Vol.-4: Design Basis Report

CONSTRUCTION OF DISTRICT DRUG WAREHOUSE AT PRAYAGRAJ &KAUSHAMBI (U.P.)

HLL INFRA TECH SERVICES LTD. (HITES)

As

Construction Agency of

National Health Mission, Govt. of U.P.

Invites e-Tender for

"Construction of District Drug Warehouse at Prayagraj & Kaushambi in the state of Uttar Pradesh on Design, Engineering, Procurement and Construction"

on EPC Basis

Tender No. HITES/IDN/EPC/DWH-NHM/2021-22/PKG-1

Volume-4

DESIGN BASIS REPORT

(March, 2022)

CLIENT

NATIONAL HEALTH MISSION राष्ट्रीय स्वास्थ्य मिशन

NATIONAL HEALTH MISSION
Govt. of Uttar Pradesh

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DESIGN BASIS REPORT

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Construction of District Drug Warehouse at Prayagraj & Kaushambi in the state of Uttar Pradesh on Design, Engineering, Procurement and Construction (EPC) Basis

DESIGN BASIS REPORT

A. DESIGN BASIS REPORT- GENERAL

INTRODUCTION

National Health Mission (U.P.) has appointed HLL Infra Tech Services Limited (HITES), a 100 % subsidiary of HLL Lifecare Limited, a Mini Ratna Central Public Sector Enterprise, under the administrative control of Ministry of Health & Family Welfare as Construction Agency for setting up of Drug Warehouse in District in the State of Uttar Pradesh.

The project is to be executed on Turnkey i.e., EPC (Engineering, Procurement & Construction) basis wherein the Site Plans& Concept Designs shall be provided to the EPC Contractors. After award of work the EPC Contractor shall be responsible for complete detailed designing, engineering, procurement and Construction of District Drug Warehouses under National Health Mission (NHM) in various locations in the State of Uttar Pradesh.

SCOPE OF WORK:

The bidders are being provided with, prototype Concept Plans of the proposed District Drug Warehouses, Technical specifications and other details forming the part of bid document. Based on these drawings and documents, the Bidders shall prepare their detailed designs in conformity with the local Bye-laws and actual site conditions.

EPC contractor shall be solely responsible for carry out liaison, coordination & approvals etc. with concerned Medical Officers/ Chief Medical Officers / State Govt. Engineering Officials / Districts Administration Officials / NHM Officials/ Central Govt. Authorities etc. for all project related activities upto completion of Project, Handing over to Client & Project Closer, as per contract provisions.

The prototype concept plans, design and drawings prepared in respect of District Drug Warehouses are being provided only as a preliminary reference document by way of assistance to the Bidders. The bidders are expected to carry out their own due diligence, surveys, soil investigations and other detailed examination of sites before submitting their Bids. Nothing contained in the concept plan, design and drawings shall be binding on the HITES/NHM.

HITES/ NHM shall have no liability whatsoever in relation to or arising out of any or all contents of the Concept plan, design and drawings. Bidders are expected to do their own due diligence and investigations into the Project and its related details prior to submission of their Bids.

Present scope of work involves construction of District Drug Warehouses as per Concept plan, design and drawings in State of Uttar Pradesh as per location given herewith. The total tentative plinth area each unit is given below:

Sl. No.	Location of District Drug Warehouse	Tentative area per unit
1.	T.B. Hospital, Teliarganj, Prayagraj District Prayagraj	
	a. Ground Floor (3.5 Mtr. Ht.):	350 Sqm
	b. Ground Floor (7.0 Mtr. Ht.):	1246 Sqm
	c. First Floor (3.5 Mtr. Ht.)	350 Sqm
	d. Portico Area (7.0 Mtr Ht.)	54 Sqm
	Total Area:	2000 Sqm

2.	Manjhanpur, District Kaushambi a. Ground Floor (3.5 Mtr. Ht.): b. Ground Floor (7.0 Mtr. Ht.): c. First Floor (3.5 Mtr. Ht.) d. Portico Area (7.0 Mtr Ht.) **Total Area:**	 350 Sqm 1246 Sqm 350 Sqm 54 Sqm **2000 Sqm**

Note: The Portico size is 18 M X 6 M i.e. 108 sqm at drug warehouses at Prayagraj & Kaushambi. 50% of area of Projections of entrance portico area i.e. 54 sqm has been considered as per norms.

Boundary Wall Length with MS Gate:- Tentative Boundary Wall Length with MS Gate is given below:

Sl. No.	Location of District Drug Warehouse	Tentative Boundary Wall Length with MS Gate
1	T.B. Hospital, Teliarganj, Prayagraj District Prayagraj	MS Gate only
2	Manjhanpur, District Kaushambi	272 Mtr.

Besides, Construction of District Drug Warehouse Building, required Electrical points, fixtures, Fans, Plumbing &Sanitary work, fixtures, Telephone, LAN/Data, Electrical Sub-Station, Street lighting, External development works, Landscaping, Road/ pathways etc. for functioning of District Drug Warehouses are also included in the scope of work. Brick Masonry Boundary Wall with MS Grill and Gate is to be constructed at Drug Ware House at Kaushambi as per Tender drawings & UP PWD/ CPWD Specification.

The EPC Contractor shall be responsible for smooth integration & connection of all Services with the existing services/facilities available in the existing Hospital as per directions of Engineer-In-Charge. The EPC Contractor is advised to study & assess, in his own interest, all existing infrastructure for purpose of smooth integration with all the new facilities to be created under this contract. The services required to be integrated with existing facilities, but not limited to, are electrical power, drainage lines, storm lines, Telephone, LAN/Data, CCTV etc. as per directions of Engineer-In-Charge. All necessary materials, equipment & items etc. as required for such integration of Services shall be provided by the EPC contractor. Nothing extra shall be payable to EPC contractor on this account.

The scope of works and specification are given in general but they are not exhaustive i.e. does not mention all the incidental works required to be carried out for complete execution of the item of work. the work shall be carried out, all in accordance with true intent and meaning of the specifications and the drawings taken together, regardless of whether the same may or may not be particularly shown on the drawings and / or described in the specifications, provided that the same can be reasonably referred there from. There may be several incidental works, which are not mentioned in the contract document/ specifications but will be necessary to complete the item in all respect. All these incidental works/ costs which are not mentioned, but are necessary to complete the work shall be deemed to have been included in the overall amount quoted by the contractor for various components of work. Also no adjustment of rates shall be made due to any change in incidental works or any other deviation in such element of work (which is incidental to the items of work and are necessary to complete such items in all respects) on account of the directions of Engineer-in-Charge. Nothing extra shall be payable on this account.

In case, some of items are missing in the scope of work or specifications in the bidding documents same shall be taken from the specification mentioned in similar type of items mentioned for similar type of buildings in the scope of work or shall be executed as given in the UP PWD/ CPWD specifications, NBC-2016, IS codes and according to sound engineering practices so as to make the building including related services fully functional. No claim what so ever may be entertained at later stage. All cost of providing and making buildings with service, fully complete in all aspect unless specifically mentioned in the contract document and making buildings with services fully functional are included in the cost tendered for this work.

SITE ANALYSIS

Location and Description

List of proposed sites to be constructed are located as per details given below:

Sl. No.	Location of District Drug Warehouse	Plot Area
1	T.B. Hospital, Teliarganj, Prayagraj District Prayagraj.	5041 Sqm
2	Manjhanpur, District Kaushambi.	5000 Sqm

Site Levels

The plinth level for all units is to be kept (+) 1200mm from the ground level. The floor-to-floor height shall be as per proposed in the tender drawings.

CONSTRUCTION WORKS RELATED COMPLIANCE:

The Contractor shall also adhere to the following during construction:

i. Proper construction material staging shall be executed on the site.

ii. The contractor shall not store /dump construction material or debris on metaled road.

iii. The contractor shall get prior approval from Engineer-in-Charge for the area where the construction material or debris can be stored beyond the metaled road. This area shall not cause any obstruction to the free flow of traffic/inconvenience to the pedestrians. It should be ensured by the contractor that no accidents occur on account of such permissible.

iv. Proper site management strategies shall be followed on the site to ensure labour safety and sanitation. Display warning and safety signs all across the site. Also ensure that safety nets and harnesses are provided for construction workers working on higher floors. The walking boards and formwork shall also be stable. Workers shall be provided with safety equipment like safety helmets, jackets, boots and gloves.

v. Provide fire extinguishers and barrels of water with bucket tans on the site and sufficient light for workers to work safely at night.

vi. The Contractor shall provide adequate level of sanitation and safety facilities for construction workers.

vii. Contractor shall provide PPE (Personal Protective Equipment) like safety shoes, safety belt/harness, Helmets/Masks/Gloves, Hand sanitizers etc. to all workers at site.

viii. The EPC Contractor shall strictly adhere to & comply with the guidelines issued by Govt. of India, State Govt., National Disaster Management Authority, District Administration,

Chief Medical Officer & other statutory bodies from time to time, for effective prevention of infection spread from the Covid-19 pandemic among the workers/ labors/ supervisors/ officials involved in the project activities at respective sites. The EPC Contractor shall take adequate steps and make all necessary arrangements in this direction during entire duration of project (with extended period, if any) including DLP period within the quoted price in financial bid. Nothing extra shall be payable to EPC Contractor on this account. The EPC Contractor shall be solely accountable for all issues & situations arising at site, if any, owing to Covid -19 pandemic. Contractor shall comply with SOP given under CPWD Circular no. F.No.2/9/2020-WII/169 dated 05.05.2020 & other Government compliances notified therein.

ix. The contractor shall provide mask to every worker working on the construction site and involved loading, unloading and carriage of construction material and construction debris to prevent inhalation of dust particles etc. The contractor shall provide all medical help, investigation and treatment to the workers involved in the construction of building and carry of construction material and debris relatable to dust emission.

x. The contractor shall establish a fully equipped First Aid centre on site to deal with accidental injuries and workers health. The first aid box shall be marked with a red cross on a white background.

xi. The contractor shall not allow an individual to work on site while his ability or alertness is impaired by fatigue, illness or some other cause which might expose him to injury.

B. DESIGN BASIS REPORT- CIVIL STRUCTURES

1. General

Site Plan & Concept Plans of the Construction of Drug Warehouse at Prayagraj & Kaushambi in the state of Uttar Pradesh, shall be provided to the EPC Contractor. The EPC Contractor shall prepare the detailed architectural design and drawings of the Project for approval from the local bodies and statutory authorities as per requirement. The structural design of buildings shall be done by the EPC Contractor with Proof checked/vetted by IIT/NIT or approved Engineering College. The requirements for the structural designs are briefed hereunder.

2. Geo Technical Investigations

The EPC Contractor shall, after award of work, carry out the required site surveys and soil investigations and obtain soil investigation report as per codal requirements from the specialized agency, with the prior approval of HITES as per requirement. This soil investigation report shall be got vetted by the approved design vetting Institute and additional requirements/ details will be included for implementation of structural design thereafter. However, the data, as per the available Geo-Technical investigations conducted before the above referred earth filling, is given hereunder for reference/guidance only:

Soil Characteristics for Prayagraj Site:-

i. The subsoil in general consists of soft silty clay up to a depth of 10.0m followed by a silt clay layer(s) of good bearing capacity up to explored depth. N' values suggest that the soil condition improved with depth.

ii. Water Table: -The ground water table has not been encountered at the depth of 10.00m (approximately) below the Natural Ground level.

iii. Recommended Soil Bearing Capacity: - Isolated is recommended. In case isolated foundation, for assessment of net safe bearing capacity and settlement. However, for warehouse structures is recommended. The bearing capacities for various types of foundations are as under.

A. FOUNDATION (settlement under permissible settlement)

Depth of foundation From NGL (Existing-Before filling) (m)	Size of foundation(m)	Net Safe Bearing Capacity (T/m2)	Settlement (mm)
1.50	2.00 X 1.50	11.87	35.21

Soil Characteristics for Kaushambi:-

i. The subsoil in general consists of soft silty clay up to a depth of 10.0m followed by a silt clay layer(s) of good bearing capacity up to explored depth. N' values suggest that the soil condition improved with depth.

ii. Water Table: -The ground water table has not been encountered at the depth of 10.00m (approximately) below the Natural Ground level.

iii. Recommended Soil Bearing Capacity: - Isolated is recommended. In case isolated foundation, for assessment of net safe bearing capacity and settlement. However, for warehouse structures is recommended. The bearing capacities for various types of foundations are as under.

A. FOUNDATION (settlement under permissible settlement)

Depth of foundation From NGL (Existing-Before filling) (m)	Size of foundation (m)	Net Safe Bearing Capacity (T/m2)	Settlement (mm)
1.50	2.00 X 1.50	12.13	37.74

3. Structural Concept & Design:-

3.1. Objective

The intent is to identify and record all the pertinent input requirements, analysis & design criteria for structural design of the building. It is aimed at formulating the basis of the structural analysis, design & detailing requirements for the structural scheme of the buildings which will be compatible with the architectural theme, satisfying functional needs, at the same time conforming to the Indian Standards and other applicable building norms to achieve safe, stable, strong and yet optimally economical structures.

The parameters adopted in this report are going to be the basis of the structural design calculations. The minimum design requirement has been laid down to establish the unified design basis that will form the overall design philosophy to be adopted in the structural design of the proposed building.

3.2. Statutory Requirements

The design of the Civil Structure will comply with the requirements of the following:

- National Building Code.
- Local Building Regulations.
- Bureau of Indian standard codes.
- International codes as applicable.
- Any other regulation as per requirements.

3.3. Design Philosophy

a. Type of Structure: RCC framed structure with shear walls, as required, has been proposed for all the structures.

b. 3-D Analysis of all the building structures is to be carried out by the EPC Contractor using latest versions of modern software packages such as STAAD Pro and the results of the analysis shall be used for designing the various elements. All designs shall strictly conform to the standards specified in National Building Code 2016 and to be proof checked.

c. HITES reserves the right to conduct third party design validation and the EPC Contractor shall provide all data and carry out all modifications that may be suggested by the third party so appointed.

d. The recommendations of the past Geo Technical investigation as above are indicative. The EPC Contractor shall conduct soil investigations on their own and shall be responsible for the adequacy of the design.

e. Overhead tank for domestic and firefighting purposes shall be located at terrace level, unless planned otherwise.

f. Prayagraj Site falls in Zone III and Kaushambi site falls in Zone-II of Seismic Zones of India

3.4. Structural designs:

The main considerations followed for the design of structure are:

a. Structure safety and stability.
b. To meet the demands of aesthetics conceived by the architect.
c. Availability of material, equipment and expertise.
d. Constructability and ease of maintenance.
e. Durability.
f. Economy

3.5. StructuralArrangement:

The proposed building is considered to be of RCC frame structure with shear walls, as per requirements. The foundation system shall be planned and designed as per design requirements.

The external walls are proposed to be constructed with 230 mm thick brick masonry and internal walls are with 115mm/ 230 mm thick brick masonry or light partitions as per requirements.

3.6. Design Standards:

The relevant Indian Standard Codes, as given below have been followed for structural design.

S.NO.	CODE	DESCRIPTION
1	IS-875 (Part 1) – 1987	Code of Practice for Design Loads (other than earthquake) for buildings and structures – Unit weights of buildings materials and stored material
2	IS-875 (Part 2) – 1987	Code of Practice for Design Loads (other than earthquake) for buildings and structures – Imposed loads
3	IS-875 (Part 3) – 2015	Code of Practice for Design Loads (other than earthquake) for buildings and structures – Wind loads
4	IS-875 (Part 4) – 1987	Code of Practice for Design Loads (other than earthquake) for buildings and structures – Snow loads
5	IS-875 (Part 5) – 1987	Code of Practice for Design Loads (other than earthquake) for buildings and structures – Special loads and load combinations
6	IS: 456 – 2000	Code of Practice for Plain and Reinforced Concrete
7	IS: 1786 – 2008	Specification for High Strength Deformed Bars and Wires for Concrete Reinforcement
8	IS: 432 (Part 2)-1982	Specification for Mild Steel and Medium Tensile Steel Bars and Hard Drawn Steel Wire for Concrete Reinforcement – Hard Drawn Steel Wire
9.	IS:1343-1980	Code of Practice for Pre-stressed concrete
10	IS: 13920 -2016	Ductile detailing of reinforced concrete structures subjected to seismic forces - Code of practice

S.NO.	CODE	DESCRIPTION
11	IS:14268-1995	Uncoated stress relieved low relaxation seven-ply strand for pre-stressed concrete – specification
12	IS: 2062 –1999	Steel for General Structural Purposes. Specification
13	IS: 1161 –1998	Specification for Steel tubes for Structural Purposes
14	IS: 800 – 2007	Code of Practice for General Construction in Steel
15	IS:1893-2016	Criteria for Earthquake resistant design of structures
16	IS: 2210 – 1998	Criteria for Design of Reinforced Concrete structures and Folded plates
17	IS : 269 –1989	Specification for Ordinary, rapid hardening and low heat Portland cement
18	IS : 455 -1989	Specification for Portland blast furnace slag cement
19	IS : 1489 -1991	Specification for Portland pozzolana cement
20	IS : 383 -1970	Specification for coarse and fine aggregates from natural sources for concrete
21	IS : 516 -1959	Method of test for strength of concrete
22	IS:432-1982	Specification for Mild Steel and Medium Tensile Steel Bars and Hard Drawn Steel Wire for Concrete Reinforcement
23	IS:4990-1993	Specification for plywood for concrete shuttering works
24	IS : 2645 -1975	Specification for integral cement water proofing compounds
25	IS: 2950 (Part 1) -1981	Code of Practice for Design & Construction of Raft Foundations
26	IS: 16700-2017	Criteria for Structural Safety of Tall Concrete Buildings
27	IS: 10262-2019	Concrete Mix Proportioning -Guidelines (2nd revision)
28	NBC-2016	National Building Code of India
29	IS:3370 (Part 1 to 4) - 2009	Code of Practice for Concrete Structures for Storage of Liquids.
30	SP:24-1983	Explanatory handbook on Indian standard code of practice for Plain and reinforced concrete (IS:456-1978)
31	SP:16-1980	Design aids for Reinforced concrete to IS : 456-l978
32	SP:34-1987	Handbook on concrete Reinforcement and detailing

Note: The above list is suggestive and not exhaustive. Apart from these basic codes, any other related codes shall also be followed wherever required.

3.7. Fire Resistance

As per NBC 2016, Table-2 – Page-20 – Part-4 Type-2 construction is to be followed. Type-2 construction shall be followed. Fire resistance shall be 2.0 hours.

Minimum dimension shall be as per clause 21 of IS: 456:2000 and NBC 2016

a. Beam – 200mm,

b. Slab – 110mm and

c. Column – 300mm (Fully exposed)

d. Walls – 160mm

e. Minimum cover shall be as per beam clause 26 of IS: 456:2000 and NBC 2016.

3.8. Normal Cover to the Reinforcement:

The appropriate grade of concrete and nominal cover to reinforcement is governed by the following main considerations:

i) Durability of Concrete

ii) Corrosion Protection of the Reinforcement

iii) Bar Size

iv) Nominal maximum aggregate size

From Durability requirement, exposure condition is assumed as moderate for Structural elements.

The cover shall be as per the clause 26.4 of IS: 456-2000 and shall be as under:

Structural Element	**Proposed Nominal Cover**
Beams (Moderate)	20 mm
Slab (Moderate)	25 mm for simply supported 20 mm for continuous
Stitch Slabs - (Moderate)	30mm
Columns (Moderate)	40mm
Footings (Severe)	50mm
Raft Slabs (Severe)	75mm
Retaining Walls / Under Ground Water Tank Wall (Moderate)	Earth Side - 40mm Inside Side – 25 mm
Over Head Water Tank Wall(Moderate)	Outer Side - 25mm Water Side – 40mm

For any other elements not specified above, clear cover shall be as per the clause 26.4 of IS: 456-2000.

3.9. GRADE OF CONCRETE

a) Foundations - M25

b) Water Tanks walls - M25/M30

c) Columns - M30

d) Shear walls - M25

e) Suspended beam slab - M25

f) Stair waist slab - M25

NOTE: The column portion of beam arrangement shall be casted in same grade as columns /shear walls.

3.10. REINFORCEMENT

High yield strength deformed bars with Fe = 500D N/mm^2 confirming to IS: 1786 – 2008 and having minimum elongations 12% and IS13920-2016 having elongations more than 14.5% shall be used in the project. Reinforcement Bars of 8, 10,12,16,20,25,28,32 mm shall be used.

3.11. STRUCTURAL SYSTEM AND DIMENSIONING

In addition to the requirements governed by loads and forces the minimum structural dimensions are also governed by other considerations like size of aggregates, reinforcement detailing etc.

As per clause 21 and fig-I of IS-456:2000, to achieve fire resistance of 2.0 hours, minimum thickness of floors required is 110 mm.

In case of any slopes in foundations, the slope at top of the foundations shall not be steeper than 1:2.5 in order to obtain well-compacted concrete throughout the footing.

3.12. LOAD COMBINATIONS

All structural designs are carried out by Limit State method of design. For this purpose, the Load factor for various load combinations indicated in IS-875 (Part 5) – 1987 are as follows:

1) 1.5*DL + 1.5*LL
2) 1.5*DL ± 1.5 * EL / WL
3) 1.2*DL+1.2*LL± 1.2* EL / WL
4) 0.9*DL± 1.5 * EL / WL
5) 0.75(1.4 DL±1.4 TL +1.7 LL)
6) 1.4(DL±TL)

Whenever imposed load is combined with earthquake load, the appropriate part of imposed load as specified in IS: 1893 – 2016 is used both for evaluating earthquake effect and for combined load effects used in such combination. Live Load Reduction shall be done as per procedure give in Appendix-A of IS 875 Part 2 for the design of columns and foundations.

In addition, following load combinations are considered for calculating the forces at serviceability limit states:

1) ±ELx±0.3 Ely ± 0.3 ELz,
2) ±ELy±0.3 Elz± 0.3 ELx, and
3) ±ELz±0.3 Elx± 0.3 Ely,

3.13. Loads, Hazard Classification And Material Properties:-

3.13.1. Loads:-

The structural Members are loaded with various loads and load combinations during its service conditions. The loads on the structure are taken for analysis and design as per the relevant IS codes of practice;

a) Dead load as per IS: 875- 1987 Part -1
b) Imposed Live Load as per IS: 875 - 1987 Part -2

c) Wind loads as per IS: 875- 2015

d) Seismic Load as per IS: 1893- 2016

Dead loads comprises of the self-weight of all permanent construction including walls, slabs, beams, columns, water proofing treatment, water tanks, stair case, floor finish etc.

The structure would be designed for earthquake resistance as per IS 1893:2016, with due consideration for the structural detailing as per provisions of IS 13920:2016 and SP 34-1987.

3.13.2. Dead Loads (DL) (IS:875(part 1) -1987):-

1.	Self-weight of reinforced concrete	: 25 kN/m^3
2.	Self-weight of plain concrete	: 24 kN/m3
3.	Brick Masonry wall	: 18.85 kN/m3
4.	Ceiling plaster (12mm thick)	: 0.25 kN/m2
5.	Waterproofing (Av. 150 mm thick brickbat coba)	: 9.90 kN/m^3
6.	Cement plaster	: 20.40 kN/m3
7.	Water in overhead water tank	: 10 kN/m3
8.	Granite (average)	: 26.70 kN/m3
9.	Marble/Sand stone	: 24.00 kN/m^3
10.	Vitrified tiles (considering density as 2.4gm/cc)	: 24.00 kN/m^3

3.13.3. Live loads (LL) (IS: 875(part 2) -1987):-

1.	Office areas	: 4.0 kN/m^2
2.	Toilet and bath rooms	:2.0 kN/ m^2
3.	Staircase Corridors & balconies	:4.0 kN/ m^2
4.	Accessible roofs	:1.5 kN/ m^2
5.	HALL	:5.0 kN/m^2
6.	AHU Rooms	:7.5 kN/ m^2
7.	Electric Rooms	:5.0 kN/ m^2
8.	UPS	:10.0 kN/ m^2
9.	Projection Rooms	:5.0 kN/ m^2
10.	Lift lobby	:4.0 kN/ m^2
11.	Machine Rooms & Services	:10.0 kN/ m^2
12.	Storage	:5.0 kN/ m^2
13.	Parking	:3.0 kN/ m^2

3.14. WIND LOADS:

The wind pressure shall be calculated based on basic wind speed, risk coefficient, terrain category, topography factor and other provisions laid in IS: 875 (Part 3) – 2015 & NBC 2016.

3.14.1. SEISMICLOADS:

Bureau of Indian Standards, based on the past seismic history, grouped the country into four seismic zones, viz. Zone-II, -III, -IV and –V. Of these, Zone V is the most seismically active region, while zone II is the least.

3.15. DESIGN AND DETAILING FOR SEISMIC FORCES:

The proposed structure is a reinforced beam slab structure with shear walls /column. The seismic aspects will be accounted for as per IS: 1893-2016 which are applicable for Indian conditions. As per the code the project site Prayagraj falls in Zone-II and Kaushambi falls in Zone-II. Earthquake resistance is offered by ductile shear walls / frames.

3.16. ANALYSIS:

For this purpose, computer software STAAD Pro/ETABS shall be used for carrying out Static Analysis and dynamic analysis using IS 1893-2016.

3.17. Materials Properties:-

a. **CONCRETE:** The concrete mix shall be either RMC or BMC as per requirements. Type of cement shall be PPC. The concrete mix shall be designed for minimum workability as specified in para 7 of IS: 456-2000. Exposure condition is moderate. Maximum size of coarse aggregate is 20mm. The characteristic compressive strength of various grade of concrete shall be as given below:-

Sl. No.	Grade	Specified characteristic compressive strength at 28 days (N/mm^2)	Minimum Cement Content (Kg per cums.)	Maximum Water Cement Ratio
1	M25	25	330	0.45
2	M30	30	340	0.45
3	M35	35	350	0.45
4	M40	40	360	0.45
5	M45	45	370	0.45

For Drug Warehouse Building, the EPC contractor shall be permitted to use precisely Engineered Aluminium form work construction technique with Self-compacting Concrete as per IS: 10262-2019 in place of conventional structural system with no extra cost. However, in case, there is cost reduction, the same shall be credited to the HITES.

b. **REINFORCEMENT:-**Reinforcing steel are TMT bars of Grade Fe-500 /500D conforming to IS: 1786-2008.

3.18. Cover to Reinforcement:-

From durability considerations, exposure condition is assumed to be Moderate. The clear cover to main reinforcement to be considered in the design satisfying durability & 2 Hr fire rating requirements is as per clause No 26.4.2 , Clauses 21.4-, 26.4.3 and Fig. 1 of IS 456-2000.

C. DESIGN BASIS REPORT- CIVIL WORKS

1. General

The Construction of Drug Warehouse Building shall be done on Turnkey i.e. EPC (Design, Engineering, Procurement & Construction) basis and the EPC Contractor shall be responsible for shortfall of any technical propriety and of upholding prevailing standard of Code of Practice according to NBC 2016 and all other relevant IS-Codes on the way to accomplish the work according to requirement. The Civil Work shall in general conform to the Latest UP PWD/ CPWD Specifications.

The proposed facilities shall be completed in conformity with high standards of construction and specification. The Architectural finishes shall be of such quality that will ensure better hygienic conditions. The design of building shall ensure control of noise due to walking, movement of trolleys and banging of doors etc. The architectural design should take in to account the requirements of physically challenged patients. The planning shall include landscaping and horticulture to increase the comfort & hospitality conditions inside the building along with development of parking, approach roads and other service requirements meant for the Construction of Drug Warehouse Building shall be done on Turnkey i.e. EPC basis.

Based on the Concept Plans& Design, the EPC Contractor shall prepare the detailed architectural design and other drawings of the Project for approval from the local bodies and statutory authorities as per requirement. The structural designs of the buildings and structures shall be done by the EPC Contractor and shall be Proof checked/vetted by the IIT/NIT/or any Govt. Engineering College as approved.

2. Site clearance, Excavation & Earth Work:

Before commencement of construction work at site, clearing of jungle including uprooting of rank vegetation, grass, brush wood and rubbish shall have to be removed and disposed of outside the campus. The Contractor shall carry out felling/ replanting of trees, if any, including cutting of trunks and branches, removing the roots and stacking of serviceable material and disposal of unserviceable material as per requirement.

The EPC contractor shall under take necessary leveling, back filling/ cutting, dewatering, bailing out water and shoring, as required, to maintain the levels as per Plans. The EPC Contractor shall be permitted to use the excavated good earth for filling, leveling, consolidating etc. for the Project. However, as per Project requirements, if additional good earth is required, the EPC contractor shall bring the Good earth from outside to maintain the required levels and shall ensure proper compaction.

The work, in some cases, may be carried out in the vicinity of existing buildings/ services. Therefore, due diligence shall be exercised by the EPC contractor while carrying out excavation and other construction activities so that no damage is caused to existing buildings/ services. The contractor shall be solely responsible for any damage caused and consequences arising out of this damage. The contractor shall make good damage caused to building/ property at his own cost.

3. Anti-termite treatment:

Anti-termite treatment of all buildings in the project with Chlorpyriphos/ Lindane E.C. 20% as specified in IS-6313 (Part-2) 2013 and as per CPWD Specifications shall be got done through approved specialized agencies only. Anti-termite treatment of all buildings shall be

guaranteed for TEN YEARS, to be reckoned from the date of expiring of the Defect Liability period prescribed in the contract

4. Damp-proof course:

The damp-proof course (DPC) shall be laid at plinth level/ or as per requirement in the brick work walls resting on brick foundations, as per approved drawings and as directed of 50mm thickness with cement concrete 1:1.5:3 (1 cement: 1.5 coarse sand: 3 graded stone aggregate 20 mm nominal size) mixed with water proofing material in cement concrete work in doses by weight of cement as per manufacturer's specification.

5. Plinth Protection:

Plinth protection, as required, shall be with 75 mm thick of cement concrete 1:2:4 (1 cement: 2 coarse sand:4 graded stone aggregate 20mm nominal size) over 100 mm bed by dry brick ballast/ stone aggregates 40mm nominal size well rammed and consolidated and grouted with fine sand including finishing all around the buildings, as per tender drawings and approval of Engineer-in-charge. The width of the plinth protection shall be 750 mm (Minimum). The required brick toe wall/brick on edge/stone pitching on slope shall be provided as per site requirements.

6. Plain Cement Concrete and Reinforced Cement Concrete Work:

a. Plain Cement Concrete/Lean Concrete: -Plain Cement Concrete / Lean concrete of 1:4:8 (1 Cement : 4 coarse sand (zone-III) derived from natural sources : 8 graded stone aggregate 40 mm nominal size derived from natural sources) in required thickness as per design shall be laid below the raft and all type foundation works, below kerb stone, under floors or wherever required as per UP PWD/ CPWD Specifications with correction slips up to the last date of submission of tender documents and as specified in the Tender Drawings.

b. RCC Work (Concrete Mix Design):- The RCC work of specified Grade as per approved Structural Design/ drawings shall be done with Ready Mix Concrete /Design Mix Concrete, unless otherwise specified as per UP PWD/ CPWD Specifications with correction slips up to the last date of submission of tender documents.

In case, Ready-Mix Concrete (RMC), the EPC contractor shall be permitted to procure the same from the source approved by the Engineer-in-charge. In such a situation, all technical requirements such as cement type and minimum cement quantity, w/c ratio, slump, admixture etc. shall be conveyed to RMC supplier by the contractor and contractor shall be wholly responsible for ensuring the property of concrete as required at site.

In case of Design Mix Concrete, the EPC Contractor shall install the Batching plant (Digital) of adequate capacity with approval of the Engineer in charge. The concrete shall be produced through fully computerized weigh-batching plant of suitable capacity conforming to IS: 4925 with the arrangements for automatic dispensing admixture and having facility of giving print out indicating weight / details of all ingredient of concrete in each lot/ batch and variations from the approved design mix if any. The contractor shall carry out the concrete mix design with and without admixture through one of the following laboratories/Test houses to be approved by Engineer-in-charge: -

i) IITs, NITs or any Govt. Engineering Colleges.

ii) In the event of all the above laboratories being unable to carry out the requisite

design/testing; the Contractor shall have to get the same done from any other reputed laboratory with prior approval of the Engineer-in-Charge.

iii) Samples of materials (i.e. Cement, Coarse, fine aggregates & admixtures) shall be jointly sealed by Engineer-in-charge and contractor before sending the same for Mix design. The design mix shall be with or without admixtures as per specifications /requirements at site.

7. Brick Work:

The bricks used in the brick work shall be Common burnt clay bricks of F.P.S. (non-modular) of class designation 7.5.

i. Bricks used in the work shall be obtained from kilns to be got approved from the Engineer in charge and shall be best quality bricks. There characteristic compressive strength shall be in conformity to the provision in Latest UPPWD/CPWD Specifications for works.

ii. For mortar, use of PP Cement shall be preferred. The mortar shall be as under:

a) For brick work cement mortar 1:6 (1 cement: 6 coarse sand)

b) For half brick masonry cement mortar 1:4 (1 cement: 4 coarse sand)

iii. The half brick masonry (with F.P.S. bricks) shall be provided with 2 Nos. 6mm dia. M.S. bars at every third course of masonry.

iv. RCC Coping of specified thickness and shape to be carried out over Brick Parapet walls/ Boundary/Toe walls etc. of required M25 Concrete Grade.

The work shall be done in accordance with UPPWD/CPWD specifications with correction slips up to the last date of submission of tender documents.

8. Finishing:

The surfaces of brick work, RCC, CC etc. shall be treated and finished with Cement Plaster. The cement plaster shall be provided as under:

a. Plane wall faces: 12mm thickness (minimum) cement plaster 1:6 (1 cement: 6 fine sand).

b. Rough wall faces: 15mm thickness (minimum) cement plaster 1:6 (1 cement: 6 fine sand).

c. Ceiling and RCC works: 6mm thickness (minimum) cement plaster 1:3 (1 cement: 3 fine sand). In respect of RCC works, in continuation with the brick work, plastering as per brick work shall be continued over RCC works.

d. All External faces: 18mm thickness (minimum) cement plaster in two coats, under layer 12mm thick cement plaster 1:5 (1 cement: 5 coarse sand) finish with a top layer of 6mm thickness (minimum) cement plaster 1:6 (1 cement: 6 fine sand).

e. The junction of RCC work and brick walls shall be covered with minimum 26 gauge G.I. chicken wire mesh fixed with screws/washers, crack fill etc. to avoid cracks in plaster work.

f. The trenches / open drains: 15mm plaster finished with cement plaster 1:4 (1 cement: 4 fine sand) with floating coat of neat cement & adding of Water proof compound.

g. Provide drip course/ groove in plastered surface or moulding to R.C.C. projections and Grooves in plaster as per requirement.

The work shall be done in accordance with UPPWD/CPWD specifications with correction slips up to the last date of submission of tender documents.

9. Painting:

The plastered surfaces shall be finished as per the finishing schedule/tender drawings.

Painting on doors, windows, Grills, MS work, structural steel, rolling shutters, railing and other members requiring painting, shall be treated with primer coat and finished with painting of approved shade and manufacture in required coats, as per UPPWD/CPWD Specifications, to meet the functional requirements as specified in the Finishing Schedule.

a. All paint work on concrete and plaster surfaces shall include application of white cement-based putty as base preparation, application of primer in compatibility with the respective type of paint and painting with 2 or more coats of paint as per technical specifications.

b. All paint work on structural components (excluding Stainless steel) shall include application of coat of Zinc Chromate primer & two or more coats of Synthetic Enamel paint of desired shade & approved make complete in all respect as per technical specifications.

c. The soffits of all projections, jambs, parapet walls terrace (in side) shall be finished with premium acrylic smooth exterior paint with silicone additives of approved shade and make.

d. The wood work shall be painted as per finishing schedules / requirements.

e. Road Painting: Thermoplastic paint for indicating parking spaces & road marking as per IRC guidelines.

10. Door & Windows

The doors and windows shall be provided as per the requirements indicated in the finishing schedules/tender drawings and Technical specifications. In case of variance, the decision of HITES shall prevail. However, the various types of Doors and Windows as per UPPWD/CPWD specification shall be as under:

a. <u>Wooden</u>

Flush doors- Providing and fixing ISI marked flush door shutters conforming to IS : 2202 (Part I) decorative type, core of block board construction with frame of 1st class hard wood and well matched teak 3 ply veneering with vertical grains or cross bands and face veneers on both faces of shutters fixed with SS ISI marked butt hinges. Shutters to be polished with Melamine polishing (one or more coat) as per CPWD/UPPWD specifications. Lipping of 2ndclass teak wood battens 25 minimum depth to be provided on all edges of flush door shutters. Glass Vision panel to be provided as per requirement in the Flush Shutters.

Hardware: All hardware for doors and windows shall be of Stainless Steel of SS 316 Grade or as specified of approved size and design.

b. uPVC Windows:

The factory made uPVC Glazed windows (shutters including frame) of approved colour and approved uPVC make shall be provided as per Schedule /opening size given in the tender drawings with all Hardware like rollers, locking devices, handles etc. complete in all respect as per CPWD/ UPPWD Specifications.

c. Aluminum Works

i. All Door frames/ Ventilators and partitions with Powder coated aluminum extruded built up standard tubular sections/ appropriate Z sections/built up sections and/or other sections with minimum thickness of powder coating 50 micron of approved make conforming to IS: 733 and IS: 1285 as per UPPWD/CPWD specifications.

ii. Hardware: All hardware for windows shall be of Powder coated aluminum or as specified.

d. MS Works

MS Works shall be carried out as per UPPWD/CPWD specifications and duly painted with coat of Zinc Chromate primer & two or more coats of Synthetic Enamel paint of desired shade & approved make complete in all respect as per specifications and as per requirement.

i. MS door shutter and frame at Mumty.

ii. Hardware: All hardware for MS doors and windows shall be Powder coated MS

iii. M.S. Grill as per requirement in windows.

e. Rolling Shutter

Rolling Shutters to be provided as per UPPWD/CPWD specifications with all fitting and fixtures, shutters to be duly painted with coat of Zinc Chromate primer & two or more coats of Synthetic Enamel paint of desired shade & approved make complete in all respect as per specifications and as per requirement.

i. With mechanical operation system.

ii. With MS Grill / without MS Grill as required.

f. Channel collapsible MS Gate

Channel collapsible MS Gate to be provided as per UPPWD/CPWD specifications with all fitting and fixtures, shutters to be duly painted with coat of Zinc Chromate primer & two or more coats of Synthetic Enamel paint of desired shade & approved make complete in all respect as per specifications and as per requirement.

Note: -

- Door Frames shall be fixed with expandable dash fasteners of approved make of specified size with necessary plastic sleeves and SS screws including drilling holes complete as per the instruction of Engineer-in charge. Size of Fasteners should not be less than 10mm dia& 140mm long.
- All aluminum members shall be wrapped with self-adhesive non-staining PVC tapes of make approved by the HITES.
- Filling the gap in between aluminum frame/uPVC& adjacent RCC/ Brick/Stone work by providing weather silicon sealant over backer rod of approved quality as per architectural drawings and direction of Engineer-in-charge complete.

11. Railing Work:

a. Mild Steel:

The Mild Steel railing shall be provided in staircase / ramps of building and other locations etc. as specified in the tender drawings/ finishing schedule and as per UPPWD/CPWD Specifications duly painted with coat of Zinc Chromate primer & two or more coats of Synthetic Enamel paint of desired shade & approved make complete in all respect as per specifications and as per requirement.

b. The open drains / channels /cable trench shall be covered with the Epoxy coated MS Gratings.

12. Structural Steel

MS Ladder: Provision of suitable size MS Ladders finished with coat of Zinc Chromate primer & two or more coats of Synthetic Enamel paint of desired shade & approved make complete in all respect as per specifications and as per requirement . MS Ladder shall be provided for approach to terraces of single storied Buildings/ single storied portion of the Buildings, Mumty, Water Tanks, and Pump Rooms etc.

13. Flooring:

a. Various types of flooring, skirting, dado and window sill work shall be carried out by the EPC Contractor as per the finishing schedule, tender drawings and in accordance with UPPWD/CPWD specifications

b. In order to keep the floor finish as per Architectural drawings and to provide required thickness of the flooring as per specification, the level of top surface of RCC shall be accordingly adjusted at the time of its centering, shuttering and casting. Alternatively, for maintaining the floor finish, grading with cement concrete with nominal mix 1:2:4 (1 cement: 2 coarse sands: 4 graded stone aggregate 10mm nominal size) shall be provided.

c. Protective layer to be provided for all types of flooring, during construction activities.

d. Stone for Staircase and entrance steps/treads and risers and handicap ramp shall be in single piece unless otherwise as specified/as per requirement.

e. The edges of steps in the staircases, counters, kitchen platform, window sills, facias and similar location shall be edge molded.

f. <u>Minimum Bed mortars for various types of flooring</u>

i. Chequered tiles/stone flooring/kota stone flooring/granite flooring/ Ceramic glazed floor tile flooring/vitrified flooring - 20mm thick bed of cement mortar 1:4 (1 cement: 4 coarse sand).

ii. For dado, skirting and risers of steps in Chequered tiles/stone /kota stone /granite / Ceramic glazed floor tile /vitrified tiles- 12mm thick bed of cement mortar 1:3 (1 cement: 3 coarse sand).

iii. The vertical facia and drops shall be finished with epoxy resin-based adhesive.

g. <u>Types of flooring</u>

The types of flooring shall be as per finishing schedule / tender drawings. However, these are brief as under:

i. Ironite Concrete Flooring

ii. Vitrified Flooring(Double/Multi-Charged/ Full body) F

iii. Ceramic tile Flooring

iv. Kota Stone Flooring

v. Chequered Tile Flooring

vi. Flooring for SERVER/ EPABX/ Fire Control/ CCTV Room: - Removable raised/ false access flooring with system and its components of approved make for 300/450 mm height with possible height adjustment conforming to UPPWD/CPWD Specifications.

vii. Skirting/Dado:-

a. Skirting in respect of above shall be of the same material and specifications and the height as specified in tender drawings/finishing schedule.

b. The dado works in the toilets/ washroom/ kitchen/ pantry/ lobby area/ shall be with ceramic tiles and of height as specified in tender drawings/finishing schedule.

c. The dado work in the corridors of Drug ware house and other locations shall be as specified in tender drawings/finishing schedule.

14. Water Proofing Treatment

i. All items for water proofing treatment for Roof Slab, sunken portion, Basement, Water Tanks shall be guaranteed for TEN YEARS, to be reckoned from the date of expiring of the Defect Liability period prescribed in the contract.

ii. The Water proofing treatment of terrace shall be done with Integral Cement Based Water proofing treatment with brick bat coba, laid in proper slope, as per specification with Khurras, Golas etc. complete as per UPPWD/CPWD Specifications.

iii. Integral Cement Based Water Proofing Treatment for Sunken Floors of W.C`S/ Bathrooms etc. to be carried out as per UPPWD/CPWD Specifications. The Water Proofing shall by applying cement slurry mixed with water proofing cement compound consisting of applying:

- First layer of slurry of cement @ 0.488 kg/sqm mixed with water proofing cement compound @ 0.253 kg/ sqm. This layer will be allowed to air cure for 4 hours.
- Second layer of slurry of cement @ 0.242 kg/sqm mixed with water proofing cement compound @ 0.126 kg/sqm. This layer will be allowed to air cure for 4 hours followed with water curing for 48 hours. It shall be protected with concrete screed, of required mix, laid in proper slope all complete.

iv. The water proofing of all water tanks, shall be done by Crystallization Water proofing treatment as per latest CPWD Specifications/DSR Items of UPPWD/CPWD.

v. The Water proofing work shall be got executed from the approved specialized agency.

15. Pavers

a. **Interlocking Pavers :-**

The Interlocking pavers shall be provided in Pathways, roundabout, cycle track of required size and thickness 80 mm thick, factory made of cement concrete mix of M-30 manufactured in joint less moulds on vibrator table finished smooth as per required shape size and pattern, colour and to be laid over subgrade etc. as per UPPWD/CPWD specification.

16. Roadwork

All the roads/ approaches to buildings are to be constructed as per layout drawings and UPPWD/CPWD specifications (up to date correction slip). The roads shall meet the firefighting norms.

In the Drug Warehouse Building complex RCC Roads shall be with minimum M-40 Grade of specified thickness and with required reinforcement as per designs and as per drawings of required width. Service roads of required width from main RCC roads to all round the buildings shall be constructed as per NBC/ IRC Codes.

All the roads camber, super elevation, semi - circle, circle & gradient etc. are to be kept with respect to road levels decided in road sections and as per IRC code. Wherever cross drainage or for other purposes culverts are required, sufficient levels of road are to be raised with proper gradient to provide the sufficient depth of culvert. The width of sub grade is to be kept sufficient to rest the kerb stone. Wherever box culverts/culverts are required the same shall be designed and provided as per I.R.C code.

All the road markings etc. shall be provided as per traffic rules. Footpaths connected to buildings plinths shall be provided with proper gradient, with brick masonry toe walls and MS/SS railing as specified. All footpath levels shall be 150 mm higher than road edge/green belt/ cycle track levels or as specified.

17. Window sills:

All projected window sills inside rooms of Drug Warehouse Building shall be provided with 18mm thick pre-polished granite stone of approved shade with edges molded.

18. Scale of Amenities and Finishing Schedule for Drug Warehouse Building: -

Scales of Civil & Electrical amenities for Drug Warehouse Building are proposed as below. EPC Contractor shall fulfill the requirements as indicated in the List given below:

Sl. No.	Item	Drug Warehouse Building
1.	Set of Pegs SS grade 316	In all toilets/ bath/ WCs
2.	18mm thick projected window Sill lining window jambs	Granite
3.	**WC with seats in toilets**	
	Orissa pan WC (European Style) with seat, lid and low level flushing PVC cistern.	As specified in tender drawing
	European-type floor mounted/ WC with seat, lid and low level flushing PVC cistern, water jet /health faucet.	
	Water jet /health faucet with EWC.	
4.	Wash Basin with CP Brass mixture type for hot & cold water with single lever, quarter turns ceramic cartridges.	
5.	Tap (Kitchen, toilet, bath & WC) CP Brass bib cock provided with quarter turns.	
6.	Tower rail of SS grade 316	
7.	6mm thick Clear looking Mirror with 12mm thick BWP ply paint finish fixed SS flat button studs.	As per design with each wash basin

8.	Toilet paper holder of SS grade 316 with European WC.	Yes
9.	Plumbing for Geyser.	Yes, in each toilet

a. **Finishing Schedule**

Sl. No	Location	Flooring	Dado/Skirting	Wall Finish	Ceiling
1.	Walk in Cooler	Thermally insulated 80 mm thick PUF insulation having 40+/- Kg/ m3 density as per IS 661with Bitumen Tar felt and Kota Stone Flooring	150mm Kota skirting	Thermally insulated 80mm thick PUF insulation having 40+/- Kg/ m3 density as per IS 661with suitable chicken wire mesh and further Civil work as per norms.	Thermally insulated 80mm thick PUF insulation having 40+/- Kg/ m3 density as per IS 661with suitable chicken wire mesh and further Civil work as per norms.
2.	Office, Pharmacist Room, Cold Chain Room, Computer Room, CCTV Room, SMO Room, Corridors and Storage area at F. Floor	Double charge vitrified tile (600x600mm) with 3mm spacer and cementations grout flooring	150mm High vitrified tile Upto 1350 ht. ceramic tile dado	Oil bound Distemper(OBD)+with Primer coat over smooth base of putty	Oil bound Distemper(OBD)+with Primer coat over smooth base of putty
3.	Toilet	Anti-skid Ceramic tiles	Ceramic tile dado(upto 2100mm height)	Oil bound Distemper(OBD)+with Primer coat over smooth base of putty	Oil bound Distemper(OBD)+with Primer coat over smooth base of putty
4.	Staircase with MS Railing 1050 mm high	Kota Stone	150mm High Kota stone skirting(Including skirting 1350mm synthetic enamel paint dado)	Oil bound Distemper(OBD)+with Primer coat over smooth base of putty	Oil bound Distemper(OBD)+with Primer coat over smooth base of putty
5.	Ramp with MS Railing 1050 mm high	Chequered precast cement tiles with 150mm skirting		Oil bound Distemper(OBD)+with Primer coat over smooth base of putty	Oil bound Distemper(OBD)+ with Primer coat over smooth base of putty
6.	Loading Unloading Platform, Rejected Medicine Area & Rest Of 7m Hich Store Area, Quarantine & Sorting Area/ Portico And Pump Room & HT Meter Room etc.	Vacuum Dewatered flooring with ironite floor hardener	150mm Cement Concrete skirting. All the exposed RCC columns in these area shall have edge protection with 50x50mm x5mm angle up to 1200mm duly painted	Oil bound Distemper(OBD)+with Primer coat over smooth base of putty	Oil bound Distemper(OBD)+with Primer coat over smooth base of putty
7.	Boundary Wall, Grill & Gate:- Cement Plaster 12 mm & 18 mm thick as per Specification on both faces of wall. Wall to be painted with premium acrylic smooth exterior paint with silicone additives of approved shade and make as per Specifications. MS Gate & MS Grill to be provided and painted with Zinc Chromate primer & two or more coats of Synthetic Enamel Paint				
8.	All Exterior walls/soffits of all projections, jambs, parapet walls of buildings shall be finished with premium acrylic smooth exterior paint with silicone additives of approved shade and make as per Specifications. All paint work on concrete and plaster surfaces shall include application of white cement-based putty as base preparation, application of primer in compatibility with the respective type of paint and painting with 2 or more coats of paint as per technical specifications.				

Sl. No.	Description	Drug Warehouse Building
1.	**Door & Window Frames, Shutters and Hardware Fittings (Finishing schedule shall govern)**	
2.	Main Entrance Door & Shutter	MS Rolling shutter
3.	Internal Door Frame	Aluminium
4.	Windows	uPVC with Toughened Glass
5.	Ventilators	Aluminium
6.	Staircase Door	MS
7.	Walk In Cooler	Puff sandwich Door as per Specification
8.	Rooms-shutters	Flush Door with Teak Veneered Ply
9.	Toilets -	FRP door shutter
10.	Hardware & Fittings for Doors	Mortise Lock cum handle/ Sliding door bolts, two tower bolts (250x10mm) and handles (125mm) of SS grade 316 of approved make

19. Horticulture and Plantation:-

The Horticulture and Plantation works shall be carried out around the building as per the related plans. Maintenance of plants/ lawn shall be carried out during defect liability period.

D. DESIGN BASIS REPORT- PLUMBING

(Water Supply and Sanitary Installation)

1. Basic Objectives

The EPC Contractor shall provide all sanitary engineering services and specification in relation to:

i. High standards of materials and workmanship.

ii. Leak proof plumbing.

iii. Reliable and dependable engineering systems.

iv. Plan the system in such a way as to minimize the energy requirements.

v. Create minimum nuisance and disturbance to the environment.

2. List of Codes and Manuals

The following codes of practice and design manuals are being referred for designing the Water Supply, Sanitary and Drainage Systems:

S. No.	Description
i)	National Building Code 2016 Handbook on Water Supply & Drainage (with Special Emphasis Plumbing),
ii)	Bureau of Indian Standards SP-35
iii)	Manual on Water Supply & Treatment (Ministry of Urban Development)
iv)	Manual on Sewerage & Sewage Treatment (Ministry of Urban Development)
v)	UP PWD/ CPWD Specifications

3. General:

i) The EPC Contractor shall carry out design, supply, installation, testing & commissioning of the water supply, sanitary installations and drainage system and integration with the existing system, all complete.

ii) The water supply system shall be gravity based and water supply system for domestic water supply shall consist of pumps, control panel, interconnecting pipes, valves, cabling, switchgear etc. as required for all buildings. For continuous water supply at adequate pressure, complete water supply system shall be designed. The sanitary installations systems and drainage systems shall be designed as per relevant BIS Codes and in conformance with the UP PWD/ CPWD specification and the guidelines given in the DBR.

iii) The work shall in general conform to the Latest UP PWD/ CPWD Specifications. The water supply and sewerage demand shall be estimated, based on the population as required by NBC norms, Local bye Laws & statutory norms. The different components related to services are listed as below:

3.1 Internal Plumbing Works

i. Sanitary fixtures & C.P brass fittings

ii. Soil, waste & rain water piping system

iii. Internal domestic and flushing water supply system

iv. Hot water supply system

v. Disposal of soil, waste & rain water

3.2 Source of Raw Water Supply & External Water Supply System

The tapping of raw water supply shall be done from Bore well/ Municipal water Supply Line, meeting the requirements under the scope of construction works.

i. Rain water shall be collected/ discharged to the rain water harvesting pits.

ii. Daily water requirements shall be met with storage of water in underground and overhead storage tanks.

iii. Suitable water Distribution System shall be provided as per norms/ requirements.

iv. Suitable capacity bore well, one number shall be provided in the Complex at a location as directed by Engineer-In-Charge.

3.3 Bore Well:

The bore well, one number, shall be provided with suitable submersible pump in the Complex up to adequate depth as per UP PWD/ CPWD specifications. The yield of the bore well shall be minimum 250 Liters per Minute. The bore well shall be provided as per detailed design distribution and requirement at the location as directed by Engineer-In-Charge and as marked in Site Layout Plan. The EPC Contractor shall, at his own cost, duly obtain all statutory approval/ No Objection Certificate (NOC) etc. from Central Ground Water Authority (CGWA) and other statutory bodies, as applicable. Pipes & fittings shall be used in bore well as per UP PWD/ CPWD specifications and water supply pipes & fittings with necessary gate valves shall be provided as per requirements from bore wells to the overhead/ underground tanks, as per site requirements.

Drilling shall be done with 300 & 250 mm dia upto required water quality. Bore hole in soft land for installation of pump set with Hydraulic DTH rig machine. Same shall be including supplying all materials tools drilling rig and Air compressor and equipment as well as fuel, lubricants and cost of transportation or Rig machine and other vehicles up to the site including flushing charges, Geological investigation etc all complete.

Bore well work shall also include the following:

- ISI marked PVC tube well casing pipe as per IS: 12818, suitable for medium well application with threaded joints.
- ISI marked PVC tube well screen / slotted pipe as per IS: 12818, with threaded joints.
- Chemical and bacteriological examination of water.
- Sanitary sealing, disinfection of tube well as required.
- Submersible bore well water pump of suitable capacity motor having 250 liter per minute discharge at required head (Minimum 30 meter) as per water table including electrical control panel with Star/Delta starter, ammeter, voltmeter, single phasing preventer and all motor protection arrangement complete in all respects for erection and lowering of submersible pump, column pipe, valves, submersible cable up to the control panel, Starter, supporting clamps, cable clips, pressure gauge, connection line up to UG tank, Level controller interconnection to fill the tank, and all other accessories required for the proper completion of the work as desired on the site and by the Engineer-In-charge.
- 3" dia (88 mm OD) or as per requirement, uPVC submersible column pipe (Standard duty, min walls thickness = 5.2 mm at mid-point) with coupler, pipe fittings such as bends, tee, sockets, clamps, nipple, elbow, nut bolts, rubber packing etc as required to complete threaded joints complete, shall be provided.

- Water meter/ pressure gauge/Valve/Cables complete as required, shall be provided.

3.4 Storm Water Drainage System

The rainwater for all buildings shall be collected in separate catch basin /Manholes and shall be discharged in the rain water harvesting pits, to be provided by EPC contractor.

4. Water Supply System

The water supply system shall include the gravity-based water supply system for water supply consisting of pumps, control panel, interconnecting pipes, valves, cabling, switchgear etc as required for all buildings. For continuous water supply at adequate pressure, complete water supply system shall be designed with following type of pipe-lines.

4.1 The water supply lines and inside building shall be connected with designed pipeline grids for buildings which shall be CPVC Pipe conforming to IS-15778 code (for Internal Water Supply Pipe.) & GI pipes', conforming to the requirements of IS 1239 Part-I (For External Water Supply). The water supply lines have been designed with CPVC & G.I pipes of different diameters with push on joints for (CPVC), as per requirements. All the operational valves/fittings also designed as per relevant IS code latest amended as on date and shall be fixed in clay bricks masonry chambers as per specification.

4.2 Water supply pipe from underground tanks to overhead tanks, ring main at terrace, down take from ring mains (in the shaft) up to the entry into the floors shall be with GI pipe (medium class). The water supply pipes from the shaft inside the floors concealed piping and to other end points shall be of C-PVC pipes of required grade/class, conforming to the requirements of IS-15778 Codes. To regulate the water supply, valves and fittings, at required places, shall be fixed as per specification. Laying of these pipe lines up to building shafts shall be underground and in shafts, supported with standard clamps up to the overhead's tanks complete as per UP PWD/ CPWD specification.

5. Sanitary Works:

Suitable guidelines shall be followed for providing the plumbing and sanitary requirements as per NBC-2016/ UP PWD/CPWD.

5.1 Sanitary Fixtures & C.P Brass Fittings

Plumbing fixtures, Chrome Fittings and accessories will be as per IS: 781-1984 and shall be of premium quality of approved make as per requirement of space, location complete in all respect including all accessories. Colour, shade, shape, size shall be selected and approved by Engineer-in charge. All appliances, fixtures and fittings shall be tested before and after installation.

5.2 Porcelain fixtures of fairly high quality as given below:

i. **WCs –**For general toilets/ other toilets, floor mounted EWCs with low volume dual flushing system (Chinaware cistern) along with Health Faucet with 1.2 meter long chrome plated finish flexible pipe with wall hook shall be provided.

ii. **Urinals** shall be provided with auto closing urinal flush valve for flushing arrangement. The partitions between the urinals shall be of granite of required thickness and size.

iii. **Accessories: -** Soap dispensers, toilet paper holders, Towel rail, hand drier (one each in common toilets), etc. shall be of Stainless Steel of approved make.

iv. **Chrome Fittings:-** Provision for additional and special hospital fittings where required shall be made as per IS: 781 - 1984.

v. **Sinks: -** Provision of Stainless Steel Sinks in Pantry/ kitchen/ Laboratories and other specified area with all fittings/fixtures.

5.3 Soil, Waste Pipe System

5.3.1 General:

i. Above ground piping shall be designed on the basis of two pipe system as recommended in code of practice for soil and waste. Soil pipes shall carry the wastes from WC's & urinals etc. Soil pipes shall connect directly through gully trap to the manhole outside the building.

ii. Internal buildings sanitary disposal system will be under the RCC slab (By core cutting RCC slab and suspended at bottom).

iii. Waste pipes shall carry the wastes from waste appliances (lavatory basins, kitchen sinks etc.). Waste pipes shall connect to Gully Traps outside the buildings and shall be connected to the external manholes.

iv. Soil/ Waste water pipe from building to manhole shall be Hub less centrifugally cast (Span) iron pipes epoxy coated in sides and outside as per IS code 15905. From manhole till soak pit, pipe shall be of suitable size of stone ware.

5.3.2 Design Parameters

i. Piping system shall be designed in accordance with Code of Practice for Installation of Soil & Waste Pipes.

ii. All vertical stacks will terminate as vent pipes at terrace level.

iii. All Vertical Stacks in the buildings will terminate at the ground floor level and connected to the external sewer. Pipe dia. and slope will be as per connected load.

5.3.3 Pipe Work

i. All vertical stacks will be installed in pipe shafts on the external face of the buildings or in internal shafts within the building according to the architectural planning of the toilets.

ii. Provision shall be made to provide cleanout doors and plugs for Roding and maintenance where necessary and required.

5.3.4 Materials for Soil, Waste & Vent Pipe System

Pipes used for Soil, Waste and Vent system shall be Hub less centrifugal cast (Span) iron pipes epoxy coated in-sides and out-side as per IS:- 15905. The pipes and fitting are jointed with SS 304 grade coupling with EPDM rubber gasket joints as per requirement and specifications. Pipe fittings viz. P or S Trap shall be

5.3.5 Sand Cast Iron Floor Trap or Nahani Trap

Sand cast Iron Floor trap or Nahani trap shall be 'P' or 'S' type with minimum 50 mm seal. However, if the plumbing is in two pipe system and with a gully trap at the ground level the minimum water seal shall be 35 mm. The traps shall be of self-cleansing design and shall have exit of same size as that of waste pipe. These shall conform to IS 1729.

6. Sewerage System

6.1 Design Parameters

a) Velocity

Minimum velocity at peak	=	0.60 m/sec
Maximum velocity at peak	=	3.00 m/sec

b) Peak Factor = 3 times the average flow c)

c) Interception factor = 0.80

d) Manning Constant = 0.011 (for uPVC pipes)

e) Design Equation = Manning Equation.

6.2 Flow conditions in pipe

Pipes up to 250 mm dia = 50% full running. Pipes from 400-

900 mm dia = 67% full running.

6.3 Min. depth for sewers

For branches = 1 M.

For lateral, main & trunk sewers = 1.5 M. / as per required gradient

a. Type of Distribution

Sewer flow shall be by gravity up to the final disposal point. The external sewer shall be connected to soak pit/septic tank as per requirement.

b. Manholes

The manholes are to be constructed with brick masonry as per standard specifications of NBC 2016 and shall have details as follows:

i. Rectangular manhole of size 900 x 800 mm up to 0.89 mtr depth.

ii. Rectangular road gully chamber of size 500 x 450 mm up to 0.6mtr depth.

iii. Circular manhole of size 910 mm dia for 0.9 to 1.64 mtr depth.

iv. Circular manhole of size 1220 mm dia for above 1.65 to 2.29 mtr depth

v. Circular manhole of size 1520 mm dia for above 2.3 mtr depth.

c. Spacing of Manholes

i. Manhole shall be provided with all the junctions, change of directions, change in diameters and as per connection requirement from every units.

ii. A distance of 20 meters (maximum) on the main sewer line depending on dia of pipes and local conditions.

d. Manholes Covers

i. Medium duty S.F.R.C. manhole covers/ RCC grating for manholes on service roads, gully traps and manholes / chambers not following in the road / pedestrian ways/side berms/lawn area.

ii. Heavy duty S.F.R.C. manhole covers/RCC grating for manholes /service chambers/gully traps falling on main roads & service roads.

iii. Shape and dimensions of Manhole covers/RCC grating shall conform to UP PWD/ CPWD specifications & IS 12592

e. Treatment of Sewage

EPC Contractor shall carry out design and execution of Septic Tank suitable for 50 person as per IS- 2470 (Part-1 & 2) latest amended, for treatment of sewerage generated in the campus through NP2 RCC Pipes from Building as per UPPWD/ CPWD Specifications.

7. Storm Water Drainage System

7.1 General:

i. The rainwater from the terraces, open surface areas, as per design, shall be collected in the clay brick masonry chambers, collection chambers and shall be taken through the rain water system (RCC Pipe) & connected to the rain water harvesting pit.

ii. The network of storm water system shall be mostly catch basins and RCC pipe network, as per requirements.

iii. All paved/road/green areas, the runoff shall directly connect to the main storm water drains.

iv. Storm water pipe/Rainwater pipe from inside the building to the manhole outside the building shall be of uPVC of required grade/class, 6kg/sq.cm pressure rating conforming to relevant IS codes. The network system from manhole onwards shall be NP2/NP3 pipes as required up to Rain Water Harvesting Pits.

7.2 Design Parameters

i. The rainfall intensity of 50 mm/hr shall be considered for designing of storm water drainage system. However, The EPC contractor shall verify and in case, the rain fall intensity is higher, same shall be adopted.

ii. Minimum Pipe diameters for Rainwater Pipes from Terraces shall be 110 mm and maximum 160 mm dia.

iii. All construction specifications with respect to the manhole sizes etc. will be respected and followed and as per UPPWD/CPWD specification.

iv. The complete campus storm water drainage system designed with underground RCC pipe line with clay brick catch basin and manholes etc.

8. Raw Water & Fire Water Storage Tanks:

The Underground Tanks & Overhead Tanks at Terrace level shall be of adequate capacity. The storage capacity of firefighting tanks shall be strictly as per NBC Code 2016, local bye-laws provisions and as per specific provisions of this DBR in the respective head. Internal walls and floors of RCC water storage tanks are to be finished with ceramic glazed tiles.

The raw water received from Municipal Supply/ Borewell source shall be fed to UG Fire Water Tanks. UG Fire water tank shall have 2 compartments. Water will overflow from Fire Water Tank compartments to UG Raw Water Tank. Raw water shall be pumped to Overhead Tanks of the building through Water Transfer Pumps (2 No – 1W+1S) of suitable size & head. Necessary water distribution water lines shall be provided to meet the functional requirements as per directions of engineer-In-Charge. Fire Pump Room, & water pumps shall be provided adjacent to the respective UG water tanks as per NBC-2016 norms & CPWD specifications.

The minimum capacity of various underground and overhead water tanks is mentioned here as under:

Overhead Water Storage Tanks:

Sr. No.	Description	OH Fire Water Storage Tank Litres	OH Domestic Water Storage Tank, Litres
I	Drug Warehouse Building	10,000	5,000

Underground Water Storage Tanks:

Sr. No.	Description	UG Fire Water Storage Tank, Litres	Raw Water Storage Tank, Litres
I	Drug Warehouse Building	75,000 (2 compartments)	10,000

2 No (1W+1S) submersible sump pumps of suitable size shall be provided for pumping water out of Water Pump Room into nearest drain on the ground level.

The capacities of underground and overhead tanks mentioned above are indicative only. However, during detailed designing, if required and found necessary to meet functional & statutory requirements, the capacity / rating of the overhead tanks/ equipment shall be upgraded/ revised by EPC Contractor without extra cost subject to concurrence of Engineer-In-Charge.

PVC/ RCC Over Head Tanks shall be provided as directed by Engineer-in Charge.

DESIGN BASIS REPORT - ELECTRICAL & LV WORKS

1. GENERAL

(a) The EPC Contractor shall carry out Design, Planning, Engineering, Supply, Installation, Testing & Commissioning of complete Internal & External Electrification works including Low Voltage (LV) and other works as required and described hereinafter. All Electrical & LV works shall be designed and executed as per latest codes of practice for electrical installations and meeting the requirements of Indian Electricity Rules/Act, applicable I.S. Codes/ Rules and relevant IS/ CPWD/ UP PWD Specifications, special requirements of State Electricity Board latest up to date.

(b) EPC contractor shall obtain No Objection Certificate (NOC) from concerned Electrical Inspector authorities before energizing the electrical equipment & installations as per prevalent rules & regulations as part of scope of works.

(c) The rating and capacity of equipment indicated herein below are the minimum to be provided. However, during detailed engineering &designing, if required and found necessary, the capacity / rating of the equipment may be upgraded.

2. SCOPE OF WORKS:

Electrical & Allied Services cover required Electric Substations, 11/ 0.433 kV Transformer, Double Pole structure for receiving 11 KV HT Power, Internal Electrical Installations, HT Switch/Panel, HT Meter, LT Panels, Distribution Boards, External Electrical Installations, 11 KV HT and LT Cables, Road/ Compound/ Building Lighting, Street Light Poles, UPS, Internal & External Electrical Distribution work. It shall also include Fire Alarm System.

Suitable size shafts, cutouts, Niche, openings etc. shall be provided by EPC Contractor to facilitate installation of Cable Trays and Ducts etc. in all floor slabs of various buildings for various service areas, as required. All shafts, cutouts, Niche and openings etc. provided on floor slabs shall be suitably closed after laying of services lines with fire containing materials as per fire safety norms contained in NBC 2016 and CPWD specifications. Suitable size Fire Rated doors shall be provided for all shafts at all floors as per fire safety norms stipulated in NBC 2016 & CPWD specifications.

3. ELECTRICAL POWER REQUIREMENT

The Electrical load for lighting & power requirements has been calculated on the basis of covered area of various buildings/ blocks as per NBC 2016 & ECBC latest as amended.

Peak Electrical Demand for Drug Warehouse including various lighting & power loads considering diversity factor is 100 KVA.

Oil Type Transformer, 11/0.433 KV shall be provided with Off Load Tap changer. All Transformers, HT Switch/ Panel, HT Meter, LT Panels, Capacitor Panels etc shall be provided as per norms and directions of Engineer In-charge.

4. SOURCE OF ELECTRICAL POWER SUPPLY:

11 KV HT Incoming power shall be obtained from state electricity board or from existing HT Panels of nearby existing substations in the campus by suitably extending these 11 KV HT Panels.

The modifications/ extension work in the existing HT Panels located in existing substations shall be carried out by the EPC Contractor, if required. Such modifications/ extension work shall comprise of but not limited to, coordination with client for shut downs, HT Panel bus bar extension, supply/ laying of 11 KV HT cable & control cables including their termination, jointing etc, instrumentation work, all required civil foundation works etc. The Make/ Model of 11 KV VCB feeders to be extended shall be preferably matched with Make/ Model of existing incoming/ outgoing feeders in existing HT Panels.

5. ELECTRIC SUB-STATION:

Electric Substations shall be outdoor Type complete with 11 KV HT Panel Board or Double pole structure with isolator, 11/0.433 KV Oil Type Transformer of 100 KVA -1 No, LT Switch Board, Capacitor Bank Panel (30 KVAR) and all other items/accessories as required to meet functional requirements. Suitable 11 kV HT Meter with suitable weather proof, outdoor type enclosures, complete with all accessories shall be provided as per UPPCL rules & regulations.

Main LT Panel shall be PTTA type (partially type tested assembly). Main LT panel shall have provision of suitable incoming feeder for receiving power supply from DG Set (future) also. Necessary control wiring for Auto Star / Stop of DG Set and integration with DG Set controller shall be provided in main LT Panel.

Trenches with suitable width & depth shall be provided for installation of HT Panels, LT Panels, Capacitor Panels, Battery Charger etc. and also for laying of HT/LT Power cables & Control Cables. Substation shall comprise of all ancillary equipment like Battery Charger etc. Suitable size supporting MS structures and MS Chequered Plates of minimum thickness 6 mm, duly painted shall be provided for the trenches inside the panel room as required. Hot Dip Galvanized Perforated/ Ladder type Cable trays of suitable size shall be used inside trenches as required.

All armoured HT/LT power cables, control cables, signal cables etc. shall be laid underground preferably along the roads & pathways at suitable depth as per CPWD/ UP PWD specifications. Adequate no. of Hume pipes/ DWC HDPE Pipes having suitable diameter with spare pipes shall be laid across the roads/pathways etc. as per directions of Engineer-In-Charge.

Maximum allowable transformer losses at 50% & 100% load shall comply to latest ECBC norms. All Substation/HT/LT Panel Rooms/Floor panel Rooms shall be provided with safety equipment/items like suitable elastomeric mat (as per relevant IS codes), fire buckets, fire extinguishers, hand gloves, danger plates (HT/LT rating), safety charts, framed Schematic/SLD etc. to meet statutory norms prescribed by electrical inspectorate authorities and as directed by Engineer-In Charge.

Suitable civil foundation/trenches etc. for all substation equipment shall be provided as per design load of respective equipment. All LT Panels shall have 20% spare outgoing feeders for different rating of feeders. At least one spare outgoing feeder shall be of highest breaker rating of the LT panel.

The bus bar size rating of all LT Panels will be one capacity/ size higher than that of incomer breaker capacity. 20% spare terminal blocks shall be provided for motor starter feeders and control wiring purpose in the panel.

Electrical Panel Rooms, Battery Room, Control Room and civil foundations & structures for all the equipment, as required shall be constructed by EPC Contractor in 11/0.433 kV Substation.

All electrical substations shall be provided with safety equipment/ items like suitable elastomeric mat (as per relevant IS codes) for Panels, fire buckets, fire extinguishers, hand gloves, safety charts, framed Schematic/ SLD etc. as directed by Engineer-In-Charge and as required by Electrical Inspectorate authorities as per statutory norms.

6. POWER FACTOR IMPROVEMENT: Real time Automatic Power Factor Control (APFC) Panels with ultra-heavy duty capacitors shall be provided as per details above to achieve overall power factor between 0.97 to unity (lagging) from existing Power Factor, as per ECBC with operation in both Auto and Manual mode.

The Rating & No. of Transformer and APFC Capacitor Panel is summarized as below:

SR.	SUBSTATION	TRANSFORMER	APFC CAPACITOR PANEL
1	11 KV/ 0.433 KV	1 X 100 KVA	30 KVAR

7. ELECTRICAL POWER DISTRIBUTION

The Electrical Power Distribution for electric supply shall be as detailed below.

a. Separate distribution system shall be provided for lighting load, Power & AC Load & UPS load. Each distribution system shall be with Electrical panels, Floor panels, Double door MCB Type DB's, VTPN DBs etc, as required.

b. Sub mains from Floor Panel to DBs & VTPN DBs shall be connected with armored power copper cables on surface/cable tray. Alternatively, DBs& VTPN DBs can be fed power through suitable size flexible PVC insulated, FRLS copper wires laid in concealed MS conduits of suitable size as per directions of Engineer-In-charge.

c. Hot Dip Galvanized Perforated Type Cable trays of suitable size with perforation not more than 17% shall be provided as required in all the Substations & Buildings as per requirements.

d. All power cables, up to & including 16 sq mm size, shall be 1.1 KV, Copper conductor, Armoured, XLPE cables conforming to IS-7098 code. All power cables above 16 sqmm size shall be 1.1 KV, Aluminum conductor, Armoured, XLPE cables conforming to IS-7098 code.

e. All control cables shall be 1.1 KV, Copper conductor, Armoured, XLPE cables conforming to IS-7098 code.

f. The power cabling shall be sized so that Voltage drop for cables/ feeders shall not exceed 2% at design load and for branch circuit; it shall not exceed 3% at design load.

8. EARTHING NETWORK

Earthing with GI Plate Earthing System & Copper Plate Earthing system, as required, shall be provided for Earthing of Substations equipment, Electrical Panel Boards, UPS and other Equipment /installations in each building. Earthing shall be in conformity with provisions of Indian Electricity Rules 1956 & as per IS-3043/ CPWD norms as amended up to date. Copper/GI earth strips shall be used for connecting the Electrical equipment's and Medical equipment's with Earth pits as per prevalent norms. Earth Leakage circuit breakers/ RCBO shall be provided in the DBs for individual units.

Copper Earth strips and Copper Electrode Earth Pits shall be provided for Body & Neutral Earthing of all electrical equipment in the Substation as per CPWD Specifications. Copper Earth strips and Copper Electrode Earth Pits shall also be provided for all Medical Equipment or as per OEM recommendations.

Earthing shall be carried out for all power distribution system and effectively bonding the equipment. Separate and dedicated earth pits/stations with Copper electrode & Copper earth strips shall be provided for the following:

a. 11 KV HT Panel/ Double Pole Structure/ HT Switch/ HT Meter

b. Main LT Panels, Capacitor Panels, Fire Pump Panel etc

c. UPS system – Body & Neutral

d. Transformers - Neutral & Body

e. Any other equipment as required and directed by Engineer-In-Charge.

However, GI strip earthing with GI electrode earth pit shall be provided for Electrical Floor panels located in various buildings. For Lifts, Copper /GI strip earthing with Copper /GI electrode earth pit shall be provided as per OEM requirements.

Suitable sized Elastomeric Safety Mats with suitable thickness shall be provided for all HT/LT Panels installed in the substations and all buildings, as required.

All three phase electrical installations shall be provided with double Earth connection and single phase electrical installations with one Earth connection as per CPWD specifications & NBC-2016.

9. LIGHTNING PROTECTION SYSTEM:

Lightning protection System for various buildings and blocks shall be provided by EPC Contractor as per IS/ IEC-62305-1:2010 (latest as amended), CPWD Specifications and NBC 2016 norms. The main and most effective measure for protection of structures against physical damage is considered to be the lightning protection system (LPS). An external LPS which consists of air-termination system, down-conductor system and earthing system is intended to:

a) Intercept a lightning flash to the structure (with an air-termination system),

b) Conduct the lightning current safely towards earth (using a down-conductor system), and,

c) Disperse the lightning current into the earth (using an earth-termination system).

Accordingly a standard lighting protection system will be provided in all the buildings as per NBC 2016 Standards, using single prone finials, horizontal and down comer Copper earthing strips of suitable size, terminating in the Copper Plate Earth Pits.

10. INTERNAL ELECTRIFICATION:

a. Following works shall be carried out in coordination with the civil work within the buildings complete in all respects as per latest IS Codes and CPWD Specifications.

   i. Wiring &Conduiting (PVC Conduits) for internal electrification, LV & Allied works except unarmoured Fire Survival Cable. MS Conduits shall be provided for laying unarmoured Fire Survival Cable. However, armoured Fire Survival Cable shall be laid on surface with suitable GI clamps as per NBC norms.

   ii. LED Light fixtures, Fan (Ceiling & Wall) & Exhaust Fans.

   iii. 6A Light Point /UPS Modular Switch & Socket Outlets.

   iv. 16A/ 20A Power/UPS Modular Switch & Socket Outlets

   v. L.T. Cables and Sub main wiring, circuit wiring.

   vi. Hot Dip Galvanized perforated Cable Trays

   vii. Raceways

   viii. Floor Panels, Distribution Boards & VTPN DBs.

   ix. Earth strips & Earth Pits

   x. Fire Detection & Alarm System

   xi. Any other system as required.

b. Following points shall be generally followed for internal and external electrification of various areas:

   i. Internal areas like rooms, corridors, lobbies, staircases, terraces, washrooms etc. of all buildings and blocks shall be adequately illuminated conforming to provisions stipulated in NBC 2016, ECBC and CPWD technical specifications maintaining the indicated Lux levels and Light Power Density.

   ii. The Internal Electrification work shall be carried out in recessed/surface mounted PVC conduits in accordance with CPWD General Specifications for Electrical Works Part-I (Internal)-2013 and Part-II (External)-1994 with up to date amendments.

   iii. PVC Conduits shall be surface mounted or laid on GI angle/ channels with suitable hanging GI supports in areas wherever there is false ceiling provision. In case there is no provision for false ceiling, PVC Conduits shall be concealed in the slab concrete during slab casting.

iv. FRLS PVC insulated Copper conductor wires will be used for points, circuit & sub-main wiring conforming to relevant IS-Codes. Wiring shall be carried out with following sizes of PVC insulated FRLS multiple stranded single core copper conductor wire/cable.

a. Light Point - 1.5 sq.mm

b. Ceiling /Cabin/Exhaust Fan Point - 1.5 sq.mm

c. Call Bell Point - 1.5 sq.mm

d. 6A Plug Point/ UPS Computer outlets (up to 3 outlets on one ckt.)- 2.5 sq.mm

e. Circuit Wiring - 2.5 sq.mm

f. General Power Point – 4 sq.mm

g. Modular Type Socket with 25A DP MCB for Water Geysers – 6 Sqmm

h. 20A Industrial Socket Outlet with 20A SP MCB – 6 Sqmm

i. Special Power Point – 6 Sqmm

j. Modular Type Socket with 25A DP MCB for AC Units- 6 Sqmm

k. Sub Main wiring from VTPNDB/ Floor Panel to DB:-

- For DB Incomer Size 25 A DP – 2RX6 Sqmm + 1R X6 Sqmm
- For DB Incomer Size 32/40 A DP – 2RX10 Sqmm + 1R X10 Sqmm
- For DB Incomer Size 63 A DP – 2RX16 Sqmm + 1R X16 Sqmm
- For DB Incomer Size 25 A 4 Pole – 3RX6 Sqmm + 2R X6 Sqmm
- For DB Incomer Size 32/40 A 4 Pole – 3RX10 Sqmm+2R X10 Sqmm
- For DB Incomer Size 63 A 4 Pole – 3RX16 Sqmm + 2R X16 Sqmm

v. Modular type switches, sockets and stepped type electronic fan regulators, bell push button along with matching mounting boxes of same make shall be used. Suitable call bells/ door bells with modular type bell switches shall be provided as required as directed by engineer-In-Charge.

vi. Color coding of the conduits, switches, sockets shall be provided for Normal & UPS power supply as per NBC 2016.

vii. LED Type Lighting Fixtures with inbuilt harmonic suppression mechanism shall be provided. All internal and external LED Light fixtures shall have THD less than 10%. Layout Drawings for Light Fixtures shall be submitted to HITES for prior approval before commencement of works.

viii. Suitable size & capacity Exhaust Fans shall be provided as required, for ventilation purpose in toilets/ washrooms etc and other utility/service buildings as per NBC 2016 provisions and as directed by Engineer-In-Charge.

ix. Suitable size & capacity Ceiling Fans/ Wall Fans (White/Off White color) shall be provided in all Office Rooms, Walk-In Cooler, Cold Chain Room, Store Rooms and other rooms/ areas of buildings as required and as directed by Engineer-In-Charge. Layout Drawings for Ceiling Fans shall be submitted to HITES for prior approval before commencement of works.

x. Separate dedicated shafts shall be provided for laying of pipes, cables, ducts etc. for Electrical, Mechanical and Fire Fighting services as required.

xi. Laying of DWC HDPE / Hume pipes for road crossing or in pucca portion & CC path etc. for electric / street lighting cables complete with adequate number of cable chambers shall be provided by the agency.

xii. After completing the work, necessary test results as envisaged in latest CPWD General Specifications Part-I (Internal) & Indian Electricity Rules, shall be recorded and submitted. The results shall be within the permissible limits.

xiii. GI Raceways with all accessories shall be provided in Data Server Room, ELV Rooms of various buildings as per requirements.

xiv. For areas having grid type false ceiling, recessed type LED Light Fixtures of size 600 mm X 600 mm shall be provided unless otherwise stated. For areas having false ceiling with Gypsum board, Down Lighter round type fixtures of suitable size shall be provided unless otherwise stated. Surface mounted Light Fixtures shall be provided in the areas without False Ceiling.

11. LIGHTING DESIGN & LIGHTING FIXTURE

LED lighting fixtures shall be provided with inbuilt harmonic suppression system to achieve total harmonic distortion (THD) less than 10% in all areas and buildings to achieve the illumination levels conforming to IS Code, NBC 2016, ECBC latest amended up to date. All LED lighting Fixtures shall have system luminous efficacy of more than or equal to 110 Lumens per watt including driver & accessories. Power Factor at 240 V AC shall be ≥0.95. Color Rendering Index shall be minimum 80 for Indoor Light fixtures & minimum 70 for Outdoor Light fixtures. Lighting Power Density (LPD) shall be achieved as per NBC/ECBC norms. Number of Light Fixtures (not less than 10%) shall be fed with UPS power in common areas, rooms corridors etc. of the buildings.

12. FIRE DETECTION / ALARM SYSTEM

Fire Detection & Alarm System shall be provided by the EPC Contractor in Drug Warehouse Building. Addressable Intelligent fire detection and Alarm system of latest IP based technology with Fire alarm panels, multi Sensor detectors, smoke detectors, heat detectors, beam detectors, response indicators, manual call point and hooters, light strobes etc. shall be provided. Manually Operated Electronic Fire Alarm System shall be provided in building as per NBC 2016 norms. EPC Contractor shall provide all the requirements specified for Fire Fighting installations under Table 7, Part 4, Fire & Life Safety, NBC 2016 & NFPA 72 norms under the scope of works and as directed by Engineer-In-Charge.

Fire Detection & Alarm System shall meet the requirement of NBC 2016/ CPWD Specifications/ State By-laws. License/Approval of Local Fire Authorities shall be provided for the complex. There shall be the proper Zoning of the buildings/floors. Repeater panel shall be provided in the building as required.

The Addressable Fire Alarm System shall have features as follows:

a) Addressable intelligent fire detectors with inbuilt short-circuit isolator and automatic addressing facility shall be provided.

b) All fire detectors shall have provision of visual indication in normal condition visible from a distance of 6 meters. A visual indication of detector's alarm condition shall be provided which shall be visible from a distance of 6 meters and shall be visually different from the indication (s) of other condition (s).

c) Detectors should be installed as per coverage defined in NBC 2016 and NFPA 72. It should include all rooms, halls, storage areas, stilts/basements, attics, lofts, and spaces above suspended ceilings including plenum areas utilized as part of the HVAC system. In addition, coverage should include all closets, elevator/Lift shafts, enclosed stairways, shafts,chutes, and other subdivisions and accessible spaces.

d) Suitable numbers of input/ output (C/M) relay modules shall be provided for connecting other equipment like Electrical Panels, lifts, firefighting system, Ventilators etc.

e) Fire Alarm Control Panel shall have maximum devices and detectors in one loop as per OEM standards and spacing between two detectors shall not be more than 7 Mtr.

f) Cabling shall be with Fire Survival category Armoured copper cable as per NBC 2016 norms. In case unarmoured fire survival cable is used, it shall be laid in MS conduit.MS Conduits for Fire Alarm system, if laid on surface, shall be provided with color band markings at interval of 2 meters with post office red color.

g) At least 10% spare provision for future device connection shall be provided in each loop card.

h) Suitable addressable loop powered sounders/ hooters with strobe for minimum 90db sound level.

i) Addressable manual call boxes shall be provided near all exits, stair cases, lift lobbies etc. as per relevant Norms.

j) Response Indicators shall be provided in all areas/ rooms, waiting areas, Corridors, Common Area, or in large room and above false ceilings etc. as per NBC 2016 norms.

k) Microprocessor IP-based fire alarm control panel for number of required loops with 24 hrs. Battery backup with LCD/ LED display, printer etc. shall be located in the fire control room.

l) Two Way communication Fire Fighters Telephone Jack & Handset with necessary accessories are to be provided in all the buildings as required.

A Repeater Panel shall be installed in the Fire Control/ Security Guard Rooms in a location accessible to the operators/ Fire Fighting personnel as per directions of Engineer-In-Charge.

13. UPS:

UPS Unit - 1No having capacity of **3 KVA** shall be provided by EPC Contractor for emergency lights, Fire Alarm Panels, Computers, CCTV System, LAN IP-EPABX and other essential loads as required in the building. Microprocessor Based UPS with latest IGBT technology shall be provided for uninterrupted power supply. UPS with separate Power distribution boards shall be provided.

The UPS System shall provide 30-Minute backup with Maintenance Free batteries and Bypass system. The system shall include the interconnection of UPS units & Batteries through flexible copper cables of suitable size, as required.

14. EXTERNAL STREET LIGHTING:

EPC contractor shall carry out supply, installation, testing & commissioning of Street Light Poles (7 Meter height above ground), outdoor Flood Lights (for loading/ unloading area & other areas as required) & outdoor Gate Lamps complete in all respects with LED light fixtures & civil foundations for external road lighting and compound/landscape lighting. The lighting control /operation for street Light Poles shall be automatically controlled with digital timer control switch through outdoor type Feeder Panels (IP-66) along with required size armoured power cables &earthing etc. Adequate number of Street Light Poles with outdoor type light fittings (IP-66) shall be provided for achieving illumination level of external areas as per NBC & ECBC Codes. Also, **4 No Solar Street Light Poles** "All in One Type" (7 Meter height above ground), GI Octagonal poles, shall be provided.

Street Light Layout Drawing shall be prepared by EPC Contractor & submitted to Engineer-In-Charge for approval before commencement of works.

All street light poles shall be made out of Galvanized Iron (GI) Octagonal tubes. Poles will be suitable for single and double side arms as required. Poles shall have a service window at the bottom comprising connector terminal, flexible copper wires for interconnections with light fixture & 6A SP MCB. Poles shall be mounted on civil foundations with Anchor bolts of suitable size & quantity as per OEM recommendations. Civil foundations for street light poles along with flexible corrugated pipes of suitable size shall be included in scope of works. The spacing of the street light poles pole will be designed to achieve illumination Lux levels as per latest CPWD Specifications, NBC 2016 and other relevant norms.

DESIGN BASIS REPORT- FIRE FIGHTING SYSTEM

1. GENERAL

The EPC Contractor shall carry out supply, installation, testing & commissioning of Fire Fighting System complete in all respects for the Drug Warehouse Building project as per norms specified for Fire Fighting installations under Table 7, Part 4, Fire & Life Safety, NBC 2016 under the scope of works and as directed by Engineer-In-Charge.

EPC contractor shall obtain No Objection Certificate (NOC) from concerned Fire Inspector authorities for Fire Fighting System works as per prevalent rules & regulations as part of scope of works.

- Type of the Building -- Ware House Building
- Max height of storage Building -- Category: Below 15m in height and covered area more than 250 Sqm.
- Categories as per NBC 2016 -- Group H (Storage Building),
  Subgroup: 2 (ii) Ground + one floor

Accordingly, following components & equipment under Fire Fighting System shall be provided by EPC Contractor as per NBC 2016 norms:

a. Fire Extinguishers – Required
b. First Aid Hose Reel - Required
c. Wet Riser -Required
d. Down Comer- Not Required
e. Yard Hydrant - Required
f. Automatic Sprinkler System - Required
g. Manually operated Electronic Fire alarm System - Required
h. Automatic Detection & Alarm System - Required
i. Underground Static Water Storage Tank – 75,000 Litres required
j. Overhead/Terrace Fire Tank – 10,000 Litres required
k. Fire Pumps near UG Storage Tanks & Terrace Fire Pump:
    i. Electrical Fire Pump, 2280 lpm – 1 No
    ii. Diesel Fire Pump, 2280 lpm – 1 No
    iii. Electrical Jockey Pump, 180 lpm – 1 No
    iv. Terrace Fire Pump, 450 lpm – 1 No

Fire Fighting System shall comprise of Wet Riser /Hydrant (Internal & External), Sprinkler system, Fire Extinguishers, Fire Signages near Fire Exits, Fire Brigade Inlet/Draw Out Connections etc. for the Building. Suitable size shafts, cutouts, Niche, openings etc. shall be provided to facilitate installation of pipelines etc. in floor slab of building as required. All shafts, cutouts, Niche, openings etc. provided on floor slabs shall be suitably closed after laying of fire services lines as per fire safety norms as per NBC 2016. Doors shall be provided for all shafts at all floors as per fire safety norms as per NBC 2016.

The system proposed is water based firefighting system having piping network inside and outside the building with internal and external Hydrants, First Aid Hose reel at regular intervals according to various type of occupancy. The distribution system shall be finally connected to ring main system for firefighting.

Water sprinkler system with water distribution pipes sprinkler heads above and below false ceiling shall be designed & provided to actuate automatically to extinguish the fire by discharge of water when room temperature crosses 68° C in case of fire.

Each Fire Hose Cabinet shall consist of:

- 2 No, 63mm dia and 15m long rubberized fabric lined hose pipe as per IS: 636 types-II.
- Gunmetal/SS male and female instantaneous type coupling as per I.S:903 with I.S. specifications.
- Gunmetal/ SS branch pipe with nozzle as per I.S:903
- First-aid fire hose reels with 20mm dia 36.5m long with 5mm bore gunmetal nozzle as per I.S:884 - 1969.
- Fireman's axe.
- Sprinkler to be installed in entire building As per NBC/Local Fire authority guidelines

The following standards, bye-law, manual has been followed in designing the firefighting system: -

a) Relevant IS codes published by Bureau of Indian Standards.

b) National Building Code- Part IV for Fire Protection System 2016.

c) Pumps, Valves and Accessories shall be preferably UL listed and FM approved.

d) CPWD General Specifications for Electrical Works-Part V (Wet Riser & Sprinkler System-2006).

e) NFPA/UL/FM certifications & TAC for guidance.

2. <u>Fire Signages:</u>

Various types of fire Signages shall be provided in the building complex as per NBC 2016 Part -4. Material of signage shall be of acrylic/aluminum of required dimensions. Floor signage will be provided in each floor within the staircase & should be easily readable. Each corridor of every floor will have directional signage indicating Fire Escape route. These Fire Signages shall be LED-based with UPS power backup as per requirement & directions of Engineer-In-Charge so that they will be visible in dark in case of power failure. Signage for Assembly Point also needs to be provided. Evacuation path signage & Emergency Exit signage shall also be provided. Some of the signages shall be hung from ceiling (both ways) to have proper visibility.

3. <u>Fire Extinguishers:</u>

The following type of portable fire extinguishers, conforming to IS : 15683 shall be provided at strategic locations of the building and premises as per directions of engineer-In-Charge.

- 6 No ABC Dry powder type of 6 Litre capacity
- 2 No CO_2 type of 4.5 Litre capacity

E. DESIGN BASIS REPORT- HVAC SYSTEM

1. SCOPE OF WORK:

The EPC Contractor shall carry out Design, Engineering, Supply, Installation, and Testing & Commissioning of HVAC System for the building. Split Air-Conditioning Units with Cooling mode provision, shall be provided in rooms/ areas as per following details:

Heat Load Calculation Sheet For Drug Ware House (Ground Floor)

Sr.	Description of Area	Length(m)	Width (m)	Area (Sqm)	Height(m)	Area In (Sqft)	TR	Approx (TR)
1	Walk In Cooler (GF)	6	11.77	70.62	7	759.87	7.60	8.00
2	Cold Chain (GF)	6	11.77	70.62	3.5	759.87	6.33	7.00
3	Office	4.2	3	12.6	3.5	135.58	1.04	1.50
4	Pharmacist	4.2	3	12.6	3.5	135.58	1.04	1.50
	Total (GF)			**164.44**		**1790.90**		**18.00**

Heat Load Calculation Sheet For Drug Ware House (First Floor)

Sr.	Description of Area	Length(m)	Width(m)	Area (Sqm)	Height (Ft)	Area In (Sqft)	TR	Approx (TR)
1	Computer Room(FF)	4.2	3	12.6	3.5	135.58	1.04	1.50
2	CCTV Room (FF)	4.2	3	12.6	3.5	135.58	1.04	1.50
3	CMO Room (FF)	4.2	3	12.6	3.5	135.58	1.04	1.50
	Total (FF)			**37.8**		**406.74**		**4.50**

All Split AC Units shall be Energy Efficient, having minimum 3-Star BEE rating, inverter driven with cooling mode.

Ceiling Fans shall also be provided in all above Rooms and areas as per directions of Engineer-In-Charge.

The rating and capacity of equipment indicated herein below are minimum to be provided. However, during detailed designing, if required and found necessary, the capacity/ rating of the equipment may be upgraded as per directions of Engineer-In-Charge.

2. <u>Ventilation System:</u>

Mechanical Ventilation System shall be provided for double height storage area of the Building as per relevant norms, standards & statutory bye law's provisions. **16 No. mechanical Air Circulator/ Ventilation Fans, 600 mm size,** shall be provided for efficient air circulation & ventilation of the double height drug storage area.

Mechanical Ventilation Fans shall also be provided for Toilets & other areas as per requirements. All ventilation fans shall be provided power supply through suitable Distribution Board, suitable size Switches/ MCB, wires etc. complete in all respects.

Suitable size stainless steel wire mesh shall be provided for all ventilation fans installed in double storage area and toilets for preventing entry of mosquitoes/ flies etc.

Fan Design, selection and sizing shall be done in accordance with provisions stated in NBC 2016, ASHRAE, ISHRAE, ECBC 2017 and Fire Bye-Laws.

END OF DBR