is to be done with power drill or magnetic drill.

3.7 The defective welds which shall be considered harmful to the strength shall cut out and re-welded.

3.8 Finished welds and adjacent part shall be protected with clean boiled linseed oil and after all stag has been removed welds and adjacent parts shall be painted after the same are approved.

3.9 All the members shall be thoroughly cleaned of rust, cakes, dust etc. and given a priming coat of red lead paint before fixing them in position. All fabricated members shall be suitably packed to be protected from any damage while transportation, if any.

3.10 Grinding to the finished level is to be done, if directed by the Architects and Engineer in charge. All exposed weld shall be ground smooth. Welds which have not been ground shall be scrubbed with a 10% solution of Hydrochloric acid which shall be washed of with water before painting unless alkali resistant paint is used.

3.11 Erection in general, of the entire/part structure shall be carried out as per the requirement and approval of the Engineer-in-charge. Positioning and leveling of the structure, alignment and plumbing and fixing every member of the structure shall be in accordance with the relevant drawings and to the complete satisfaction of the Engineer-in-charge.

The following checking and inspection shall be carried out before, during and after erection:

-Damages during transportation

-Accuracy of alignment of structures

-Erection according to drawings and relevant specifications

-Progress and workmanship

3.12 Painting

3.12.1 First priming coat of zinc chromate yellow oxide primer / PU primer is to be applied on the fresh steel arrived at site.

3.12.2 Once the cutting and fabrication is completed second coat of primer and first coat of synthetic enamel / PU paint (as per the manufacturer's recommended process - preferably light shade of the chosen color) is to be applied.

3.12.3 After paint has been already dried, erection is done as specified in the item or as directed by engineer-in-charge.

3.12.4 After the erection final coat or second coat of paint / PU paint is to be applied on the structural steel.

4.0 Mode of Measurement and Payment

4.1 All work shall be measured on the basis of finished dimensions, as fixed on site and measured net unless specified otherwise.

4.2 The weight of steel sections, steel strips in finished works shall be calculated from standard weight on the same basis on which steel is supplied to the Contractor by the Client or those given in relevant IS Codes if steel is arranged by the contractor.

4.3 The weight of steel plates and strips shall be taken from relevant IS Codes, based on 7.85 kg/m² for every mm sheet thickness, if steel is supplied by the Contractor, otherwise, the weight shall be calculated on the basis on which steel is supplied to the Contractor by the Client.

4.4 Unless otherwise specified weight of cleats, brackets, packing pieces, bolts, nuts, washers, distance pieces, separators, diaphragm gusset (taking over all square dimension) fish plates etc. shall be added to the weight of respective items.

4.5 In riveted work, allowance shall be made for weight of rivet heads. No deductions shall be made for rivet or bolt holes excluding holes for anchor or holding down bolts.

4.6 For forged steel and steel castings, weight shall be calculated on the basis of 7850 kg/m3

4.7 Unless otherwise specified an addition of 2.5% of the weight of structure shall be made for shop and site rivet heads in riveted steel structure.

4.8 Dimensions other than cross sections and thickness of plates shall be measured to nearest 0.001m.

4.9 Mill tolerance shall be ignored when weight is determined by calculation.

4.10 Weight of only structural steel is considered and welding will not be considered in measurement.

4.11 The rate shall include cost of all material, labour, erection, hoisting, scaffolding, safety measures and sundry required for proper completion of the item of work, at all heights. This shall also include conveyance and delivery, handling, loading, unloading and storing etc. required for completion the item described above including necessary wastage involved. The rate shall be for one unit of Kg.

Item No:- 52

Providing and fixing shock absorbing rubber corner guard having size 115x115mm, height 1000mm and thickness 10mm, manufactured from flexible high strength rubber, embedded with highly reflective weather resistance reflective material, tamper resistant, with black base and tape color options in yellow, white and lime.

Specification as per item description & Manufacturer, Architecture drawing and as interactive engineer in-charge.

Item no:-53

Providing, supply, fabrication, installing, fixing, testing, cleaning, protection and handing over the Aluminium (Z-Type) louvers system, at all floors, levels & locations, aluminium section [extruded] for aluminium Z type louver system as per drawing of approved manufactures with extruded sections of Jindal / Indal / Aluminax or other approved eqivalent sections with size and weights as shown in the drawing [including wastages if any] conforming to relevant I.S specifications, including grouting the gap with thermocole & polysulphide sealant, providing & fixing MS brackets etc. all complete generally as per drawings, specifications etc., all as directed by Engineer in charge. (The aluminium system consist of the extruded aluminium sections of alloy 6063 T5/T6 & tolerances confirming to DIN / EN standards from approved make and manufacturer. The aluminium sections shall have approved shade and colour super durable powder coating with minimum 50 micron thickness. The non visible aluminium sections shall have approved chromatizing treatment. {The weight of extruded aluminium sections only will be mesured for payment}).

The Aluminium Z type louver system shall with stand the wind pressure of confirming to IS -875 part III. The Aluminium Z type louver system shall have louvers of size as per drawing and thickness of Z shape louvers, fixed at fixed distance (as per drwing) to aluminium frame, louver profile to be fixed on 3 mm thick aluminium flat to form a frame, the louver frame is supported on the aluminium box frame including providing & fixing SS-316 fastners, necessary MS brackets with SS-316 fastners, EPDM gasket, non staining weather sealant, SS-304 grade pan head screws etc complete.

Refer specifications from "CPWD vol. 1 & 2"

Item No:- 54

Supply, Installation, Testing, Commissioning of- Electromechanical boom barrier with a 3-meter boom arm for car and 1.5mtr boom arm for bike lane, And a 0.6-second opening/closing time. Key features include a corrosion-resistant powder-coated cabinet, die-cast aluminium motor with thermal radiating and cooling fan, and 100% duty cycle with an MTBF of 10 million cycles. Safety features include manual release, obstacle

reversal, auto-closing, and support for external photocell and vehicle loop detectors. The system operates on 220V/110V at 50/60Hz, with IP54 protection, a motor torque of 300Nm, and a working temperature range of 0°C to 65°C.

BOOM BARRIER=Havey Duty & high Speed Electromechanical boom barrier
Power Supply = 220-240V ~ 50/60Hz (120W Consumption)
Motor Type = 220V AC Servo Motor
Opening Time = 0.6 Seconds
Max. Power = 120 W Max.
Torque = 300 NM
MTBF = Up to 10 Million Operations (100% Duty Cycle)
Backup power = By UPS
Material (Housing) = 2.5 mm thick Mild Steel with polished, phosphatized, and plastic coating
Surface Treatment = Pre-hot dip galvanized (20µm) + polyester powder coated
Mechanism = Electro-Mechanical (Automatic)
Control Type = Electronic + Mechanical
Boom Type = Octagonal
Max Boom Length = 3 Meter for car and 1.5 mtr for bike
Boom Weight = 3 Kg
Boom Shape = Straight Arm, Telescopic Type
Operating Temperature = 0°C to +65°C
Humidity Tolerance = 0–90% RH
Protection Class = IP54
Communication Module = RS485
Weight Approx. =48 Kg
Encoder = Incremental, Integrated in the Motor
Electronic Controller Equipment = E614
Declaration Type = Electronic + Mechanical
Certifications = FCC, ISO–9001, CE Certified
Dimensions (Housing) = W 335 mm x D 285 mm x H 925 mm
Dimensions (Boom Arm) =Approx. 4.5 cm x 8 cm
Finish = Corrosion Resistance, Anti-Corrosion Treatment
Applications = Suitable for Indoor & Outdoor Use

Item No:-55
Drinking WATER COOLER
Refrigerant: R-134a
Compressor type: Reciprocating
Full stainless Steel Body
Full Stainless Steel Water Tank
No of Faucets: 2 (Cold)
Water Drainage option for Cleaning tank: yes
Water temperature controller: Yes (Manual)
Material - SS 304
Cooling Capacity - 60 Lit/hr
Storage Capacity - 120 Lits
Size: 730 mm X 549 mm X 1230 mm

Note:
1. Supply, Installation and Commissioning of equipment which includes preparation of shop drawings, supply, packing and forwarding, delivery to site, including transit insurance arrangement, unloading, handling and storage at site, final

assembly at designated rooms at any floor level.
2. All dimensions are in M.M. unless mentioned otherwise.

Specification as per item description & Manufacturer, Architecture drawing and as interactive engineer in-charge.

Item No:-56

Providing and fixing FRP grating having size as per detailed drawing to bear respective traffic load for drain channels at all level. The same shall be fixed in MS frame (size 50 x 50 x 6mm) to receive numbers of grating pre-approved by EIC. MS frame shall be fitted with hold fast and others in CC / masonry work in true line and level with one coat of zinc oxide + two coats of oil paint, colour shall match with grating as approved by EIC.

FRP Grating for Storm Water Drain

Specification as per item description & Manufacturer, Architecture drawing and as interactive Engineering-charge.

Item No:- 57

Road marking with hot applied thermoplastic paints with reflectorising glass beads on bitumen surface providing and laying a hot applied thermoplastic compound 2.5 mm thick including reflectorising glass beads @ 250gms per sqm area, thickness of 2.5mm is excluding of surface applied glass beds as per IRC:35-2015. The finished surface to be level, uniform and free from streaks and holes. zebra patta /bump patta lane/center line/ edge line/cut patta. The white color marking should provide luminance coefficient on cement road shall be min 130 mcd/m2/lux and Asphalt road shall be min 100 mcd/m2/lux during the service life during the day time. The marking should meet the performance criteria for night time reflectivity, wet reflectivity and skid resistance as mentioned in the section-15 of IRC 35-2015. Warranty for the Retro reflectivity should be two years.

The colour width and layout of road making shall be in accordance with the Code of Practice for Road Markings with paints, IRC: 35, and as specified in the drawings or as directed by the Engineer- in-Charge.

Material

Road markings shall be of ordinary road marking paint (retro-reflective), hot applied thermoplastic compound as specified in the item.

Hot Applied Thermoplastic Road Marking

General

7. The thermoplastic material shall be homogenously composed of aggregate, pigment, resins and glass reflectorizing beads.

8. The thermoplastic compound shall be screeded/extruded on to the pavement surface in a molten state by suitable machine capable of controlled preparation and laying with surface application of glass beads at a specific rate. Upon cooling to ambient pavement temperature, it shall produce an

adherent pavement marking of specified thickness and width and capable of resisting deformation by traffic.

9. The thermoplastic material shall conform to ASTM D36/BS-3262-(Part I).

10. The material shall meet the requirements of these specifications for a period of one year. The thermoplastic material must also melt uniformly with no evidence of skins or unmelted particles for the one-year storage period. Any material not meeting the above requirements shall be replaced by the manufacturer/supplier/Contractor.

11. Marking: Each container of the thermoplastic material shall be clearly and indelibly marked with the following information:

    a. The name, trademark or other means of identification of manufacturer.
    b. Batch number
    c. Date of manufacture
    d. Colour (White or yellow)
    e. Maximum application temperature and maximum safe heating temperature.

12. Sampling and Testing: The thermoplastic material shall be sampled and tested in accordance with the appropriate ASTM/BS method. The Contractor shall furnish to the Engineer-in-Charge a copy of certified test reports from the manufacturers of the thermoplastic material showing results of all tests specified herein and shall certify that the material meets all requirements of this Specification.

Preparation

3. The material shall be melted in accordance with the manufacturer's instructions in a heater fitted with a mechanical stirrer to give a smooth consistency to the thermoplastic material to avoid local overheating. The temperature of the mass shall be within the range specified by the manufacturer and shall on no account be allowed to exceed the maximum temperature stated by the manufacturer. The molten material should be used as expeditiously as possible and for thermoplastic material which has natural binders or is otherwise sensitive to prolonged healing, the material shall not be maintained in a molten condition for more than 4 hours.
4. After transfer to the laying equipment, the material shall be maintained within the temperature range specified by the manufacturer for achieving the desired consistency for laying Properties of Finished Road Marking

    a. The stripe shall not be slippery when wet.
    b. The marking shall not lift from the pavement in freezing weather.
    c. After application and proper drying, the stripe shall show no appreciable deformation or discoloration under traffic and under road temperatures upto 60oC.
    d. The marking shall not deteriorate by contact with sodium chloride, calcium chloride or oil drippings from traffic. The stripe or marking shall maintain its

original dimensions and position. Cold ductility of the material shall be such as to permit normal movement with the road surface without chopping or cracking.

e. The colour of yellow marking shall conform to IS Colour No. 356 as given in IS 164.

Application

Marking shall be done by fully /semi-automatic paint applicator machine fitted with profile shoe, glass beads dispenser, propane tank heater and profile shoe heater, driven by experienced operator as specified in item. For locations where painting cannot be done by machine, approved manual methods shall be used with prior approval of the Engineer-in-charge. The Contractor shall maintain control over traffic while painting operations are in progress so as to cause minimum inconvenience to traffic compatible with protecting the workmen.

The thermoplastic material shall be applied hot either by screeding or extrusion process. After transfer to the laying apparatus, the material shall be laid at a temperature within the range specified by the manufacturer or otherwise directed by the Engineer-in-Charge for the particular method of laying being used. The paint shall be applied using a screed or extrusion machine.

The pavement temperature shall not be less than 10oC during application. All surfaces to be marked shall be thoroughly cleaned of all dust, dirt, grease, oil and all other foreign matter before application of the paint. Thermoplastic paint shall be applied in intermittent or continuous lines of uniform thickness of at least 2.5 mm unless specified otherwise. Where arrows or letters are to be provided, thermoplastic compound may be hand sprayed.

The minimum thickness specified is exclusive of surface applied glass beads.
The finished lines shall be free from ruggedness on sides and ends and be parallel to the general alignment of the carriageway. The upper surface of the lines shall be level, uniform and free from streaks.

Measurements for Payment
The painted markings shall be measured in square metres of actual area marked (excluding the gaps, if any) correct upto the two places of decimal.

Rate
The rate includes the cost of all materials, labour and equipments required in all the above operations.

In case of Discrepancy Refer specifications from “Central Public Work Department Specifications (Vol-2)” Item no 16.51, Page 840.

Item No: -58

FOOD Kiosk Container – Providing, fabricating, supplying and installing in True line & level on specified level as per detailed drawings for Pre-fab Factory Made Portable Container type Food Kiosk Counter in Hot dip Galvanised Structural members and GI Sheet having size of 20' x 8' x 8' with following facilities inside of each compartment as per specifications:
(1) Work table (Type 1) in one number of size 3910 x 600 x 925 mm or as per drawing and provision for 2 nos. under counter refrigerator to be made as per specification
(2) Work table (Type 2) in one number of size 2340 x 600 x 925 mm or as per drawing and to be provided with 250mm height shelf under the counter top with SS supports & partitions.

(3) 2 no's SS Sink unit & bottom pipe shelf as per drawing & 1 no SS pipe shelf mounted above sink unit on wall with SS 316; size: 1370x300 mm at 600mm from top of sink. The unit shall be fabricated with 3 openable shutter as shown in drawing.
(4) All the preparation tables & sink tables should have 16 GA fabrication sheet at the top and the grade of steel used should be SS 316(Jindal Make).
(5) Side wall ventilation (type-1) in one number of size 755 x 158 mm to be provided horizontally as per drawing. Unit to consist of 03 such vents separated by the structural frame of the container as indicated in drawings.
(6) Side wall ventilation (type-2) in two numbers of size 755 x 158 mm with exhaust fan (outer size 158x158mm)of preferred make and model as per drawing.
(7) Back wall ventilation (type -1) in three number of size 1175 x 158 mm to be provided horizontally as per drawing. Vents shall be provided from the center of the wall and separated by the structural frame of the container.
(8) Back wall ventilation (type-2) in two numbers of size 1150 x 158 mm with exhaust fan (outer size 158 X 158 mm)of preferred make and model as per drawing. All vents to be provided from the centre of the wall separated by structural frame of the drawing. Each ventilation opening to have 50 mm wide MS plate frame projecting from the outer surface of the container on all 4 sides.
(9) Two service windows with flap door of size 1360 x 1025 mm at the front longer side on container. Window sill to be at 925 mm height from the container floor finish level.Each window to be fitted with 900mm height flap shutter foldable to 500mm, where the 500 mm portion serves as a counter top when open and the remaining 400 mm folds back anchored to the container. Features include a 125 mm height perforated panel at the top, 03 hooks on the outside for counter anchoring, and 04 nos. hook and stopper for internal closing.
(10)Main Door of size as per specification and drawing. Outside handle to be vertical D Type (minimum 450mm high and 25mm diameter) with the top fixed at 1200mm from the door bottom. Entry shall include 01 No. aldrop installed on the adjoining part and a door closer provided at a level of 900mm from the door bottom. Inside shall be provided with a mortise handle set with lever mortise lock (horizontal lock). Door must be fixed at a proper level to avoid obstruction while closing.
(11) Flooring to be covered with PVC vinyl sheet with proper drainage for water.
(12) Inner wall & ceiling shall be finished with Cement board including painting.
(13) 1 no Waste Bin Trolley below Sink with size of 375mm dia & 650mm Height with wheels.
(14) Three fans of 1200mm dia
(15) Electrification: It is provided with 6 Nos. of LED light (15Watt) & 6 No. 25Amp. Switch & socket & on/off switch for commercial kitchen equipment, Points.
(16) To be provided with 1 no of water tank (Sintex/equivalent Make) made of Plastic having capacity of 500 ltr. All welding joint should be TIG welded. The supplier should have manufacturing set up should be certified with EN-15085 and ISO 9001:2015 from a recognized third party agency.
17) Supply and Fixing of mechinical foam type Fire Extingusher conforming to IS 15683:2018 as per the required capacity of 6 liters to 9 liters.
Notes: 1) Contractor shall provide 10 years guarantee for container materials & facility inside material & accessories including 1 year defect liabilities period & 4-years M&R scope.
2) Refer Container specifications attached in Specification Volume.
3) Contractor shall connect all water supply and drainage services to the given point in external water and drainage network system as directed by EIC.

4) All the ironmongery shall be as approved by architect.
5) All structural members must be hot dip galvanised.
6) All Furniture shall have edge banding
7) All structural members shall be painted with 300-500 micron of Epoxy paint system with PU top coat of 50-60 micron as per manufacturer specification with 10 years guarantee.
8) Container shall be fire proof & shock proof.

Detailed Specifications are as per the item description.

Item No:-59

Supplying, providing, placing, installing and fixing in position in true line and level as per detail drawing approved by EIC, MODULAR TOILET PARTITIONS along with specified brand or approved equivalent of size as per detail drawings, Floor mounted including providing and fixing all accessories, fixtures, fastenings, hinges, anchorages, all hardware with approved locking arrangement as recommended by manufacturer and as approved by EIC etc. complete as directed, at all levels. Item description:
Cubicle size - 900mm x 1550mm x 2100 mm (height includes 150 mm gap from bottom).
Colour of Boards : As per the Shade card - approved by EIC. Thickness of Compact Sheet : 12mm (min.). Material:Compact Laminate in panels. Made from solid grade compact high-pressure laminate as per IS:2046 and EN438- manufactured under high specific pressure > 5 MPa and temperature 120° C with bunch of kraft papers impregnated with thermosetting phenolic resin and decorative papers made of cellulose fiber impregnated with thermosetting melamine resin which provide superior scratch, abrasion, heat, chemical, impact, graffiti & moisture resistance along with anti-bacterial properties. Panels have a black core that when machined, presents a distinctive black edge. Size of panels to be as per drawing.
Door size - 1750 x 600(H X W)
All doors will be of single colour and made of 12 mm thick HPL compact panel. The doors will have chamfered edges. Each door will be supported by 3 stainless steel made hinges affixed to the pilasters. Stainless steel made coat hook and Lock set (comprised of Thumb turn and occupancy indicator) are provided with each door. All the doors will be routed at the vertical ends and the rubber sponge lining will be incorporated at the routed ends.
Pilaster dimension - 1830 x 300 (H X W).
All pilasters will be made of 12 mm thick HPL compact panel with chamfered edge and completed with stainless steel made thumb turn lock set. Pilasters will be anchored to the floor using stainless steel made adjustable legs. All pilasters will be routed at their vertical ends to facilitate closure of doors. The bottom gap is 150-100 mm.
Dividers - 1775 x 1550 (H X W)
All intermediate partitions or dividers will be made of 12 mm thick HPL compact laminate panels. They are affixed with stainless steel made U-channel at their ends for ultimate stability of the system.
Hardware and Accessories Details : below mentioned all accessories – Stainless Steel - 304 Grade
a) Adjustable Pedestal Footing of base diameter 60 mm made from Stainless steel grade 316 giving an adjustable height of 100mm to 150mm. Surface finish to be matt type.
b) SS U -Channel
c) SS F Channel
d) SS Door Stopper Channel

e) SS Top Rail with circular cross section (Diameter 32mm). Surface finish will be mirror type.
f) SS Coat Hook with rubber stopper made from Stainless steel grade 304. Surface finish to be lacquer type.
g) SS Privacy Thumb turn c/w Occupancy Indicator made from Stainless steel grade 304. Surface finish to be lacquer type.
h) Round Door knob diameter 30 mm with grooves for better hand grip made from Stainless steel grade 304. Surface finish to be matt type.
I) SS Spring Loaded Butt Hinges with Cover
j) Anti-noise rubber padding of thickness 2 mm and width 10 mm
k) Screws & Wall Plugs. Stainless steel grade 304 screws.
l) Tubular panel holder made of stainless steel grade 304. Surface finish will be lacquer type.
m) Corner joinery section made from Stainless steel grade 304. Surface finish to be brush type. A thin plastic film pasted for surface protection. Size to be 35mm x16.4mm x 0.8 mm.
n) Wall joinery section with hamming profile made from Stainless steel grade 304. Surface finish to be brush type. A thin plastic film is pasted for surface protection. Size to be 21mm x 16mm x 0.8 mm.

Supplying, providing, placing, installing and fixing in position in true line and level as per detail drawing and approved EIC, Modular Toilet Urinal partition UMP along with specified brand or approved equivalent of size as per detail drawings, Colour of Boards : As per the Shade card - approved by EIC.
Item description:
The Urinary Panel has a 12 mm thick High Pressure Laminates (HPL) Compact Board, with a recommended panel width dimensions of 400-500 mm. The size of the panel is 500 mm (W-Top) X 400 mm (W-Bottom) X 1200 mm (H), with the overall height of 1200 mm.
Final Size of Partitions : As per drawing given - shop drawings approved by EIC.
Accessories Details : below mentioned all accessories –
Stainless Steel - 304 Grade made 2 brackets used to fix each urinal panels to the walls.

Detailed Specifications are as per the item description.

Item No:- 60
Providing and installing outdoor convex mirror of size 600mm diameter, 130 degree viewing angle, polycarbonate construction, vandal resistant with and without MS pole.

Material, Color and Fixing
It shall be manufactured from polycarbonate which shall be about 200 times stronger than glass and vandal resistant. It shall be of the diameter as mentioned in item description and as per selection and approval of architect and EIC with 130 degree viewing angle. It shall be lightweight and enable secure fixing with brim and back holding plate in metal/FRB as per selection. It shall be pole mounted or wall mounted with brackets as directed by architect and EIC. The fixing and finishing shall be as per manufacturer's instruction and as supplied for any of the two types of mounting accessories as per requirement. It shall be mounted with vendor supplied brackets and the installation surfaces shall be prepared as per manufacturer requirement. The location of the installation shall be as per drawing and shall be approved by architect & EIC before installation.

Mode of measurement and payment
The rate shall be of nos

Item No:- 61
Providing and installing the speed breaker of PVC material with size of 250x350x50mm and/or 250x450x60mm on the cement concrete surface of the road with labour and all the necessary accessories, hexacore design, oil resistance, chemical resistance, water resistance, UV stabilized, non fading colors, with reflector tape.

Specification as per item description & Manufacturer, Architecture drawing and as interactive engineer in-charge.

Item No:- 62
Providing and fixing in Stainless steel Floor Mounted Dustbin with dimensions and design as per Architect selection, in SS 316, Dual bins with 50 liters each having Matt / Mirror Finish including required foundation, anchor bolts and fixing details etc. completed as directed by EIC. Including Minimum 2 mockups for approval complete as per instruction of engineer in charge.

Specification as per item description & Manufacturer, Architecture drawing and as interactive Engineer-in-charge.

Item No;-63
Supplying and fixing in position various dia GI pipe for sleeves, using 'B' class (medium duty) GI pipes of any diameter as per requirement and as per drawing for sleeves etc. including cutting, placing in position, bending, welding, in line and level, at all levels & location including painting with one coat of approved zinc chromate primer, scaffolding. labour, wastage etc. complete all as per specifications, drawings and as directed by the Engineer in charge
Detailed Specifications are as per the item description.

Item NO:-64
All types of Signage

Specification as per item description & Manufacturer, Architecture drawing and as interactive engineer in-charge.

Item No:- 65
Landscaping Work

Specification as per item description & Manufacturer, Architecture drawing and as interactive engineer in-charge.

ITEM NO-66

TENSILE WORK

Design, Supply, Fabrication and Installation of Membrane Panels of combination Mesh as per the design. Membrane shall be Fiberglass fabric EC 6 filaments and Both sides

multi-layer Polytetrafluoroethylene reinforced coating having minimum Weight of 670 g/m2. The Fabric shall have minimum 21% openness porosity for Maximum Light Visibility with minimum Tensile Strength (Warp/ Weft) - 6000/ 6000 N/5cm, minimum Tear Strength (Warp/ Weft) -500/500 N/5 cm. Fabric Flame Retardancy Rating to be Non combustible class A2/DIN 4102 — A2-s1,d0/EN 13501 — ASTM E136 — ASTM E84 — NFPA 701 —Cal T19. Warranty of 10 years and Life span of 35 plus years with proven track record. The applicator to submit the fabric load analysis for approval of fabric. Cost shall include the supply of fabric/SS Cables with end terminals minimum 25mm thickness for main grid and minimum 10mm thickness for edge cable along with all the accessories. Fabric Flame Retardancy Rating to be Euro Class - Bs2, d0, Micro Organism Resistance-Degree 0 Excellent – EN ISO 846-A and Warranty of 10 years and Life span of 30 plus years with proven track record. The design complies with the requirements of BS and, EU Standards. The tension membrane structure shall include engineering design of structural members and accessory parts. Membrane systems shall include PVC/ PVDF coated Membrane Fabric, Clamps and tensioning hardware as per specification, drawings and engineers' approval. Vendor to provide an OEM certificate for authorisation. The Mesh must withstand its Self-load and windspeed resistance of up to 180-200kmph. All the accessories like GI Cables, Turnbuckels,Brackets to be fixed to the substructure/Civil work considering the weathering effects(windspeed/loadbearing capacity/Structural strength). Fabric analysis report shall be provided by vendor to understand the load calculation. Steel consumption to be provided by vendor. The entire system has to be backed up by a structural stability report.MS Built-up section/Tubular Structure (MS built-up section :-Rolled section & plates confirming to IS 2062 Grade Yst 350,Tubular Structure:- made from Steel hollow sections, ISI marked from SAIL / RINL / TATA/JINDAL, conforming to IS 1161/4923/1239, Minimum Yst 240 thickness upto 10mm) in the profile shape as per drawings with special plate connector, pinion joints, Plates, hollow sections etc. with special plate connectors, pinion joints, plates, hollow sections including Preparation of detailed fabrication and erection drawings of Structural steel work from design drawings issued by Engineer-In-Charge and incorporation of Engineer-In-Charge's comments on same, transportation from fabrication yard, cutting , threading, machining, leads and lifts upto all heights, tools and plants and necessary scaffolding etc. required for all operations involved to make structure of Tensile Membrane shade. The tubular structure system with plate connectors, pinion joints, etc. is to be provided. The structure has to be provided as per conceptual drawings of Tensile fabric profile , including all arch beam, curved lateral beams and bracings, vertical support columns, nodal joints, ,bases of columns and high tensile bolts of grade not less than 10.9 having black phosphate coating. The complete structure to be Hot Dip Galvanized along with one coat of epoxy primer and two coats of Polyurethane paint on steel work at all locations prepared by sand blasting in required minimum 210 micron DFT (dry film thickness) for each coat as specified in particular specification. Required detailed shop drawing and sample is needs to get approved from the project Architect before execution on site. Work shall be carried out as directed by the Engineer-In-Charge. Make List-Serge Ferrari/Sherfil/Chucko/F.I.T/Fibertech

Detailed Specifications are as per the item description.

GENERAL NOTES

6. Products with relevant I.S. markings from the B. I.S. Licensed manufacturers, who have been in the market for the last three years with a valid I.S. License, shall be considered for approval.

7. In the event of items where I.S. marked material is not available, the contractor shall procure the same from the following list, subject to prior approval of the Engineer-in-charge. Periodic tests shall be carried out as per contract / specifications at contractor's own cost.

8. In case any new brand other than BIS certified or from a departmental list of manufacturers is proposed, adequate information about the product and manufacturer shall be provided at the tender stage.

9. The Department reserves the right to accept / reject any new brand(s) proposed by the tenderer.

10. Samples of all materials, fittings etc. to be incorporated in the work shall be submitted by the contractor and approved by the Engineer-in-Charge, before supply in bulk at the site of work. Wherever particular make or its equivalent is mentioned in the item schedule, the decision of the Engineer-in-Charge in selection of particular make or its equivalent shall be final and binding on the contractor. The approved samples will be kept in custody of the Engineer-in-Charge till completion of the work. Materials not conforming strictly to the approved samples will be rejected.