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(ଓଡ଼ିଶା ସରକାରଙ୍କ ପୂର୍ବ ବିଭାଗ ଅଧ୍ୟନର ଏକ ଉଦ୍‌ଦେୟାଗ)

ODISHA BRIDGE & CONSTRUCTION CORPORATION LIMITED

(A Government of Odisha Undertaking under Works Department)

No: 6798
File: SMT- 1741

Date 21/08/2021

CORRIGENDUM NO. 1 (Extension of Date, ADDENDUM & Reply to Prebid queries)

Name of the Work	: Construction of 1 No. 500 seated Boys Hostel for final year & PG students, 200 seated Farmers Hostel and Upgradation of 10 Nos. of Ladies Hostel of OUAT, Bhubaneswar on Lump- Sum Turnkey basis.
Bid Identification No	: 06/TENDER/OBCC/2021-22
E-Procurement Tender_ID	: 2021_OBCC_70316_1

The bidders are requested to take note of the following changes made in the RFP documents, which are to be considered while submitting the RFP. They shall be presumed to have done so and submitted the RFP accordingly.

SI No	Reference	As per RFP	As modified
1	NIT SI No.1	The Bid documents will be available in the website: www.tendersodisha.gov.in from 5.00P.M. of Dt. 11.08.2021 to 5.00 P.M. of Dt. 31.08.2021 for online bidding	The Bid documents will be available in the website: www.tendersodisha.gov.in from 5.00P.M. of Dt. 11.08.2021 to 5.00 P.M. of Dt. 13.09.2021 for online bidding
2	NIT SI No.3	Bids Shall be received only on online on or before 5.00 P.M. of Dt. 31.08.2021 .	Bids Shall be received only on online on or before 5.00 P.M. of Dt. 13.09.2021 .
3	NIT SI No. 9	The original financial transaction receipt in support of Bid processing fee and Bid Security declaration shall have to be submitted on or before 11:00 A.M on 01.09.2021 to the Managing Director, OB&CC Ltd. failing which the bid shall not be evaluated and liable for rejection.	The original financial transaction receipt in support of Bid processing fee and Bid Security declaration shall have to be submitted on or before 11:00 A.M on 14.09.2021 to the Managing Director, OB&CC Ltd. failing which the bid shall not be evaluated and liable for rejection.

Sl No	Reference	As per RFP	As modified
4	NIT Sl No.7	Technical Bids received online shall be opened at 11:30 A.M. on dt. 01.09.2021.	Technical Bids received online shall be opened at 11:30 A.M. on dt. 14.09.2021.
5	Bid Data Sheet Clause No: 20.1	<p>Time and date of online submission is on or before 5.00 P.M. of Dt. 31.08.2021 .</p> <p>For Cover-III & Cover-IV, time and date of offline submission is on or before 11:00 A.M on 01.09.2021 in the office of the Employer.</p>	<p>Time and date of online submission is on or before 5.00 P.M. of Dt. 13.09.2021 .</p> <p>For Cover-III & Cover-IV, time and date of offline submission is on or before 11.00 A.M on 14.09.2021 in the office of the Employer.</p>
6	Bid Data Sheet Clause No: 23.1	All the bids received shall be opened in the Office of the Managing Director, Odisha Bridge & Construction Corporation Ltd, Vikash Bhawan, Nayapalli, Bhubaneswar-751012 on 1st September, 2021 at 11:30 A.M.	All the bids received shall be opened in the Office of the Managing Director, Odisha Bridge & Construction Corporation Ltd, Vikash Bhawan, Nayapalli, Bhubaneswar-751012 on 14th September, 2021 at 11:30 A.M
7.	Section-8 P-215, Other Materials Clause-h(i)	Glazing of windows: Glazing shall be minimum 6 mm thick toughened glass complying with codal safety provisions and the wind speeds. Other areas shall have glazing with reflective coating	Glazing of windows: Glazing shall be minimum 5.5 mm thick toughened glass and for other areas (staircase, lobbies for hostel block & dinning, common rooms for amenities block) shall have fixed glazing of minimum 12mm thick toughened glass with reflective coating. complying with codal safety provisions and the wind speeds
8.	Section-8 Page-213 g.Water supply network Clause-v	Planning, design & construction of RCC underground sumps of adequate capacity as per the direction of Engineer	Planning, design & construction of RCC underground sumps/ RCC Overhead tank of adequate capacity as per the direction of Engineer

SI No.09 : Refer the responses to the pre-bid queries attached as Annexure-I

SI No.10 : Refer to the Addendum for the renovation of 10 Nos of Ladies Hostel, OUAT, Bhubaneswar (Details of quantities of items) as Annexure-II.

SI No.11 Refer to the Addendum for PH & Electrical technical specification as Annexure-III

SI No.12 Refer revised Section-9 (Payment Schedule)

- SI No.13** : The Corrigendum shall be the part of the RFP documents
- SI No.14** : All the items specified in this corrigendum supersede relevant items to that effect as provided in the original RFP documents. All other specifications, terms & conditions of the original RFP document shall remain unchanged.
- SI No.15** : The queries raised and given by the bidders, but the clarifications are not made in this corrigendum shall be considered to remain unchanged as per the terms & conditions mentioned in the original RFP documents.
- SI No.16** : Bidder shall read and consider following points, which shall be a part of the RFP documents
- SI No.17** : All other terms and conditions remain unchanged.
- SI No.18** : Refer the link for the drawings given below
<https://drive.google.com/folderview?id=1zzfsxhVmEjxIWQJUvbFtQSLCFeQr0fp8>

Bidders are advised to go through the corrigendum and addendum carefully along with the RFP while preparing the response/ proposal.

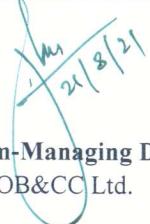
Yours sincerely
21/8/21
EIC-cum-Managing Director
WAT

ANNEXURE-I**"REQUEST FOR INFORMATON" REGISTER**

Construction of 1 No. 500 seated Boys Hostel for final year & PG students, 200 seated Farmers Hostel and Upgradation of 10 Nos. of Ladies Hostel of OUAT, Bhubaneswar, Odisha

Sr. No.	Queries	Reply
A	CIVIL	
1	Land development upto required formation level, to be part of contractor's scope and what shall be the FRL & FFL with respect to the contour levels.	land developemnet is within the scope of the contractor. Plinth level of the building is 750 mm above the average ground level
2	Construction water & power in contractors scope, pls clarify.	Yes, will be in Contractor's Scope
3	Require autocad drawings of the renovation ladies hostel block	Details being uploaded in Corrigendum
4	Structural stability for the renovation work of ladies hostel does not lies in contractor scope, pls clarify.	Yes, structural stability does not lies in contractor's scope
5	The Mandatory Requirements as noted in Page No . 209 of Bid document , it is noted that in b. General plantation (Trees to be planted should be fully grown of above 4M Could You please spell out the number of such Trees for a better understanding and clear considerationheight)	No of trees will be decided as per design of the landscape designer within the area mentioed.
6	We request the Employer to provide Us space as available for setting up Our Temporary Office and labour accommodation with adequate Power and water supply till the duration of the Project and we will pay for the Energy consumed as applicable	It is to be arranged by the contractor
7	Glazing shall be minimum 6 mm thick toughened glass complying with codal safety provisions and the wind speeds. Other areas shall have glazing with reflective coating. Please Clarify which are all the other areas to be considered here .	Details being uploaded in Corrigendum
8	Renovation of Ladies Hostel :- Outside weather coat painting over primer shall be provided without putty coating.	Details being uploaded in Corrigendum
a	We have assumed all plaster (Internal as well external) to be removed and redone.	Details being uploaded in Corrigendum
b	Creterion for replacement of damaged doors and windows.	Details being uploaded in Corrigendum
c	All the Steel Casement windows are damaged and needs to be replaced. Some portions of the Building are provided with Aluminium Sliding Windows . Can we change all the Windows and ventilators replacing the same with Colour anodised Aluminium Sliding windows.	Details being uploaded in Corrigendum
d	Similarly, it may not be advisable to change only the damaged doors as most of them are damaged and it may not look good if the adjoining doors are not changed.	Details being uploaded in Corrigendum
e	2 ft. wide plinth protection – Can it be out of Pore Cast Concrete Slabs	Details being uploaded in Corrigendum
f	Complete renovation to internal water supply and sanitary installation, please clarify	Details being uploaded in Corrigendum
g	Please clarify on the Floor finish as some areas are provided with Mosaic Tile flooring and other areas are provided with IPS flooring . Are we to replace the complete area with vitrified Tile Flooring	Details being uploaded in Corrigendum
h	Paving to courtyards. (Specify the material to be Used) Can it be out of Grass paver Blocks	Details being uploaded in Corrigendum
i	At some places in the Elevation treatment they have used Terracotta tiles which are broken and or falling off at places due to poor bonding with the base concrete . Shall be remove all and redo the same with plaster finish with appropriate paint finish.	To be taken up as per the site requirement
j	The Entire Terrace Water proofing has to be redone along with the treatment for Sunken slabs in all toilets	Details being uploaded in Corrigendum

B	Technical	
	MEP	
1	Electrical Point of Tapping for Hostel - 2 & Farmers hostel from existing source / extension / new application to be done to be confirmed.	New application to be done for 2 hostels separately
2	Scope of work for External Electrical works with respect to getting the power till the premises to be clarified.	the agency will coordinate and get the the work done. The payment will be made by OUAT.
3	External Source of Water for Fire/ Domestic water to be confirmed, if to be applied new/ extension of existing	New connection to be applied
4	Scope of CCTV , locations or monitoring areas to be clarified.	as per the area mentioned in RFP (Entrance , Exit & in Common places)
5	Scope of Data, Tel & Netowrking to be clarified with respect to building floors.	all rooms & office will be equipped with LAN access
6	Details (Plan, Elevations & Sections) of 10 nos of Ladies Hostel to be renovated to be provided	Only plans being provided in corrigendum
7	Capacities provided for following are for single hostel or Combined to be confirmed, 1. Electrical Load - 1300 KVA 2. DG Set - 350 KVA 3. Water Demand - 370 KLD 4. STP - 125 KLD	within the scope of the contractor as per the RFP
8	For Farmers Hostel, the Utilities (Water Tank. Fire Tank. Transformer. DG Set, STP, Etc) to be considered for Existing as well for proposed building or only for proposed Building.	only for proposed building
9	Complete renovation to internal electrification with changing the switch boards, Distribution boards etc please clarify.	Yes, Complete renovation


 E.I.C-cum-Managing Director
 OB&CC Ltd.
 21/8/21

RENOVATION FOR 10 NOS LADIES HOSTEL

Sl No.	Name of the Items	Unit	Quantities						Total Quantity			
			HOSTEL -3	GOLDEN JUBILEE - RAMADEVI HOSTEL	GOLDEN JUBILEE - KAMALA PUARI	GOLDEN JUBILEE - KUNATALA KUMARI	GOLDEN JUBILEE - MALATI DEVI	GOLDEN JUBILEE - TULASI MUNDA				
1	(a) Surface preparation The cleaning and preparation of the substrate to which waterproofing barrier is applied must be carried out thoroughly to leave a sound base for the application. 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. Surface shall be maintained in SSD condition before applying waterproof coating. (b) Waterproof coating Providing and applying waterproof coating using Nitoproof 725 One-component cold-applied water based modified polyurethane hybrid elastomeric waterproof membrane of Fosroc Chemicals at minimum 0.8mm dft. in one coat having Solids by Volume : 62%, Tensile strength ASTM D412 : >550%, Tear strength, ASTM D624 : 13N/mm , Adhesion to substrate : 1.9MPa concrete, Crack bridging, static/dynamic : 2mm ASTM C836 , Resistance to water : 10m pressure & SRI value 106 for white to be used on the Roof of including parapet wall surface as per manufacturer direction. (c) Coving at Right Angle Junctions All the right angle junctions between floor and wall shall be provided with coving of size 75mm x 75mm minimum 15mm thickness in cement mortar 1:4 admixed with Nitobond SBR of Fosroc Chemicals @ 2 litres per 50 kg bag of cement after saturating the surface with water and applying a slurry primer coat with Nitobond SBR. (d) Protective coating Providing & applying PU coating Fosroc Dekguard PU on the applied water proofing surface as per the manufacturer direction.	Sqm	2168.00	960.00	1025.00	922.00	900.00	252.00	900.00	506.00	8533.00	
2	Providing and laying 1st quality vitrified tiles in floors and dados of minimum size 600x 600 mm of 8mm thick with water absorption less than 0.08% and conforming to IS:15622, of approved make, in all colours and shades, laid on 20mm thick cement mortar 1:4 (1 cement : 4 coarse sand), joining with grey cement slurry @ 3.3 kg/ sqm including grouting the joints with white cement and matching pigments etc., complete./ Fixing Vitrified floor tiles with cement based high polymer modified quick-set tile adhesive (Water based) conforming to IS: 15477, in average 3mm thickness etc complete as per direction of Engineer- in charge. (in all rooms, kitchen, dining etc)	Sqm	3002.00	349.00	1345.00	396.00	633.00	840.00	974.00	641.00	8813.00	
3	Providing and laying flamed finish Granite stone slabs in flooring and dados in required design and patterns, in linear mm for common areas/ single piece for risers and treads with 2mm groove line of staircase over 20 mm (average) thick base of cement mortar 1:4 (1 cement : 4 coarse sand) laid and jointed with cement slurry and pointing with white cement slurry admixed with pigment of matching shade including rubbing, curing and polishing etc, all complete as specified and as directed by the Engineer-in-Charge .(in staircase, landings and corridors after removing existing flooring)	Sqm	2688.00	326.00	788.00	626.00	764.00	263.00	464.00	290.00	6973.00	
4	Providing and fixing Stainless Steel (Grade 316) Railing made of Hollow tubes,channels, plates etc., including welding, grinding, buffing, polishing and making curvature (wherever required) and fitting the same with necessary stainless steel nuts and bolts complete, i/c fixing the railing with necessary accessories & stainless steel dash fasteners , stainless steel bolts etc., of required size, on the top of the floor or the side of waist slab with suitable arrangement as per approval of Engineer-in-charge, (for payment purpose only weight of stainless steel members shall be considered excluding fixing accessories such as nuts, bolts, fasteners etc.,)etc complete as per direction of Engineer- in charge.	Kg	2400.00	1200.00	1200.00	2400.00	600.00	600.00	800.00	800.00	10600.00	
5	Providing and fixing 1st quality antiskid floor tiles of 8mm thick of minimum size of 300 x 300mm conforming to IS : 15622 of approved make in all colours, shades except burgundy, bottle green, black of any size as approved by Engineer-in-Charge in Skirting, risers of steps and dados over 12 mm thick bed of cement Mortar 1:3 (1 cement: 3 coarse sand) and jointing with grey cement slurry @ 3.3kg per sqm including pointing in white cement mixed with pigment of matching shade complete.Antiskid tile flooring in bathrooms after removing existing flooring etc complete as per direction of Engineer- in charge.	Sqm	414.00	128.00	299.00	64.00	116.00	116.00	100.00	101.00	73.00	1411.00
6	Providing and fixing of 1st quality minimum 4 mm thick ceramic glazed wall tiles of minimum size 300x 450 mm upto lintel level over 12 mm thick bed of cement Mortar (1:3) with grey cement slurry @ 3.3 kg/ sqm in wash areas/ toilets after removing existing tiles etc complete as per direction of Engineer- in charge.	Sqm	2645.00	241.00	2561.00	453.00	805.00	805.00	668.00	780.00	734.00	9692.00
7	Removing old cement plaster from walls including raking out joints 12 mm deep and removing the debris within 50m lead and providing 16 mm thick cement plaster (1:4) to internal walls etc complete as per direction of Engineer- in charge.	Sqm	9315.00	2039.00	4838.00	1676.00	3002.00	3002.00	2559.00	3503.00	1961.00	31895.00

8	Providing 12 mm thick cement plaster (1:4) to R CC surfaces finished smooth including closed deep chipping and slurry treatment etc complete as per direction of Engineer- in charge.	Sqm	3900.00	416.00	1828.00	689.00	1178.00	934.00	2184.00	683.00	12990.00
9	Removing old cement plaster from walls including raking out joints 12 mm deep and removing the debris within 50m lead and providing 12 mm thick cement plaster (1:4) to outside walls etc complete as per direction of Engineer- in charge.	Sqm	6444.00	795.00	2489.00	1135.00	2154.00	1077.00	2035.00	1309.00	19592.00
10	Providing Wall painting 2 coats with plastic emulsion paint of approved brand and manufacture to give an even shade over a coat of priming with putty etc complete as per direction of Engineer- in charge.	Sqm	18183.00	3433.00	2885.00	9196.00	3254.00	5761.00	4823.00	7734.00	3655.00
11	Providing Wall painting 2 coats with weather coat paint of approved brand and manufacture to give an even shade over a coat of priming with weather coat putty etc complete as per direction of Engineer- in charge.	Sqm	8055.00	994.00	1584.00	3111.00	1419.00	2693.00	1346.00	2544.00	1637.00
12	Providing 32mm thick hard wood frame with 12mm thick BWP laminated ply panel shutters complete with aluminium fitting and wooden hinged cleats etc., fitted and fixed in position with 12mm M S square bar grills including all labour and materials complete etc complete as per direction of Engineer- in charge.	Sqm	105.00	105.00	63.00	21.00	53.00	53.00	11.00	42.00	42.00
13	Providing Anti termite treatment to existing concrete floors by drilling holes @ 300mm c/c both ways upto soil level and filling with solution of Chlormyrtos 20 EC or Lindane 20 EC and outside of the wall using Chlormyrtos 20 EC or Lindane 20 EC as per IS 6313 (Part 1, 2, 3) :2001 etc complete as per direction of Engineer- in charge.	Sqm	2168.00	960.00	370.00	1025.00	900.00	537.00	537.00	215.00	900.00
14	Making 2 ft. wide plinth protection 50mm thick of cement concrete 1:2:4 (1 cement : 2 coarse sand (zone - II) : 4 graded stone aggregate 20 mm nominal size) over 600mm wide and 400mm thick brick masonry (1:6) including necessary excavation, levelling & dressing & finishing the top smooth etc complete as per direction of Engineer- in charge.	Rmt	584.00	141.00	237.00	124.00	170.00	170.00	85.00	260.00	102.00
15	Providing Cement concrete (1:11/2:3) with 72mm size broken hard granite chips for R.C.C. works including hoisting and laying per 1cum (To be used for minor repair work only) etc complete as per direction of Engineer- in charge.	Cum	20.00	20.00	15.00	15.00	16.00	16.00	12.00	20.00	154.00
16	Providing Brick work with Flyash. bricks 25cm x 12cm x 8cm size having crushing strength not less than 75 Kg/cm ² with dimensional tolerance ± 8 percent in cement mortar (1:4) in super structure etc complete as per direction of Engineer- in charge.	Cum	15.00	20.00	19.00	18.00	15.00	15.00	15.00	15.00	147.00
17	Providing and laying 60mm thick factory made cement concrete interlocking paver block of M -30 grade made by block making machine with strong vibratory compaction, of approved size, design & shape, laid in required colour and pattern over and including revetting existing bed in courtyards over compacted bed filling the joints with lime sand etc. all complete as per the direction of Engineer-in-charge.	Sqm	1920.00	309.00	121.00	0.00	1920.00	1920.00	0.00	229.00	136.00
	Removal of existing Internal Electrification works including all fixtures and providing internal electrification to entire building as per the technical specification	Builup area (\$qm)	5773.00	2880.00	1076.00	2630.00	922.00	1610.00	1610.00	632.00	1660.00
	Removal of existing PH and sanitary installation works including all fixtures and providing new PH and sanitary installation to entire utility area of the building as per the technical specification	Builup area (\$qm)	5773.00	2880.00	1076.00	2630.00	922.00	1610.00	1610.00	632.00	1660.00

The items mentioned above are not exhaustive, whatever required by the Engineer-in-Charge will be taken up for renovation.

The quantities mentioned above may vary by $\pm 5\%$.


 E.I.G-cum-Managing Director
 OB&CC Ltd.


PH TECHNICAL SPECIFICATION

GENERAL:

All items of Works will be executed as per the specification mentioned in the respective items/ as per relevant IS codes with latest revision/ as directed by the Engineer-in-charge. The bidders are to submit all the sample of the materials to be used and get it approved before execution of the item of work.

TECHNICAL SPECIFICATION OF CIVIL PORTION OF WORK

Materials of following specification are to be used in work. The Tenderers are expected to possess and be well conversant with the following IS standard and code of practice.

1.	Cement	Only Ordinary Portland Cement and Portland Slag cement are to be used. The grade of Portland Cement is to be decided by the Engineer-in-Charge. 53 grade Ordinary Portland Cement confirming to IS:12669 or Portland Slag Cement confirming to IS:455 is to be used in RCC works. For other work, the grade of Ordinary Portland Cement will be decided by the Engineer-in-Charge. Portland Slag Cement confirming to IS:455 can be used in any type of work.
2.	Steel	I.S. 432 (Plain) and I.S.: 1786 (Tor) :Fe 500
3.	Vibrator	I.S. 7246
4.	Aggregate	I.S. 383, I.S. 515
5.	Water for mixing and curing	Shall be clean, free from injurious amount of oil, salt, acid, vegetable materials and other substances and harmful to concrete in conformity to I.S. 456 and I.S. 2025.
6.	Sand/ Fine Aggregate	I.S. 2116, 383
7.	Binding wire	I.S. 280 (galvanized minimum 1 mm)
8.	Rain water pipe	I.S. 2527
9.	Construction joints	I.S. 3414
10.	Steel Window Frame	I.S. 1038/83
11.	Steel Door Frame	I.S. 4351/75
12.	Fitting & Fixtures for joinery works	Conforming to I.S. 7452/82 strictly conform to I.S. specification and as per direction of Engineer-in-Charge.

Note : For road work (Approach Road) specification as per road and bridges (latest edition) published by I.R.C & M.O.S.T. shall be followed. In case of any doubt and absence of provision, regarding specification I.S. shall be referred (Indian standard).

ITEM OF WORK

1. Concrete shall be with conformity to I.S.456.
2. Foundation shall be with conformity to I.S.1080.
3. Stone masonry (R.R.) shall be with conformity to I.S.1597 (Part-I)
4. C.R. Masonry shall be with conformity to I.S.1597.
5. Brick masonry shall be with conformity to I.S.2212.
6. Cement plastering shall be with conformity to I.S.9103 & 6925.
7. Mortar shall be with conformity to I.S.2250
8. White and colour washing shall be with conformity to I.S.6278.
9. CC in foundation shall be with conformity to I.S.2571.
10. Anti-Termite Treatment shall be with conformity to I.S.6813. (Part – I & Part – II)
11. Painting to all surfaces shall be with conformity to I.S.2395 (Part – I & Part – II)
12. DPC shall be with conformity to I.S.3067
13. Tarfelt treatment shall be with conformity to I.S.1346
14. Mosaic flooring with conformity to I.S.2114
15. Steel painting shall be with conformity to I.S.1477 (Part – I & Part – II) I.S.1661

TECHNICAL SPECIFICATIONS OF P.H. PORTION OF WORK

(Internal & External PH Engg. Works)

1.1 GENERAL INSTRUCTIONS: The detailed specifications given herein after are for the items that are required for the works described in the schedule of quantities attached herein and shall be guidance for proper execution of work to the required standards. It may also be noted that the specifications are of generalized nature, and these shall be read in conjunction with the description of item in schedule of quantities and drawings. The work also includes all minor details of construction which are obviously and fairly intended, and which may not have been referred to in these documents but are essential for the entire completion in accordance with standard Engineering practice.

Unless specifically otherwise mentioned all the applicable latest codes and standards published by the Indian Standard Institution and all other standards shall govern in all respects of design, workmanship, quality and properties of materials and methods of testing, method of measurements etc. Wherever any reference to any Indian Standard Specification occurs in the documents relating to this contract, the same shall be inclusive of all amendments issued there to or revisions thereof, if any. In case there is no I.S.I specification for the particular work, such work shall be carried out in accordance with the instructions in all respects, and requirements of the Engineer-in-charge. The work shall be carried out in a manner complying in all respects with the requirements of relevant byelaws of the Municipal Committee/Municipal Corporation/Development Authority/Improvement Trust etc. under the jurisdiction of which the work is to be executed or as directed by the Engineer-in-charge and, unless otherwise mentioned, nothing extra shall be paid on this account.

Samples of various materials, fittings etc. proposed to be incorporated in the work shall be submitted by the contractor for approval of the Engineer-in-charge before order for bulk supply is placed.

The contractor shall take instructions from the Engineer-in-charge regarding collection and stacking of materials in any place. No excavated earth or building materials shall be stacked on areas where other buildings, roads, services, compound walls etc are to be constructed.

The contractor shall maintain in perfect condition all works executed till the completion of the entire work allotted to him. Where phased delivery is contemplated, this provision shall apply to each phase.

The contractor shall give a performance test of the entire installation(s) as per standard specifications before the work is finally accepted and nothing extra whatsoever shall be payable to the contractor for the test.

The contractor shall clear the site thoroughly of all debris, surplus excavated materials and rubbish etc. left out of his work and dress the site around the building to the satisfaction of the Engineer-in-charge before the work is considered as complete.

The EIC Cum Managing Director OB&CC. shall be the sole deciding authority as to the meaning; interpretations and implications for various provisions of the specifications and his decision in writing shall be final and binding on all concerned.

In case any difference or discrepancy between the specifications and the description in the schedule of quantities, the schedule of quantities shall take precedence. In case of any difference or discrepancy between specifications and drawing, the specifications shall take precedence. In case any

difference or discrepancy between the specifications for Civil works and specification for Public Health Engg. Works, specifications for civil works shall take precedence.

1.2 LIST OF INDIAN STANDARDS

The following IS codes shall be referred in execution of PH Engineering works

Indian Standard	Reaffirmation	Subject
269-1989	Reaffirmed 2004	Specifications for 33 grade Ordinary Portland Cement
4985		PVC pipes for portable water supply
456-2000	--	Code of practice for Plain & Reinforced concrete
458-2003	--	Specifications for Concrete pipes
10124	--	Fabricated PVC fittings for Portable water supply
636-1988	Reaffirmed 2003	Firefighting hose, rubber lined, or fabric reinforced rubber lined woven jacketed
638-1979	Reaffirmed 2003	Sheet rubber jointing & rubber insertion jointing
12235		Methods of tests for unplasticized PVC pipes for portable water supplies.
ASTM D-2467		SCH80 uPVC fittings
1068		Electroplated coatings for nickel and chromium on iron steel and brass fittings.
13592		Codes of Practice for uPVC SWR pipes.
771-1979(P-III)	Reaffirmed 2003	Specific requirements of urinals
771-1985(P-III)	Reaffirmed 2000	Specific requirements of urinals
5329		Code of practice for sanitary pipe work above ground for Building.
2556		Various sanitary appliances.
14735		uPVC SWR pipe fittings
781		Sand cast brass screw down bib taps & stop taps for water services.
774-1984	Reaffirmed 2000	Flushing cistern for water closet & urinals
775-1970	Reaffirmed 2000	Cast iron brackets and supports for wash basin and sink
5382		Rubber rings
1172 & 5329		Testing of Pipeline and fixtures of Plumbing of Building
781-1984	Reaffirmed 2001	Specifications for cast copper alloy screw down bib taps & stop cocks for water services
1742		Code of Practice for Building drainage.
783-1985	Reaffirmed 2001	Code of practice for laying concrete pipes
784-2001	Reaffirmed 2002	Pre-stressed concrete pipes
884-1985	Reaffirmed 2000	Fire aid hose reel for firefighting (for fixed installation)
901-1988	Reaffirmed 2003	Specification for couplings, double males & double female, instantaneous pattern for fire fighting
902-1992		Specification for suction hose couplings for firefighting purpose
903-1993	Reaffirmed 2003	Couplings for fire hose delivery, branch pipe, nozzles specification
904-1983	Reaffirmed 2000	Specification for 2 way & 3-way suction collecting heads for firefighting purposes
905-1980	Reaffirmed 2002	Specification for delivery breechings, dividing and collecting instantaneous pattern for fire fighting

Indian Standard	Reaffirmation	Subject
906-1988	Reaffirmed 2000	Specification for revolving branch pipe for fire fighting
907-1984	Reaffirmed 2000	Specification for suction strainer, cylindrical type for fire fighting
908-1975	Reaffirmed 2000	Fire hydrants, stand post type
909-1992	Reaffirmed 2002	Specifications for underground fire hydrants sluice valve type
940-1989	--	Portable fire extinguisher, water type (Gas cartridge)
941-1985	Reaffirmed 2000	Specification for blower and exhauster for fire fighting
1172-1993	Reaffirmed 2002	Code of basic requirements for water supply, drainage and sanitation
1200-1979(P-16)	Reaffirmed 2002	Method of measurements for laying of water and sewer lines including appurtenant items
1200-1981(P-19)	Reaffirmed 2002	Method of measurement for water supply, plumbing and drains
2963		Non-Ferrous Waste fittings for Wash basin & Sink
3311		Waste coupling and its accessories for its wash basin.
1300-1994	Reaffirmed 2000	Phenolic molding material specification
5434		Nonferrous alloy Bottle trap
1703-2000		Ball valve (horizontal plunger type) including floats for water supply
1711-1984	Reaffirmed 2000	Self-dosing taps
1726-1991	Reaffirmed 2003	Cast iron manhole covers and frames
1742-1983	Reaffirmed 2002	Code of practice for building drainage
1795-1982	Reaffirmed 2000	Pillar taps for water supply purpose
1979-1985	Reaffirmed 2002	Specification for high test line pipe
2065-1983	Reaffirmed 2001	Code of practice for water supply in buildings
2097-1983	Reaffirmed 2000	Specification for foam making branch pipe
2104-1981	Reaffirmed 2003	Water meter boxes (domestic type)
2171-1999		Specification for portable fire extinguisher, dry powder
2190-1992	Reaffirmed 2002	Code of practice for selection, installation & maintenance of portable first aid fire extinguisher
2267-1995	Reaffirmed 2000	Polystyrene moulding and extension materials
2326-1987	Reaffirmed 2003	Automatic flushing cistern for urinals
2379-1990	Reaffirmed 2000	Color code for identification of pipe lines
2401-1973	Reaffirmed 2003	Code of practice for selection, installation & maintenance of domestic water meters
2470-1985 (P-I)	Reaffirmed 2001	Design criteria and construction
2527-1984	Reaffirmed 2000	Code of practice for fixing rain eater gutters and down pipe for roof drainage
2546-1974	Reaffirmed 2000	Specification for galvanized mild steel fire bucket
2548-1996(P-I)	Reaffirmed 2002	Plastic water closet seats and covers
2548-1996(P-II)	Reaffirmed 2002	Plastic water closet seats and covers
2556 (P I to XV)		Specification for vitreous (vitreous china) sanitary appliances
2556-1994 (P-I)	Reaffirmed 2004	General requirements
2556-1994 (P-II)	Reaffirmed 1999	Specific requirements of wash down water closets

Indian Standard	Reaffirmation	Subject
2556-2004 (P-III)		Specific requirements of squatting pans
2556-2004 (P-IV)		Specific requirements of wash basins
2556-1995 (P-VI)	Reaffirmed 2003	Specific requirements of urinals & partition plates
2556-1995(P-VII)	Reaffirmed 2003	Specific requirements of accessories for sanitary appliances
2556-1995(P-VIII)	Reaffirmed 1998	Specific requirements of pedestal close coupled & wash down and symphonic water closets
2643-1999	--	Type threads where pressure tight joints are not made on the threads dimension, tolerances and designation
2692-1989	Reaffirmed 2003	Specifications for ferrules for water services
2871-1983	Reaffirmed 2000	Specification for branch pipe, universal, for firefighting purpose
2878-2004		Fire extinguisher, carbon dioxide type (portable and trolley mounted) specification
2951 (P I to II)		Recommendation for estimate of flow of liquids in closed conduits
2951-1965 (P-I)	Reaffirmed 2003	Head loss in straight pipes due to frictional resistance
2951-1965 (P-II)	Reaffirmed 2003	Head loss in valves & fittings
3076-1985	Reaffirmed 2003	Low density polyethylene pipes for portable water supply
ASTM D-2846		CPVC fittings
3311-1979	Reaffirmed 2003	Water plug & its accessories for sinks and wash basins
3328-1993	Reaffirmed 2003	Quality tolerance for water for swimming pools
3389-1994	Reaffirmed 2000	Urea formaldehyde moulding materials
ASTM D-2467		uPVC fittings SCH 80
ASTM D - 2564		Solvent cement of uPVC
15778-2007	--	SDR 11 CPVC pipe of Working Pressure 28.1 kg cm ² at 23 0 C & 7 kgcm ² at 82 Degree C.
ASTM D 2846 class 1 3597-1998	--	Method of test for concrete pipes
3844-1989	Reaffirmed 2000	Code of practice for installation & maintenance of internal fire hydrants hose reels in premises
3950-1979	Reaffirmed 2003	Specification for surface boxes for sluice valve
3989-1984	Reaffirmed 2000	Centrifugally cast (spun) iron spigot and socket soil, waste and ventilating pipes, fittings & accessories
4038-1986	Reaffirmed 2000	Foot valves for water works purposes
4111 (P I to V)		Code of practice for ancillary structures in sewage system
4111-1986 (P-I)	Reaffirmed 2001	Manholes
4111-1986	Reaffirmed 2001	Flushing tanks

Indian Standard	Reaffirmation	Subject
(P-II)		
4111-1986 (P-III)	Reaffirmed 2001	Inverted siphon
4111-1986 (P-IV)	Reaffirmed 2001	Pumping stations & pumping mains (rising mains)
4111-1986 (P-V)	Reaffirmed 2004	Tidal out falls
4120-1967	Reaffirmed 2000	Tubs & baths
4127-1983	Reaffirmed 2001	Code of practice for laying of glazed stone ware pipes
4308-2003	--	Dry chemical powder for firefighting B & C class fires specification
4350-1967	Reaffirmed 2001	Specification for concrete porous pipes for under drainage
4733-1972	Reaffirmed 1992	Methods of sampling & test for sewage effluents
4736-1986	Reaffirmed 2001	Specification for hot dip zinc coating on mild steel tubes
4854 (P I to III)		Glossary terms for valves and their parts
1854-1969 (P-I)	Reaffirmed 1999	Screw down stop, check & gate valves & their parts
4854-1968 (P-II)	Reaffirmed 1999	Plug valves & cocks & their parts
4854-1974 (P-III)	Reaffirmed 1999	Butterfly valves
4927-1992	Reaffirmed 2002	Unlined flax canvass hose for fire fighting
4947-1985	Reaffirmed 2000	Specification for gas cartridge for use in fire extinguishers
4984-1995	Reaffirmed 2002	Specification for HDPE pipes for water supply
4985-2000	--	Specification for unplasticised PVC pipes for potable water supplies
5290-1993	Reaffirmed 2003	Specification for landing valves
5312 (P-I)	--	Swing check type reflux (non return) valve
5312-1984 (P-I)	Reaffirmed 2000	Reflux (non-return) valves single door pattern
5329-1983	Reaffirmed 2001	Code of practice for sanitary pipe work above ground for building
5330-1984	Reaffirmed 2000	Criteria for design for anchor blocks for pen stocks with expansions joints
5382-1985	Reaffirmed 2003	Specification for rubber sealing rings for water, gas & sewer mains
5455-1969	Reaffirmed 2003	Cast iron steps for manholes
5600-2002	--	Specification for sewage and drainage pumps
5611-1987	Reaffirmed 2002	Code of practice for waste stabilization ponds (facultative type)
5714-1981	Reaffirmed 2002	Specifications for hydrant stand pipe for fire fighting
5822-1994	Reaffirmed 2004	Code of practice for laying of welded steel pipes for water supply
5961-1970	Reaffirmed 2003	Specifications for cast iron grating for drainage purpose
6234-2003	--	Portable fire extinguisher water type (stored pressure) specification
6279-1971	Reaffirmed 2001	Equipment for grit removal
6280-1971	Reaffirmed 2001	Sewage screens
6295-1986	Reaffirmed 2001	Code of practice for water supply & drainage in high altitude &/or subzero region
6392-1971	Reaffirmed 1998	Steel pipe flanges
6411-1985	Reaffirmed 2000	Specification for gel coated glass fiber reinforced polyester resin

Indian Standard	Reaffirmation	Subject
		bath tubs
6494-1988	Reaffirmed 2000	Code of practice for water proofing of underground water tanks
7231-1994	Reaffirmed 2004	Specifications for plastic flushing cisterns for w.c.& urinals
7558-1974	Reaffirmed 2001	Code of practice for domestic hot water installation
7634 (P I to III)		Code of practice for plastic pipe work for potable water supplies
7634-1975 (P-I)	Reaffirmed 2002	Choice of materials & general recommendations
7634-1975 (P-III)	--	Laying & jointing unplasticised PVC pipes
7740-1985	Reaffirmed 2001	Code of practice for road gullies
7834 (P I to VIII)		Injection moulded PVC socket fittings with solvent cement joints for water supplies
7834-1987 (P-I)	Reaffirmed 2003	General requirements
7834-1987 (P-II)	Reaffirmed 2003	Specific requirements for 45 elbows
7834-1987 (P-III)	Reaffirmed 2003	Specific requirements for 90 elbows
7834-1987 (P-IV)	Reaffirmed 2003	Specific requirements for 90 tees
7834-1987 (P-V)	Reaffirmed 2003	Specific requirements for 45 tees
7834-1987 (P-VI)	Reaffirmed 2003	Specific requirements for sockets
7834-1987 (P-VII)	Reaffirmed 2003	Specific requirements for unions
7834-1987 (P-VIII)	Reaffirmed 2003	Specific requirements for caps
8008 (P I to VII)		Injection moulded HDPE fittings for potable water supplies
8008-2003 (P-I)	--	General requirements for fittings
8008-2003 (P-II)	Reaffirmed 1997	Specific requirements for 90 bends
8008-2003 (P-III)	--	Specific requirements for 90 tees
8008-2003 (P-IV)	--	Specific requirements for reducers
8008-2003 (P-V)	--	Specific requirements for ferrule reducers
8008-2003 (P-VI)	--	Specific requirements for pipe ends
8090-1976	Reaffirmed 2000	Coupling, branch pipe, nozzle used in hose reel tubing for fire fighting
8413 (P-I)		Requirements for biological treatment equipment
8413-1977 (P-I)	Reaffirmed 2001	Trickling filter
8835-1978	Reaffirmed 1999	Guideline for planning and design of surface drains
8931-1993	Reaffirmed 2003	Specifications for copper alloys fancy single taps, combination

Indian Standard	Reaffirmation	Subject
		tap assembly & stop valves for water services
9140-1996	Reaffirmed 2002	Method of sampling of vitreous & fire clay sanitary appliances
9338-1984	Reaffirmed 2000	Specification for cast iron screw down stop valves and stop & check valves for water works purpose
9668-1990	Reaffirmed 2000	Code of practice for provision and maintenance of water supplies for fire fighting
9739-1981	Reaffirmed 2003	Specifications for pressure reducing valves for domestic water supply system
9758-1981	Reaffirmed 2003	Flush valves and fittings for water closets & urinals
9762-1994	Reaffirmed 2004	Specifications for polyethylene floats for float valves
10221-1982	Reaffirmed 1997	Code of practice for coating and wrapping of underground MS steel pipeline
11108-1984	Reaffirmed 2000	Specification for portable fire extinguisher halon 1211 type
11606-1986	Reaffirmed 2000	Method of sampling of cast iron pipes and fittings
12183-1987(P-I)	Reaffirmed 2004	Code of practice for plumbing in multi storied buildings (for water supply)
12231-1987	Reaffirmed 2003	UPVC pipes for section & delivery lines of agricultural pumps
12235-1986	Reaffirmed 1998	Method of test for UPVC pipe for potable water supply
12288-1987	Reaffirmed 2002	Code of practice for use and laying of ductile iron pipes
12469-1988	Reaffirmed 2002	Specifications for pumps
12592-2002	--	Precast concrete frame & cover (SFRC frame & cover)
12701-1996	Reaffirmed 2002	Specifications for rotational moulded polyethylene water storage tanks
12709-1994	Reaffirmed 2004	Glass fiber reinforce plastic (GRP) pipes, joints & fittings for use for potable water supply specification
12820-1989	Reaffirmed 1999	Dimensional requirements of rubber gaskets for mechanical joints & push in joints for use with cast iron pipes & fittings for carrying water, gas & sewage
13095-1991	Reaffirmed 2003	Butterfly valves for general purpose
13382-2004	--	Cast iron specials for mechanical & push on flexible joints for pressure pipelines for water, gas & sewage
13592-1992	Reaffirmed 2002	Specifications for PVC soil, waste & rain water (SWR) including ventilation pipes
13593-1992	Reaffirmed 2002	UPVC pipes fittings for use with section and delivery lines for agricultural pumps specification
13916-1994	Reaffirmed 2004	Code of practice for installation of GRP piping system
13983-1994	Reaffirmed 2004	Specifications for stainless steel kitchen sinks & drain boards for domestic purpose
14333-1996	Reaffirmed 2001	Specifications for HDPE pipes for sewerage system
14402-1996	Reaffirmed 2001	GRP pipes, joints & fittings specification
14735-1999	Reaffirmed 2004	UPVC injection moulded fittings for UPVC SWR pipes specification
14845-2000	Reaffirmed 2004	Resilient seated cast iron air relief valves for water works purposes specification
14846-2000		Specifications for sluice valve for water works purpose (50 to 1200mm size)
15265-2003		Specifications for flexible PVC pipes or polymer reinforcement

Indian Standard	Reaffirmation	Subject
		thermoplastic hoses for suction and delivery lines for agricultural pumps
15328-2003		UPVC non pressure pipes for use in underground drainage and sewerage system specification
15450-2004		Polyethylene/aluminum/polyethylene composite pressure pipes for hot and cold water supplies specification

1.3 MINIMUM WEIGHT OF MOST COMMONLY USED SANITARY APPLIANCES & WATER FITTINGS:

The minimum unit weight of each fitting shall not be less than as given in the following table and tolerance for weight shall be as per relevant IS codes.

Sl	Description of items	Nominal size / thickness	IS code	Minimum unit weight
1	Brass non fancy type bib tap please see table under relevant item for other sizes	15mm	781-1984	400 Grams
2	C.P brass fancy type bib tap	15mm	8931-1993	550 Grams
3	Brass non fancy types stop cock internally threaded	15mm	781-1984	330 Grams
4	Brass non fancy types stop cock externally threaded	15mm	781-1984	400 Grams
5	C.P brass fancy types stop cock	15mm	8931-1993	550 Grams
6	C.P brass concealed typed stop cock	15mm	8931-1993	750 Grams
7	C.P brass fancy pillar tap	15mm	1795-1982	650 Grams

8	C.P brass waste coupling	32mm	3311-1979	200 Grams
9	C.P brass waste coupling	40mm	3311-1979	250 Grams
10	C.I Nahani trap 165mm inlet	75mm outlet	1729-2002 /3989-1984	6.5 kg
11	C.I floor trap 100mm inlet	75mm outlet	1729-2002 /3989-1984	4.8 kg
12	C.I Nahani trap with 20mm water seal	65mm outlet	Non ISI	4.5 kg
13	Cast iron surface box for sluice valve rectangular shape		3950-1979	33 kg

3.0 SANITARY INSTALLATION

3.1 INDIAN WATER CLOSET

3.1.01 GENERAL: The item pertains for providing white or color glazed vitreous chinaware Indian water closet of size and color as specified in the schedule including fixing.

3.1.02 MATERIAL: Squatting pan (Orissa Pattern) is of white, or color glazed vitreous china conforming to IS 2556 part III 2004. Pan shall have flushing rim and are inlet of self- draining type. It shall have weep holes at the following inlet to the pan. The flushing inlet shall be in front unless otherwise specified. The inside of the bottom of the pan shall have sufficient slope from the front to the outlet and surface shall be uniform and smooth to enable easy quick disposal while flushing. The exterior surface of the outlet below the flange shall be an unglazed surface which shall have groove at right angle to the axis of the outlet. In all the cases pan shall have be provided with 110mm P trap uPVC SW pipe (IS 14735.)

3.1.03 FIXING: The water closet pan shall be placed in position as shown in the drawing. The uPVC SW "P" trap shall be fixed on the floor with C, M.1:3, placing around the" P" trap. Then IWC shall be supported on loose brick & then P.C.C.1:4:8 using hard Granite metal 4cm Nominal size shall be placed under the IWC & shall be perfectly compacted surround the below the IWC, complete or as directed by the Engineer-in-charge. The pan shall be fixed slightly lower than the floor level. If the pan or trap is damaged during handling or fixing, it shall be replaced by the contractor at his own cost. The pan, trap and uPVC, SW pipe shall be jointed with help of thermoplastic rubber co-moulded on high strength polyolefin EN 681-2 D.M. seal & lipring for P or S trap. The gap between WC and floor shall be finished with white/matching cement as directed.

3.1.04 PROTECTION AND FINAL CLEANING: The IWC shall be covered with husk and sand till all the civil and electrical works are completed and shall be removed and cleaned on completion of civil and electrical works prior to testing and handing over. However, the contractor should ensure that the outlet is plugged with gunny bags or similar materials to avoid the pipe getting blocked.

3.2 EXTENDED WALL MOUNTED EUROPEAN WATER CLOSET

3.2.01 GENERAL: The item pertains for providing white or color glazed vitreous chinaware European or Anglo Indian water closet with seat and cover of size and color as specified in the schedule including fixing.

3.2.02 MATERIAL: European type water closet shall be wash down pattern unless otherwise specified. Water closet shall be vitreous china conforming to IS 2556 (P-I & II). The closet shall be of one piece construction and shall have minimum two hole of 6.5mm diameter for fixing closet to floor. Closet shall

have integral flushing rims of self -draining type. Each water closet shall have an integral trap with either P or S outlet with and trap shall be uniform and smooth in order to enable an efficient flush. Plastic seat and cover shall be of same color or as specified, they shall have conformity to IS 2548 part I & II.

3.2.03 FIXING: The water closet pan shall be placed in position as shown in the drawing. If the pan trap is damaged during handling or fixing, it shall be replaced by the contractor at his own cost. The pan, uPVC soil pipe shall be jointed of thermoplastic rubber co-moulded on high strength polyolefin EN 681-2 D.M. sea l&lipringfor P or S trap. The gap between WC and floor shall be finished with white / matching cement and sand as directed. Seat and cover shall be fixed to the pan by two corrosion resistance hinge with 65mm shank and threaded to within 25 mm from of flange. Seat shall be fixed in level by providing the washers of rubber with nonferrous or stainless steel washer to bolt.

3.3 WASH BASIN WITH HALF PEDESTAL

3.3.01 GENERAL: The item pertains for providing color or white glazed vitreous chinaware wash basin with half pedestal of size and color as specified in the schedule including fixing.

3.3.02 MATERIAL: Wash basins shall be of vitreous china conforming to IS 2556 (P-IV) or flat back or angle back as specified shall be of one-piece construction including combined overflow, basin shall be provided with single or double tap holes of size 28mm square or 30mm rounded. Each basin shall have circular waste hole or 5 sqcm slot type overflow. Pedestals for wash basin shall be exactly same

Glazing that of basin. Pedestal shall be capable of supporting the basin and completely recessed at the back to accommodate supply and waste pipes and fittings. The basin shall be supported on pair of CI cantilever brackets conforming to IS 775. Use of MS angle or tee section as bracket is not permitted.

3.3.03 FIXING: The wash basin shall be fixed in position as indicated in the drawing. Basin shall be supported on a pair of CI brackets which is embedded in cement concrete (1:2:4) block 100x75x150mm.& rack bolts also. Oval shape or round shape wash basins are required to be fixed in RCC platform with stone tapping either fully sunk in stone top or flush with stone topping. The wall plaster on seat shall be cut to rest over the top edge of the basin so as not to leave any gap for water seepage through between wall plaster & skirting of basin. The gap between basin and wall shall be finished with white matching cement.

3.4 URINAL

3.4.01 GENERAL: The item pertains for providing color or white glazed vitreous chinaware urinal in single and size as specified in the schedule with necessary fittings and appliances including fixing.

3.4.02 MATERIAL

3.4.02.1 Bowl type (with flushing rim): Urinal basin shall be flat back or corner wall type lipped in front. The vitreous china conforming to IS 2556 (P-VI). Urinal shall have an integral flushing rim and inlet or supply horn for connecting flush pipe. Flushing rim and inlet shall be of the self-draining type. At bottom of basin and outlet horn for connecting outlet shall be provided. The inside surface of the urinal shall be uniform and smooth throughout to ensure efficient flushing.

3.4.02.2 CP Brass flush pipe: The flushing arrangement to urinals for single shall be of CP brass with CP brass spreader of 15mm dia conforming to IS 407.

3.4.03 FIXING

3.4.03.1 CP Brass flushing arrangement: The flushing arrangement to urinal in single or range shall be of CP brass from 25mm dia to 15mm dia and CP brass spreader of 15mm size to each urinal including the cost of CP brass elbow, tees, coupling, crosses, clamps, clips, union CP brass check nut and screws etc.

3.5 FROST GLASS URINAL PARTITION.

3.5.01 GENERAL: The item pertains for providing Frost glass partition of size and color as specified in the schedule including fixing.

3.5.02 MATERIAL: The partition shall be Frost glass. Frosted glass is produced when a piece of clear glass is etched with acid or sandblasted. The result is a piece of glass that is opaque but still translucent. The blurred glass allows light to pass through it but it prevents you from seeing what is on the other side. The beautiful frosty or cloudy surface adds an element of elegance and beauty to space.

3.5.03 FIXING: Partition shall be fixed vertically in position as indicated in the drawing at proper height 600 mm from FFL. The size of Frost glass shall be 800 mm x 400 mm as per IS: 2064.

3.6 DIVISION PLATE / PARTITION PLATE

3.6.01 GENERAL: The item pertains for providing white or color glazed vitreous chinaware division plate of size and color as specified in the schedule of size 800 x 400 mm including fixing.

3.6.02 MATERIAL: Division plate shall be white, or color glazed of size as specified in the schedule and shall conform to IS 2556 (P-VI).

3.6.03 FIXING: Division plate shall be fixed vertically in position at proper height 600 mm from FFL with expandable anchor fasteners, CP brass screws, wooden plugs etc.

3.7 HALF ROUND CHANNEL

3.7.01 GENERAL: The item pertains for providing color or white glazed vitreous chinaware half round channel of size and color as specified in the schedule including laying and fixing.

3.7.02 MATERIAL: The half round channel shall be of white, or color glazed vitreous chinaware of size as mentioned in the schedule with or without dead end and shall conform to IS 2556 (P-VII)

3.7.03 FIXING: The channel shall be laid to the correct alignment to required slope. It shall be fixed on 80 mm thick bed of 1:2:4 cement concrete. The channel shall be used in standard length. Pieces are not allowed except where it is necessary to make up exact length. The joint and gap shall be finished with white / matching color cement.

uPVC SW FLOOR TRAP WITH STAINLESS STEEL HINGED GRATING.

3.8.01 GENERAL: The item pertains for providing uPVC SWR floor trap with stainless steel hinged grating of size as specified in the schedule including fixing.

3.8.02 MATERIAL: The trap shall be uPVC SWR of IS:14735 or as specified in the schedule with hinged shaped grating of stainless steel as specified.

3.8.03 FIXING: The uPVC SWR trap shall be laid to the correct alignment and to required slope. The trap shall be fixed on 80 mm thick bed of 1:2:4 cement concrete with DM Seal.

3.9 FLAP TYPE TOILET PAPER HOLDER

3.9.01 GENERAL: The item includes providing CP on Brass flap type toilet paper holder of size 150 mm as mentioned in the schedule including fixing.

3.9.02 MATERIAL: The toilet paper roll holder shall be of CP brass as specified and of size 150 mm and design as approved by the Engineer-in-charge. Toilet paper roll holder shall conform as per IS standard and should have ISI mark.

3.9.03 FIXING: Toilet paper roll holder shall be fixed in position by means of CP brass covers and raw plug embedded in the wall. Flap type toilet paper roll holder shall be fixed into the wall with PVC inserter and steel Screw by means of drilling machine.

3.10 PVC WATER INLET CONNECTIONS

3.10.01 GENERAL: The item pertains to providing color or white PVC water inlet connection for cistern and wash basins.

3.10.02 MATERIALS: PVC water inlet connection shall conform to IS specification and shall be of standard pattern with nylon insulation of minimum 450mm long with CP brass check nut at both the end and shall be able to withstand the testing pressure of 1 MPa (10kg/sqcm) & it shall be 15mmx450 mm braided hose connection pipe with both side nuts and rubber washers etc complete as per direction of Engineer in-charge.

3.10.03 FIXING: The PVC water inlet connection shall be fixed in position as indicated in the drawing or as directed by the Engineer-in-charge.

3.11 CP SOAP DISH HOLDER

3.11.01 GENERAL: The item includes providing CP soap dish holder of size as mentioned in the schedule including fixing.

3.11.02 MATERIAL: Soap dish shall be of CP on brass specified and of size; design is approved by the Engineer-in-charge. Soap dish shall conform to relevant IS standard and should have ISI certification mark.

3.11.03 FIXING: Soap dish shall be fixed in position by means of CP brass covers and raw plug embedded in the wall. It shall be fixed with PVC inserter and steel screws.

3.12 BEVELLED EDGE GLASS MIRROR

3.12.01 GENERAL: The item providing beveled or plain edges mirror with or without frame of size as mentioned in the schedule including fixing.

3.12.02 MATERIAL: The mirror shall be of superior sheet glass with edges rounded off or beveled, size 600x450mm unless specified in the schedule. It shall be free from flaws, specks or bubbles and thickness plated and should not be less than 50mm. The back of mirror shall be uniformly silver plated and should be free from silvering defects. Silvering shall now have a protective uniform covering of red lid paint, where beveled edge mirror is not available. Fancy looking mirrors with PVC beading/border or aluminum beading or stainless-steel beading/border based on manufacturers specification, provided nothing extra shall be paid on this account. The backing of mirror shall be provided with 6mm thick marine plywood or environmentally friendly material other than asbestos sheet.

3.12.03 FIXING: Mirror shall be fixed in position with 6mm thick marine plywood backing. It shall be fixed by means of 4 nos CP brass screws & caps over rubber washers and raw plug or as per manufacturers specification unless specified otherwise the longer side shall be fixed horizontally.

3.13 GLASS SHELF

3.13.01 GENERAL: The item includes providing glass shelf of size 600 mm long as mentioned in the schedule including fixing.

3.13.02 MATERIAL: Glass shelf shall consist of an assembly of glass shelf frame of size 600x125mm or as specified in the schedule. It shall be with a pair of CP brass brackets fixed to the wall with CP screws and CP brass rails all round with guard bar of 6mm diameter fixed to the glass shelf frame with 5 numbers CP brass brackets. The glass shall not be less than 5mm thick. PVC stainless steel shelf or as per manufacturer's specification and size as specified in the schedule of work shall be provided.

3.13.03 FIXING: The complete accessories shall be fixed to proper line and level as indicated in drawing with 40mm long CP brass screws, wooden raw plug, drilling hole and making good the wall to original condition after fixing the glass shelf.

3.14 CP TOWEL RING

3.14.01 GENERAL: The item includes providing CP towel ring of size as mentioned in the schedule including fixing.

3.14.02 MATERIAL: Towel rail shall be of CP brass with two CP brass bracket coated with chromium plating of thickness not less than grade No 2 of IS 4827. The size of rail shall be 600mm x 20mm dia unless otherwise specified in the schedule. Towel ring of CP brass with one CP brass bracket with thickness not less than grade no 2 of IS 4827. The diameter of the ring shall be 175mm unless otherwise specified in the schedule.

3.14.03 FIXING: The towel ring shall be fixed to proper line and level as indicated in drawing with CP brass screws, wooden rawal plug, drilling hole etc. and making good the wall to original condition after fixing the towel ring.

3.15 BIB TAP, STOP COCK & ANGLE STOP COCKS

3.15.01 GENERAL: The item pertains to provide chromium plated brass bib tap and stop cock and angle stop cocks, free flanges (if joined to concealed pipe) including fixing.

3.15.02 MATERIAL: Bib cock (bib tap) is drawn off tap with a horizontal inlet and free out let and a stop cock is a valve with a suitable means of connections for insertion in a pipe line for controlling or stopping the flow. These shall be of size 15mm or as specified and shall be of screw down type. The closing device shall work by means of disc carrying a renewable nonmetallic washer with shuts against the water pressure on a seating right angle to the axis of the threaded spindle which operates it. The handle shall be crutch, butterfly or fancy design type securely fixed to the spindle. The tap shall open

anti clock wise direction. Brass bib taps and stop cocks and angle stop cocks shall conform to IS 781. They shall be polished bright. The minimum finished weight of different sizes of bib tap and stop cock shall be as per table given below. They shall be sound and free from taps, blow whole and fitting. Internal & external surface shall be clean, smooth and free from sand and neatly dressed. Taps shall be nickel chromium plated and thickness of coating shall not be less than service grade no 2 of IS 4827 and plating shall be capable of taking high polish which shall not be easily tarnished.

Minimum finished mass of bib taps & stop valves as per IS 781-1984

Size		Minimum finished mass		
		Bib taps		Stop valves
		Internally threaded	Externally threaded	Mixed end
1	2	3	4	5
Mm	Kg	Kg	Kg	Kg
8	0.25	0.22	0.25	0.235
10	0.33	0.33	0.35	0.325
15	0.40	0.33	0.40	0.365
20	0.75	0.675	0.75	0.710
25	1.25	1.18	1.30	1.250
32		1.68	1.80	1.750
40		2.09	2.25	2.170
50		3.70	3.85	3.750

Every tap complete with its component shall stand an internally applied hydraulic pressure of 2 MPa (20kg/sqcm) maintained for a period of 2 minutes during the period it shall neither leak nor sweat. Leaky joint shall be remade to make it leak proof without any extra cost from contractor.

3.15.03 FIXING: Bib tap stop cock shall be fixed to the pipe line with CP brass specials if required or as ordered by Engineer-in-charge. Jointing shall be done with teflon tape etc. A few turns of teflon tape shall be taken over the threaded ends to obtain complete water tightness.

3.16 AUTO CLOSING PILLAR COCK

3.16.01 GENERAL: The item pertains to provide chromium plated brass pillar tap including fixing.

3.16.02 MATERIAL: The pillar tap shall be 15mm nominal size or as specified in the schedule. Fancy type pillar tap shall be of CP brass approved quality and shall conform to IS 8931. Non fancy pillar tap shall be chromium plated brass and shall conform to IS 1795. Casting of pillar tap shall be sound and free from laps, blow hole and pitting. External and internal surface shall be clean, smooth and free from sand and be neatly dressed. All the parts fitted to pillar tap shall be axial, parallel and cylindrical with surfaces smoothly finished. The minimum of finish weight of pillar tap shall not be less than 650 grams (body weight 250 gms, washer plate loose valve 150 gms and back nut 40 gms. Thickness of CP coating shall not be less than service grade no 2 of IS 4827 and plating should be capable of taking high polish which shall not easily tarnish or scale.

3.16.03 TESTING: The testing pressure on completion of the work the piping system can be pressurized to 125% of its designed working pressure ie. 28.1kg/cm^2 for SDR11 CPVC Pipe 20mm nominal dia, 25mm nominal dia & 32mm nominal dia respectively. However care must be taken to ensure the pressure does not exceed the working pressure of the lowest rated component in the system. The pressure test should not exceed one hour. Any leaking joints or pipe must be cut and replaced and the line

recharged and retested using the same procedure. Without any additional requirement of make-up-water the test pressure should not fall more than 0.02 MPa (0.2Kg/sqcm) at the end of one hour test duration.

3.16.04 FIXING: Pillar tap shall be fixed to the pipe line as indicated in the drawing with necessary special as required or as ordered by Engineer-in-charge. Jointing shall be done with Teflon tap. A few turns of teflon tap shall be taken over the threaded ends to obtain complete with tightness.

3.17 AUTO CLOSING FLUSH COCK

3.17.01 GENERAL: The item pertains to provide chromium plated Auto closing flush cock with necessary accessories including fixing to concealed pipes with help of Teflon tape. (Free flanges if jointed to concealed pipes)

3.17.02 MATERIAL: The auto closing flush cock shall be nominal diameter as specified in the schedule of quantities. It shall be of CP brass approved and heavy quality and shall conform to IS. The auto closing flush cock shall have working pressure of 0.15 to 0.5 MPa. The value shall be tested to a hydraulic pressure of 2 MPa for 2 minutes.

3.17.03 FIXING: Auto closing flush cock shall be fixed to the pipe line as indicated in the drawing with necessary special as required or as ordered by Engineer-in-charge. Jointing shall be done with Teflon tape. A few turns of Teflon tape shall be taken over the threaded ends to obtain complete with tightness. Leaky joint shall be remade to make it leak proof.

3.18 WASTE COUPLING

3.18.01 GENERAL: The item pertains to provide chromium plated brass waste coupling i.e half thread and full thread for wash basin and urinal including fixing.

3.18.02 MATERIAL: Waste coupling shall conform to IS 3311. Waste fitting shall be of CP with thickness of CP coating not less than service grade no 2 of IS 4827 which is capable of receiving polish and will not easily scale off. The fitting shall conform in all respect to IS 2963 and shall sound, free from laps below, holes and fittings and other manufacturing. External and internal surface shall be clean and smooth. They shall be neatly dressed. The waste fitting for wash basin shall be of nominal size of 32mm and for urinal shall be nominal size 40mm.

3.18.03 FIXING: Waste coupling shall be fixed to wash basin or urinal as ordered with necessary specials. Jointing shall be done with Teflon tape. A few turns of Teflon tape shall be taken over the threaded ends to obtain complete with tightness. Leaky joint shall be remade to make it leak proof.

3.19 BOTTLE TRAP

3.19.01 GENERAL: The item pertains to provide chromium plated brass bottle trap including fixing.

3.19.02 MATERIAL: Bottle trap shall be of CP with thickness of CP coating not less than service grade no 2 of IS 4827 which is capable of receiving polish and will not easily scale off. The fitting shall conform in all respect of IS 2963 and shall be sound, free from laps, blow hole and pitting and other manufacturing defects. External and internal surface shall be clean and smooth. They shall be neatly dressed and be truly machined so that not smoothly moves on the body. The bottle trap for wash basin shall be of nominal size of 32mm and for sink shall be nominal size 40mm.

3.19.03 FIXING: Bottle trap shall be fixed to wash basin, sink or urinal as indicated in the drawing with necessary specials or as ordered by the Engineer-in-charge. Jointing shall be done with white zinc, spun yarn etc. A few turns of fine hemp yarn dipped in linseed oil shall be taken over the threaded ends to obtain complete with tightness. Leaky joint shall be remade to make it leak proof.

3.20 COAT HOOK

3.20.01 GENERAL: The item pertains to provide chromium plated brass coat & hot hook including fixing.

3.20.02 MATERIAL: Coat hook shall be of three way type of approved and heavy quality. Coat & hat hook shall be CP coating shall not be less than service grade no 2 of IS 4827.

3.20.03 FIXING: The coat hook shall be fixed to proper line & level as indicated in drawing with CP brass screws.

3.21 FLUSHING CISTERNS

3.21.01 GENERAL: the item pertains to provide white or color PVC flushing cistern with all inside symphonic fitting including fixing.

3.21.02 MATERIAL: The flushing cistern shall be automatic or manually of rates high level or low level as specified for water closets and urinals.

Cistern shall be of PVC for automatic flushing cistern and plastic (IS 7231). Cistern shall be mosquito proof. All working parts shall be designed to operate smoothly and efficiently. The cistern shall have removable covers which shall fit closely on it and be screwed against top displacement where operating mechanism is attached to the cover. This may be made in two sections, but the section supporting the mechanism shall be securely fitted or screwed to the body. The outlet fitting of the cistern shall be securely connected to the cistern. The nominal internal diameter of the cistern outlet shall not be less than 32 mm and 38 mm for high level and low level respectively. Length of outlet cistern shall be 37+/-2 mm ball valve shall be screwed type 15 mm in diameter and shall confirm of IS 1703. The flat shall be made of polyethylene as specified in IS 9762. A high-level cistern is intended to operate with minimum height of 125 cm and a low- level cistern with maximum height of 30 cm between the top of the pan and under side of the cistern In case of low level cistern handle shall be of CP brass, in case of plastic cistern, operation of cistern shall be through push button at the top for dual system and beyond plastic handle. The discharge rate of the cistern as per IS 774 shall be 10+/- 5 liters 6 second and 5+/- . 5 litres in 3 second for cistern capacity 10 litres and 5 litres respectively. Flush pipe shall be of class B GI pipe of 32 +/- mm diameter for high level. Polyethylene flush pipe shall be low density confirming to IS 3076 or high density confirming to IS 4984 of UPVC pipe confirming to IS 4965 of 40 mm outer diameter. Over flow pipe shall not be less than +/- 5 mm B diameter

3.21.03 FIXING: The chinaware flushing cistern shall be placed over a pair of CI brackets CP Brass flush pipe shall be fixed to cistern and WC pan using check nut, spun yam, cement mortar etc. The cast iron flushing cistern shall be placed over a pair of CI or GI or PVC flush pipe of specified diameter shall be fixed to cistern and WC pan by using check nut, while zinc. Spun yam, cement mortar etc. The PVC flushing cistern shall be placed or fixed as recommended by the manufacturer, PVC flush pipe of specified diameter shall be fixed to cistern and WC pan by suing check nut, white zinc, spun yam, cement mortar etc.

3.22 BRACKET

3.22.01 GENERAL: The item pertains to provide a pair of bracket for wash basin, flushing cistern etc. including fixing.

3.22.02 FIXING: Brackets shall be imbedded into or fixing to the wall with plugs, screws, nails etc. hole shall be made in the wall, if they are not left for fixing the brackets and shall be made good after fixing, the gap shall be filled with 1:2 cement mortal and finishing shall be done with white/matching color cement.

SANITARY FIXTURES:

Different sanitary fixtures must conform to the relevant Bureau of Indian Standard specification.

1. Indian Water Closet Squatting Pans (I.W.C)

- A. Distance of the rear edge of the pan and the wall surface where the cistern is to be installed should normally be 350mm to 400mm from the wall surface.
- B. The bottom of the cistern (i.e the height of the brackets) from the top face of the squatting pan should be 1250mm.
- C. Foot rest- 175 mm from the inner edge of the back side of the pan. Distance between two foot rests 330 mm at back and 370mm in the front.
- D. Ablution taps 200 to 300 mm from floor level, projection 1150 mm from the wall surface.

2. Water closet, pedestal type or European Water Closet (EWC)

- A. The water closet should be so fixed that its tip should be at a distance of 710 mm from the rear wall. ‘P’ trap or ‘S’ trap may be used as per suitability.
- B. The top of the EWC should be at 400 mm from the floor
- C. The top of the low level cistern should remain at 775 mm from the floor
- D. Toilet paper holder should be fixed at a height of 400 mm from the floor

3. Wash Hand Basin :

- A. Placement of bracket Height from floor - 790 mm, Center to center distance 580 mm for 630 mm x 460 mm size wash hand basin and 500 mm for 560 mm x 400mm size wash hand basin.
- B. Placement of glass shelf- Height 1150 mm from floor level
- C. Mirror- 1200 mm from floor level
- D. Towel rail – 750 mm from floor level
- E. Distance between basins in row minimum 100 mm or 700 mm center to center and 400 mm away from the wall.

4. **Sink**

Sink is to be placed on CI or M.S Angle brackets. The angle brackets should be made out of 40mm x 40mm x 6 mm M.S. Angle.

- A. Height of the sink - 800 to 900mm from floor level
- B. Tap of the sink is to be placed at the center of the sink and at 150mm above the top edge of sink.

General: IS 2064-1973 gives the code of practices for the selection, installation and maintenance of sanitary appliance.

Installation of sanitary appliances in any public or private building is usually governed by the local body bye-laws and rules framed under the Act relating to the local body. These are intended to regulate proper layout of the appliance and their connections so that wastes are suitable disposed off the drains without causing in sanitary conditions and nuisance to public. Noting the variations in the bye laws and rules framed by different authorities in the country IS: 2064-1973 was issued to ensure fulfillment of minimum requirement.

SANITARY FIXTURES:

Soil waste and ventilating branch connection with support brackets shall be fitted before the fitting of the appliances is begun. Appliances except those permanently built in shall not be fixed until floor and wall surface are finished ready for decoration. All appliances shall conform to the relevant Indian Standards where they exist, otherwise they shall be of the best quality and workmanship, which shall be approved by a competent authority. All appliances and sanitary accommodation shall be arranged to facilitate access for cleaning and repairing.

4.0 WATER SUPPLY SYSTEM

4.1 Unplasticized Poly Vinyl Chloride , lead free (uPVC),SCH-80 Plastic PIPING WORK as per ASTM D 1785& Fittings as per ASTM D 2467 (exposed and External)

4.1.01 GENERAL: the item includes provision of uPVC ASTM D-1785, pipes SCH-80 with uPVC fitting of ASTM D-2467 specified nominal bore and class as mentioned in the schedule including laying, fixing, the uPVC pipes and fittings shall run on the surface of the walls or ceilings unless otherwise specified.

The system shall be highly resilient, tough and durable with high tensile strength and high impact strength. It shall be free from problems caused by scale formation, rusting, weathering and chemical action, and lasting for a life time. The PVC piping system shall be virtually immune to attack by bacteria, fungi and other microorganisms or insects.

The system shall be non-conductive and immune to galvanic and electrolytic corrosion. The PVC piping system shall be corrosion resistant to a great extent, so much that they can be buried in alkaline or acidic soils or installed in over-the-ground environments, with no paint or special coating.

The PVC piping system shall be inert to most chemicals and can resist attacks from most chemicals at moderate temperatures.

The interior walls of the pipes and fittings shall have a mirror smooth finish ensuring high flow rates and low frictional losses.

The PVC pipings system shall be free from rusting, pitting or scale formation so that there is no particle deposition and the inner bore of the pipe remains undiminished throughout the life of the system.

Jointing shall be done with the special solvent which ensures 100% leak proof joints.

The system shall be UV stabilized which eliminates the adverse effect of sunlight and weather. The system can, therefore, be safely used for outdoor installations.

The PVC pipes shall be relatively more flexible and shall have adequate tensile strength and even burst strength to withstand the operating pressures encountered in most service conditions, with the acceptable range of temperature for the system. External shocks or impacts that could cause failure of more rigid materials can be absorbed by the system, with little or no damage.

Pipes shall be self-extinguishing and shall not support combustion. This eliminates the need for fire resistant coating.

4.1.02 MATERIAL: The pipes and fittings shall be of, SCH-80 as specified in the schedule they shall conform to ASTM-D 1785 & ASTM-D2467. All the pipes and fitting shall have ASTM certification mark. The specified nominal bore of the pipe shall refer to inside approximate bore according to the wall thickness i.e. 7.01mm & 7.62mm of nominal pipe size 65mm & 80mm, corresponding to outside fixed diameter 73.02mm & 88.90mm with tolerance ± 0.18 & ± 0.20 respectively. The pipe and fitting shall be smooth, sound free, free from any imperfections and neatly dressed. The pipe and fitting shall be able to withstand a hydrostatic working pressure of (29.53kg/cm^2) for SCH 80 -65mm nominal size & test pressure of (26.01 kg/cm^2) for SCH 80- 80mm at 23°C & during testing the piping systems should be slowly filled with water, taking care to prevent surge and air entrapment. The velocity should not exceed one foot per second. The piping system can be pressurized to 125% of its designed working pressure. However care must be taken to ensure the pressure does not exceed the working pressure of the lowest rated component in the system. The pressure test should not exceed one hour. Any leaking joints or pipe must be cut and replaced and the line recharged and retested using the same procedure.

4.1.03 EXAMINING: Before laying the pipe line, it shall be first examined for damages and cracks, no cracked or damaged pipe and fittings shall be used in the work and they shall be removed from the site by the contractor at his own cost and charge.

4.1.04 CLEANING: All the pipes and fittings shall be thoroughly cleaned with brush and washed if necessary to remove any accumulated stone, soil or dirt inside and outside surfaces

4.1.05 LAYING: The plumbing contractor shall set the layout of the plumbing approved by the engineer in charge as may be required by the byelaws pipes shall be laid in plumb and in straight and parallel lines. When unavoidable, pipes may be buried for short distances provided additional protection is given against damage and where so required joints are not buried. Where directed by the engineer in charge, Under the floors the pipe shall be laid in layer of sand filling as done under concrete floors.

In case laying in trenches the pipes shall be carefully laid straight to the correct alignment in gradients as indicated in the drawing. All the pipes shall be used in standard length as far as possible. Cut length may be used only where it is necessary to make up exact length. The entire length of pipe shall be evenly supported on bed of the trench throughout. Care shall be taken to prevent any sand, earth or

other materials from entering into the pipes during laying. At the end of the day's work the open end shall be suitable plugged

4.1.06 FIXING: The entire pipe line shall be fixed in position as shown in the drawing or as directed by the Engineer in charge. All pipes shall be fixed truly vertical and horizontal unless unavoidable. The pipe line shall be supported with U type anchor straps not less than 2mm thick and steel screws &pvc inserter grips not less than 40 mm long, wooden gut ties etc. keeping the pipe about 15mm clear of the wall.

Spacing between clamps for fixing internal piping shall be as given below

Pipe Dia	For Horizontal Runs	For Vertical Runs
20 mm	762 mm	762 mm
25 mm	914.40 mm	914.40 mm
32 mm	1066.80 mm	1066.80 mm
40 mm	1066.80 mm	1066.80 mm
50 mm	1066.80 mm	1066.80 mm
65mm	1219.20 mm	1219.20mm
80mm	1219.20mm	1219.20mm

No joints shall be located inside the wall if the pipe is required to be cut, the hums of the cut end shall be filled smooth and any obstruction in bore shall be entirely eliminated, down take line shall be provided with union soc with EPDM O-Ring seal of every floor for easy maintenance. Die cast union shall not be permitted in the shaft.

4.1.07. TRENCHES: The trench bottom shall be carefully examined for the presence of hard objects such as flints, rock projection or tree roots etc. Pipe shall be embedded in sand or soft soil, free from rock and gravel, back till 150mm above the pipe shall also be of fine sand or soft ail. Pipe shall not be painted. The width of trench shall not be less than outside diameter of pipe plus 300 mm in case of gravel soils. Pipe shall be laid at least 900 mm below the ground level (measured from the surface of the ground to the top of pipe)

Crossing Road or Drain: Where the line crosses a road or a drain, it shall be through CI or R.C.C. pipe.

Supports for Valve and Hydrant: Valve and hydrant tees shall be supported that the torque applied in operating a valve is not transmitted to the pipe line.

Inspection and Testing Solvent welded pipe shall not be pressure tested until at least 24 hours after the last solvent cemented joint has been done.

All control valves shall be positioned open for duration of the test and open end closed with water tight fittings. The testing pressure on completion of the work shall not be less than one and a half times the working pressure of the pipes..

Pressure shall be applied either by hand pump or power driven pump. Pressure gauges shall be correctly positioned and closely observed to ensure that at no time are the test pressure exceeded. The systems shall be slowly and carefully filled with water to avoid surge pressure or water hammer. Air vents shall be open at all high points so that air may be expelled from the system during filling.

When the system has been fully charged with water and air displaced from the line air vent shall be closed and the line initially inspected for seepage at joints and firmness of supports under load, Pressure may then be applied until the required test sure is reached.

Without any additional requirement of make-up-water the test pressure should not fall more than 0.2 kg/sq.cm. at the end of one hour test duration.

4.1.08 MAKING JOINT: The jointing of pipes and fittings generally shall be done with approved make cement solvent of ASTM D2564 including making surface rough. The pipe shall be cut to desired length. Care shall be taken that profile or cut surfaces shall not be changed and the fibrous material shall be removed with scraper or knife.

4.1.09 DETACHABLE JOINT: Detachable joints shall be made where pipes of deferent materials have to be jointed or as specified in the schedule. The flanges are first pushed over the pipe ends and jointing shall be made by cement solvent.

4.1.10 DEWATERING: In case of underground pipes the contract rate shall include bailing or pumping out all the water till completion of work if accumulated during the progress of work either from seepage springs, rain or any other cause.

4.1.11 TESTING: Solvent welded pipe shall not be pressure tested until at least 24 hrs after the last solvent cemented joint has been done. All control valves shall be positioned open for the duration of the test and open end closed with water tight fittings. The testing pressure on completion of the work the piping system can be pressurized to 125% of its designed working pressure ie. $29.53\text{kg}/\text{cm}^2$ & $26.01\text{kg}/\text{cm}^2$ for 65mm nominal dia & 80mm nominal dia respectively. However care must be taken to ensure the pressure does not exceed the working pressure of the lowest rated component in the system. The pressure test should not exceed one hour .Any leaking joints or pipe must be cut and replaced and the line recharged and retested using the same procedure.

Pressure gauges shall be correctly positioned and closely observed to ensure that at no time are the test pressure exceeded.

The systems shall be slowly and carefully filled with water to avoid surge pressure or water hammer. Air vents shall be open at all high points so that air may be expelled from the system during filling.

When the system has been fully charged with water and air displaced from the line air vent shall be closed and the line initially inspected for seepage at joints and firmness of supports under load. Pressure is reached. Without any additional requirement of make-up-water the test pressure should not fall more than 0.02 MPa (0.2Kg/sqcm) at the end of one hour test duration.

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4.2 CPVC PIPING WORK (concealed)

4.2.01 GENERAL: The item includes supplying of CPVC pipes with fittings of specified diameter including laying, fixing, cutting, joining, painting etc. for vent, over flow, waste water pipe line etc.

4.2.02 MATERIAL: The pipes & fittings shall conform to IS 15778-2007, as per ASTM- D2846 class-1 of SDR-11 ,CPVC pipes and fittings shall be free from cracks, flows and defects and shall be able to withstand a pressure $28.1\text{kg}/\text{cm}^2$ at 23°C & $7\text{kg}/\text{cm}^2$ at 82°C as mentioned in the schedule of quantities & the material is also certified by NSF for its safe use with portable water and thus completely safe for drinking water.

4.2.03 EXAMINING: Before laying the pipe line, it shall be first examined for damages and cracks, no cracked or damaged pipe and fittings shall be used in the work and they shall be removed from the site by the contractor at his own cost and charge.

4.2.04 CHASES: Chases of size 75mm x 75 mm shall be cut in the wall, floor, slab wherever required or as directed by chases cutting machine. After testing the pipe line the chases shall be filled with cement mortal 1:3 and surface made good to its original condition.

4.2.05 LAYING: The plumbing contractor shall set the layout of the plumbing approved by the Engineer in charge. The entire pipe line shall be fixed in position as shown in the drawing or as directed by the Engineer in charge as may be required by the bye laws. All pipes and fittings, which are to be concealed, shall be properly embedded in the wall, flooring etc. Pipes shall be laid in plumb and in straight and parallel lines, after being treated, no molding or plaster design or any ornamental plaster work shall be done over the walls or flooring or ceiling where concealed pipes have been laid.

4.2.06 MAKING JOINT: The jointing of pipes and fittings generally shall be done with approved make cement solvent of ASTM F493 including making surface rough. The pipe shall be cut to desired length. Care shall be taken that profile or cut surfaces shall not be changed and the fibrous material shall be removed with scraper or knife.

4.2.07 TESTING: Solvent welded pipe shall not be pressure tested until at least 24 hrs after the last solvent cemented joint has been done. All control valves shall be positioned open for the duration of the test and open end closed with water tight fittings. The testing pressure on completion of the work the piping system can be pressurized to 125% of its designed working pressure ie. 28.1kg/cm² for SDR11 CPVC Pipe 20mm nominal dia, 25mm nominal dia & 32mm nominal dia respectively. However care must be taken to ensure the pressure does not exceed the working pressure of the lowest rated component in the system. The pressure test should not exceed one hour. Any leaking joints or pipe must be cut and replaced and the line recharged and retested using the same procedure.

Pressure gauges shall be correctly positioned and closely observed to ensure that at no time are the test pressure exceeded.

The systems shall be slowly and carefully filled with water to avoid surge pressure or water hammer. Air vents shall be open at all high points so that air may be expelled from the system during filling.

When the system has been fully charged with water and air displaced from the line air vent shall be closed and the line initially inspected for seepage at joints and firmness of supports under load. Pressure is reached. Without any additional requirement of make-up-water the test pressure should not fall more than 0.02 MPa (0.2Kg/sqcm) at the end of one hour test duration.

4.3 BALL VALVES WITH CTS SOCKET (COPPER TUBE SIZE) ASTM D 2846 & BALLVALVE SOC ASTM D 2467

4.3.01 GENERAL: All thermoplastic ball valves shall be Utility sealed unit type constructed from PVC Type I Cell Classification 12454 or CPVC Type IV Cell Classification 23447. All O-rings shall be EPDM. All valves shall have Safe-T-Shear® stem and double stop Polypropylene handle. All valves shall be listed by NSF® for use in potable water service. All valves shall be pressure rated at 28.1 kg/cm² for water at 23°C, as manufactured by Spears® Manufacturing Company.

4.3.02 MATERIAL: CPVC fittings ASTMD2846 & uPVC fittings ASTMD-2467 Ball valve Body-PVC, Seat- EPDM, Ball-PVC, Stem-PVC, O Ring-EPDM, Handle- ABS, Bolt- Zinc plated steel, Cap-ABS.

Diameter in mm	BALL VALVE (Kg)CPVC	BALL VALVE (Kg) uPVC
20	0.122	
25	0.168	
32	0.285	
40	0.426	
65	1.079	1.05
80	2.03	

4.3.03 FIXING: The valve shall be fixed in position in the pipeline as shown in the drawing or as directed with necessary solvent cement joint.

4.3.04 MAKING JOINT: The jointing of pipes and fittings generally shall be done with approved make cement solvent of ASTM D2564 for uPVC ball valve and ASTM F493 for CPVC ball valve, including making surface rough. The pipe shall be cut to desired length. Care shall be taken that profile or cut surfaces shall not be changed and the fibrous material shall be removed with scraper or knife.

4.3.05 TESTING: The joints shall be tested to a hydraulic pressure be pressurized to 125%rated working pressure along with the testing of pipe line.

a) Hydrostatic Tests

Hydrostatic Tests: The portions of the line shall be tested by subjecting to pressure test as the laying progresses before the entire line is completed. In this way any error of workmanship will be found immediately and can be corrected at a minimum cost. Usually the length of the section to be tested shall not exceed 500m.

Where any section of a main is provided with concrete thrust blocks or anchorages, the pressure test shall not be made until at least five days have elapsed after the concrete is cast. If rapid hardening cement has been used in these blocks or anchorages, test shall not be made until at least two days have elapsed.

Prior to testing, enough back fill shall be placed over the pipe line excluding the joints to resist upward thrust. All thrust blocks forming part of the finished line shall have been sufficiently cured and no temporary bracing shall be used.

The section of the line to be tested shall be filled with water manually or by a low pressure pump. Air shall be vented from all high spots in the before making the pressure strength test because entrapped air gets compressed and causes difficulty in raising the required pressure for the pressure strength test.

The test pressure shall be gradually raised at the rate of approximately one Kg./sq. cm./min. The duration of the test period if not specified shall be sufficient to make a careful check on the pipe line section.

5 UPVC SWR PIPING WORK

5.1.01 GENERAL: The item includes supplying of UPVC soil waste and rain water (SWR) and ventilation pipes with fittings of specified diameter including laying, fixing, cutting, jointing painting if required etc.

5.1.02 MATERIAL: The pipe shall be conforming to IS 13592, Type-B, UPVC SWR and fittings conforming to IS 14735 shall be free from cracks, flaws and defects and shall be able to withstand a pressure as mentioned in the schedule of work. Rubber sealing rings DMSeal, conforming to IS 5382 with lubricant for sliding socket joints as mentioned in the schedule of work.

5.1.03 EXAMINING: Before laying the pipe line, it shall be first examined for damages and cracks no cracked or damaged pipe and fittings shall be used in the work and they shall be removed from the site by the contractor at his own cost and charge.

5.1.04 CLEANING: All the pipes and fittings shall be thoroughly cleaned with brush and washed if necessary to remove any accumulated stone solid or dirt side and outside surfaces.

5.1.05 LAYING: The pipe shall be carefully laid straight to the correct alignment in gradients as indicated in the drawing. All the pipes shall be used in standard length as far as possible. Cut length may be used only where it is necessary to make up exact length. The entire length of pipe shall be evenly supported on bed of the trench throughout. Care shall be taken to prevent any sand, earth or other materials from entering into the pipe during laying. At the end of days work the open end shall be suitably plugged.

5.1.06 FIXING: The pipe line shall be fixed in position as shown in the drawing or as directed by the Engineer in charge. The pipe shall be fixed with GI clamps not less than 2.0 mm thick or with suitable UPVC clamps/clips. The damps/clips shall be fixed into the wall with GI nails not less than 40mm long and wooden gutties keeping the pipe about 15mm clear of the wall.

5.1.07 MAKING JOINT: The jointing of pipes and fitting generally shall be done with approved make cement solvent including making surface rough or rubber sealing DMSeal with lubricant for sliding socket joints. The pipe shall be cut to desired length. Care shall be taken that that profile or cut surfaces shall not be changed and the fibrous material shall be removed with scraper or knife.

5.1.08 DETACHABLE JOINT: Detachable joints shall be made where pipes of different materials have to be joined or as specified in the schedule. The flanges are first pushed over the pipe ends and jointing shall be made by cement solvent.

5.1.09 PAINTING: In case of underground piping, the pipe line shall be painted with two coats of approved oil paint of matching color over a coat of primer.

5.1.10 DEWATERING: In case of underground pipes, the contract rate shall include bailing out all the water till completion or work if accumulated during the progress of work either from seepage, springs, rain or any other cause.

5.1.11 TESTING: The joints shall be tested by either smoke test for vertical stacks or 2.5m head of water at the highest point of the section under test for horizontal drainage pipes. Smoke shall be pumped into the pipes at the lowest end from a smoke machine which consists of a blow and burner. The material usually burnt is greasy cotton waste which gives out a clear pungent smoke which is easily detectable by sight as well as by smell, if there is leak at any point of the drain. The water head test shall be carried out by suitably plugging the lower end of the drain and the ends of the connection if any and filling the system with water.

6 uPVC PIPING WORK

6.1.01 GENERAL: The item includes supplying of uPVC pipes with fittings of specialized diameter including laying, fixing, cutting; jointing & painting etc for vent, over flow, waste water pipe line etc.

6.1.02 MATERIAL: The pipes and fittings shall conform to series IV of IS 4985, uPVC pipes and fittings shall be free from cracks, flaws and defects and shall be able to withstand pressure as mentioned in the schedule.

6.1.03 EXAMINING: Before laying the pipe line, it shall be first examined for damages and cracks no cracked or damaged pipe and fittings shall be used in the work and they shall be removed from the site by the contractor at his own cost and charge.

6.1.04 CLEANING: All the pipe and fittings shall be thoroughly cleaned with brush and washed if necessary to remove any accumulated stone soil ordinates and outside surfaces.

6.1.05 LAYING: The plumbing contractor shall set the layout of the plumbing approved by the engineer in charge as may be required by the byelaws pipes shall be laid in plumb and in straight and parallel lines. When unavoidable, pipes may be buried for short distances provided additional protection is given against damage and where so required joints are not buried. where directed by the engineer in charge, Under the floors the pipe shall be laid in layer of sand filling as done under concrete floors.

Incase laying in trenches the pipes shall be carefully laid straight to the correct alignment in gradients as indicated in the drawing. All the pipes shall be used in standard length as far as possible. Cut length may be used only where it is necessary to make up exact length. The entire length of pipe shall be evenly supported on bed of the trench throughout. Care shall be taken to prevent any sand, earth or other materials from entering into the pipes during laying. At the end of the day's work the open end shall be suitable plugged

6.1.06 FIXING: The entire pipe line shall be fixed in position as shown in the drawing or as directed by the Engineer in charge. All pipes shall by fixed truly vertical and horizontal unless unavoidable. The pipe line shall be supported with U type anchor straps not less than 2mm thick and steel screws &pvc inserter grips not less than 40 mm long, wooden gut ties etc. keeping the pipe about 15mm clear of the wall.

6.1.08 MAKING JOINT: The jointing of pipes and fittings generally shall be done with approved make cement solvent including making surface rough. The pipe shall be cut to desired length. Care shall be taken that profile or cut surfaces shall not be changed and the fibrous material shall be removed with scraper or knife.

6.1.09 FIXING: The entire pipe line shall be fixed in position as shown in the drawing or as directed by the Engineer in charge. All pipes shall by fixed truly vertical and horizontal unless unavoidable. The pipe line shall be supported with U type anchor straps not less than 2mm thick and steel screws&pvc inserter grips not less than 40 mm long, wooden gut ties etc. keeping the pipe about 15mm clear of the wall.

6.1.10 DETACHABLE JOINT: Detachable joints shall be made where pipes of different materials have to be jointed or as specified in the schedule. The flanges are first pushed over the pipe ends and jointing shall be made by cement solvent.

6.1.11 TESTING: Solvent welded pipe shall not be pressure tested until at least 24 hrs after the last solvent cemented joint has been done. All control valves shall be positioned open for the duration of the test and open end closed with water tight fittings. The testing pressure on completion of the work the piping system can be pressurized to 125% of its designed working pressure. The systems shall be slowly and carefully filled with water to avoid surge pressure or water hammer. Air vents shall be open at all high points so that air may be expelled from the system during filling.

When the system has been fully charged with water and air displaced from the line air vent shall be closed and the line initially inspected for seepage at joints and firmness of supports under load. Pressure is reached. Without any additional requirement of make-up-water the test pressure should not fall more than 0.02 MPa (0.2Kg/sqcm) at the end of one hour test duration.

7 GULLY TRAP

7.1.01 GENERAL: The term includes provision of uPVC square gully trap with including construction of Gully Trap Chamber.

7.1.02 MATERIAL: The Gully Trap shall be of uPVC square type with 110 mm diameter outlet. Brick work, plastering, concreting shall be as per general specification under section- II.

7.1.03 CONSTRUCTION:

1. Internal dimension of the Gully trap chamber shall be (300x300x500)mm as specified in the schedule.
2. Foundation of 1:5:10 concrete shall be 100 mm thick, and shall have 100mm offset.
3. Brick masonry shall be of 250 mm thick in cement mortar 1:5 and masonry shall be plastered with 12mm thick plaster in 1: 3 cement mortars inside and outside surface with smooth finish.

7.1.04 RCC SLAB: RCC slab of 80mm thick cement concrete 1:2:4 shall be fixed with the cement mortar 1:3 at the top of Gully trap chamber,

7.1.05 DEWATERING: The contract rate shall include bailing or pumping out all the water till completion or work if accumulated during the progress of work either from seepage, springs rain or any other cause.

8 FLOOR TRAP

8.1.01 GENERAL: The item includes supplying uPVC floor trap with CP brass / stainless steel grating specified diameter with fittings and fixtures including fixing and jointing with the pipe line.

8.1.02 MATERIAL: 110 mm nominal outlet dia uPVC trap ,IS14735 with an effective water seal of 50mm. Outlet dia floor 110mm top grating shall be of CP brass or stainless steel of heavy quality size and shape to suit the trap.

8.1.03 FIXING: uPVC floor trap with the bend and pipe piece shall be fixed in position over the bed of 1:2:4 cement concrete. The jointing trap and pipe shall be DM seal. The grating shall be fixed over the floor trap flush with the floor level and the gap finished with matching cement.

9 RAINWATER GRATING

9.1.01 GENERAL: The item includes supplying of stainless grating of specified diameter including fixing and painting.

9.1.01 MATERIAL: The rainwater grating shall be stainless with closed grained without any casting defects. The thickness should be uniform throughout, one shaped stainless grating

9.1.03 FIXING: Stainless rainwater grating shall be fixed in position with 1:1 cement mortar.

10. RCC PIPES AND MANE HOLES

10.1. Laying of RCC S/S pipes of class NP₃ / NP₂ in Sewerage System

RCC (Spun) non-pressure pipes of class NP₃ / NP₂ shall be socket and spigot end confirming to IS-458/ 2003 with ISI Mark.

Width of trench:

- i. For all diameters up to an average depth of 120 cm width of the trench in cm dia of the pipe + 30 cm.
- ii. For all diameters for depth above 120 cm width of the trench in CM= dia of the pipe + Cm.
- iii. Not with standing (a) and (b) above, the width of trench should not be less than 75 cm for depth exceeding 90 cm.

Dewatering of trenches if required shall be done by the contractor without any extra claim.

The laying, jointing, testing and commissioning of the R.C.C. pipe in sewer shall be strictly as per P.H. specification and approved by EIC.

Excavation and preparation of trench shall be as per latest IS specification.

Usage of anchor and thrust blocks shall be as per relevant IS-Specification.

Rubber gasket SBR/EPDM used with push on joints or mechanical joints shall conform to IS-5382 /1985 bearing ISI mark.

Back filling shall be as per relevant IS-specification

Flushing and disinfection of mains before commissioning shall be as per relevant IS specification.

No extra payment shall be made to the contractor on account of breakage of specials etc. during transportation, loading and unloading. The contractor shall replace those materials at his own cost. Similarly, any damage of RCC pipes/ PVC pipes due to mishandling by the contractor during transportation, loading and unloading shall have to be taken care of /replaced by the contractor.

Pipe & fittings if found to be defective during lowering shall have to be replaced immediately by the contractor at his own cost and no claim whatsoever shall be entertained on account of this.

Blasting for excavation shall be permitted only after the approval of competent authority is obtained by the contractor.

Thrust blocks shall be provided in the pipe line at required places by the contractor as per requirement in consultation with Engineer-in-charge and as per drawing approved by IDCO.

No section shall be accepted unless it withstands the test pressure. The contractor shall make all arrangement including labour, pumps , pressure gauge and equipment etc. for testing of the pipe line as per relevant IS specification.

The SBR / EPDM gasket shall conform to relevant IS: 5382 /1985 and shall be from reputed manufacturers with ISI mark on the body of the materials.

To avoid any complication during jointing & installation of the pipes and to ensure dimensional compatibility, the rubber gaskets are also be supplied by the pipe manufacturer. Pipe manufacturer who does not produce gasket or fittings themselves, may procure and supply the same from their approved vendors so that the pipe suppliers will be responsible for quality of the related item as well as the dimensional compatibility required for the leak tightness of the pipe joints.

The tenderer shall clearly state the name of the manufacturers/make of all the materials in his offer.

10.2 SPECIFICATION FOR LAYING OF RCC S/S PIPES OF CLASS NP₃ / NP₂ IN SEWERS.

1. Excavation in trench:

- a. Depth of trench- It should be sufficient to provide a minimum cover of 90 cm of more according to the required gradient and alignment.
- b. Width of trench- (i) For all diameters up to an average depth of 120 cm outside diameter of pipe + 30 cm and (ii) for all diameters for depth above 120 cm outside diameter of pipe + 40 cm.

However the total trench width should not be less than 75 cm for depth exceeding 90 cm.

2. Cement concrete pedestal:

RCC pipe will lay over the Cement concrete (1:2:4) pedestal of size not less than 600mmx250mmx450mm ht. including earth work excavation in all kinds of soil, back filling, PCC (1:3:6) with 40mm & down size h.g.c.b. metal with necessary form work required for the work. There are 2 (two) nos. (Minimum) of pedestal will be constructed for each pipe length. The location of pedestal will be placed as per site requirement & direction of EIC.

Bed concrete

- a. Bedding- Where the pipes are laid on soft soil with maximum water table level, laying at the invert level of the pipe.
- b. Hunching- Where the pipes have to be laid on a soft soil with the maximum water table level rising above the invert level of pipe but below the top of the barrel.
- c. Surround or Encasing- The pipes shall be completely encased or surrounded with concrete in the following cases.

- i. Where the maximum water table level is likely to rise above the top of the barrel.
 - ii. Where the sewers are to be laid adjacent to growing trees.
 - iii. Where the depth of the pipe is less than 1.2 mtr under the road surface.
 - iv. When the superimposed load exceeds 1600 kg per mtr length of pipes.
3. **Laying:**
The RCC pipes shall be laid with sockets facing up the gradient on desired bedding to proper gradient (IS: 4127-1967)
4. **Jointing:**
The RCC S/S pipes shall be push on joint with Rubber Gasket.

10.4 SPECIFICATION FOR CONSTRUCTION OF MANHOLE CHAMBERS:-

1. All manhole chambers shall be constructed with RCC M25 as per relevant IS specification and as per details outlined below.
The roof slab of all chambers shall be of RCC (M25) with reinforcement not less than 90 Kg./cum with thickness not less than 150mm. The roof slab shall be cast-in-situ.
2. The base slab, side wall & roof slab of chamber shall be not less than 150mm, 150mm & 125mm respectively having crushing strength 250Kg/cm² at 28 days conforming to IS456/200 & IS-3370.
3. The foundation and floor (continuation of foundation) of the manhole chamber shall be C.C.(1:3:6) of thickness not less than 100mm. There shall be a foundation offset of minimum 150mm on outside of base slab.
4. Both outside & Inside wall plaster of the walls shall be in cement mortar 1:3 and cement punning only on Inner wall and floor surface of proper plumb and smooth.
5. The manhole cover of the chamber shall be pre-cast factory made with frame as per IS-12592/2002 (SFRC Heavy duty) for clear opening of 560mm with 2 nos. of lifting hook on the cover slab.
6. Benching (1:2:4) with 12 mm size h.g.c.b. chips. The benching should have a fall towards the invert of about 1:10.
7. Manhole cover: - The size of man hole cover shall be such that there shall be a clear opening of at least 500 mm in diameter.
8. Size of manhole- The minimum internal sizes of different manholes should be as follows:

a. **Inner size of Rectangular Manhole:-**

- i. 800mmx900mm x 900mm Depth
- ii. 1200mmx900mmx900mm Depth

9. **Spacing of manholes :**

The maximum spacing of manholes in any sewer line should be as per site condition.

Manholes should also be built at every change of alignment gradient or diameter at head of all sewers and branches and at the junction of two or more sewer.

Paragraph 4.2.1.1 of manual on Sewerage and Treatment (2nd Edition) may be referred.

DEWATERING: The contract rate shall include baiting or pumping out all the water if accumulated during the progress of the work either from rain, seepage, springs or any other cause.

10 Precast Concrete Frame And Cover For Manholes

10.1.01 GENERAL: The item includes supply LD/MD/HD/EHD factory made precast steel fiber reinforced concrete (SFRC) frame and cover as specified in schedule including fixing and placing.

10.2.02 MATERIAL: The precast frame and cover shall be of steel fiber reinforced concrete (SFRC) conforming to IS 12592 and shall be of approved make. The frame and cover shall be of LD/MD/HD/EHD grade, size and thickness as mentioned in the description of the item. The defective frame and cover shall be replaced by the contractor at his own cost and charges.

10.3.03 FIXING: Frame shall be fixed in cement concrete 1:2:4 for bearing course & capping on the top of masonry wall of chamber or manhole and finishing shall be done in 1:2 cement plaster finished smooth with neat cement.

11 Polypropylene Step Iron / Rungs:

11.1.01 GENERAL: The item includes supplying of Polypropylene steps including fixing in two parallel lines of 300 mm spacing in vertical wall with center to center 375 mm staggered.

11.2.02 MATERIAL: The steps shall be of Polypropylene step iron and minimum 150mm wide.

11.3.03 FIXING: The steps shall be fixed in RCC wall with 1:2:3 cement concrete with 75mm cement concrete cover at all around the step. The first step shall be 450 mm below from top surface of structure and next shall be fixed 300mm centre to centre in two rows at 375mm distance or as shown in the drawing.

10.5 SPECIFICATION FOR CONSTRUCTION OF INSPECTION CHAMBERS: -

1. All inspection chambers shall be constructed with brick masonry (Fly Ash) as per relevant IS specification and as per details outlined below.
2. The roof slab of all chambers shall be of RCC (M20) with reinforcement not less than 90 Kg./cum with thickness not less than 125mm. The roof slab shall be cast-in-situ.
3. All side walls of chamber shall be not less than 250mm thick brick masonry wall having crushing strength not less than 75Kg/cm².
4. The foundation and floor (continuation of foundation) of the inspection chamber shall be C.C.(1:3:6) of thickness not less than 100mm. There shall be a foundation offset of minimum 150mm on outside of base slab.
5. Both outside & inside wall plaster of the walls shall be in cement mortar 1:3 and cement punning only on Inner wall and floor surface of proper plumb and smooth.

6. The cover of the chamber shall be pre-cast factory made with frame as per IS-12592/2002 (SFRC Medium duty) for clear opening of 500mm with 2 nos. of lifting hook on the cover slab.
7. Benching (1:2:4) with 12 mm size h.g.c.b. chips. The benching should have a fall towards the invert of about 1:10.
8. Chamber Cover: - The size of cover shall be such that there shall be a clear opening of at least 500 mm in diameter.
9. Size of inspection chamber- The minimum internal sizes of different inspection chamber should be as follows:
 - a. **Inner size of Rectangular Inspection Chamber:-**
 - iii. 900mmx800mm x 450mm Depth (Avg.)

10. **Construction of Inspection Chamber :**

The spacing of the chamber in sewer line should be as per site condition.

Chambers should also be built at every change of alignment gradient or diameter at head of all sewers and branches and at the junction of two or more sewer.

Paragraph 4.2.1.1 of manual on Sewerage and Treatment (2nd Edition) may be referred.

11. SPECIFICATION FOR CONSTRUCTION OF RCC SEPTIC TANK: -

1. The number & capacity of Septic Tank are given in BOQ except safe bearing capacity of the soil, Ground levels, sub-soil water levels which to be ascertaining by the agency. The Septic Tank will construct as per IS: 2470 (Part-I)-1985. The septic tank will construct on item basis as per BOQ, however detail drawing and structural designed will be submitted & should be approved by IDCO before execution.
2. Any loose pocket patch below foundation shall be cleared and filled with P.C.C 1:3:6.
3. If the soil or subsoil water contains sulphate, the same shall be submitted and appropriate measures taken as per relevant spec. / codal requirements as specified by the Engineer-in-charge.
4. Foundation conc. In 1:3:6 mix (P.C.C) shall have coarse aggregate h.g.c.b. of size not more than 40mm.
5. RCC to be of grade M-30.
6. No concrete shall be cast at a temp. above 39°C or below 10°C unless special precautions relevant are codes are taken.
7. In two-way slabs place short span bars in bottom layer web reinforcement and anchorages.
8. Follow CPWD rules I.S- 456-2000 & IS- 13920 as to stirrups, columns ties and anchorages details of steel etc. must be carried out accordingly, unless otherwise shown.
9. Clear cover for main reinforcement is as follows:-
 - a. In footing : 50mm

b.	In columns	: 50mm
c.	In beams	: 45mm
d.	In slabs	: 45mm

10. All steel reinforcement shall be of high yield strength TMT bars confirming to IS: 1786 with minfield stress 0.2% proof stress of 415 N per Sq.mm (Grade Fe 415)
11. Provide normal laps of 50 dia in Grade M-25 Mix.
12. Distance of 1st stirrup from edge column line/beam shall be 50mm max.
13. All bricks in the masonry shall have characteristic compressive strength of 7.5N/sq mm unless otherwise specified and laid in 1:4 cement coarse sand.
14. All center line dimensions should be taken off Arch. Drawings.
15. Not more than 1/3 rd of total col. Bars shall be lapped at any section of column laps shall be staggered and avoided at the places of max. Stress a lap shall be considered staggered if the centre to centre distance of the lap is not less than 1.3 times the development length as mentioned elsewhere in these notes.
16. Lap in column should be provided in the middle half between two braces.

17. Lap should not be provided
 - a. Within a joint
 - b. Within a distance of 2d from joint face
 - c. Within a quarter length of the member from the joint face
18. Not more than 50% of bars shall be spliced at one section.
19. Wherever necessary horizontal bars shall be left in the column for lintels and other similar members.
20. The disposition of hooks of similar col. times shall be vertically staggered and placed on opposite faces for alternate ties.
21. Only stirrups of column are to be continued through beam column junction.
22. During casting of beam if the work is stopped for duration longer than initial setting time of cement, then such discontinuity shall be threaded as construction joints.
23. Construction joint shall be made vertical by proper template with slots for accommodating reinforcement bars. The joint shall be treated in accordance with C.P.W.D specification.
24. Construction joint shall be planned at or near mid span but not outside the middle third of the span provided the beam does not carry any concentrated load. Incase beam carries concentrated load due to the reaction of the secondary beam, the construction joint in the main beam shall be off-set by a distance equal to twice the width of the secondary beam.
25. Construction joints shall not be provided in cantilever beams shall be cast monolithically with interior beam.

26. Drilling the holes of dia not less than 16 mm on inner wall and floor surface, spacing not less than 600mm C/C, grouting the holes by pressure grouting equipment using polymer modified cement.
27. Any vibratory equipment, if placed on the structure must be mounted on properly designed vibration isolators and seismic snobbery so as not to transmit any dynamic forces on the structure nor dismount in an earthquake.
28. Where there are two or more rows of reinforcement bar, the reinforcement bars shall be vertically in line and minimum vertical distance. Between the reinforcement bars shall be 15mm or 2/3 of the nominal size of the aggregate or the max. size of bar whichever is more.
29. The stirrups and column bars at splices shall be bent at a slope not steeper than 1.6 (max) to avoid extension bars.
30. The specification of the approved drawing should be strictly followed.
31. Excavation of foundation including dressing and leveling the bed in all kinds of soil/rock up to the required depth as per design including dewatering shoring and shuttering if necessary depositing the excavated materials 50 meters clear of site as per direction of Engineer-in-charge.
32. Cement concrete grade M-10 as per design of suitable thickness under R.C.C foundation with 40mm of downgraded size crusher broken hard granite metal as per relevant B.I.S.
33. Reinforced cement concrete grade M-25 as per design in all members of the supporting structures.
34. Reinforced cement concrete grade M-25 in all members in contact with water and members subject to condensation like roof slab etc.
35. The supporting structure may be either on a group of columns connected by rigid braces or a load bearing shaft subject to fulfillment of a architectural and economic requirements as indicated at Clause -2.4 IV or B.I.S.-3370.Part-II, 1965.
36. In case of roof slab having no slope, necessary protection measures shall be provided as per clause 6.1 and 6.4 of B.I.S- 3370 (Part-II) 1965.
37. The Septic tank shall be ventilated by providing 110mmx1.80m ht. vent pipe with terminal guard- 2 nos. The opening of the ventilator shall be protected with mosquito proof wire net made of Stainless steel will be fixed on roof of the tank with C.C. Pedestal at suitable location as per direction of EIC.
38. SFRC (Medium Duty) man-hole covers with frame of clear opening size 500mm dia. Frame and cover-2 (Two) nos. will be fixed at suitable place in the roof of the tank & 1 (One) no. each for inlet and outlet chambers.
39. Providing, fitting & fixing of polypropylene steel reinforced manhole steps of approved quality & size in two parallel line of 300mm spacing in vertical walls with center to center 375mm (staggered) will be fixed in two locations inside septic tank & inlet and outlet chambers.
40. Providing, fitting & fixing of stone ware salt glazed Tee of size 150mm both inlet & outlet of the tank.
41. Cavity of the tank should be filled with excavated & selected earth, laying in layers not exceeding 23cm thick well watered& rammed etc. as per direction of EIC.
42. All R.C.C works shall be finished smooth, inside surface of walls and floors of the tank which shall be rendered with 12mm thick C.P. (1:3) with punning. All exposed surface of the concrete and plaster over masonry shall be given two or more coats of weather coat paint over a coat of

primer of approved shade. All iron works of the tank shall be painted with two or more coats of approved anticorrosive paint (Epoxy) over a coat of primer of approved shade. All masonry works shall be plastered with 12mm thick C.P. in (1:4) cement mortar.

12. SPECIFICATION FOR CONSTRUCTION OF SOAK PIT:-

1. The number & size of Soak pit are given in BOQ except safe bearing capacity of the soil, Ground levels, sub- soil water levels which to be ascertaining by the agency. The Soak pit will construct as per approved PH specification & detail drawing and designed should be submitted & approved by IDCO before execution.
2. Foundation conc. In 1:3:6 mix (P.C.C) shall have coarse aggregate h.g.c.b. of size not more than 40mm.
3. RCC to be of grade M-20.
4. No concrete shall be cast at a temp. above 39°C or below 10°C unless special precautions relevant are codes are taken.
5. All steel reinforcement shall be of high yield strength TMT bars confirming to IS: 1786 with minfield stress 0.2% proof stress of 415 N per Sq.mm (Grade Fe 415)
6. Provide normal laps of 50mm dia in Grade M-20 Mix.
7. Distance of 1st stirrup from edge column line/beam shall be 50mm max.
8. All bricks in the masonry shall have characteristic compressive strength of 7.5N/sq mm unless otherwise specified and laid in 1:4 cement coarse sand.
9. All center line dimensions should be taken off Arch. Drawings.
10. Dry brick work of wall thickness 250mm will construct from invert level up to bottom & brick work in cement mortar (1:4) of wall thickness 250mm including Cement Plaster 1:4 of outer surface & cement plaster with punning on inner surface will be constructed from invert level to above G.L.
11. Both inner & outer peripheral cavity (width-450mm) of the Pit should be filled with 40mm & down size Hard granite hand broken graded metal from invert level up to bottom & rest outer cavity of the pit should be filled with excavated & selected earth, laying in layers not exceeding 23cm thick well watered& rammed etc. as per direction of EIC.
12. Providing, fitting & fixing of precast man hole cover with frame (SFRC medium duty) of clear opening 500mm dia on the roof slab of the pit at suitable location as per direction of EIC.

13 TERRACE WATER TANK

Water tanks at terrace shall be of RCC made over a staging on terrace slab.

14 GENERAL SPECIFICATIONS FOR WATER TANK

16.1.01 TESTING OF WATER TANK AND SEPTIC TANK: After construction of tank, it shall be tested for leak proofness. The tank shall be first filled with water up to the top of wall. The water level

should not drop more than 50mm within 48 hours. If the drop of water level is found more than 50mm the defective and leakage point shall be rectified to the full satisfaction of the Engineer in charge.

16.1.02 CLEANING OF WATER TANK: The cleaning of the tank shall be done by manually or by hydrodynamic mechanism with low or high pressure as directed. Potable water approved disinfectant etc. shall be used for cleaning of water tank before use.

15 RCC CORE CUTTER & ITS APPLICATION

18.1.01 GENERAL: The RCC roof slab shall be cut with help of powerful drilling system for rig-based coring in diameters up to 200 mm with help of diamond drilling equipment.

Rig-based wet drilling in concrete for pipe penetrations in plumbing, heating and air conditioning installations stitch drilling for cable trays and ventilation ducts. Drilling blind holes for large-diameter anchors, reinforcing bars and the installations of railings and barriers. RCC roof slab can be drilled maximum depth up to 450 mm for passing the SWR pipes P traps,etc complete as per direction of Engineer in-charge.

16 CUTTING HOLES UP TO 30 CM X 30 CM ON WALLS INCLUDING MAKING GOOD THE SAME.

General: - Square holes of size as specified or as directed by the Engineer -in-charge shall be cut in the masonry for taking pipes . Any damage to the adjoining portion or to any other items shall be made good as directed by the Engineer-in-charge . All dismantled materials shall be removed from the site.

Masonry Works: Brick work etc., shall be made good by using the same class of brick, tile or stone masonry as was cut during the execution of the work. The mortar to be used shall be cement mortar (1:4) as directed by the Engineer-in-charge.

Finishing: Cement mortar in 1:4 shall be used for plastering or pointing as may be required. The surface shall be finished with two or more coats of white wash/colour wash/distemper/painting as required but where the surfaced is not to be white washed, colour washed, distempered or painted, it shall be finished smooth with a floating coat of neat cement or as required to match with the surrounding surface.

The specifications for brickwork, stonework and finishing etc. shall be the same as detailed under relevant sub-heads of State PWD specification.

16.1 CUTTING HOLES UPTO 15CM X 15CM IN RCC FLOORS INCLUDING MAKING GOOD THE SAME.

General : Square holes of size as specified shall be cut in R.C.C. floor and roofs chajjas for passing pipes etc. Any damage to the adjoining portion or to any other item shall be made good as directed by the Engineer-in-charge. All dismantled materials shall be removed from the site.

Cement Concrete : After insertion of pipes etc. the holes shall be repaired with cement concrete 1:2:4 and the surface finished to match the existing surface. The top and bottom shall be finished properly to make the joint leak-proof. The specifications for cement concrete work and finishing etc. shall be the same as detailed under relevant sub-heads of State PWD specification.

16.2 CUTTING CHASE IN MASONRY WALLS INCLUDING MAKING GOOD TO THEM .

Making Grooves: Grooves are made in the walls for housing CPVC, uPVC. pipes etc. These shall be up to 7.5 cm x 7.5 cm as directed by the Engineer-in-charge. These shall be provided in correct position as shown in the drawings or as directed by the Engineer-in-charge. No grooves be made if the stability of the building is in danger.

Any damage to the adjoining portion or to any other item shall be made good as directed by the Engineer-in-charge. All dismantled materials shall be removed from the site. Chase on wall should be done by electric function carbide cutter with adequate depth as per specification shall be straight horizontally vertically as per direction of engineer in-charge.

Filling Grooves:

After CPVC, uPVC. Pipes are fixed in grooves, the grooves shall be filled with cement concrete 1:2:4 or cement mortar 1:4 as may be specified or otherwise directed by the Engineer-in-charge and Made flush with the masonry surface. The concrete surface shall be roughened with wire brushes to provide a key for plastering.

17 HANDICAPPED TOILET

20.1.01 GENERAL: The fixtures such as white glazed vitreous china water closet (European Patter) P or S type with cistern, seat cover wash hand basin of size 460x360 mm with one pair basin bolt one number hinged rail 760 mm long and four numbers grab rail 600 mm long each along with PVC wall inserter and brass screw for handicapped toilet shall be aligned and fixed as per IS codal Specification for each of the above mentioned fixtures for easy accessible of handicapped personnel etc as per direction of Engineer in-charge.

18 HEALTH FAUCET

21.1.01 GENERAL: The fixtures with one-meter-long easy flex tube in Chrome Finish and wall hook along with one end adjustable CP on brass revolving nut with washer for suitable to angular stop cock outlet thread and other end of the chrome finish flex tube shall be provided with faucet sprayer and it shall be fixed as per direction of Engineer in-charge.

19 CP ON BRASS SPREADER

22.1.01 GENERAL: The fixtures CP on brass spreader shall be fixed on the top of the flat back urinal with help of brass or steel screw and the inlet of the CP brass on spreader shall be joined to the Brass tube both side nut and washer of auto closing flush cock etc after direction of Engineer in-charge.

20 CP EXTENSION PIECE

23.1.01 GENERAL: The fixtures CP on Brass extension Piece of 15 mmx50 mm long shall be provided to the concealed CPVC pipe elbow to angle stop cock,bib cock, flush cock for adjustment of gap of plastering of wall etc. complete as per direction of Engineer in charge.

21 INBUILT RO PURIFIER WITH CHILLER

24.1.01 GENERAL: The fixtures chiller cum water dispenser with inbuilt RO purifier. It is ABS front cover and stainless steel body with elegant looks. Purification by RO+UF+TDS controller for commercial offices. A complete water Chilling capacity up to 25 ltr/hr& Purification capacity 20 ltr.

22 ANCHORING ARRANGEMENT FOR HANGING SWR PIPELINES WITH FITTINGS

25.1.01 GENERAL: For anchoring the hanging lines of SWR pipes and fittings such as P trap, bends, tees, elbows, offsets under the roof slab Flush anchor 12mm dia x 50 mm long, anchor rod with both side thread 12mm x 1000mm long, anchor clamp and ring shall be fixed to the roof slab for fastening/hanging to maintain the gradient for free flow of sewerages all complete as per direction of Engineer in -charge.

23 SINKING OF BORE WELL.

23..1.01 GENERAL: Vertical Electro-sensitivity sounding test (V.E.S) shall be Performed to obtain adequate pervious zone as per the direction of Engineer in-charge.

23..1.02 TECHNICAL SPECIFICATION: Drilling of perfectly vertical borehole 250mm x 150mm dia up to 100mtr depth below ground level through consolidated and unconsolidated rock with DTH/combination drilling rig(1200 cfm/300 Psi) as required to suite the site condition with lowering of 200mm dia PVC schedule 80 pipes as per ASTM D-1785/2004 or housing/Casing treated with Socket with or without well screen as per the necessary for soft,medium,hard and boulder formation. PVC casing pipe if required to prevent collapse of overburden shall be provided by the contractor including lowering and withdrawing after the completion of tube well and development of tube well by the help of air & measurement of Discharge and drawdown of the tube well. The tube well should be covered to Prevent from dropping Foreign materials by Trespassers etc. complete as per direction of Engineer in-charge.

24 BORE WELL (200mm/150mm dia).

24.1.0 GENERAL: Labour for drilling a perfectly vertical bore hole of specified dia (200mmx150mm) for a specified depth of 40 mtrs below the ground level through consolidated and unconsolidated rock with down the hole hammer drilling rigs or combination drilling rigs including use of own rigs with its accessories, T&P and consumables etc. for lowering of 200mm dia PVC pipes for housing as per the direction of Engineer in charge etc complete as per direction of Engineer in-charge.

24.1.02 GENERAL: Lowering of 200mm dia PVC casing with or without slotted pipes as per the necessity from ground level and fitted and fixed up in perfectly vertical position, including cutting and threading pipe and slotted pipe and supplying and fixing all the jointing materials, T&P, etc complete as per direction of Engineer in-charge.

24.1.03 GENERAL: Cleaning and developing the bore well using compressor continuously worked till clear and adequate discharge is obtained from the bore well including supply and use of all necessary equipment and cost of all labours etc complete as per direction of Engineer in-charge.

25 GRAVITY SEWERAGE.

25.1.01 GENERAL: For gravity sewerage disposal earthwork shall be executed in all kinds of soil within 50mtr initial lead & 1.5mtr initial lift including dressing, leveling & breaking clods to maximum 5cm to 7cm & laying in layers not exceeding 0.3mtr depth & as per specification & Direction of Department.

25.1.02 Foundation trenches and plinth shall be filled with excavated & selected earth, Laying in layers not exceeding 23cm thick well watered& rammed etc complete including labour, T&P lead & lift cost & conveyance, loading, unloading etc. complete as per Specification & direction of Engineer in-charge.

25.1.03 Centrifugally cast (spun) RCC non pressure pipes of class NP2 with socket & spigot ends conforming to IS :458 with ISI mark shall be provided in standard length and required diameter i.e. 200 mm Nominal bore and 250 mm nominal bore RCC S/S pipes suitable for push on joints including lowering the pipes in to trenches to required depth below G.L with proper alignment & gradient, testing ,commissioning (de-watering) if required including rubber gasket as per IS-5382/1985 with ISI mark with all taxes and duties etc all complete as per Specification & direction of Engineer in-charge.

25.1.04 Cement Concrete Pedestal shall be casted of C.C 1:2:4 with 12mm size hard granite crusher broken chips (hgcb) as shown in drawing for support of the RCC NP2 pipe of Nominal dia i.e 200 mm & 250 mm RCC NP2 Pipe.

26 CENTRIFUGAL PUMPS & APPURANTENCES

26.1.01 GENERAL: Supply installation, testing and commissioning of Centrifugal Pump sets with delivery Piping arrangements for both drinking water & Flushing water application.

26.1.02 Centrifugal pump set (split casing) and capacity of each pump with total head 45 mtr and discharge 15m³/hr shall be provided as per Engineer in-charge.

26.1.03 Induction motor of TEFC (Totally Enclosed, Fan Cooled) of three phase 50 Hz shall be coupled with a common base and electrical control panel suitable for the pump set shall be provided as per Engineer in-charge.

26.1.04 Base concrete shall be provided on the floor with grouting of Base bolt for fixing the pump and motor of required size over the base plate. The pump and motor shall be aligned properly, to run without vibration.

26.1.05 Butterfly valve, Non return valve (Pressure rating PN1.0) ,threaded or flanged short piece along with Piping arrangement shall be provided for both side suction and delivery of pumps .

26.1.06 In case of negative suction flanged end foot valve with strainer shall be provided

26.1.07 TECHNICAL SPECIFICATION OF PUMP SETS

Location of Project: Clear Water Pump House

(A) Specification of pump set:

i) Pump:

- | | |
|------------------------------|---|
| 1. Type of pump set | : Horizontal Split casing Centrifugal Pump |
| 2. Pump model | : To be furnished by the bidder |
| 3. Make | : WILO MATHER+PLATT/KIRLOSKAR BROTHERS/WPIL |
| 4. No. of pump | : 2 (two) (one working and one standby) |
| 5. Discharge | : 20.00 m ³ /hr. |
| 6. Head | : 25.00 meter |
| 7. Efficiency | : Should not be less than – 60% |
| 8. Nominal speed (Full Load) | : To be furnished by the bidder |
| 9. Pump suction and delivery | : To be specified by the bidder |

	Nozzle dia	
10.	NPS Hr	: To be specified by the bidder
11.	Service	: Pump clear water from UGR
12.	RPM	: To be furnished by the bidder
13.	Specific gravity	: 1.00
14.	Ambient Temperature	: 35° C
15.	Duty	: Continuous
16.	Recommended motor K.W	: to be furnished by the Bidder
17.	Performance test	: As per IS- 5120

Material construction of Pump :

1. Pump casing : C.I. (IS:210 Gr FG260)
2. Impeller : CI-FG-210,
3. Shaft : SS 410
4. Shaft sleeve : SS 410
5. Casing wearing : CI-FG-210
6. Gland : CI confirming to IS-210/1978 of latest version
7. Foundation bolts & nuts : Carbon steel

The materials for construction of pump casing, impeller, pump shaft, shaft sleeve, base plate, casing ring have to meet the related IS- specification.

The duty parameters of pump set shall be on the best efficiency point of the performance curve of pump with clear indication to the above & the rated head, capacity, power input, NPSHr etc. must be enclosed. NPSHr should be as per IS-5120. No negative tolerance is acceptable. This is to make sure that no cavitations take place during operation of the pump. The grease nipple should be provided on both the points for future lubrication.

The pump should be supplied with accessories such as, common base plate, fabricated from MS channel, suitable cement concrete pump foundation and vibration damping arrangement with casting foot mounting all required, set of coupling with coupling bolts & nuts, rubber bush, companion pipe flanges, coupling guard, required nos of foundation bolts and nuts 100mm dia pressure gauge (0-7Kg/Cm²) with control ball valves- 2 nos., 100mm dia vacuum gauge-2 nos. and any other materials required for the same. Since the area is quite prone to corrosion, rubber base paint or epoxy base anticorrosive paint to the pump should be preferred.

The characteristic curve of pump should be continuously raising type with decrease in flow and shutoff head shall be at least 120% of the total discharge head at design point and should operate between 70% to 150% of total discharge.

The bidder should furnish the following details & drawing for scrutiny along with offer.

- (i) Make, MOC, model, size, capacity etc. including complete billing of materials.
- (ii) Performance curve indicating range of impeller dia meter, discharge Vs. Head, power input (K.W), Break horse power & Torque speed curve. Single line curve should also be furnished.

Pump shall be proven type, no new pump shall be acceptable. Pump manufacturers should have proven experience of supplying such pump for clear water application. For future maintenance of pump the bidders should supply a set of tools with box.

ii) **Motor:**

- | | | |
|-----|----------------------------------|--|
| 1. | Type | : Non-flame proof squirrel cage horizontal Induction motor (suitable for above pump) |
| 2. | Recommended rating | : To be furnished by bidder |
| 3. | Duty | : Continuous |
| 4. | Voltage rating | : 415 V + 10% |
| 5. | Frequency | : 50 Hz + 3% |
| 6. | Mounting | : Horizontal |
| 7. | Enclosure | : TEFC |
| 8. | Synchronous speed | : To be furnished by bidder |
| 9. | Insulation | : 'F' Class |
| 10. | Protection | : IP-55 |
| 11. | RPM | : To be furnished by bidder |
| 12. | Phase | : 3 (Three) |
| 13. | Rated output in KW | : To be specified by the bidder |
| 14. | Winding connection | : -do- |
| 15. | Full load current | : -do- |
| 16. | Starting current | : -do- |
| 17. | No load current | : -do- |
| 18. | Efficiency at:- | |
| | (i) 100% load with power factor | : -do- |
| | (ii) 75% load with power factor | : -do- |
| | (iii) 50% load with power factor | : -do- |

The motor shall be horizontal shaft foot mounted TEFC, 3 phase squirrel cage induction motor. This should be manufactured as per the environment code of IP-55 as per IS-Specification. The dimensions, performance, output, protection and mounting should be as per IS- 1231 or 2223, 25, 123, 4961 & 2253 respectively.

The motor shall operate on a wide voltage from 320 to 440 Volt at the rated duty at frequency of 50 Hz + 3%. The supply voltage may be assumed as sinusoidal. The insulation system of motor should be Class 'F' and designed to operate with continuous running duty (S.I) suitable for 3 equally spaced cold starts per hour or at least one hot restart under the rated share of the overload eventualities as per the CEPHEEO manual on "water supply and treatment". The motor should also have common base plate with the respective pump to which it will be directly coupled. The pump and motor should be properly aligned to prevent wear and tear of coupling and facilitate easy operation and maintenance. The motor should have a moderate speed of 1440 to 1500 RPM having clockwise rotation when viewed from the drive end as per IS- 12065. The roller coupling assembly with the pump should constitute metallic ball & roller bearing mounted directly into the bore of end shields and properly lubricated. Grease nipple should be provided (both side) for future lubrication. Since the area is quite prone to corrosion, rubber base paint or epoxy base paint to motor should be preferred. The motor should be provided with space heater as per required specification. The motor should have in-built thermostats. The input, output & efficiency characteristics curve of motor proposed should also be furnished along with tender.

**26.08SPECIFICATION OF DELIVERY AND SUCTION PIPE LINE,
R.C.C. FOUNDATION, VALVES AND SPECIALS ETC.**

Specification for valves.

Sl No.	Specification of valves	Qty.	Make	Remarks
1.	Suitable dia. double flanged Ductile Iron sluice valves (Rising spindle) with manual operation and hand wheel of PN-1.0 conforming to IS- 14846/2000 with ISI mark.	2 (Two)	IVC/KBL/Zoloto	Will be fixed at pump delivery line of approved size.
2.	Suitable dia. double flanged Ductile Iron non-return valve with by-pass arrangement, single door (Swing type), and mounting on horizontal pipe line of pressure rating PN-1.0 conforming to IS-5312/1984 (Part-I) with ISI mark	2 + 1 = 3 (Three)	IVC/KBL/Zoloto	Will be fixed at pump delivery line of approved size & 1(One) no. of 100 mm dia will be fixed with common delivery line.
3.	Suitable Ductile Iron, foot valve with strainer and flange type end connection as per IS- 4038/1967 with ISI mark.	2 (Two)	IVC/KBL/Zoloto	Will be fixed with suction pipe end of approved size.
4.	Suitable dia. double flanged Ductile Iron butterfly valve wafer type (Wafer long) quarter turn worm gear box (manual) with hand wheel operation of PN-1.6 conforming to BS- 5155.	2 (Two)	IVC/KBL/Zoloto	Will be fixed with suction pipe line of approved size.

Technical specification and materials construction:

(A) **Ductile Iron double flange sluice valve:**

i.	Body, wedge (door) dome, bonnet gland, thrust bridge, valve stem cap/hand wheel	D.I IS-210 Gr. FG 200/260
ii.	Seat & door face ring wedge nut	S.S as per IS- 1570, IS-6603
iii.	Spindle	S.S as per IS-6603 Gr. 12 Cr-12
iv.	Gland packing	Graphite asbestos /greased hemp
v.	Gasket	Rubber IS- 638 type-B
vi.	Fasteners	Carbon steel
vii.	Hydrostatic test pressure (i) Body (ii) Seat leakage	15 Kg/Cm ² 10 Kg/Cm ²
viii.	Operation	Anti-clock wise
ix.	Flanges	Faced and drilled as per IS- 1538/1969
x.	Body painting	Epoxy coated

(B) **Ductile Iron Double flange Non-return valve:**

i.	Body, door & cover	D.I. IS-210 Gr. FG 200
ii.	Turning shaft/hinge pin	SS AISI- 410
iii.	Body seat, door face rings bearing block	SS AISI –410
iv.	Flow direction clearly embossed on valve body	
v.	Plug	SS AISI – 410
vi.	Fasteners	Carbon steel
vii.	Hydrostatic test pressure (iii) Body (iv) Seat leakage	15 Kg/Cm ² 10 Kg/Cm ²
viii.	Flanges	Faced and drilled as per IS- 1538/ 1969
ix.	Body painting	Epoxy coated

(C) **Ductile Iron foot valve:**

i.	Body, Disc, flap and lift guide	Ductile Iron conforming to IS-210/ Gr. FG 200
ii.	Ring	SS AISI 410
iii.	End connection	Flanged type
iv.	Strainer	Cast iron conforming to IS-210/ Gr. FG 200
v.	Flanges	Faced and drilled to IS- 1538/1969
vi.	Body painting	Epoxy coated

26.09 Specification of delivery and suction pipe line with specials, construction of RCC

Foundation etc.

Suction and delivery piping shall be provided for both the pumps and shall be of M.S. pipe (heavy duty) with required fittings suitable for drinking water application, pipe & fittings confirming to relevant IS- Specification with ISI mark. All M.S. Pipes & fittings Should be painted with 2 (two) or more coats of epoxy paint of approved shade.

The thickness of all MS flanges shall be of 12mm conforming to IS- 6392/1971. The wall thickness of the specials like Bend, taper, offset etc. wherever used should be 8mm wall thickness.

The pipe line shall be so laid that there shall be independent suction for two pumps and a common delivery including fixing of valves, specials, expansion joints, flange joints with required and approved sizes of jointing materials like nuts & bolts (made out of carbon steel), rubber gasket (made

out of nitrile rubber of 6mm thick), paints etc. The delivery pipe line should extend up to 10.00 mtr beyond the common delivery point of pumps with flange end. Required no. of pipe supports should be provided both for suction and delivery pipe line of both the pumps. The pipe supports should be made out of concrete (1:1½:3) pedestal of required height and approved design including grouting the same on the floor. Besides above, the scope of work comprises construction of required size and shape of RCC (M-25) pump foundation as per IS- specification, cutting holes in the 250mm thick Brick/ R.C.C wall and making good the damages and alignment of the pump sets inside pump house. Necessary earth work, back filling, de-watering (if required) shall also be taken up to complete the work in all respect.

26.10 Specification of Control Panel:

The control panel should be fully automatic & shall be provided with IP-65 ingress protection suitable for operation of 2 (two) no's centrifugal pump sets each of 5 HP (approx.) (One working & one standby).

The panel board shall be floor mounted type and fabricated with 2mm thick CRCA sheet. The board shall be painted with 2 coats of approved enamel industrial gray paint on exterior surface, 2 coats of white enamel paint on interior surface over 2 coats of zinc chromate primer. The board should be dust and vermin proof and of double door type having interlocking with the switchgear i.e., the door can be opened only after the switch is 'OFF' position. Ventilation louvers with fine wire mesh should be provided. The panel board should be provided with punch holes on the Top plate for glanding of incoming and outgoing cables. The board should be provided with at least 2 nos. of earthing stud with hexagonal G.I. nuts and bolts. One no. enamelled danger board and nomenclature plate should be fixed on the front of the panel board. Each detachable hinged door shall be earthed with 2.5 sqmm. PVC insulated multi stranded copper conductor wire of green colour. Adequate clearance shall be provided from the gland up to the spreader link of the MCCB (preferably 500 mm) for easy termination of 3.5 C × 35 sqmm. Armored aluminum XLPE insulated cable.

The panel shall be incorporated with the following components;

Incoming:-

1 no. 100A, (I th 80 A) 3 Pole MCCB.

Bus bar:-

4 nos. 100 A, 25 x 3 mm Electrolytic Copper strips.

Outgoing:-

A. 2 nos. 16 A (11 – 16 A) 3P MPCB.

DOL 3 Phase starter suitable for 2 nos. centrifugal Pump sets.

1 no. 32 A 4P MCB

Instrument:-

A. 1 no. Voltmeter (0 – 500 V) digital multi function meter.

1 no. Ammeter (0 – 30 A) digital

Panel Complete duly factory wired.

Approved Makes:

Volt meter/ammeter	: AE/ IMP/ MECO
Selector Switch	: KAYCEE/ SLAZER
Contactor	: L&T/ SIEMENS/ BCH/ Telemecanique
CT	: Kappa

Starter : L&T/ BCH/ Telemecanique/ SIEMENS
MCCB/MCB : Legrand / L&T/ Schneider/ SIEMENS/ ABB/
Anchor/Panasonic /HAGER

Note: General arrangement drawing & SLD of the control panel should be submitted for approval before execution.

Inspection & testing of materials

1. All materials supplied by the Contractor shall be subjected to inspection & testing by the OB&CC for its material, quality, workmanship and the performance. The contractor shall arrange and carryout all such inspections, testing, trial run etc. and demonstrate in presence of the Engineer-in-Charge of the OB&CC.
2. The cost of such inspection, testing, trial run, demonstration etc. at factory, laboratory and site shall be borne by the contractor. All responsibility of such inspection, testing, trial run, demonstration etc. and any damage/loss that may cause directly or indirectly shall exclusively rest with the contractor.
3. Such inspection, testing, trial run, demonstration etc. shall, however, not relieve the contractor of their liability for replacing/ rectifying any defects, which may subsequently appear or be detected during erection and guarantee period.
4. Copies of certificates for materials test and other routine shop's quality assurance tests shall be furnished by the contractor prior to carrying out of the inspection and testing.
5. For all materials, the contractor shall furnish Manufacturer's test certificate with each consignment. At site/ works, testing and inspection shall be carried out as per Indian standards/ International Standards/ Manufacturer's specifications in presence of the Engineer-in-Charge, the contractor and the manufacturer. The contractor shall detail out the codes and standards in accordance with which the testing shall be carried out. In case such standards do not exist, procedure for inspection and tests shall be mutually agreed to between the contractor and OB&CC and as per the manufacturer's recommendations.

Tests at Site:

1. The contractor shall give at his cost concrete cubes to the OB&CC made from samples of fresh concrete taken as per IS: 1199 cured for 7 days and 28 days for testing by the OB&CC at any recognized testing laboratory at the cost of the Contractor. Besides, the contractor shall also carry out such tests as required by OB&CC at regular intervals at his own cost at site.

2. The sample be taken from the concrete prepared for use in accordance with relevant IS specification at the following component of the structure: Foundation. Each lift of supporting structure. Floor beam
Floor each lift of the wall Roof slab. Any portion of the structure required by the Engineer-in-charge.
3. In the event of any deviation from the desired strength, the contractor shall dismantle the defective parts of the construction and make good the same at his own cost.
4. All the building materials including chips, sand, steel rods, bricks, cement etc. shall be tested in recognized testing laboratory to be selected by OB&CC at the cost of the contractor. Any material found defective/ not to specification should be replaced forth with by the contractor without any extra claim.
5. The testing for water tightness of the structures shall be conducted as per IS: 3370 and the results shall have to satisfy the relevant provisions of the above code.
6. All reinforcement shall be checked and recorded prior to concreting by the Engineer-in-charge or his representative and this shall be countersigned by the contractor. The contractor shall give notice of at least seven days to the Engineer-in-charge or his representative so that the works can be checked by him or his authorized representative.

Performance Guarantee Test

On satisfactory completion of trial run, the complete ‘Installation’ shall be tested for demonstration of guaranteed performance. The duration for such ‘Performance Guarantee Test’ shall not be less than continuous twenty days (480 hours).

The performance guarantee test by the Contractor shall demonstrate satisfactory operation of all individual items of works.

All consumables required for the trial run, performance guarantee test etc. shall be the contractor’s responsibility. However, OB&CC shall bear the cost of power consumption during the above tests & trial run.

Guarantee:

The Contractor shall guarantee the work for a period of 12 (twelve) months from the date of preliminary acceptance. Any defects noticed during the guarantee period shall be replaced/ rectified immediately without any extra cost to OB&CC.

Acceptance:

On completion of erection, the contractor shall clear all the left-over surplus earth, bricks, boulders, debris, scrap, temporary structures etc. from the erection site and present the entire premises in a neat and tidy manner. The pipeline shall be cleaned thoroughly.

On completion of successful testing, trial running & satisfactory performance guarantee test, up to the stipulated period, the work shall be accepted by OB&CC.

ELECTRICAL TECHNICAL SPECIFICATIONS

SPECIAL CONDITIONS

(A) ADDITIONAL TERMS & CONDITIONS FOR INTERNAL & EXTERNAL ELECTRICAL WORKS

1.Terms of Payment:

Subject to any deduction which the owner may be authorised to make under the contract, the contractor shall on the certificate of the engineer or his authorised representatives whose certificate will be final regarding evidence of materials at site and completion or erection etc. be entitled to payments generally as follows.

80% of the contract price shall be paid after supply of materials in good condition at the site. (The Engineer may seek Indemnity Bond from the contractor against safe custody of the installation /materials erected as watch & ward is the responsibility of the contractor up to handing over to the client.

10% of the contract price shall be paid after installation, testing and commissioning with completion of entire work, inspection and clearance by the Statutory Authority and handing over to client.

Balance 10% of the contract price shall be paid after satisfactory completion of Guarantee period.

Regulation of Local Authorities and Status:

The contractor shall comply with the rules and regulations of local authorities during the performance of his field activities. He shall also comply with the Minimum Wages Act, 1948 and the payment made there under in respect of any employee of workmen employed or engaged by his sub-contractor.

The contractor shall get the entire installation inspected and cleared by the Electrical Inspector, Government of Odisha before commissioning. Only the statutory inspection and drawing approval fees, if any, in respect of his work pursuant to this contract shall be reimbursed to the contractor on production of documentary evidence.

However, any registration, statutory inspection fees lay fully payable under the provision of any other Regulations and statutory laws or amendments thereof from time to time shall be to the account of the contractor, only the electrical inspection fees will be paid by O.B. & C.C. Ltd.

Should any such inspection or registration need to be rearranged due to the fault of the contractor or his sub-contractor, the additional fees for such inspection and/ or registration shall be borne by the contractor.

Guarantee period:

The entire installation after satisfactory completion in all respect shall be guaranteed for trouble free performance for a minimum period of 12 months from date of completion. Any defects noticed during this period arising out of defective materials or bad workmanship shall be rectified free of cost to the owner.

C O D E S

Codes shall mean the following including the latest ascendants and / or replacement if any.

Indian Boiler Act, 1923 and Rules and Regulations made there under.

Indian Electricity Act, 1923 and Rules and Regulations made there under.

Indian Factories Act, 1948 and Rules and Regulations made there under.

The minimum wages Act.

Women's Compensation Act.

The Payment of Wages Act.

The Fatal Accident Act.

The Industrial Employment Act.

The Employment provident Fund Act.

Indian Explosive Act 1984 the Rules and Regulations made there under.

Indian Petroleum Act 1934, and Rules and Regulations made there under.

A.S.M.E. Test Codes.

AIRE Test, Codes.

American Society of Materials Testing Codes.

Standards of the Indian Standards Institution.

1)	Low Tension Circuit Breakers:	IS 2516-1955 Part I Sec.1
2)	Switchgear Bus Bars	IS 375-1963
3)	HRC fuse links	IS 2208-1962
4)	Distribution fuse boards	IS2675-1966
5)	Enclosure for Low Voltage switchgear	IS214701962
6)	PVC Cables	IS1554-1975
7)	Tabular fluorescent lamps for Cameral lighting service	IS2418-1963
8)	Tungsten Filament Lamps for cameral service	IS415-1963
9)	Ceiling Fans	IS274-1966
10)	Flood lights	IS1947-1961
11)	Wall Glass flame-proof electric light fittings	IS2206-1962 (Part 1)
12)	Water Tight Electric Light Fittings	IS3553-1956
13)	Steel Boxes for Enclosure of Electrical Accessories	IS5133-1969
14)	Fittings for Rigid Steel conduit	IS2667-1979

15)	Rigid steel circuits for electrical wiring	IS3837-1966
16)	Accessories for Rigid Steel Conduits for Electrical Wiring	IS3837-1966
17)	Switch Socket Outlets	IS3837-1966
18)	PVC Wiring	IS694-1977
19)	Switches for domestic and similar purpose	IS3854-1966
20)	PVC wiring	IS694-1977
21)	Call Bell and Buzzers	IS2268-1966
22)	Straight through joint boxes and leads sleeves or paper insulated cables-	EID-0032-1964
23)	Earthing	IS3043-1966
24)	Electrical Wiring installations	IS732-1963
25)	Switchgear	IS3072-1965 (Part I)
26)	Lighting protection	IS2309 -1969
27)	Public Address system	IS1882-1962
28)	Low Tension switch use units	IS4064-1978
29)	Code of Practice for Automatic FIRE ALAM system	IS2189-1970
30)	Specification for Heat Sensitive Fire Detectors	IS2175-1977
31)	Guide for Safety procedure in Electric work	IS5216-1969
32)	Rubber Mats for Electric works	IS5424-1969

p. Other internationally approved standards and / or Rules and Regulations touching the subject matter of the contract.

STANDARDS:

Except as modified in this specification, the materials and work covered under this specification, shall confirm to IS 802(Part-II) 1977 & the amendments thereof the following of Indian Standards and equivalent International Standards whenever indicated below:

Sl. No	Bureau of Indian Standards (BIS)	Title	International & internationally recognized standard
1.	IS:209	Specification for zinc	ISO/R/752
2.	IS:2062/85 00	Structural steel (Standard quality)	ISO/R660
3.	IS:432	Mild Steel & Medium tensile bars and hard drawn steel wire for complete reinforcement	BS-785 CSA-G-30
4.	IS:802	Code of practice for use of structural steel in overhead transmission line. Part-I Load and permissible stresses. Part-II: Fabrication, Galvanizing Inspection and Packing. Part-III: Testing.	
5.	IS: 1367	Technical supply conditions for threaded fasteners.	
6.	IS: 1893	Criteria of Earthquake resistant design structures.	
7.	IS: 2016	Plain washers.	ISO/R/987
8.	IS: 2551	Danger Notice Plates.	
9.	IS: 2629	Recommended practice for hot dip galvanizing of Iron & Steel.	
10.	IS: 2633	Method of testing uniformity of casting of zinc coated articles.	ASTM A 239
11.	IS: 3063	Single coil rectangular section spring washers for bolts, nuts screws.	DIN-127.
12.	IS: 5358	Hot dip galvanized coatings on fasteners.	
13.	IS: 5613 Part-I & II Section-I	Code of practices for design. Installation maintenance of overhead power lines.	
14.	IS: 6610	Specification for heavy washers for steel structures	
15.	IS: 6745	Methods of determination of weight of zinc coating of zinc coated Iron and Steel articles.	

Sl. No	Bureau of Indian Standards (BIS)	Title	International & internationally recognized standard
16.	IS: 12427	Hexagonal bolts for steel structures	
17.		Indian Electricity Rules, 1956.	
18.		Publication for regulation for electrical crossing of railway tracks.	

TECHNICAL SPECIFICATION

General Requirements

The installations shall generally be carried out in conformity with the requirements of Indian Electricity Act, 1910 as amended up to date and Indian Electricity Rules, 1956 framed there under, the relevant regulations of the Electric Supply Authority concerned and also with the specifications laid down in the Indian Standard IS:732/1963 "Code of Practice (Revised) for Electrical Wiring Installations (System Voltage not exceeding 650V)". The work shall be executed as per National Electrical Code and if any item is not covered there under or there is any doubt, the specification approved by the Engineer-in-charge will be final and binding.

Ambient Conditions

All Electrical installations and equipments shall be suitable to work in following ambient conditions.

Maximum Temperature	:	50 degree Celsius
Relative Humidity	:	100%
In the vicinity of	:	Satyanagar Office, OBCC Ltd., Bhubaneswar.

System Conditions

The Electrical installations and equipments shall be suitable for operation in following system conditions.

Supply voltage	:	415 Volts +/-10%
Supply frequency	:	50Hz +/-5%
Number of Phases	:	Three

Scope:

The scope of work covers the following for electrification of Satyanagar Office, OBCC Ltd., Bhubaneswar complete in all respect.

Cost of all required materials.

Cost of handling & storage of materials.

Cost of labour for installation, testing & commissioning.

Cost of obtaining statutory clearance required for the work and handing over.

Materials:-

All materials, fittings, appliances used in electrical installations shall confirm to Indian Standard Specifications wherever these exist. A list of approved materials is attached in annexure-I. Materials not included in the list as well as any particular make should be approved by the Engineer-in-charge before use. All required materials covered under this specification except mentioned otherwise clearly, shall be supplied and installed by the contractor complete in all respect. The materials and accessories required for completing the work will form part of the work although they have not been specified separately.

Selection of materials and installation work shall be such as to simplify operation, inspection, maintenance and testing. The work shall include all reasonable precautions and provisions for safety of operation and maintenance personnel.

Standard:-

Unless otherwise specified, all materials covered under this specification shall be designed, manufactured, tested and installed in conformity with the latest Indian Standard Specifications. In case such Indian Standard Specifications are not published equivalent British Standard Specifications shall be followed. All equipment shall conform to latest Indian Electricity Rules, PWD, Local Electricity supply agency provisions, State laws or byelaws as regards to safety, earthing and other essential provisions specified therein.

All equipment and materials selected shall also be supplied and installed taking into consideration the Factories Act, Fire Regulations and Local laws or byelaws. All light fittings and equipment selected shall be of well tried out design. All materials used in the assembly of fittings and their accessories shall be of high quality and manufactured in accordance with the best modern practice.

All the materials supplied by the contractor according to the contract conditions will be subject to inspection and approval by the Engineer-in-charge or their authorised representative from time to time. The contractor shall extend all required facilities for such inspection free of cost. At the time of inspection, the inspecting officer shall have full liberty to reject any such material, which does not conform to specifications or the requirements. The owner shall not entertain any claim for any rejected materials. The contractor shall remove all rejected materials from the site at his own cost.

The owner will not accept any surplus material procured by the contractor.

The contractor will be responsible to get electrical installations inspected by the Electrical Inspector of the State Government and to obtain the statutory clearance for energisation. The owner, on production of documentary evidences, will reimburse the necessary inspection fees.

The contractor should possess valid electrical contract licence and labour licence issued by the appropriate statutory authority of the State Government during the execution of the contract.

Inspection and Approval

The contractor shall put up samples of all major items for inspection and testing by the Engineer-in-charge prior to use at site. Similar procedure shall be adopted for the approval of samples of minor materials/ accessories to be used for the work.

Materials

Power Cables

The power cables shall have high resistance to ageing and abrasion with high mechanical strength. It shall be moisture proof, corrosion proof and weather proof. It shall have resistance to effects of majority of natural acids, alkalis, oils and fuels. It shall have smooth surface, good bending properties and neat appearance. It shall possess flame-retarding properties i.e. it shall not support combustion and shall be self-extinguishing when the source of ignition is removed.

The power cables shall be either single core or multi core as specified in bill of quantities. For conductor cross section of more than 4.0 sq-mm, stranded conductor cables shall be provided. The cables shall be with either Aluminium or Copper conductors as specified in bill of quantities.

The PVC insulated and PVC sheathed power cables shall be of 1100 Volt grade for LT application. For HT application, Cross-linked Polyethylene (XLPE) insulated and PVC sheathed power cables shall be used.

LT Power Cables:

The cores of the cable shall be either circular or shaped to have overall circular cross-section. It shall be properly colour coded for easy identification. Unless mentioned otherwise, the cables shall be GI wire / strip armoured. In case of multi-core cables, inner sheath of PVC tape wrapping shall be provided over the cores. To obtain a circular shape, the space between the cores shall be filled up by fillers. The inner sheath shall be surrounded by armours, which ultimately shall be covered by outer sheath of PVC extrusion. The cables shall be of approved make and shall bear ISI mark. The PVC used for insulation or sheath of the cables shall be capable of withstanding the maximum conductor temperature of 70 degree Celsius. The cables shall generally confirm to IS: 1554(Part-I)/1976.

Rigid PVC pipes / Polythene Pipes for conduits: -

Only 25mm diameter polythene/Rigid PVC pipes confirming to IS:6946/72 as amended upto date is to be used. Wires for more than one point may be drawn in the same pipe subject to clearance inside the pipe. Further in the pipe where sub-main / main wires are drawn, no point wires shall be drawn.

Wires: -

The wires used for internal electrical wiring shall be single core fire retardant low smoke type (FRLS) PVC insulated unsheathed 1100 Volt grade stranded copper conductor wires suitably colour coded to distinguish different phases, neutral and earth continuity conductor. The colour of neutral conductor shall be black and that of earth continuity conductor be green inside the entire installation. The colour of phase conductors shall be either Red or Yellow or Blue. It shall be of approved make with ISI mark. The wires shall confirm to IS: 694 (Part-I & Part-II)/1964. The minimum cross sectional area of conductors for the different uses shall be as specified below.

Lighting point wiring	: 1.5 sq-mm Copper
15A Power point wiring	: 4.0 sq-mm Copper
Circuit wiring	: 2.5 sq-mm Copper
Sub-main wiring	: 4.0 sq-mm copper

Metal Boxes (Switch Boards): -

Metal boxes for switchboards shall be made of mild steel sheet and round junction boxes shall be made of cast iron. The minimum wall thickness of mild steel boxes shall be 2mm / 1.6mm and cast iron boxes shall be 3-mm. Fan hook boxes shall be made of mild steel sheet of 1.6-mm wall thickness with a 10-mm round steel hook inside. The size of the fan hook box shall be 150-mm diameter and 65-mm high. All mild steel boxes shall have four or more screwed holes for fixing the top cover. Each box shall have an earthing stud. Each metal box shall be provided with a cover of phenolic laminated sheet (Bakelite sheet), not less than 3-mm thick fastened to the box with brass screws and cup washers. The covers should have a minimum overlap of 12.5-mm on all sides of the box for concealed wiring. The boxes shall be painted inside and outside, with two coats of anticorrosive primer and two coats of enamelled paint of approved shade. Adequate numbers of half punched holes shall be provided for conduit entry. The following sizes of mild steel boards shall normally be used.

Switch board size		
Length	Breadth	Height
100-mm	100-mm	50-mm
100-mm	100-mm	65-mm
150-mm	100-mm	65-mm
200-mm	150-mm	65-mm
250-mm	200-mm	65-mm
300-mm	250-mm	65-mm
450-mm	300-mm	65-mm

Switches & Plug Sockets:-

All switches, 5A plug sockets, power plug sockets, TV sockets and Telephone sockets shall be flush mounting piano type. It shall be of approved make with ISI mark. The switches and plug sockets shall confirm to IS: 3854/1988, IS: 1293/1988, IS: 6538/1971 & IS: 4615/1968.

Fan Regulators & Dimmers: -

Electronic type fan regulators and light dimmers of approved make shall generally be used and shall be of flush mounting type.

6) Angle/ Batten/ Pendant Holder & Ceiling Rose:-

Brass or Bakelite type 5A, 250V, Angle Holders, Batten Holders, Pendant Holders & three way ceiling rose confirming to IS: 732(Part-2)/1982 & IS: 371/1979 of approved make and design with ISI mark shall be used.

Installation

Portions of Wiring

Point Wiring

Point wiring shall consist of a switch on the board and wiring up to termination point via the control switch and neutral. These termination points can be:

A ceiling rose or connector in case of call bell or ceiling fan or exhaust fan point wiring. The wiring from ceiling rose or connector to ceiling fan or exhaust fan point shall be considered with the installation/fixing of fans.

A ceiling rose in case of directly fixed type fluorescent fixtures, suspended pendants.

A back plate in case of suspended type fluorescent fixtures, suspended or stiff pendants, wall brackets, bulkheads, spot light similar fittings.

A lamp holder in case of angle or batten holders.

A convenient wall plug in case of plug on board or separate board points.

Wiring for light points and fan points shall be carried out with minimum 1.5 sq-mm stranded copper conductor wire. For the purpose of measurement, the point wiring shall mean wiring to the all types points as described above irrespective of the length of the point.

The wiring, whether concealed or surface, shall be easily accessible for inspection. Power and Heating sub-circuits shall be kept separate and distinct from lighting and fan sub-circuits. The balancing of circuits in three phase installations shall be arranged before hand. Circuits of different phases of a.c. system shall be kept minimum 2.0-m apart or enclosed in earthed metal casing. Medium voltage wiring and associated apparatus shall comply, in all respect, with the requirements of rules 50, 51 and 61 of Indian Electricity Rules, 1956.

The position of runs of wiring and the exact position of all points, switch boards, distribution boards shall be marked in the building for approval of Engineer-in-charge prior to execution. The wiring shall be carried out in looping back system in which the phase conductor shall be looped at the switch box and the neutral conductor at the junction box / point terminals only. In no case, there should be joints inside conduits and no joints shall be made bare or by twisting the conductors.

Lights and fans may be wired on a common circuit. Such circuit shall not have more than a total of either 10 points or a load of 800 watts.

For the purpose of determining load per circuit, the following rating for points shall be assumed.

Light points (Incandescent)	: 60 watts
(4' fluorescent single tubes)	: 40 watts
(2' fluorescent tubes)	: 20 watts
Ceiling fan points	: 80 watts
Exhaust fan points	: 100 watts
5Amp plug points	: 100 watts
15Amp plug points	: 1000 watts

Unless and otherwise specified, the following minimum mounting height of the bottom most part of the fittings and fixtures from finished floor level shall be maintained.

Branch Distribution Boards	:	2.130 metre
Switch board	:	1.300 metre
5A & 15A plugs on separate board	:	0.300 metre
Ceiling fan	:	2.750 metre
Light fittings	:	2.600 metre
TV antenna and Telephone outlets	:	0.300 metre

Circuit Wiring

Circuit wiring shall mean wiring from BDB/ SDB up to the junction boxes for switchboards containing 5A/15A switches and plugs. For the purpose of measurement, in case of multiple switch boards under one circuit, the circuit wiring shall mean the sum of the length of wiring from BDB/ SDB up to junction box of first switch board and junction box of first switch board to the junction box of next switch board and so on. The minimum size of conductor for circuit wiring shall be 2.5 sq-mm copper.

(III) Sub-main Wiring

Sub-main wiring shall mean wiring from Main switch/ Meter board up to BDB/ SDB. The minimum size of wire shall be 4.0 sqmm copper. There shall be no jointing of wires; only single run wires should run from BDBs to SDB with proper color coding as per the phase. PVC ferrules shall be provided at both the ends of the wire for easy identification.

Types of Wiring

Concealed / Recessed PVC Conduit Wiring

Concealed / Recessed PVC conduit wiring shall be done as far as possible. Places, where it would not be possible to have concealed PVC wiring, surface PVC conduit wiring shall be done. The concealed PVC conduit wiring shall be completed in the following three phases.

Conduit laying in roof before casting.

Conduit laying in walls & fixing of switchboard before plastering.

Wire drawing inside conduit, fixing of switch, socket accessories, testing of installations complete.

The size of conduit shall be so chosen that the wires provided inside shall not occupy more than 50% of the cross sectional area. The maximum permissible number of single core wires, which can be drawn inside rigid steel conduit, shall be as per the table given below.

Size of wire in Sq-mm	Size of conduit in mm (Maximum number of wires permissible)				Remarks
	16	20	25	32	
1.0 sq-mm	4	5	10	-	
1.5 sq-mm	3	5	10	-	
2.5 sq-mm	2	4	8	-	
4.0 sq-mm	2	3	6	10	
6.0 sq-mm	-	2	5	8	
10.0 sq-mm	-	-	3	5	
16.0 sq-mm	-	-	-	3	

A detail conduit route layout avoiding unnecessary crossing shall be prepared by the contractor and get it approved from Engineer-in-charge prior to laying of conduit in roof slab. The conduits and junction & fan hook boxes shall be painted with one coat of red oxide primer and rigidly tied to the reinforcement of the slab. Minimum 75mm x 75mm size sheet metal inspection cum pull box shall be provided within 6-metre run of conduit. Suitable expansion joint fittings shall be provided along the conduit run crossing the expansion joint of the building. The junction boxes shall be provided 300mm off the centre for 4' long tube light fitting and 150mm off the centre for 2' long tube light fitting. Dummy or spare conduits shall be laid wherever required as per direction of Engineer-in-charge.

The drops from the roof slab in walls and columns shall be made vertical as far as practicable. Horizontal run of conduit on brick or stone masonry walls shall be avoided. The conduit and the switchboards shall be fixed in the wall by cutting chase and neatly finished with plastering after fixing. The use of bend & elbow shall be avoided. All curves in the conduit pipe shall be made by bending pipe with a long radius. It will permit easy drawing of conductors. Double check nuts and rubber bush shall be provided at each end of the conduit at the entry to the boxes. The mild steel boxes shall be provided with temporary covers to safe guard against filling of cement mortar etc within the tendered cost. The entire conduit and the boxes shall be thoroughly cleaned before wire drawing and all the internal surface of the mild steel boxes shall be painted with another 2 coats of enamel paint of approved shade.

The wires shall be properly colour coded and carefully drawn inside the conduit through use of fish wire. While drawing of insulated wires inside conduit, care shall be taken to avoid scratches and kinks. All the metal boards shall be suitably earthed by earth continuity conductor. All Conductors shall be provided with cable sockets at termination points expect at switchboard looping and joint boxes.

Wires carrying current in a conduit shall be so bunched that the outgoing and the return wire are drawn into the same conduit. Wires of different phases from different circuits shall not run in one conduit. In three-phase installation, plans shall be made for balancing of loads in all phases before commissioning.

Rigid PVC conduit Wiring

The concealed PVC conduit wiring shall be completed in a single phase only. The size of conduit shall be so chosen that the wires provided inside shall not occupy more than 50% of the cross sectional area. The maximum permissible number of single core wires, which can be drawn inside rigid conduit, shall be same as per the table given.

Approval from Engineer-in-charge shall be taken prior to laying of conduit. Inspection bend, elbow and similar other Rigid PVC conduit fittings of threaded type shall be used. Conduits shall be joined by means of inspection type coupler. In order to avoid damage to the insulation of conductor, cut end of conduit shall have no sharp edge. Conduits shall be fixed rigidly by means of heavy gauge G.I. saddles of approved quality at an interval not exceeding 500mm and on either side of coupler and bends. Saddles shall be fixed on Nylon fill plugs of appropriate size. The conduit fittings such as inspection boxes, draw boxes, bends, elbows etc shall be so installed that they remain accessible for purpose of drawing and removal of wires.

The wires shall be properly coloured coded and carefully drawn inside the conduit. While drawing of insulated wires inside conduit, care shall be taken to avoid scratches and kinks. All the metal boards shall be suitably earthed by earth continuity conductor. The entire system of conduit after installation shall be made mechanically and electrically continuous and permanently connected to earth by means of the earth continuity conductor clamped on outer side of conduit. All Conductors shall be provided with cable sockets at termination points except at switchboard looping and joint boxes.

Wires carrying current in a conduit shall be so bunched that the outgoing and the return wire are drawn into the same conduit. Wires of different phases from different circuits shall not run in one conduit. In three-phase installation, plans shall be made for balancing of loads in all phases before commissioning.

Cable Laying & Installation

The cables shall be of approved make and tested at factory in presence of Engineer-in-charge or his authorised representative. The cables shall be despatched to the work site packed on wooden drums with both ends properly sealed. Jointing of the cables in between the terminal points shall be avoided as far as possible. For longer length of cable exceeding the normal length of manufacture, cables may be joined by means of jointing kits only. The cables shall be tested for insulation resistance by 500-volt insulation Megger for cables up to 1100-volt grade and by 2500-volt insulation Megger for cables beyond 1100V grade prior to laying of the same. Cable loops for future requirement shall be kept at both ends as per direction of the Engineer-in-charge.

One number 6-swg GI wire in case of single phase 230V a.c. system and either 2 numbers 6-swg GI wire or 2 numbers suitable size GI flat in case of multi phase 400V or more a.c. system shall run all along the trench or tray with the cables as earth continuity conductor. The supply and laying of earth continuity conductor such as G.I. wire or flat has been considered separately in the schedule of quantity.

Minimum bending radius for PVC insulated armoured cables shall be 1200mm. At joints and terminals, the individual cores of multi-core cable should never be bent so that radius of bending is less than 12 times the overall diameter of the cable.

Wherever more than one cable shall exist, suitable marker tags inscribed with cable identification details shall be permanently attached to all cables in the man hole, pulpits, joints, open ducts, under ground cables etc. at suitable intervals.

The laying and installation of cable shall be carried out as per IS: 1255/1983. The methods of cable laying shall be of following types depending upon the requirements.

Laying directly under ground

Laying inside ducts

Laying on racks or trays in air

Laying along building structural elements

Laying Directly Under Ground / Under Concrete Flooring

Cable trenches shall be excavated cutting all types of soil and rock / concrete flooring up to a minimum depth of 750mm for L.T. cables & 1200mm for H.T. cables and of appropriate width (not less than 350mm) to accommodate the cables and cable protecting materials within the tendered rate.

The sides and bottom of the trench shall be dressed and filled with 75mm thick layer of fine sand. The cables shall then be laid with bricks on both side of each cable continuously along the length. Space between the bricks shall be filled with fine sand up to 75-mm above the top of the cable. The top layer bricks shall be placed side by side continuously as protective cover. The horizontal distance between the adjacent cables shall be at least equal the diameter of the bigger cable. The clearance between the outer cable to the sides of the trench shall be at least 150mm.

In case of multiple tiers, same procedure shall be applied keeping a vertical clearance of 300mm among the tiers and the top most layer shall be kept at a depth of 750mm for LT cables and 1200mm for H.T. cables from finished ground level.

The trench shall then be filled up with the excavated materials free from stone or sharp edged debris and duly compacted. A crown of earth neither less than 50mm nor more than 100mm in the centre and tapering towards the sides of the trench shall be left to allow for subsidence.

Cable route markers shall be installed at salient and strategically located points parallel to and 500-mm or so away from the edge of the trench for easy identification of cable routes at a maximum interval of 10-metre for straight run.

In locations such as road crossing, pipeline crossing, entry to buildings or poles in paved area etc, the cables shall be laid in pipes or closed ducts. Pipes provided for entry to building shall slope upward to prevent entry of water to the building. Stone ware, cast iron, NP-2 class RCC pipes or medium class Mild Steel / GI pipe of appropriate diameter shall be laid during the construction to avoid damage later on. Cost of such pipe shall be considered separately in the bill of quantities.

In case of stoneware pipes, a 100-mm thick 1:3:6 cement concrete covering shall be provided. In case of cast iron or RCC pipes, no concrete covering is required. The collars, in case of RCC pipes, shall be embedded by 1:2:4 cement concrete. Top surface of pipe shall be at a minimum depth of 1.0-metre. The minimum size of Hume pipes shall not be less than 100-mm in diameter for a single cable and not less than 150-mm for multiple cables.

The diameter of the cable protecting pipes shall be at least 1.5 times the outer diameter of the cable. In one pipe, single core cables shall not be laid individually but instead, all the three/four cables of the same system shall be laid.

Laying on Racks or Trays in Air

The racks or trays shall be fixed to the wall or column or suspended from ceiling. The racks shall be ladder type made of mild steel or GI angles and flat. The trays shall be perforated type made of mild steel or GI sheets. The mild steel racks or trays shall be painted with red-oxide primer followed by anticorrosive paints. The vertical distance between two racks or trays shall be minimum 300-mm and clearance between first cable and the wall

(if the racks or trays are mounted on wall) shall be 25-mm. The width of rack shall not exceed 750-mm. The cables shall be laid directly on the rack or tray with saddles or clamps at an interval of 1 metre each. Each tray or rack shall contain only one layer of cables.

Laying along Building Structural Elements

Cables can be routed inside the buildings along the structural elements such as walls, columns etc or inside trenches or Hume pipes or GI pipes under floor. The cables shall be laid or fixed along the wall or column with the help of mild steel / GI flat clamps or saddles with an interval not exceeding 0.5-metre. The cables inside brick masonry trenches shall be laid on racks or directly above the floor of the trench and the trench shall be covered with mild steel chequered plates. In case of laying inside Hume pipes or G.I. pipes, man hole chamber with RCC cover shall be provided at suitable location for easy maintenance. The cables shall not intersect each other along its route.

Jointing of Cables

The quality of joints shall be such that it does not add any resistance to the circuit. The materials and techniques employed for jointing should give adequate mechanical and electrical protection to the joints under all service conditions. The joints shall be resistant to all corrosion and chemical reactions. The following three basic types of cable joints shall be used.

Straight through joints

Tee or branch joints

Termination or sealing joints

TESTING

Before a completed installation or an addition to an existing installation is put into service, the following tests shall be carried out by the electrical contractor in presence of Engineer-in-charge.

Polarity test

Insulation resistance test

Earth continuity test

Earth electrode resistance test

4.1 Polarity Test

It shall be ensured by this test that the single pole switches have been fitted on the live side of the circuit they control. In a two-wire installation, test shall be made to verify that all switches in every circuit have been fitted to phase conductor or non-earthed conductor of the circuit. In three or four-wire installation, test shall be performed to verify that every non-linked single pole of switch is connected to one of the phase conductor of supply.

4.2 Insulation Resistance Test

The insulation resistance shall be measured by applying between earth and whole system of conductors or any section thereof with all fuses in place and all switches closed and except in earth concentric wiring, all lamps in position or both poles of installation otherwise electrically connected together, a d.c. voltage of not less than twice the working voltage, provided that it does not exceed 500 volts for medium voltage circuit. Where the supply is derived from 3 wire a.c. or d.c. or polyphase a.c. system the neutral pole of which is connected to

earth direct or through added resistance, the working voltage shall be deemed to be that which is maintained between the outer or phase conductor and neutral.

The insulation resistance of an installation measured as above shall not be less than 50 Mega-Ohms divided by the number of points of the circuit provided that the whole installation shall be required to have insulation resistance greater than one Mega-ohm.

Control rheostats, heating and power appliances and electric signs may, if desired, be disconnected from the circuit during the test, but in this case the insulation resistance between the case of frame and all live parts of each rheostat, appliances and signs shall not be less than half a Mega-ohm.

The insulation resistance shall also be measured between all conductors connected to one pole or phase conductor of the supply and all conductors connected to the neutral or the other pole or phase conductor of supply. Such test shall be made after removing all metallic connections between two poles of the installation. The insulation resistance between the conductors of installation shall not be less than that specified above.

4.3 Earth Continuity Test

The earth continuity conductor including metal conduits and metallic envelope of cables in all cases shall be tested for electric continuity and electrical resistance of the same along with the earthing lead but excluding any added resistance of earth leakage circuit breaker measured from the connection with the earth electrode to any point in the earth continuity conductor in the completed installation shall not exceed 1 ohm.

Distribution Boards:-

The L.T. Distribution Boards shall be suitable for operation in 3 phase / single phase, 415 / 240 Volts, 50 Hz, neutral grounded at transformer system. All Distribution Boards shall generally confirm to all relevant Indian Standards amended up to date.

Distribution boards shall be of floor mounting type and totally enclosed having hinged doors; dust, damp and vermin proof construction. These should be made out of CRCA sheet steel and the enclosure should be acid treated for rust proofing, thoroughly cleaned, painted with two coats of anticorrosive primer and two coats of white enamel paint for interior and industrial grey enamel paint for exterior. All doors and covers shall be fully gasketed with neoprene PVC strips and shall be lockable. All the hinged doors shall be effectively earthed with flexible copper wires. Cadmium plated fixing screws shall enter holes tapped into an adequate thickness of metal or provided with hank nuts. Self-threading screws shall not be used.

The distribution boards shall be of adequate size with a provision of 25% spare space to accommodate possible future additional switchgears. Knock out holes of appropriate sizes and number shall be provided on detachable plates in the board in conformity with the location of incoming and outgoing cables/ conduits. The switches shall be so arranged that fuses are not alive when the switch is in OFF position. No apparatus shall project beyond the edges of the panel. No switch body shall be mounted within 25mm of any edge of the panel and no holes, other than that meant for fixing the panel, shall be drilled within 13mm of the edge of the panel. The various live parts shall be effectively screened by barriers of non-hygroscopic, non-inflammable insulating materials or shall be so spaced that an arc can be maintained between such parts and earth. All items of switchgears shall be readily accessible and all connections, including those to instruments and apparatus, are easily traceable.

The bus bars and interconnections shall be of electrolytic annealed copper/ high conductivity electrolytic wrought aluminium of rectangular cross section suitable for carrying full load current for phases & neutral bus bars and shall be extendable on either side. The maximum current density shall be 1.00 Amp/sq-mm for Aluminium and 1.50 Amp/sq-mm for copper bus bars. The bus bars shall be supported on SMC/ DCM/ Glass fibre reinforced polyester, non-breakable non-hygroscopic insulators at regular intervals to withstand the forces

arising from short circuit in the system. The bus bars shall be provided in a separate chamber and properly ventilated. The minimum clearance between the phases shall be 32mm and between phase and earth shall be 25mm. The interconnection between bus bars and switchgears of rating above 63A shall be through strips having 125% of the switchgear current rating. All bus bars shall be suitably insulated by means of heat resistant PVC sleeves and colour coded in phase sequence of R-Y-B & N. The entire bus bar shall be covered on the front with a Bakelite sheet barrier. In longer sections of bus bars, provision shall be made for thermal expansion by providing flexible joints made out of multi-foil thin copper/ aluminium foils. All joints shall be of clamped type as far as possible else of bolted construction with double cover fishplates.

All connections between pieces of apparatus or between apparatus and terminal on a board shall be neatly arranged in a definite sequence, following arrangements of the apparatus mounted there on, avoiding unnecessary crossings. Wire interconnections shall be colour coded and connected to terminals only by soldered lugs, crimped lugs without cutting away the strands. No interconnecting wires shall come in contact with the live bus bars other than the terminal points. The arrangement of bus bars shall confirm to IS: 375/1963.

An enamelled danger notice plate shall be provided on the boards connected to medium voltage supply & above.

Adequate space shall be provided for accommodating various instruments. These shall be accessible for testing and maintenance without any accidental contact with live parts of circuit breakers, switchgears, bus bars and interconnections. The indicating lamps shall be provided with individual toggle switch and fuse. The voltmeters shall be provided with fuses for each phase. The control wires shall be 2.5 sq-mm copper wires for CT circuits and 1.5 sq-mm copper wires for the rest. The control wires shall be neatly bunched together inside PVC trunking securely fasten to the compartment properly marked with ferrules at the end. A separate tamper proof compartment with locking arrangements as per the requirements of the supply authority shall be provided for housing of the energy meters.

This Distribution board shall be fabricated with 2mm thick CRCA sheet steel. The board shall be painted with two coats of red oxide primer & two coats of industrial grey on exterior surface, two coats of enamel white on the interior surface. The distribution board shall be dust & vermin proof & shall be of double door type i.e. the switch gears can be approached after opening of the front door. Ventilation louvers with fine wiremesh shall be provided in the D.B. The D.B. shall be provided with punch holes on the bottom plate for glanding of following incoming and outgoing cables. The DB shall be provided with atleast two nos earthing studs of hexagonal G.I. nut & bolts. One number enameled danger board and nomenclature plates shall be fixed on the front of the Distribution board. Each detachable hinged doors shall be provided with flexible copper earthings.

The busbar shall be made out of electrolytic copper strips of atleast 98% purity. The current density of copper shall be 1.5 Amp per Sq.mm. 11000 Volt grade PVC insulated multistranded copper conductor wires shall be used for inter panel wiring. The minimum size of wire inside the panel except that of indicating lamps shall be 4.0 mm sqr. Post insulators for the busbars shall be of SMC/DMC. A minimum clearance of 25mm shall be maintained between the busbars. All the cables/wires shall be properly crimped with the use of suitable crimping type lugs & then terminated on the busbars/switch gears.

A general arrangement drawing may be submitted by the manufacturer for approval by the undersigned after which fabrication of the distribution board can be commenced.

List of Approved Make

Sl No	Material Description	Make of materials.	Makes Offered
	Rigid PVC conduit pipe & accessories	Sudhakar/AKG/Precision / Kinjol / any reputed with ISI mark	
	Switch, socket, holder, ceiling rose, modular switch box etc	Anchor/ Cona .	
	PVC insulated wires	Finolex/ Polycab/ L&T/RR.	
	Bakelite sheets	Hylam/Formica/National.	
	PVC insulated cables (with ISI mark only)	Havels/ INCAB/ Fort Gloster/ CCI/ Universal/ RPG/ Polycab.	
	Cable	Finolex/ CCI/ Incab/ Asian/ Crystal/Polycab/ Havells	
	Distribution Boards	Legrand / Hager /L&T or equivalent.	
	MCCB/ RCCB/RCBO/MCI.	Legrand / Hager /L&T / Siemens.	

(B) ADDITIONAL TERMS & CONDITIONS FOR VRF AIR CONDITIONING WORKS

1. Terms of Payment:

Subject to any deduction which the owner may be authorised to make under the contract, the contractor shall on the certificate of the engineer or his authorised representatives whose certificate will be final regarding evidence of materials at site and completion or erection etc. be entitled to payments generally as follows.

Supply of Materials:

60% of the value materials shall be paid after receipt, verification and acceptance of materials at site in good condition by OBCC Ltd. / Engineer - in -charge and presentation of bills, subject to submission of Security Deposit and execution of agreement.

20% shall be paid after completion of erection work.

Balance 20% shall be paid on completion, satisfactory commissioning, and performance tests and after necessary inspection by the statutory authority following final handing over to the client after completion of Guarantee period.

Erection of Materials:

60 % shall be paid for the progress made during the month on monthly progress bill against certification by the Engineer -in-charge.

20 % shall be paid after completion of erection and test on completion up to the satisfaction of the client and/or the Engineer-in-charge.

Balance 20 % shall be paid on completion of satisfactory commissioning performance guarantee test and after necessary inspection by the statutory authority following final handing over of the complete work to the client after completion of Guarantee period.

Regulation of Local Authorities and Status:

The contractor shall comply with the rules and regulations of local authorities during the performance of his field activities. He shall also comply with the Minimum Wages Act, 1948 and the payment made there under in respect of any employee or workmen employed or engaged by his sub-contractor.

The contractor shall get the entire installation inspected and cleared by the Electrical Inspector, Government of Odisha before commissioning. Only the statutory inspection and drawing approval fees, if any, in respect of his work pursuant to this contract shall be reimbursed to the contractor on production of documentary evidence.

However, any registration, statutory inspection fees lay fully payable under the provision of any other Regulations and statutory laws or amendments thereof from time to time shall be to the account of the contractor.

Should any such inspection or registration need to be rearranged due to the fault of the contractor or his sub-contractor, the additional fees for such inspection and/ or registration shall be borne by the contractor.

3. Guarantee period:

The entire installation after satisfactory completion in all respect shall be guaranteed for trouble free performance for a minimum period of 12 months from date of completion. Any defects noticed during this period arising out of defective materials or bad workmanship shall be rectified free of cost to the owner.

4. Instruction to Bidders (ITB); clause 12.6 (Addendum):-

The estimated cost of BOQ of percentage rate tender is exclusive of Service Tax as applicable. The bidders are to quote their rates excluding service tax. The service tax as applicable will be reimbursed / paid by O.B. & C.C. Ltd. as per Office Circular enclosed herewith.

C O D E S

Codes shall mean the following including the latest ascendants and / or replacement if any.

Indian Boiler Act, 1923 and Rules and Regulations made there under.

Indian Electricity Act, 1923 and Rules and Regulations made there under.

Indian Factories Act, 1948 and Rules and Regulations made there under.

The minimum wages Act.

Women's Compensation Act.

The Payment of Wages Act.

The Fatal Accident Act.

The Industrial Employment Act.

The Employment provident Fund Act.

Indian Explosive Act 1984 the Rules and Regulations made there under.

Indian Petroleum Act 1934, and Rules and Regulations made there under.

A.S.M.E. Test Codes.

AIRE Test, Codes.

American Society of Materials Testing Codes.

Standards of the Indian Standards Institution.

1)	Low Tension Circuit Breakers :	IS 2516-1955 Part I Sec.1
2)	Switchgear Bus Bars	IS 375-1963
3)	HRC fuse links	IS 2208-1962
4)	Distribution fuse boards	IS2675-1966
5)	Enclosure for Low Voltage switchgear	IS214701962
6)	PVC Cables	IS1554-1975
7)	Tabular fluorescent lamps for Cameral lighting service	IS2418-1963
8)	Tungsten Filament Lamps for cameral service	IS415-1963
9)	Ceiling Fans	IS274-1966
10)	Flood lights	IS1947-1961
11)	Wall Glass flame-proof electric light fittings	IS2206-1962 (Part 1)
12)	Water Tight Electric Light Fittings	IS3553-1956
13)	Steel Boxes for Enclosure of Electrical Accessories	IS5133-1969
14)	Fittings for Rigid Steel conduit	IS2667-1979
15)	Rigid steel circuits for electrical wiring	IS3837-1966
16)	Accessories for Rigid Steel Conduits for Electrical Wiring	IS3837-1966
17)	Switch Socket Outlets	IS3837-1966
18)	PVC Wiring	IS694-1977
19)	Switches for domestic and similar purpose	IS3854-1966
20)	PVC wiring	IS694-1977
21)	Call Bell and Buzzers	IS2268-1966
22)	Straight through joint boxes and leads sleeves or paper insulated cables-	EID-0032-1964
23)	Earthing	IS3043-1966
24)	Electrical Wiring installations	IS732-1963
25)	Switchgear	IS3072-1965 (Part I)

26)	Lighting protection	IS2309 -1969
27)	Public Address system	IS1882-1962
28)	Low Tension switch use units	IS4064-1978
29)	Code of Practice for Automatic FIRE ALAM system	IS2189-1970
30)	Specification for Heat Sensitive Fire Detectors	IS2175-1977
31)	Guide for Safety procedure in Electric work	IS5216-1969
32)	Rubber Mats for Electric works	IS5424-1969

p. Other internationally approved standards and / or Rules and Regulations touching the subject matter of the contract.

SECTION 9

PAYMENT SCHEDULE

CONTRACT PRICE: INR _____

Construction of 1 No. 500 seated Boys Hostel for final year & PG students, 200 seated Farmers Hostel and Upgradation of 10 Nos. of Ladies Hostel of OUAT, Bhubaneswar on Lump- Sum Turnkey basis.

Out of the agreement amount, the Design and Reporting stage cost shall be 2%, construction stage cost shall be 95% and Acceptance stage cost 3%. The client shall affect payments to Bidder in accordance with the following schedule.

1	<u>Design Stage</u>	Payment % for RFP
	On approval of Inception Report, detail survey and draft architectural drawing & QMP	0.50
	On approval of Site development plan and architectural drawing	0.50
	On approval of MEP	0.50
	On approval of final Architectural drawing showing electrical and sanitary layout plan and detail structural design and interior design/decoration	0.50
	Total	2.00
Hostel 2 (500 seated Boys Hostel for final year and PG students)		
Hostel Block		
A	Civil Work	
Sl No	Name of Item	Payment % for RFP
	a) On Completion up to Plinth height of 0.75m. above average G L	1
	b) On Completion Civil Structural work @ sqm.	
i.	Ground Floor	1

	ii.	First Floor	2
	iii.	Second Floor	2
	iv.	Third Floor	1.8
	v.	Fourth Floor	2
	vi.	Fifth Floor	1.8
	c)	On completion of finishing work such as flooring, plastering and other finishing works	
	i.	Ground Floor	2
	ii.	First Floor	2
	iii.	Second Floor	2
	iv.	Third Floor	1.8
	v.	Fourth Floor	2
	vi.	Fifth Floor	1.8
B	Water Supply & Sanitary Installation Services.		Payment % for RFP
1	Internal Water supply & Sanitary Installation		2.2
2	O.H. Water tank (Min 67500.00 lpd capacity)		
3	Civil external service connection		0.32
4	Local body approvals including tree cutting etc.		0.32
C	Electrical Services		Payment % for RFP
1	Internal electric installations all floors		3.22
2	External electric installation		0.96
3	CCTV area for common area, corridor (minimum 2388.00sqm)		0.05
4	Power wiring and installation in all dwelling units in all floors.		1.03
5	Lightning Conductor		0.06
6	Passenger Elevators 13 pax. (Minimum 6 Nos)		1.27

7	Fire fighting with wet riser and sprinkler system automatic fire alarm (Min 11940.00 sqm)	2.28
8	Supplying, Installation, Testing and Commissioning of LAN system comprising of core switches & L2 switches with 10 G, 10 giga SFP modules, WIFI access points, WIFI controller, network management software, racks, CAT 6A cable, patch panels, OFC etc. (Minimum 7164.00 sqm)	0.38
D.	<u>Extra for Superior finishes</u>	Payment % for RFP
1	Stainless steel railing (Modular) (Min 408.00 Rmt)	0.5
2	Stainless steel Hand rail wall mounted (Modular) (Min 348.00 Rmt)	
3	Interior works (superior finishes, cladding, metal cladding on column, sanitary fixtures etc) (Min 11940.00 sqmt)	4.25
4	Texture paint in exterior(Min 8375.00 sqm)	0.6
5	Texture paint in common lobbies(Min 1108.00 sqm)	
6	GRC tile cladding in exterior(Min 931.00 sqm)	0.65
7	GRC jail (Min 750.00 sqm)	
8	12mm Toughed glass fixed with aluminium frame (Min 1000.00 sqm)	0.53
9	MS Framing for GRC (Min 25209.00 kg)	0.34
HOSTEL 2 DINING BLOCK		
A	Civil Works (RCC framed structure non-residential building).	Payment % for RFP
	a) On Completion up to Plinth height of 0.75m. above average G L	0.5
	b) On Completion Civil Structural work @ sqm.	
	i. Ground Floor	0.5
	ii. First Floor	0.5
	c) On completion of finishing work such as flooring, plastering and other finishing works	
	i. Ground Floor	0.5
	ii. First Floor	0.3

B	Water Supply & Sanitary Installation Services.	Payment % for RFP
1	Internal Water supply & Sanitary Installation	0.24
2	O.H. Water tank (Min 17000.00 lpd)	
3	Civil external service connection	0.03
4	Local body approvals including tree cutting etc.	0.03
C.	<u>Electrical Services</u>	
1	Internal electric installations all floors	0.31
2	External electric installation	0.09
3	Power wiring and installation in all dwelling units in all floors.	0.1
4	Lightning Conductor	0.01
5	Firefighting with wet riser and sprinkler system, manual fire alarm system (Min 1100.00 sqm)	0.17
6	Passenger Elevators 8 pax. (Minimum 1 No.)	0.17
7	CCTV (minimum 770.00 sqm area)	0.02
D.	<u>Extra for Superior finishes</u>	Payment % for RFP
1	Stainless steel railing (Modular) (Min 240.00 Rmt)	0.19
2	Texture paint in exterior (Min 605.00 sqm)	0.04
3	GRC tile cladding in exterior (Min 295.00 sqm)	0.1
4	GRC jail (Min 72.00 sqm)	
5	MS Framing for GRC (Min 5508.00 sqm)	0.07
500 SEATED SINGLE BEDDED HOSTEL SITE DEVELOPMENT AND OTHER ANCILIARY WORKS		
	External Services	Payment % for RFP
1.1	Levelling (Min 14700.00 sqm)	0.45
1.2	Internal roads & paths	
1.2.1	Internal road with WBM and Bituminous top (Min 2196.00 sqm)	0.35

1.2.2	Cement concrete pavement with vacuum dewatered concrete (Min 220.00 sqm)	0.05
1.2.3	Footpath with PCC base, 60 mm thick paver blocks and kerb stone edging on one side (Min 1560.00 sqm)	0.4
1.3	External sewerage (Min 350.00 Rmt)	0.1
1.4	Filtered water supply	
1.4.1	Distribution lines upto 100 mm dia (Min 300.00 Rmt)	0.05
1.4.2	Peripheral grid 150 mm to 300 mm dia pipes (Min 500.00 Rmt)	0.19
1.5	Strom water drains (Min 380.00 Rmt)	0.35
1.6	Trenches for Services (Min 150.00 Rmt)	0.1
2	Rain water harvesting (RWH) (Minimum 2 Nos)	0.08
3	S.T.P Supplying, installation, testing and commissioning of STP/ETP of appropriate technology including civil works (except plant room), tertiary treatment etc. for building/campus (Minimum 75000.00 lpd)	0.48
4	U/G sump (Minimum 1,68,100.00 lpd)	0.36
5	Supplying, installation, testing and commissioning of 33kV/0.433 kV or 11kV/0.433 kV substation equipments comprising HT panel, dry type transformers, HT cable, bus trunking from transformer to LT panel, LT panel, automatic power factor correction panel, active harmonic filters, TVSS, SPD, essential panel, earthing, required inter-connections, substation safety equipments including LT cabling from sub station to the buildings fed by the sub station. (Min 900.00 KVA)	0.85
6	Supplying, installation, testing and commissioning of Silent Type DG Sets, AMF Panel, Bus Ducting/ Cables from DG Sets to Essential Panel, Synchronizing Panel where required, DG Set enclosure room sound insulation / ventilation / smoke exhaust as required, Earthing of DG Set system, control cabling, Fuel tank/piping, DG set Exhaust piping/ Exhaust Chimney as per CPCB norms, Civil works connected with DG Sets including Foundation as required. (Min 180.00 KVA)	0.2
7	Land Scaping (Horticulture operation including 300 mm earth filling, grassing, tree plantation / shrubs and potted plants etc) (Minimum 7350.00 sqm area)	0.2

8	Street Light Supplying, installation, testing and commissioning of LED street/compound/high mast/pathway/landscape lighting for the entire campus (Minimum 14700.00 sqm)	0.2
9	Supplying, installation, testing and commissioning of grid interactive roof top solar photo voltaic power generation system including space frame (Minimum 111.00 KWp)	0.75
10	Park furniture (SS 304 perforated Bench) (Minimum 30.00 Nos)	0.1
11	SS bollards (Minimum 20.00 Nos)	
12	Precast Boundary wall (Minimum 550.00 Rmt)	0.4
13	Motorized Steel gate (Minimum 1.00 No)	0.08
14	Illuminated Signages (Plinth area of the building) (Minimum 13,040.00 sqm)	
15	Supplying, installation, testing and commissioning of online 3 phase UPS system with 30 minutes back up including batteries, interconnecting cables, battery racks etc (Minimum 40.00 KVA)	0.08
16	RCC Canopy over connecting pathways (Minimum 90.00 sqm)	0.08
	Hostel 2 Total	51.93

FARMER'S HOSTEL		
A	Civil Works (RCC framed structure non-residential building).	Payment % for RFP
	a) On Completion up to Plinth height of 0.75m. above average G L	0.8
	b) On Completion Civil Structural work @ sqm.	
i.	Ground Floor	0.8
ii.	First Floor	1.5
iii.	Second Floor	1.5
c)	On completion of finishing work such as flooring, plastering and other finishing works	
i.	Ground Floor	1

	ii. First Floor	1.5
	iii. Second Floor	1.5
B	Water Supply & Sanitary Installation Services.	Payment % for RFP
1	Internal Water supply & Sanitary Installation	0.85
2	O.H. Water tank (Minimum 27000.00 lpd)	
3	Civil external service connection	0.13
4	Local body approvals including tree cutting etc.	0.13
C.	<u>Electrical Services</u>	Payment % for RFP
1	Internal electric installations all floors	1.25
2	External electric installation	0.35
3	Power wiring and installation in all dwelling units in all floors.	0.4
4	Lightning Conductor	0.03
5	CCTV for common area, corridor (Minimum 920.00 sqm area)	0.02
6	Supplying, Installation, Testing and Commissioning of LAN system comprising of core switches & L2 switches with 10 G, 10 giga SFP modules, WIFI access points, WIFI controller, network management software, racks, CAT 6A cable, patch panels, OFC etc. (Minimum 960.00 sqm Area)	0.05
D.	<u>Extra for Superior finishes</u>	Payment % for RFP
1	Stainless steel railing (Modular) (Minimum 57.00 Rmt)	0.09
2	Stainless steel Hand rail wall mounted (Modular) (Minimum 102.00 Rmt)	
3	Alluminium louvers/ fins at façade (Minimum 3162.00 Kg)	0.14
4	Texture paint in exterior (Minimum 2965.00 sqm)	0.19
5	GRC tile cladding in exterior (Minimum 424.00 sqm)	0.2
6	GRC jali (Minimum 216.00 sqm)	
7	MS Framing for GRC & Cladding (Minimum 11214.00 kg)	0.15

FARMER'S DINNING BLOCK		
A	Civil Works (RCC framed structure non-residential building).	Payment % for RFP
	a) On Completion up to Plinth height of 0.75m. above average G L	0.65
	b) On Completion Civil Structural work @ sqm.	
	i. Ground Floor	0.6
	ii. First Floor	0.65
	c) On completion of finishing work such as flooring, plastering and other finishing works	
	i. Ground Floor	0.6
	ii. First Floor	0.65
B	Water Supply & Sanitary Installation Services.	Payment % for RFP
1	Internal Water supply & Sanitary Installation	0.25
2	O.H. Water tank (Minimum 10775.00 lpd)	
3	Civil external service connection	0.04
4	Local body approvals including tree cutting etc.	0.04
C.	<u>Electrical Services</u>	Payment % for RFP
1	Internal electric installations all floors	0.35
2	External electric installation	0.1
3	Power wiring and installation in all dwelling units in all floors.	0.1
4	Lightning Conductor	0.01
5	Fire fighting with wet riser and sprinkler system, Manual fire alarm (Minimum 1310.00 sqm)	0.2
6	Passenger Elevators 8 pax. (Minimum 1 No.)	0.15
7	CCTV (Minimum 917.00 sqm area)	0.02

D.	<u>Extra for Superior finishes</u>	Payment % for RFP
1	Stainless steel railing (Modular) (Minimum 240.00 Rmt)	0.19
2	Texture paint in exterior (Minimum 590.00 sqm)	0.04
3	GRC tile cladding in exterior (Minimum 288.00 sqm)	0.1
4	GRC jali (Minimum 72.00 sqm)	
5	MS Framing for GRC (Minimum 5398.00 Kg)	0.07
FARMER'S HOSTEL SITE DEVELOPMENT AND OTHER ANCILIARY WORKS		
		Payment % for RFP
1.1	Levelling (Minimum 12464.00 sqm)	0.4
1.2	Internal roads & paths	
1.2.1	Internal road with WBM and Bituminous top (Minimum 1410.00 sqm)	0.24
1.2.3	Cement concrete pavement with vacuum dewatered concrete (Minimum 141.00 sqm)	0.03
1.2.4	Footpath with PCC base, 60 mm thick paver blocks and kerb stone edging on one side (Minimum 1435.00 sqm)	0.4
1.3	External sewerage (Minimum 185.00 Rmt)	0.05
1.4	Filtrered water supply	
1.4.1	Distribution lines upto 100 mm dia (Minimum 250.00 Rmt)	0.03
1.4.2	Peripheral grid 150 mm to 300 mm dia pipes (Minimum 500.00 Rmt)	0.19
1.5	Strom water drains (Minimum 650.00 Rmt)	0.55
1.6	Trenches for Services (Minimum 150.00 Rmt)	0.1
2	Rain water harvesting (RWH) (Minimum 2 Nos.)	0.08
3	S.T.P Supplying, installation, testing and commissioning of STP/ETP of appropriate technology including civil works (except plant room), tertiary treatment etc. for building/	0.3

	campus (Minimum 50,000 lpd)	
4	U/G sump (Minimum 75.500.00 lpd)	0.15
5	Supplying, installation, testing and commissioning of 33kV/0.433 kV or 11kV/0.433 kV substation equipments comprising HT panel, dry type transformers, HT cable, bus trunking from transformer to LT panel, LT panel, automatic power factor correction panel, active harmonic filters, TVSS, SPD, essential panel, earthing, required interconnections, substation safety equipments including LT cabling from sub station to the buildings fed by the sub station. (Minimum 400.00 KVA)	0.35
6	Supplying, installation, testing and commissioning of Silent Type DG Sets, AMF Panel, Bus Ducting/ Cables from DG Sets to Essential Panel, Synchronizing Panel where required, DG Set enclosure room sound insulation / ventilation / smoke exhaust as required, Earthing of DG Set system, control cabling, Fuel tank/piping, DG set Exhaust piping/ Exhaust Chimney as per CPCB norms, Civil works connected with DG Sets including Foundation as required. (Minimum 80.00 KVA)	0.09
7	Land Scaping (Horticulture operation including 300 mm earth filling, grassing, tree plantation / shrubs and potted plants etc) (Minimum 6700.00 sqm area)	0.15
8	Street Light Supplying, installation, testing and commissioning of LED street/compound/high mast/path way/landscape lighting for the entire campus (Minimum 12,464.00 sqm area)	0.2
9	Supplying, installation, testing and commissioning of grid interactive roof top solar photo voltaic power generation system including space frame (Minimum 101.00 KWp)	0.7
10	Park furniture (SS 304 perforated Bench) (Minimum 30.00 No)	0.1
11	SS bollards (Minimum 20.00 No)	
12	Precast RCC Boundary wall (Minimum 500.00 Rmt)	0.4
13	Motorized Steel gate (Minimum 1.00 No)	0.05
14	Illuminated Signages(plinth area of the building) (Minimum 5910.00 sqm area)	0.01
15	Supplying, installation, testing and commissioning of online 3 phase UPS system with 30 minutes back up including batteries, interconnecting cables, battery racks etc. (Minimum 20.00 KVA)	0.04

16	RCC Canopy over connecting pathways (Minimum 198.00 sqm)	0.17
		22.17

Renovation cost of 10 nos. Ladies hostels, OUAT, Bhubaneswar		
A	Hostel No. 3	Payment % for RFP
1	Upgradation cost of civil work	3.5
2	Upgradation cost of Internal electrification	1.5
3	Upgradation cost of Internal water supply	1.4
B	RAMADEVI	Payment % for RFP
1	Upgradation cost of civil work	1.8
2	Upgradation cost of Internal electrification	0.75
3	Upgradation cost of Internal water supply	0.7
C	KAMALA PUJARI	Payment % for RFP
1	Upgradation cost of civil work	0.1
D	KUNATALA KUMARI	Payment % for RFP
1	Upgradation cost of civil work	1.6
2	Upgradation cost of Internal electrification	0.7
3	Upgradation cost of Internal water supply	0.65
E	GOLDEN JUBILEE - MALATI DEVI	Payment % for RFP
1	Upgradation cost of civil work	0.55

2	Upgradation cost of Internal electrification	0.25
3	Upgradation cost of Internal water supply	0.2
F	GOLDEN JUBILEE - NANDINI SATHPATHY	Payment % for RFP
1	Upgradation cost of civil work	1
2	Upgradation cost of Internal electrification	0.4
3	Upgradation cost of Internal water supply	0.4
G	GOLDEN JUBILEE - TULASI MUNDA	Payment % for RFP
1	Upgradation cost of civil work	1
2	Upgradation cost of Internal electrification	0.4
3	Upgradation cost of Internal water supply	0.4
H	SARADA DEVI HOSTEL	Payment % for RFP
1	Upgradation cost of civil work	0.4
2	Upgradation cost of Internal electrification	0.15
3	Upgradation cost of Internal water supply	0.15
I	SRUJANIKA HOSTEL 10	Payment % for RFP
1	Upgradation cost of civil work	1
2	Upgradation cost of Internal electrification	0.4
3	Upgradation cost of Internal water supply	0.4
J	SRUJANIKA HOSTEL 11	Payment % for RFP
1	Upgradation cost of civil work	0.6

2	Upgradation cost of Internal electrification	0.25
3	Upgradation cost of Internal water supply	0.25
		20.9
<u>ACCEPTANCE STAGE</u>		
		Payment % for RFP
	Final approval from competent authority viz. development authority and 3- star GRIHA rating, testing, commissioning with approval from authority like fire officer and completion of all items as per approval.	2.50
	On submission of As-Built drawings and other documents as mentioned in Contract Data	0.50
		3.00
		100.00

Payment may be made on prorated basis on request of the contractor for each individual item in commensurate with progress by the Employer. However, in no case, the total cost of payment shall exceed the Lump Sum Contract Value for which the agreement is signed except change in scope, compensation, or bonus etc. as admissible as per the contract.

Sd/-
E.I.C-cum-Managing Director
OB&CC Ltd