DESIGN CONCEPT REPORT ON MEP SERVICES FOR WING E & F ACME OZONE AT THANE
DATE – 01.03.2018

Team :-	
Project :-	**ACME OZONE AT THANE**
Client :-	**ACME REALITY**
ACME Housing happiness, since 1976	5TH Floor, Solitaire Park Chakala , Andheri
Architect:-	**MANDVIWALA QUTUB & ASSOCIATES**
MQA	No. 9 & 10, Turf Estate, Shakti Mills Compound, Off Dr. E. Moses Road, Mahalaxmi, Mumbai - 400011
MEP Consultant :-	**M/s.PANKAJ DHARKAR & ASSOCIATES,MUMBAI**
PDA Pankaj Dharkar & Associates M E P Consultants	302 Trade Avenue, 3rd Floor, Behind Landmark Building, Suren Road, Andheri(E), Mumbai – 400093. 022-26837283 / 349

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Part C:- CCTV & FIRE ALARM SYSTEM

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Part E:- ELECTRICAL

HVAC

1. Design Objectives

- To evolve sustainable and energy efficient design and engineering of HVAC system.
- To develop and engineer integrated and cost effective building intelligence system.

1.1 General Requirements

- Air conditioning & Ventilation systems to be designed & installed in accordance with the latest recommendations of ASHRAE and in confirmation with the latest International Building code, all local and National codes and the requirement of agencies exercising jurisdiction over work at the project.
- All piping systems shall be complete with hangers, anchors, guides, valves, insulation, etc.
- All duct systems shall be complete with hangers, volume dampers, fire dampers, smoke dampers, filters, diffusers, grilles, registers, insulation, etc.
- All equipment shall be complete with vibration isolation, starters, control wiring, painting, insulation, etc.
- All systems shall be fully tested and balanced.
- The entire installations, commissioning and performance evaluation procedures shall be predetermined and documented.

2. Design Criteria

The building is expected to be catered with varied need of air conditioning being multi facility. The systems are conceptualized to cater such needs with inherent features mentioned in subsequent Para.

- The systems provided for this project shall meet the following parameters while satisfying all local design weather conditions and code requirements.
  - Ventilation Rate for Mechanical Areas :-

STP	:	30 ACH (Over Process Area)
Car Parking Ventilation	:	6 ACH for Normal Condition;
		12 ACH for fire condition
Pump Room	:	10 ACH
Elevator Machine Room and Other	:	As per equipment Operating Parameters User specific service areas

  - Basic Consideration for cooling load calculation shall be as follows.

Site	:	At Thane
Latitude	:	19.1724° north
Longitude	:	72.9570° east

1. AMBIENT DESIGN CONDITIONS AS PER ISHRAE DATA :

Summer	-	DB 100°F / WB 82°F / RH 47% (DB 38.0°C / WB 27.8°C)
Monsoon	-	DB 86°F / WB 83°F / RH 86% (DB 30°C / WB 28.5°C)
Winter	-	DB 65°F / WB 58°F / RH 65% (DB 18.3°C / WB 14.4°C)

AC system

DX SYSTEM for Individual Apartments.

DX SYSTEM for Club house

- Indoor units selected would be in accordance to the interior requirement matching to the system performance, to achieve the desired room conditions.
- The individual apartment the Air condition is based on end users, preferable ODU locations will be proposed which will be identical for all flats.
- The HVAC Services for Club House will be designed as per Architect requirement suitable system shall be Variable Refrigerant System.

Basement Ventilation Systems:-

CAR PARKING VENTILATION SYSTEM:

The mechanical Ventilation systems are being considered to be designed for removal of heat and provide moderate dust free working environment for car parking areas while most importantly it has To carry out the function of smoke extract in case of fire.

The system for car parking ventilation shall consist of axial type fresh air fans**/ Exhaust air fans, multiple in numbers to operate as per the requirement.

*The system shall be working for dual application in a way that during normal operations part of the fans shall be operational based on the CO sensor while in case of fire all the fans shall be made operational depending upon input from the fire panel and fire zoning.

*All the fans shall be fire rated and selected to be used for smoke temperature of 300 deg.c for a period of one hour.

Car parking areas planned for manual stacked car parking shall be planned for 6 air changes/hr for normal ventilation and 12 air changes/hr for fire conditions.

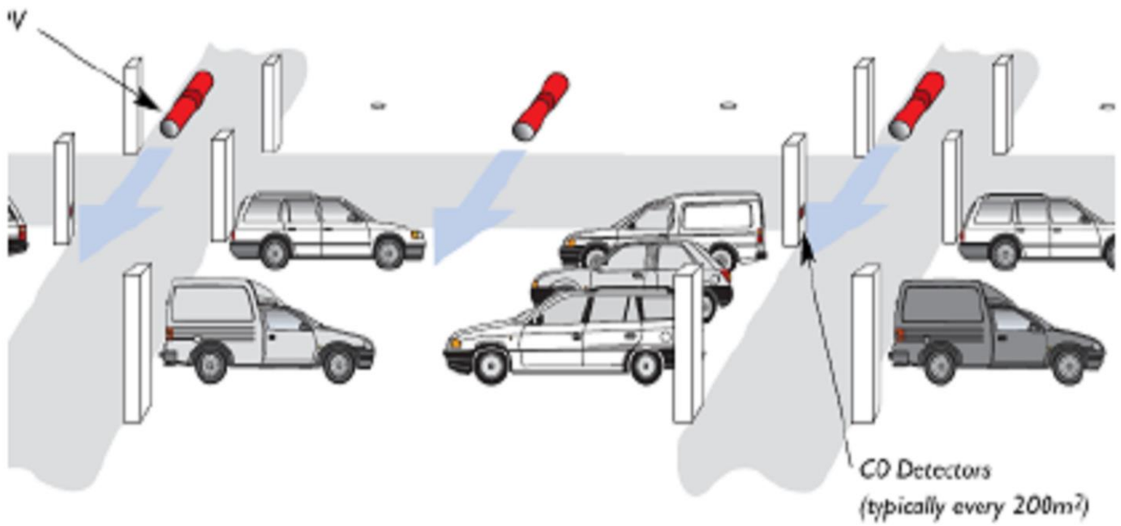
The car parking areas shall also be provided with jet fans to induce directional flow control of air over the parking areas.

The location of jet fans shall be determined based on the CFD analysis and numbers will be based on the velocity restrictions.

Jet fans also shall be suitable for fire rating with smoke temperature of 300 deg.c

The mechanical ventilation fans are being envisaged to be installed at respective fan locations shafts running from basement to grade level. The exhaust from such fans shall be ducted or taken through shafts at grade level.

The adequate space provisions in terms of shafts are expected to run through parking level -2 to grade level for the purpose.



Lift well Pressurization System.

Elevator shaft pressurization shall be carried as per NBC norms. Mechanical blower placed over staircase mumpty shall be actuated through smoke detection system and provide safe egress in case of emergency.

Staircase Enclosure Protection

The internal enclosing walls of staircases shall be of brick or RCC construction with a minimum fire resistance of 3 hours (this applies to all the tower and basement escape stairs). All enclosed stairs shall be accessed via a lobby with both doors (lobby & stair door) having a minimum fire resistance of 30 minutes.
Staircases will be mechanically pressurized throughout according to NFPA.

Mechanical Ventilation Systems

- The mechanical Ventilation systems are being considered to be designed for removal of heat and provide moderate dust free working environment.

- The systems are designed based on the adequate no. of air changes per hour however areas with higher heat dissipation could be considered for designing with restricted temperature rise over ambient temperature.

- The special emphasis is given to mechanical ventilation of plant room area with higher air changes per hour.

FIRE ENGINEERING

Project Brief:
The overall fire safety concepts for the building described within this report will deal with the means of escape strategy within the tower and the interaction with the physical fire safety features proposed within the building, such as compartmentation and fire separation. In addition to these elements, the active fire safety features, such as sprinkler protection and smoke control, will be introduced along with the building's proposed fire-fighting strategy.

1.1.1 Design Assumptions and Fire Safety Systems Design Criteria

The basic parameters for the fire safety design of M/s **ACME OZONE AT THANE** will be following local fire safety codes;

- National Building Code of India Part IV Fire & Life Safety 2016
- Practicing Engineers Architects and Town Planners Association (India) in Association with Mumbai Fire Brigade (Municipal Corporation of Greater Mumbai) Handbook on Fire Safety in High Rise and Special Type Buildings 1999

Fire safety systems within the building will be designed to a selection of appropriate standards as indicated below:

Fire Alarm System	NFPA 72, National Fire Alarm Code, 2002 Ed
Sprinkler System	As per NBC & CFO MUMBAI
Stand pipe and hose reel system	As per NBC & CFO MUMBAI
Portable Fire Extinguishers	As per NBC & CFO MUMBAI
Emergency Lighting	As per NBC
Fire resistance of elements	As per NBC
Fire Service Access & Facilities	As per NBC & CFO MUMBAI
Fire-fighting Lifts	As per NBC
Car Park Ventilation	As per NBC

1.1.2 Building Classification

In accordance to NBC, BUILDING will be classified as Group A ‘residential’. The building will comprise residential use flats.

The car park elements of the scheme are shared the between different uses and are therefore not ancillary to any one particular use. As such, this area of the building forms a separate classification in its own right and is categorized as Group H ‘storage’.

1.1.3 Fire Safety Approvals Process

In order to gain local approval of the fire safety design of the building, the following procedure requires to be followed via the local architects;
As a high rise building, the DC Regulations 1991 (Rule 43), require that the development must obtain a Clearance/No Objection Certificate (NOC) from The Chief Fire Officer (CFO) in Mumbai.

The procedure to obtain Clearance/NOC is essentially divided into two stages;

Stage I: Pre-construction

Received.

Stage II: Post Construction Final NOC from CFO

Following the construction of the building, and all the requirements of the NOC being complied with, the CFO should be approached for Final NOC. The premises will be inspected by the Fire Brigade to ensure compliance with the previously agreed requirements

Note: The Building Department will not issue an Occupation Certificate for the building without the Final NOC from the CFO.

It is to be noted that the project’s local architects/engineer will make the relevant application to the CFO.

2.0 Means of Escape

2.1.1 Emergency Egress Philosophy

The evacuation strategy for the building will be based upon minimizing disruption to occupants in the event of a small fire incident, or a false alarm, while efficiently evacuating those people who may be in direct danger from the effects of a fire. The means of escape strategy adopted for the tower will be the 'staged evacuation' of a selected portion of the building – this being considered the most efficient and least disruptive form of escape for the building.

2.1.2 Arrangement of Exits

NBC – 2005 gives specific advice with respect to when multiple exits are considered ‘alternatives’, other than to state that ‘where more than one exit is provided from a floor or room, these will be located as remote from one another as possible and arranged such that direct access in separate directions is achievable’.

Where the occupants travel to the storey exits within a 1 hour fire rated corridor, the exit separation is permitted to be measured along the actual travel distance between the storey exits

2.1.3 Travel Distances

Travel distances within all areas of the building (residential & car park) will adhere to the following maximum limits and defined by the CFO & NBC.

Escape in a single direction	15m
Escape in two directions	30m

Note 1: When measuring travel distance within the residential portions of the building, travel from 'no habitable' rooms (e.g. bathrooms, toilets, enclosed kitchens, cupboards, dressing rooms etc.) will not be considered.

Note 2: Measurement of travel distance will terminate at either a final exit (on the ground floor) or on the upper floors at either the door into the protected stair or the door into a protected lobby or corridor where provided.

2.1.4 Staircase

No exit shall be less than 1000mm except in assembly areas where this is increased to 2000mm

	Number of Occupants per 'Unit Exit Width'		
	Stairways	Ramps	Doors
Residential (Group A)	25	50	75
Mercantile (Group F)	50	60	75
Assembly (Group D)	40	50	60
Car Park (Group H)	50	60	75

Occupants per Unit Exit Width for Stairs, & Doors to be Applied to **ACME OZONE RESIDENTIAL BUILDING** at Mumbai.

2.1.5 Refuge Areas – Code Compliant Recommandations

As a high-rise residential building, a series of 'Refuge Areas' are required throughout the tower, to be used as shelters for use by evacuees exiting the building, or for use by the Fire Service to form 'staging areas' when entering the building to be followed as per the NBC-2005 / CFO-Mumbai.

2.1.6 Exit Signs

Self-illuminating, electrically operated, exit signs will be provided on all floors indicating the direction of escape in accordance with NBC.

3.0 Fire Doors

The following fire resistance periods for doors will be applied within **ACME OZONE RESIDENTIAL BUILDING** at Mumbai:

Door Location		Fire Resistance Rating (hours)
Staircase, protected lobby & refuge doors		2 hours
Corridors doors		2 hours
Lift Enclosures	Landing Doors	1 hour / 2 hour
	Car Doors	1 hour
Service Ducts/Risers Doors other than electrical		1 hours
Electrical Ducts / Risers Doors		2 hours
Transformer		4 hours
Switchgear & Generator Room Doors		2 hours

Table for Summary of Door Fire Resistances

3.1 Staircase Enclosure Protection

The internal enclosing walls of staircases shall be of brick or RCC construction with a minimum fire resistance of 2 hours. All enclosed stairs shall be accessed via a lobby with both doors (lobby & stair door) having a minimum fire resistance of 60 minutes.

3.2 Lift Shaft Enclosure Protection

The walls enclosing the lift shafts shall have a minimum fire resistance of 2 hours. Shafts shall have permanent vents at the top of 0.2m2 minimum free area. have a minimum fire resistance of 1/2 hour.
The maximum number of lifts in one bank shall be four. The shaft for the fire lift in a lift bank shall be separated from the adjacent lifts by brick masonry or RCC with a minimum fire resistance of 2 hours.

The lift machine room shall be separate from the shaft and shall not contain any other machinery.

4.0 Fire Safety Systems

4.1 Sprinkler Protection

The Car Parking Floors, lift lobbies of the building will be protected by an approved and supervised automatic sprinkler system, to be designed and installed in accordance with requirements as defined by the CFO.

The requirement of Under Ground tank and overhead tank considered as follows. However the same shall be followed as per the recommendation of Chief Fire Officer, Mumbai.

Static fire water storage tank for Fire Protection System has been provided underground of 400 cu-m capacity for Building Eucalaptia, Fenelia, Gingelia & Herbalia.. In addition, fire tank of 30 cu-m capacity shall also be provided at terrace level of each building.
Fire department connection shall also be provided on the external wall of the property near the main entrance. These shall comprise of 4 Nos. 63 mm dia male outlets capable of directly feeding the ring mains through non return valves or directly filling the static fire storage tanks. These shall be mounted in specially identified boxes.

4.2 External Fire Hydrants

A private ring main, containing external fire hydrants, will be provided in the area immediately surrounding the building for use by the Fire Service upon their attendance at an incident.

4.3 Internal Fire mains (Standpipe System)

Internal fire mains will be provided within the building to assist in fire-fighting operations for both the above and below ground floors (i.e. from the lowest to the highest storey within the building). The system will be provided as per NBC 2005 and any additional requirements as defined by the CFO.

The system will be provided with outlets within every escape stair enclosure (or protected lobby associated with each escape stair enclosure). Additional outlets will be provided where the most remote portion of a floor or storey is more than 60m, measured along a route suitable for laying hose, from a hose connection point.

The Following Pump Sets Provided for Fire Fighting System:

Fire Pumps Required for Building E,F,G,H:-

a. Electric Hydrant Pump Capacity 53.33 LPS; 3200 LPM 170 Mt head

b. Electric Sprinkler Pump Capacity 53.33 LPS; 3200 LPM 170 Mt head

c. Electric Hydrant & Sprinkler Stand by Pump Capacity 53.33 LPS; 3200 LPM 160 Mt head

d. Jockey Pump- Hydrant Capacity 3 LPS; 180 LPM 170 Mt head

e. Jockey Pump- Sprinkler Capacity 3 LPS; 180 LPM 170 Mt head

f. Jockey Stand By Pump- Hydrant & Sprinkler Capacity 3 LPS; 180 LPM 170 Mt head

g. Booster Pump– (Bldg. No.5) Capacity 15 LPS; 900 LPM 32 Mt head

h. Booster Pump– (Bldg. No.6) Capacity 15 LPS; 900 LPM 32 Mt head

i. Booster Pump– (Bldg. No.7) Capacity 15 LPS; 900 LPM 32 Mt head

j. Booster Pump– (Bldg. No.8) Capacity 15 LPS; 900 LPM 32 Mt head

Electrical pump shall provide adequate flow for catering requirement of hydrant system. Jockey pumps shall compensate for pressure drop and line leakage in the hydrant and sprinkler installation. Provision of PRS/ orifice plate shall be made in sprinkler riser to restrict pressure on sprinkler system.

Individual suction lines shall be drawn from the fire reserve tanks below podium1 level and connected to independent fire suction header. The electric fire pumps and the jockey pumps shall all draw from this suction header.

Delivery lines from various pumps shall also be connected to a common header in order to ensure that maximum standby capacity is available. The sprinkler pump shall be isolated from the main discharge header by a non return valve so that the hydrant pump can also act as standby for the sprinkler system. The ring main shall remain pressurized at all times and Jockey pumps shall make up minor line losses. Automation required to make the system fully functional shall be provided

4.4 Hose Reel System

A hose reel system will be installed within the building such that every part of the floor area is within 36.5 meters of a hose reel. The hose reels will be provided within either the protected stair enclosure, or the associated protected lobby, within a recessed area such that its presence does not reduce the effective width of the escape route. The provision of a hose reel system within the building is predominately for use by the building's occupants (prior to fire brigade arrival) and not for use by fire-fighters who will use their own hoses/equipment and the wet rising main provided in the fire-fighting lobby.

4.5 Fire Extinguishers

Portable fire extinguishers are to be provided throughout all areas of the buildings in accordance to NBC 20016.

4.6 Backup Power Supplies

An alternative source of LV/HV power will be provided from either two separate sub-stations or a diesel generator of adequate capacity for all necessary life safety & fire-fighting systems.

5.0 Fire Service Access & Facilities

5.1 Fire Fighting Philosophy

The philosophy to be adopted for fire-fighting within the building will be such that sufficient internal provisions are included within the design in order that a 'relatively' safe environment within the building can be created, in an area located near the floor of fire origin, such that fire-fighting activities can all take place internally and that external fire-fighting is not considered necessary.

5.2 Perimeter/External Access

For high rise buildings, require that an open space/courtyard be provided around the entire perimeter of the building, a minimum of 6m on either side, to allow sufficient Fire Service vehicle access to the building (this may however be Confirmed as per the requirement of CFO, Mumbai).

The necessity for vehicle access round all sides of the building is based upon the presumption that the Fire Service expect to be able to fight a fire from outside the building as well as internally.

However, the fighting strategy for the tower is that ALL fire-fighting will occur from within the building (ie. from the fire-fighting shaft using the wet rising mains etc.). This is the preferred strategy as it is consistent for ALL fire locations within the building. The largest fire appliance that the Mumbai Fire Service have available to them has a maximum working height of 60m and therefore the vast proportion of the building is always outside the reach of their tallest fire service vehicle. As such, fires above 60m (even if perimeter access was provided around all sides as per the code) would have to be fought from within the building. As a consequence, a more simplified approach will be adopted whereby good internal fire-fighting facilities will be provided and fires will always be controlled from within the building (irrespective of the height of the fire floor above ground level).

Where access to the site for the Fire Service is provided, the minimum width of any gate will be 6m and any
entrance canopy/archway will be a minimum of 4.5m in height. The open space at the entrance to the building will be paved up to a minimum of 6m from the building and the paving will be capable to supporting the weight of the a Fire Appliances up to 48 metric tonnes with a point load of 10kgs. Per cm2. The paved space will be free of obstructions and motor able.

6.0 Emergency Lighting

Emergency lighting will be provided throughout the building in accordance with NBC. The lighting will be powered from a source independent on that for the building's normal lighting capable of continuous operation for a minimum duration of 90 minutes.

The lighting will be positioned such that it clearly indicates all escape routes within the building to allow the safe movement of people in an emergency as well as providing illumination to all appropriate fire safety equipment. Emergency lighting will be sited to cover the following locations;

Near each intersection of corridors

At each exit door
Near each change in direction of escape route

Near each staircase so that each flight of the stairs receives direct light

Near any change in floor level

Outside each final exit

Near each fire alarm call point or emergency communication device

Near any fire-fighting equipment (eg. fire extinguishers / hose reels etc.)

To illuminate exit signage

Note: 'Near' is taken to be within 2m (measured horizontally)

The horizontal luminance at floor level on the centerline of an escape route will be at least 10 lux. For escape routes up to 2m in width, 50% of the route will be lit to a minimum of 5 lux.

7.0 Fire Stop Systems

The following areas / services to be minimally provided the passive fire protection system.
The cable ducts shall be sealed at every floor with noncombustible materials having the same fire resistances the fire eating of the duct.
The removable cover in the floors and the access panels shall be of the same strength of the fire rating as the floor and walls.
Every vertical openings between the floors of a building shall be suitably enclosed or protected as necessary to provide reasonable safety to the occupants while using the means of egress by preventing spreads of fire , smoke, or flames through vertical openings from floor, thus allowing occupants to complete their safe use of the means of egress.

CCTV SYSTEMS

CCTV SYSTEMS

1.0 General Description:

The CCTV system shall be considered for all the entry points to the complex, at all security doors, lift lobbies etc… Also cameras will be provided at Basement to monitor vehicular movement and personal movement.

1.2 Design Requirements:

CCTV system should be IP based with network video management software expendable up to unlimited cameras in single directory with the following components.

Digital video management base license

Camera connection licenses

Concurrent user licenses

Concurrent administration licenses

Unlimited storage license

The system should have centralized monitoring and controlling from the main security center.

Cameras to connect on IP network as shown below. All these IP connected cameras will be connected to PC via WAN or video matrix.

Closed circuit television should provide full coverage for all desired and required areas. It should be interfaced to allow programmable control for constant monitoring, motion based monitoring etc.

Location of CCTV should be strategic so it also prevents loss prevention. The following mention areas should minimum covered by CCTV:

Public Areas.

Main reception and common seating areas.

Parking areas.

Public areas like corridors, lift, library etc.

External cameras should have weatherproof housing for protection. Lighting requirement to various locations also to be considered for camera design.

Interior cameras should provide clear images under normal lighting conditions.

CCTV function should be controllable from one central location.

To view images one color monitor of proper screen size should be provided.

Motion detection is required to save images only if undefined motion has appeared in screen.

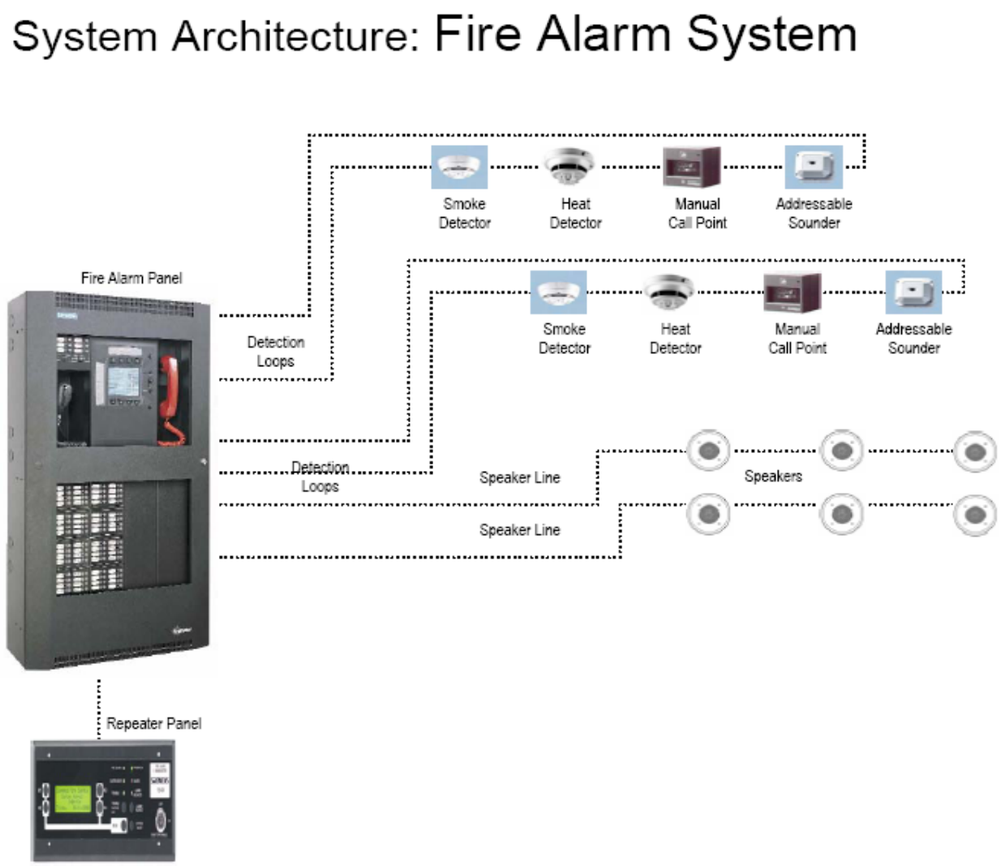
FIRE ALARM SYSTEMS

1.0 Fire Alarm & Detection

Lift Lobbies & Corridors of the building will be provided with a fully addressable automatic fire detection system and an emergency voice alarm/communication system or evacuation sounders as appropriate. The design, installation and testing of the system should be in accordance with NFPA.
The system will be designed to sound the alarm on the floors that require evacuation.

Equipments And Accessories

- Main Fire alarm control panel Analog addressable
- networkable, capacity with battery & charger, Printer (UPS Backup)
- Automatic spot type Analogue addressable Multi Criteria detector
- Addressable Manual call points
- Electronic Hooters
- Flashers / strobes
- Monitor modules
- Control modules
- Remote response indicators
- Short Circuit Isolators
- Repeater panel
- Speakers



PUBLIC HEALTH & SANITATION (PLUMBING)

4. WATER MANAGEMENT, PUBLIC HEALTH & SANITATION:

D.1 Project Brief

a. Conceptual Plan

a) The Concept report is based on the architectural concept plan, schematic design early package and several briefs given by client/architect for the building requirement.
b) The detail site survey having information like levels, area, perimeter, drains etc. provided by client is made basis to Conceptualize the water management systems.

b. Soil Investigation

a) The information regarding the sub-soil characteristics of site is not available. Detailed storm water harvesting design shall be taken up based on the available soil report.
b) Site test to find out water absorption capacity / percolation rate of soil shall be carried out for detailed design of percolation / harvesting well.

c. Climatic Data

The design of the water management system shall be done keeping in view the detailed climatic data like rainfall, temperature variation, etc. of the region.

d. Water Quality

The quality of water from all the sources shall be checked. The major source of fresh water shall be municipal corporation supply. Client to furnish water test reports for the same. Client to check and explore the possibility of water supply through bore wells / tankers for any future provision and emergency. Suggestion regarding the treatment of water required, if any, shall be given from the water test report.

e. Drainage and Storm Water Connection

The pipe size and invert levels for nearby municipal sewers and storm water drains shall be furnished by client for final design of sewage and storm water disposal.

D.2 Assumptions and Design Considerations:

a) Average annual rainfall in the vicinity – 2000 mm.
b) Maximum intensity of rainfall – 100 mm/hr.
c) Area of soft landscape is 10% of the site area.
d) Sources of water supply will be corporation supply, bore-wells, tankers and STP recycled water.
e) All the sewage generated in the building shall be treated in a Sewage Treatment Plant (STP) with a bypass connected to Municipal drains to meet emergencies. The recycled water shall be used for flushing, air-conditioning and irrigation.
f) 30 cum/hr rate of water percolation assumed for rain water harvesting.
g) Water efficient and low flow fixtures will be used in toilets.
h) Sewage Treatment Plant will be installed in the site premises and 100% sewage and waste generated will be recycled and used for flushing and irrigation.
i) Total 135 liters/person/day water is assumed per apartment Units. The break up is 90 lpcd for domestic water and 45 lpcd for flushing water as per NOC.
j) Total 15 liters/person/day water is assumed for floating population. The break up is 5 lpcd for domestic and 10 lpcd for flushing.
k) Total 45 liters/person/day water is assumed for drivers. The break up is 20 lpcd for domestic and 25 lpcd for flushing.

l) All the surface and terrace rain water runoffs will be drained through well designed storm water disposal system after adopting suitable rain water harvesting system.

D.3. Water management system Infrastructure Requirements:

Overall the Water management system consists of:

a) Water supply
b) Sewerage disposal system.
c) Sewage treatment scheme.
d) Storm water drainage system.
e) Rain water harvesting.
f) Sanitary vessels and water management system fixtures.

D.3.A. Water Supply

The main source of domestic water supply will be water supplied by Municipal Corporation. As per the inputs received from the client, Corporation will not supply sufficient quantity of fresh water. The quality of water from Corporation will be assured. Suggestion for the water treatment can be given from the water test report for all the available sources of water. Balance water requirement will be supplemented from bore wells and tankers. It is proposed to connect the entire water source to the underground tank located within the premises. In case of failure of either source, provision will be made to use water from any other water source.

Water supply required for various usages are categorized as follows:

A. Raw Water:

The water available from bore wells and tankers is the raw water and is stored in the raw water tank in the basement after overflow from the fire tank.

B. Treated Water Tank:

Raw water from the raw water tank will be passed through the multi grade filter and softened before being stored as soft water in the soft water basement tank.
The treatment scheme will be finalized after the water test report.*
Depending upon the quality of available water, it will be decided to provide soft / treated water to all the utilities.*

C. Domestic Water:

The water supplied by MCGM shall be collected in this tank. The surplus domestic requirement per day, treated tanker/bore well water shall be mixed in this tank. This water shall be used for all the domestic purposes such as at wash basins, showers, bath tubs, health faucets at WC and in kitchen for cooking and drinking.

D. Drinking Water:

Domestic water shall be passed through RO Plant / high intensity ultraviolet unit for sterilization at consumption point, and will be used for Kitchens and drinking facility.

E. Flushing Water:

Water supplied to W.C. and urinal flushing is termed as flushing water. The recycled water from STP will be used as flushing water. Provision will also be kept to use raw / domestic water for flushing in absence of recycled water.

F. Recycled Water from STP:

Sewage Treatment Plant (STP) shall be installed to treat all the sewage and sullage generated in the both the buildings. The STP shall be able to treat the sewage to generate clear water which can be used for flushing and irrigation. Recycled water shall be used for flushing WCs.

DESIGN DATA :

- The water supply & sewage disposal system shall be designed on the basis of following design parameters

DAILY WATER REQUIREMENT OF VARIOUS SERVICES FOR :

No.	Description	Flats	Persons/flat	Total Pax	Domestic Cold Water		Domestic Hot Water		Flushing Water		Total Water Requirement
					LPCD	LPD	LPCD	LPD	LPCD	LPD	Liters
A	B	C	D	E=CxD	F	G=ExF	H	J=ExH	K	L=ExK	M=G+J+L
	EUCALYPTIA										
	2 BHK	184	5	920	70	64,400	20	18,400	45	41,400	1,24,200
	Guest and visitors (@ 1 person per flat)	184	1	184	5	920	-	-	10	1,840	2,760
	Drivers (@ 1 driver per flat)	184	1	184	20	3,680	-	-	25	4,600	8,280
	Security liftman; etc.	6	1	6	20	120	-	-	25	150	270
	Gardening & Irrigation (Lumpsum)		7 ltr/Sq. mtr		-	-	-	-		1,000	1,000
	Wastage					500		-		500	1,000
	Total Water Requirement for residential			**1,294**		**69,620**		**18,400**		**49,490**	**1,37,510**
	Total Water Requirement for Residential				**say…**	**70,000**		**18,000**		**49,000**	**1,38,000**
	FENELIA										
	2 BHK	157	5	785	70	54,950	20	15,700	45	35,325	1,05,975
	3 BHK	27	5	135	70	9,450	20	2,700	45	6,075	18,225
	Shops	22	2	44	20	880	-	-	25	1,100	1,980
	Guest and visitors (@ 1 person per flat)	206	1	206	5	1,030	-	-	10	2,060	3,090
	Drivers (@ 1 driver per flat)	206	1	206	20	4,120	-	-	25	5,150	9,270
	Security liftman; etc.	6	1	6	20	120	-	-	25	150	270
	Gardening & Irrigation (Lumpsum)		7 ltr/Sq. mtr		-	-	-	-		1,000	1,000
	Wastage					500		-		500	1,000
	Total Water Requirement for residential			**1,382**		**71,050**		**18,400**		**51,360**	**1,40,810**
	Total Water Requirement for Residential				**say…**	**71,000**		**18,000**		**51,000**	**1,41,000**

	Summary of water requirement calculation for residential				
		Domestic Cold water	Domestic Hot water	Flushing water	
1	Water Requirement for Eucalyptia	70,000	18,000	49,000	Lit/day
2	Water Requirement for Fenelia	71,000	18,000	51,000	Lit/day
	Total Water Requirement	1,41,000	36,000	1,00,000	Lit/day
	Total Water Requirement for entire building			2,77,000	Lit/day

Sr. No.	Details	Total Qty of water (m^3)	Possible sources of water (m3)			Total from all water sources (m3)	Reduction of usage of potable water (m3)
			BMC	STP recycled	Borewell/Tanker		
1	Domestic water	177	176	0	2	177	1%
2	Flushing water	100	0	100	0	100	100%
3	Irrigation water	2.0	0	2.0	0	2	100%
	Total	279	176	102	2	279	

UG TANKS ARE COMMON FOR FENELIA & EUCALYPTIA						
Sr. No	Description	Total no. of Compartments	Capacity of each compartment in cum	Total Capacity in cum		Location of tank
A	Under Ground Tanks					
A.1	Fire water tank-	2	200	400		Below floor level
	Raw Domestic water tank	2	100	200		Below floor level
	Domestic / Treated water tank	2	100	200		Below floor level
	Total Capacity of U.G.T			800		cum/day
A.2	Flushing U.G.Tank	2	100	200		Near STP Area
B	Over head Tanks at terrace					
B.1	EUCALYPTIA					
1	Fire water tank	1	20	20		At Terrace level
2	Domestic water tank	2	20	40		At Terrace level
2	Flushing water tank	1	22	22		At Terrace level
	Total Capacity of O.H.T			82		cum/day
B.2	FENELIA					
1	Fire water tank	1	20	20		At Terrace level
2	Domestic water tank	2	20	40		At Terrace level
2	Flushing water tank	1	22	22		At Terrace level
	Total Capacity of O.H.T			82		cum/day

Note: one day of total storage is considered for the calculation of underground tank capacities & Half day of total storage is considered for the calculation of overhead tank capacities, excluding firefighting storage at the basement level for main storage tanks.

Water Treatment and Receipt of Water:

Domestic water from municipal supply / bore-wells / tankers will be brought to the building at approximately 1 m below ground level into firefighting storage tank. Water from this tank shall be allowed to overflow into raw water storage tank. The surplus quantity of domestic water requirement to mix water from all the possible sources in raw water tank.

From Raw water tank, water will be fed to suitable water treatment plant by means of feed pumps and stored in the domestic / treated water tank. The treatment for raw water will consist of filtration through pressure sand filters, activated carbon filters, softening and reverse osmosis. RO treated water will be further ozonized and passed through online U.V. treatment before supplying for domestic usages. The exact level of treatment will be finalized as per the water test reports for all the possible sources of water.

Water treatment philosophy shall be detailed out based on the chemical and physical analysis of water from bore wells / tankers.

As per present Scheme it is assumed that Water available from municipal can be used directly for domestic application. Online U.V shall be installed at Drinking source (i.e at Kitchen location etc) for good water quality.

In case the fresh water deficit is supplemented with tankers, we propose to have a proper system to receive tankers daily with well-planned entry and exits so as not to disturb the overall traffic movement within and outside the premises. We also suggest entering into a long term agreement with reliable tanker suppliers providing consistent quality of water.

In case the fresh water deficit is supplemented with bore wells, we suggest having a resistivity test and hydro-geological survey to ensure good quality consistent water supply throughout the year. Standby bore wells shall also be planned for the same.

The water received everyday shall be randomly checked for physical, chemical and microbial analysis to ensure that water quality is maintained.

For better efficiency of water distribution, we suggest dividing the entire water supply system in various zones as below:

Zoning:

For Tower E , F

Sr. No.	Zoning	Levels Considered in Zoning	Location tank	System of Water Supply
1.	Zone – 1	Ground, Podiums other utilities up-to 23rd floor	Terrace Level	Gravity
2.	Zone – 2	24th floor to 27th floor	Terrace Level	Hydro-pneumatic

IMPORTANT NOTE: This zoning is based on the present sections and levels. It will be further fine-tuned at detail design

Further each of the main zones will be divided into sub-zones, each comprising of 5 or 6 floors.

Water Distribution and Supply System

There will be a separate pumping and distribution system for domestic and flushing water.

Also there will be a independent pumping system for each of the tower from a central tank and a central pump room

From **Under Ground Domestic / treated water tank**, water will be fed to the Over Head tank at **Terrace floor level** using separate automatic pumping system (1 W +1 S) for each tower. The water will be connected to the fire water tank at the **Terrace floor level** and the overflow from this tank will be connected to the domestic water tank, thus assuring fire water tank full with water every time.

From this **domestic water tank at Terrace floor level**, water will be fed to the below floors of **Zone – 1** through gravity as per the table above.

The same principle will be applied for each of the zones and the sub zones for all the above levels. However for the topmost floor levels as mentioned in the table above, hydro-pneumatic pumping system shall be used to ensure sufficient required pressure for each of the tenants.

Again the same principle will be adopted for the **flushing water supply** in the buildings. However the same shall be supplied from the recycled water tanks near the STP. Water distribution for flushing system for entire building shall through gravity. Further each of the main zones will be divided into sub-zones.

- **Water Supply Piping Material Schedule:**

We have proposed following MOC for pipes for various water supplies in the project

Sr. no	Service	Location	Piping Material	Insulation
1	Domestic Cold Water Supply Pipes	In toilets, kitchen, etc	C-PVC SDR 11	Not required
2	Domestic Hot Water Supply Pipes	In toilets, kitchen, etc	C-PVC SDR 11	Required
3	Flushing Water Supply Pipes	In toilets	C-PVC SDR 11	Not required
4	Domestic & Flushing Water Supply Pipes	In shafts Vertical Downtakes	C-PVC SDR 11	Not required
5	Domestic & Flushing Water Supply Pipes	In riser shafts pump room @ B1 to OHT. ring-mains	GI-C Class	Not required
6	Irrigation water supply pipes.	Site Specific	C-PVC SDR 11	Not required

D.3.B. Generation and distribution of hot water:

Individual storage electrical heater will be given in the respective toilet ceilings for the required hot water. The geysers shall be installed by the tenants as per their requirement. The hot water distribution line within the toilets shall be suitably insulated to avoid heat loss.

D.3.C. Sewerage Disposal System:

- **General**

A sewage treatment plant shall be provided. Client has confirmed that the treated sewage and wastewater will be re-used flushing and irrigation.

Provision shall be made to dispose the sludge generated after STP into the nearby existing drainage manhole of corporation. Alternatively, sludge can be dried using filter press or centrifuge within our premises and dried sludge can be used as manure for irrigation.

- **Sewerage Disposal**

The waste water and soil water shall be collected from toilet blocks / kitchen to main drainage network.

From toilets and kitchen, soil and wastewater shall be passed through gully trap chamber before connecting the same to main drainage line.

Waste water from kitchens and pantry shall be passed through a grease trap before connecting to the drainage network.

The main drainage line will discharge the soil and wastewater to sewage treatment plant for aerobic and / or anaerobic decomposition.

The main drainage line shall discharge the soil and wastewater to sewage treatment plant for recycling the water for re use. The recycled water shall be used for flushing & irrigation .

Drainage piping schedule:

We have proposed following MOC for pipes for various drainage lines in the project

Sr. no	Service	Location	Piping Material	Jointing Method	Insulation
1	Soil, Waste & Kitchen internal to flat	Internal to flat	SWR Type B	Solution jointing	Not required
2	Basin, shower, etc. waste pipes up-to p-trap / floor trap / stack	Throughout site	PVC-6 kg/cm2 pressure / G.I. "C' class	Solution Joint/ Push Fit /Rubber Ring /Threaded / welded	Not required
3	Soil, Waste & Kitchen stacks	All shafts and throughout site	SWR Type B /HDPE/PP/PVC Sound Proof	Push Fit /Solution Joint/Fusion Joint /Rubber Ring	Not required
4	Soil & Waste pipes Suspended	Suspended / at ceiling	Cast Iron Centrifugal LA Class	drip seal jointing / Hubless groove fitting	Not required
5	Soil & Waste pipes below ground	Throughout Site	Cast Iron Centrifugal LA Class	drip seal jointing /Hubless groove fitting	Not required
6	Rain Water Stacks	All shafts and throughout site	SWR Type B /HDPE Sound Proof	Push Fit /Solution Joint/Fusion Joint /Rubber Ring	Not required
7	Rain Water pipes Suspended	Suspended / at ceiling	Cast Iron Centrifugal LA Class	drip seal jointing / Hubless groove fitting	Not required
8	Rain water pipes below ground	Throughout site	HDPE/RCC Hume Pipe NP2 class	Fusion Joint /Cement Jointing	Not required
9	Swimming Pool and water feature drain pipes.	Site Specific	agricultural U-PVC- 10 kg/cm2 pressure	Solution jointing	Not required

Calculation for Sewerage Capacity:

Refer following table for the calculation of sewerage quantity and capacity of Sewage Treatment Plant

Sr. No	Description	Units	Quantity in lpd	Remarks
	For entire building (Herbelia , Gingelia ,Eucalyptia & Fenelia)			
1	Total volume of water required		2,77,000	
	Less			
a)	wastage of domestic water	(-)	1,000	
b)	Water used for gardening and irrigation	(-)	2,000	
c)	wastage of flushing water	(-)	0	
d)	Swimming pool (Make up & backwash)	(-)	0	
	Total Volume of water entering sewerage system		**2,74,000**	
2	Volume of water entering STP @ 90% of the total water entering sewerage system	90%	2,46,600	
	That means,			
	Considering 100% load condition, STP capacity required is	**cum**	**247**	
	Considering 85% load condition, STP capacity required is	**cum**	**210**	
3	Volume of recycled water generated @ 85% of the total plant capacity			
	Considering 100% load condition	**100%**	**210**	**cum/day**
	Considering 85% load condition	**85%**	**178**	**cum/day**
Note:The sewage flow of the bldg Herbelia , Gingelia ,Eucalyptia & Fenelia is considered in Central STP				

D.3.E. Storm Water Drainage System

- **Design Criteria**

1. Maximum intensity of rainfall is assumed as 100 mm/hr.
2. Average Co-efficient of Run-off is taken as 0.80.
3. Road camber is taken as 1:100 for concrete roads starting from center.
4. Surface slope as minimum 1:500.

- **Water Disposal from Basement / Podiums**

1. Down take pipes shall be provided at the upper basements & connecting to the lower basement. Podium levels Down take pipes shall be diverted at ground & 1st basement ceiling & connected to external SWD.
2. A channel network will be provided at the lower basement level. All the down take pipes from the upper basement will be connected to these channels.
3. Channels will be provided at the starting and end of the ramps so as to avoid / minimize outside water and water along with the car wheels entering the basements.
4. Water sumps of suitable capacity will be provided in the lower basement in coordination with the structural consultant and architect.
5. Mud Pumps (1-working and 1-standby) will be provided in each of the sumps with auto level controller so as to discharge the collected water to external storm water drainage system.

- **Storm Water Disposal from Terraces**

1. Rain water pipes / spouts will be provided from terraces to ground level for taking out the rainwater.
2. Slope of natural ground and infiltration capacity of open ground within the plot will not be sufficient to absorb / dispose off surface water.
3. Looking to rain intensity in the vicinity, storm water is proposed to be disposed off through a network of channels, pipes and chambers / catch basins.
4. The rainwater from the terraces will be disposed off through channels / pipe network.
5. A grating at the main entrance will be provided to prevent entry of outside rainwater to the premises.
6. Ground shall have minimum 1:500 surface slopes towards storm water collection system.

D.3.F. Rain Water Collection and Harvesting:

- **Design Criteria**

Broadly, there are two options for rain water harvesting:

1. 100% percolation / infiltration of the rain water to raise the sub-soil water levels and no reuse.

The first option of 100% percolation / infiltration is possible only in the places where dry sub-soil aquifers are available so that the ground water table is recharged. This will help to maintains or increases the water table of the area.

D.4 Water management system Materials and Finishes

The following is schematic list of water management system materials, which we have considered at this stage.

- **Water Supply Network: :** For all domestic water supply pipes and flushing water supply lines C-PVC pipes will be used. G.I pipes will be used for the supply main risers , Ring main and pump room / plant room piping.
- **Sewerage Disposal System:** Pipes materials shall be as per above table with PCC haunch shall be used for external drainage system with proper gradient and brick masonry chambers/manholes with CI covers and steps, shall be constructed at all junctions of sewer lines and at point of change in direction of flow.. For all suspended drainage pipe lines within the building pipes shall be used with proper gradient.
- **Rain Water Disposal System:** Pipes materials shall be as per above table with PCC haunch shall be used for external storm water disposal system with proper gradient and brick masonry chambers/manholes with grating / covers and steps at all junctions of storm drain lines and at point of change in direction of flow. On driveways and landscape areas, properly designed storm water channels shall be provided as per the landscape features. For all suspended storm water drain pipe lines within the building, C.I LA class pipes shall be used with proper gradient.
- **Water Tanks / Pumps:** Underground water tank will be constructed in R.C.C. with CI manholes / steps and MS ladders. All pumps will be vertical pumps with Priming Tank with control panel.
- **Sanitary Fixtures / Water management system Fittings:** Being a high end project, the best quality fittings as approved by architect will be used. Water saver taps, push type fittings for basins / sinks / urinals, low volume dual flush cisterns will be used to reduce water consumption.

  The details of other water management system materials and finishes will be worked out at the stage of finalization of the design.

ELECTRICAL

Design Conditions Load calculation,

Although the prevailing site conditions given above are seasonal and varying to the great extent over the period of an year and bound to increase yearly basis due to many factors. Hence as far the equipment selection is concerned it is imperative to design, size, engineer, install and commission for the a standard typical tropical ambient with temperature 40ºC minimum and 50ºC maximum accompanied by 91% maximum humidity.

LIGHT SMALL POWER DENSITY:-

Sl. No.	Space	LPD w/sft below following fig as per ECBC	Small power Density (w/sft)
1	Entrance Lobbies	1.0-1.3	0.5-1
2	Amenity area	0.7	2-3
3	Gymnasium / Club Level	0.4	1-2
4	Floor Lobby & Corridors	0.50	0.5
5	Apartments Internal	1.0	3-4
6	Podium level Car parking areas	0.15-0.20	0.1

Note:-
The Bulk Loads such as Plumbing / HVAC / Lifts etc., shall be as per the load given by the specialized consultants with necessary diversity.

Electrical Load Demand
As regards the Electrical loads pertaining to the various system components and its expected power consumption figures have been worked out based on the anticipated equipment installation and the same have been put down in the following sections given below.

L.T. SERVICES -

TOTAL 688 NOS FOR APARTMENTS
TOTAL 8 NOS FOR SHOPS
TOTAL 06 NOS FOR RESIDENTIAL COMMON

DETAILED LOAD SHEETS

Load Sheet For Apartments

LOAD CALCULATION FOR 2BHK TYPE - 1 HERBELIA/GINGELIA/ECULAPTIA/FENELIA																		
	Description	**1x28W TL**	**1x18w CFL**	**1x18w BRECKET LIGHT**	**C. Fan**	**BELL BUZZER**	**E. Fan**	**5A socket**	**15A socket**	**Hood pt.**	**Fridge pt.**	**Water filter pt.**	**Washing M/C pt.**	**Microwave pt.**	**Mixer Juicer pt.**	**AC point**	**Gyser pt.**	**TV point**	**Load**
	Load per point	**28**	**18**	**18**	**60**	**15**	**75**	**100**	**250**	**250**	**250**	**150**	**500**	**1500**	**250**	**1800**	**1500**	**250**	
A	**2 BHK Type - 1**																		
1	Living/Dining room		2	2	2	1		2								1		1	
2	Lobby		1																
3	Passage		2																
2	Kitchen		2		1		1	1		1	1	1	1	1	1				
3	Dry Balcony		1																
4	Bedroom 1		2		1			2	2							1		1	
5	Toilet 1	1		1			1										1		
6	Bedroom 2		2		1			2	1							1		1	
7	Toilet 2	1		1			1										1		
	Total load (w)	56	216	72	300	15	225	700	750	250	250	150	500	1500	250	5400	3000	750	14.384
	Demand load (w) 6AM to 9AM	28	18	18	120	15	150	0	0	250	250	150	0	1500	250	0	AC & GYSER NOT ON AT THE SAME TIME	250	2.999
	Demand load (w) 9AM to 6PM	0	0	18	120	0	75	200	250	0	250	0	500	0	0	1800		250	3.463
	Demand load (w) 6PM to 9PM	56	108	36	240	0	150	300	0	250	250	150	0	1500	250	1800		250	5.34
	Demand load (w) 9PM to 11PM	11.2	432	36	60	0	75	100	0	0	250	0	0	0	0	3600		250	4.8142
	Demand load (w) 11PM to 6AM	0	18	18	120	0	0	100	0	0	250	0	0	0	0	3600		0	4.106
	OVER ALL LOAD FACTOR FOR APARTMENT - (MAX DEMAND OUT OF FOUR TIME SLOTS / TOTAL CONNECTED LOAD																		**0.37**

	TOTAL CONNECTED LOAD	**14.38**
	TOTAL MAX. DEMAND LOAD (@ 37% DIV)	**5.34**

LOAD CALCULATION FOR 2BHK TYPE 2 HERBELIA/GINGELIA																		
	Description	**1x28W TL**	**1x18w CFL**	**1x18w BRECKET LIGHT**	**C. Fan**	**BELL BUZZER**	**E. Fan**	**5A socket**	**15A socket**	**Hood pt.**	**Fridge pt.**	**Water filter pt.**	**Washing M/C pt.**	**Microwave pt.**	**Mixer Juicer pt.**	**AC point**	**Gyser pt.**	**TV point**	**Load**
	Load per point	**28**	**18**	**18**	**60**	**15**	**75**	**100**	**250**	**250**	**250**	**150**	**500**	**1500**	**250**	**1800**	**1500**	**250**	
A	**2 BHK Type-2**																		
1	Living/Dining room		2	2	2	1		2								1		1	
2	Lobby		1																
3	Passage		1																
2	Kitchen		2		1		1	1		1	1	1	1	1	1				
4	Bedroom 1		2		1			2	1							1		1	
5	Toilet 1	1		1			1										1		
6	Bedroom 2		2		1			2	1							1		1	
7	Toilet 2	1		1			1										1		
	Total load (w)	56	180	72	300	15	225	700	500	250	250	150	500	1500	250	5400	3000	750	14.098
	Demand load (w) 6AM to 9AM	28	18	18	120	15	150	0	0	250	250	150	0	1500	250	0	AC & GYSER NOT ON AT THE SAME TIME	250	2.999
	Demand load (w) 9AM to 6PM	0	0	18	120	0	75	200	250	0	250	0	500	0	0	1800		250	3.463
	Demand load (w) 6PM to 9PM	56	108	36	240	0	150	300	0	250	250	150	0	1500	250	1800		250	5.34
	Demand load (w) 9PM to 11PM	11.2	360	36	60	0	75	100	0	0	250	0	0	0	0	3600		250	4.7422
	Demand load (w) 11PM to 6AM	0	18	18	120	0	0	100	0	0	250	0	0	0	0	3600		0	4.106
	OVER ALL LOAD FACTOR FOR APARTMENT - (MAX DEMAND OUT OF FOUR TIME SLOTS / TOTAL CONNECTED LOAD																		**0.38**

TOTAL CONNECTED LOAD	**14.10**
TOTAL MAX. DEMAND LOAD (@ 38% DIV)	**5.34**

LOAD CALCULATION FOR 2BHK TYPE - 3 HERBELIA/GINGELIA																		
	Description	**1x28W TL**	**1x18w CFL**	**1x18w BRECKET LIGHT**	**C. Fan**	**BELL BUZZER**	**E. Fan**	**5A socket**	**15A socket**	**Hood pt.**	**Fridge pt.**	**Water filter pt.**	**Washing M/C pt.**	**Microwave pt.**	**Mixer Juicer pt.**	**AC point**	**Gyser pt.**	**TV point**	**Load**
	Load per point	**28**	**18**	**18**	**60**	**15**	**75**	**100**	**250**	**250**	**250**	**150**	**500**	**1500**	**250**	**1800**	**1500**	**250**	
A	**2 BHK Type-3**																		
1	Living/Dining room		4	3	3	1		2								1		1	
2	Lobby		1																
3	Kitchen		2		1		1	1		1	1	1	1	1	1				
4	Passage		2																
5	Bedroom 1		2		1			1	1							1		1	
6	Toilet 1	1		1			1										1		
7	Bedroom 2		2		1			1	1							1		1	
8	Toilet 2	1		1			1										1		
	Total load (w)	56	234	90	360	15	225	500	500	250	250	150	500	1500	250	5400	3000	750	14.03
	Demand load (w) 6AM to 9AM	28	54	18	180	15	150	0	0	250	250	150	0	1500	250	0	AC & GYSER NOT ON AT THE SAME TIME	250	3.095
	Demand load (w) 9AM to 6PM	0	0	18	120	0	75	200	250	0	250	0	500	0	0	1800		250	3.463
	Demand load (w) 6PM to 9PM	56	108	36	240	0	150	300	0	250	250	150	0	1500	250	1800		250	5.34
	Demand load (w) 9PM to 11PM	11.2	468	45	60	0	75	100	0	0	250	0	0	0	0	3600		250	4.8592
	Demand load (w) 11PM to 6AM	0	18	18	120	0	0	100	0	0	250	0	0	0	0	3600		0	4.106
	OVER ALL LOAD FACTOR FOR APARTMENT - (MAX DEMAND OUT OF FOUR TIME SLOTS / TOTAL CONNECTED LOAD																		**0.38**

TOTAL CONNECTED LOAD	**14.03**
TOTAL MAX. DEMAND LOAD (@ 38% DIV)	**5.34**

LOAD CALCULATION FOR 3BHK-HERBELIA /GINGELIA/FENELIA																		
	Description	**1x28W TL**	**1x18w CFL**	**1x18w BRECKET LIGHT**	**C. Fan**	**BELL BUZZER**	**E. Fan**	**5A socket**	**15A socket**	**Hood pt.**	**Fridge pt.**	**Water filter pt.**	**Washing M/C pt.**	**Microwave pt.**	**Mixer Juicer pt.**	**AC point**	**Gyser pt.**	**TV point**	**Load**
	Load per point	**28**	**18**	**18**	**60**	**15**	**75**	**100**	**250**	**250**	**250**	**150**	**500**	**1500**	**250**	**1800**	**1500**	**250**	
B	**3 BHK**																		
1	Living /Dining Room		3	2	2	1		1								2		1	
2	Lobby		1																
3	Kitchen		2		1		1	1	1	1	1	1	1	1	1				
4	Passage		1																
5	Bedroom 1		2		1			1	1							1		1	
6	Common Toilet	1		1			1										1		
6	Bedroom 2		2		1			2								1		1	
7	Toilet 2	1		1			1										1		
8	Bedroom 3		2		1				1							1		1	
5	Toilet 3	1		1			1										1		
	Total load (w)	84	234	90	360	15	300	500	750	250	250	150	500	1500	250	9000	4500	1000	19.733
	Demand load (w) 6AM to 9AM	28	18	36	120	15	225	200	0	250	250	150	0	1500	250	0	AC &	250	3.292
	Demand load (w) 9AM to 6PM	0	0	36	120	0	0	200	250	0	250	0	500	0	0	1800	GYSER	250	3.406
	Demand load (w) 6PM to 9PM	56	126	18	240	0	225	300	0	250	250	150	0	1500	250	3600	NOT ON	250	7.215
	Demand load (w) 9PM to 11PM	16.8	46.8	18	60	0	75	100	0	0	250	0	0	0	0	3600	AT THE	250	4.4166
	Demand load (w) 11PM to 6AM	28	18	18	180	0	0	100	0	0	250	0	0	0	0	3600	SAME	0	4.194
	OVER ALL LOAD FACTOR FOR APARTMENT - (MAX DEMAND OUT OF FOUR TIME SLOTS / TOTAL CONNECTED LOAD																		**0.37**
	TOTAL CONNECTED LOAD			**19.73**															
	TOTAL MAX. DEMAND LOAD (@ 37% DIV)			**7.22**															

LOAD CALCULATION FOR 4BHK - ECULAPTIA																		
	Description	**1x28W TL**	**1x18w CFL**	**1x18w BRECKET LIGHT**	**C. Fan**	**BELL BUZZER**	**E. Fan**	**6A socket**	**15 A SOCKET**	**Hood pt.**	**Fridge pt.**	**Water filter pt.**	**Washing M/C pt.**	**Microwave pt.**	**Mixer Juicer pt.**	**AC point**	**Gyser pt.**	**TV point**	**Load**
	Load per point	**28**	**18**	**18**	**60**	**15**	**75**	**100**	**250**	**250**	**250**	**150**	**500**	**1500**	**250**	**1800**	**1500**	**250**	
C	**4 BHK**																		
1	Living /Dining Room		3	2	2	1		1								2		1	
2	Kitchen		2		1		1	1	1	1	1	1	1	1	1				
3	Passage		1																
4	Master bedroom 1		2		1			1	1							1		1	
5	Master toilet 1	1		1			1										1		
6	Bedroom 2		2		1			1	1							1		1	
7	Toilet 2	1		1			1										1		
8	Bedroom 3		2		1			1								1		1	
9	Toilet 3	1		1			1										1		
10	Bedroom 4		2		1			1								1		1	
11	Common Toilet	1		1			1										1		
12	Servent Room	1			1														
13	Servent Toilet			1			1										1		
14	Balcony		1																
15	Terrace		1																
	Total load (w)	140	288	126	480	15	450	600	750	250	250	150	500	1500	250	10800	7500	1250	25.299
	Demand load (w) 6AM to 9AM	0	36	18	120	15	150	0	0	0	250	150	0	1500	250	0	AC &	250	2.739
	Demand load (w) 9AM to 6PM	0	0	54	180	0	0	300	250	0	250	0	500	0	0	1800	GYSER	250	3.584
	Demand load (w) 6PM to 9PM	84	144	54	300	0	225	400	0	250	250	150	0	1500	250	7200	NOT ON	250	11.057
	Demand load (w) 9PM to 11PM	28	57.6	25.2	120	0	150	200	0	0	250	0	0	0	0	3600	AT THE	250	4.6808
	Demand load (w) 11PM to 6AM	0	18	18	180	0	0	100	0	0	250	0	0	0	0	3600	SAME	0	4.166
	OVER ALL LOAD FACTOR FOR APARTMENT - (MAX DEMAND OUT OF FOUR TIME SLOTS / TOTAL CONNECTED LOAD																		**0.437**
	TOTAL CONNECTED LOAD			**25.30**															
	TOTAL MAX. DEMAND LOAD (@ 43% DIV)			**11.06**															

DETAILED LOAD SHEETS FOR ALL TOWER

ELECTRICAL LOAD SHEET									
Sr. No.	**Description**	**Qty. / Sq. Ft**	**Unit Load in W**	**Total Connected Load in KW**	**Load Factor**	**Demand Load in KW**	**3PHASE METER**	**Load on DG Normal**	**Load on DG In case fire**
	ALL L.T. SERVICES								
	EUCALYPTIA TOWER								
I	**APARTMENT LOAD**								
1	2 BHK	184	14380.00	2645.92	0.37	984	130.00		
	TOTAL			**2549.80**		**984.25**	**157.00**		
	FENELIA TOWER								
II	**APARTMENT LOAD**								
1	2 BHK	157	14380.00	2257.66	0.37	835	157.00		
2	3 BHK	27.00	19730.00	532.71	0.37	197.10	27.00		
	TOTAL			**2790**		**1032**	**184**		
	HERBELIA TOWER								
III	**APPARTMENT LOAD**								

1	2 BHK TYPE - 1	27.00	14380.00	388.26	0.37	143.66	27.00		
2	2 BHK TYPE - 2	27.00	14100.00	380.70	0.38	144.67	27.00		
3	2 BHK TYPE - 3	79.00	14030.00	1108.37	0.38	421.18	79.00		
4	3 BHK	54.00	19730.00	1065.42	0.37	394.21	54.00		
	TOTAL			**2942.75**		**1103.71**	**187.00**		
	GINGELIA TOWER								
IV	**APPARTMENT LOAD**								
1	2 BHK TYPE - 1	27.00	14380.00	388.26	0.37	143.66	27.00		
2	2 BHK TYPE - 2	27.00	14100.00	380.70	0.38	144.67	27.00		
3	2 BHK TYPE - 3	79.00	14030.00	1108.37	0.38	421.18	79.00		
4	3 BHK	54.00	19730.00	1065.42	0.37	394.21	54.00		
	TOTAL			**2942.75**		**1103.71**	**187.00**		
	TOTAL CONNECTED / ACTUAL LOAD			**11427.09**		**4380.60**			
	TOTAL CONNECTED LOAD FOR ALL FLATS								
	TOTAL ACTUAL LOAD FOR ALL FLATS - KW					**4380.60**			
	OVER ALL DIVERSITY					**0.90**			
	TOTAL DEMAND LOAD FOR FLATS - KW					**3942.54**			
V	**Shops On Ground Floor for Gingelia Tower**								
1	SHOP 1	575.00	6,190.00	6.19	0.67	4.15	1.00		
2	SHOP 2	798.00	7,030.00	7.03	0.67	4.71	1.00		
3	SHOP 3	770.00	6,790.00	6.79	0.67	4.55	1.00		
4	SHOP 4	841.00	7,390.00	7.39	0.67	4.95	1.00		
5	SHOP 5	728.00	6,430.00	6.43	0.67	4.31	1.00		
6	SHOP 6	833.00	7,320.00	7.32	0.67	4.90	1.00		
7	SHOP 7	600.00	5,350.00	5.35	0.67	3.58	1.00		
8	SHOP 8	804.00	7,080.00	7.08	0.67	4.74	1.00		
	TOTAL			**53.58**		**35.90**			
VI	**Common LT service 1 EUCALYPTIA TOWER**								
1	Entrance Lobby Lighting	5.00	36.00	0.18	0.80	0.14	1	0.14	
2	Passages Lighting	336.00	18.00	6.05	0.80	4.84		4.84	4.84
3	All Service & refuge floor - lighting	45.00	28.00	1.26	0.80	1.01		1.01	1.01
4	All Service & refuge floor - power	10.00	250.00	2.50	0.30	0.75		0.75	
5	Staircase Lighting	112.00	28.00	3.14	0.70	2.20		2.20	2.20
6	Plumbing load	1	17280	17.28	0.60	10.368		10.37	
7	3 no’s Passengers lifts - all floors - 25kw each - load assumed	3.00	25000.00	75.00	0.60	45.00		45.00	25
	Total load for common services			**105.40**		**64.30**		**64.30**	**33.04**
VII	**Common LT service 2 FENELIA TOWER**								
1	Entrance Lobby lighting	5	36	0.18	0.80	0.144	1	0.14	
2	Passages Lighting	336	18	6.048	0.80	4.8384		4.84	4.84
3	All Service & refuge floor - lighting	55	28	1.54	0.80	1.232		1.23	1.23
4	All Service & refuge floor - power	10	250	2.5	0.30	0.75		0.75	
5	Staircase Lighting	112	28	3.136	0.70	2.1952		2.20	2.20
6	Plumbing load	1	17280	17.28	0.60	10.368		10.37	
7	3 no’s Passengers lifts - all floors - 25kw each - load assumed	3	25000	75	0.60	45		45.00	25
	Total load for common services			**105.68**		**64.53**		**64.53**	**33.27**
VIII	**Common LT service 3 COMMON LOAD FOR EUCALYPTIA AND FENELIA TOWER (3)**								
1	Basement 1& 2 Lighting	125626.00	12562.60	12.56	0.80	10.05	1	10.05	10.05
2	Basement 1& 2 Power	125626.00	7537.56	7.54	0.50	3.77		3.77	

3	Ground Floor Lighting	58466.00	5846.60	5.85	0.80	4.68		4.68	4.68
4	Ground Floor Power	58466.00	3507.96	3.51	0.50	1.75		1.75	
5	Podium 1 Lighting	59,789.00	5,978.90	5.98	0.80	4.78		4.78	4.78
6	Podium 1 Power	59,789.00	3,587.34	3.59	0.50	1.79		1.79	
7	Podium 2 Lighting	17,993.00	1,799.30	1.80	0.80	1.44		1.44	1.44
8	Podium 2 Power	17,993.00	1,079.58	1.08	0.50	0.54		0.54	
9	Stilt Floor Lighting	17,993.00	1,799.30	1.80	0.80	1.44		1.44	1.44
10	Stilt Floor Power	17,993.00	1,079.58	1.08	0.50	0.54		0.54	
11	(Sump Pump + WTP)	1.00	32,500.00	32.50	0.7	22.75		22.75	22.75
12	Ventilation Load in case of normal	1.00	60,000.00	60.00	0.8	48.00		48.00	
13	Ventilation Load in case of fire	1.00	90,000.00	90.00	1.0	90.00			90.00
	Total load for common services			**137.28**		**101.54**		**101.54**	**135.14**
IX	**Common LT service - 4 HERBELIA TOWER**								
1	Ground Floor Lighting	8663.00	866.30	0.87	0.80	0.69		0.69	0.69
2	Ground Floor power	8,663.00	519.78	0.52	0.50	0.26		0.26	
3	Podium Floor Lighting	8794.00	879.40	0.88	0.80	0.70		0.70	0.70
4	Podium Floor Power	8794.00	879.40	0.88	0.50	0.44		0.44	
5	Stilt Floor Lighting	8794.00	879.40	0.88	0.80	0.70		0.70	0.70
6	Stilt Floor Power	8794.00	879.40	0.88	0.50	0.44		0.44	
7	Entrance lighting	5.00	36.00	0.18	0.80	0.14	1	0.14	0.14
8	Passages Lighting	336.00	18.00	6.05	0.80	4.84		4.84	
9	All Service & refuge floor - lighting	20.00	28.00	0.56	0.80	0.45		0.45	0.45
10	All Service & refuge floor - power	10.00	250.00	2.50	0.30	0.75		0.75	
11	Staircase Lighting	112.00	28.00	3.14	0.70	2.20		2.20	2.20
12	5 no’s Passengers lifts - all floors - 25kw each - load assumed	5.00	25000.00	125.00	0.60	75.00		75.00	25
13	Plumbing Load	1	19250	19.25	0.6	11.55		11.55	
	Total load for common services			**161.58**		**98.16**		**98.16**	**29.89**
X	**Common LT service 5 GINGELIA TOWER**								
1	Ground Floor Lighting	4,505.00	450.50	0.45	0.80	0.36		0.36	0.36
2	Ground Floor Power	4,505.00	270.30	0.27	0.50	0.14		0.14	
3	Podium 1 Lighting	8,602.00	860.20	0.86	0.80	0.69		0.69	0.69
4	Podium 1 Power	8,602.00	516.12	0.52	0.50	0.26		0.26	
5	Stilt Floor Lighting	8,602.00	860.20	0.86	0.80	0.69		0.69	0.69
6	Stilt Floor Power	8,602.00	516.12	0.52	0.50	0.26		0.26	
7	Entrance lighting	5.00	36.00	0.18	0.80	0.14	1	0.14	0.14
8	Passages Lighting	336.00	18.00	6.05	0.80	4.84		4.84	
9	All Service & refuge floor - lighting	20.00	28.00	0.56	0.80	0.45		0.45	0.45
10	All Service & refuge floor - power	10.00	250.00	2.50	0.30	0.75		0.75	
11	Staircase Lighting	112.00	28.00	3.14	0.70	2.20		2.20	2.20
13	5 no’s Passengers lifts - all floors - 25kw each - load assumed	5.00	25000.00	125.00	0.60	75.00		75.00	25
13	Plumbing Load	1	19250	19.25	0.6	11.55		11.55	
	Total load for common services			**160.15**		**97.31**		**97.31**	**29.52**
XII	**Common LT service 6 - FFTG**								
1	Main fire hydrant and sprinkler pumps			230.00	1.00				230.00
2	Jockey pumps	1.00	40,000.00	27.00	1.00				27.00
				257.00					**257.00**
	TOTAL LOAD FOR ALL COMMON SERVICES FOR RESIDENTIAL			**980.67**					
	TOTAL ACTUAL LOAD FOR ALL COMMON SERVICES - RESIDENTIAL					**461.74**			

	D.G. SET CALCULATION FOR RESIDENTIAL COMMON			**IN NORMAL CASE**	**IN FIRE CASE**				
	LOAD ON DG SET - IN KW			**425.85**	**517.86**				
	AUXILIARY LOAD			**5.00**	**5.00**				
	LOAD IN KVA @ 0.8 PF			**538.56**	**653.57**				
	EQUIPMENT LOADING @90%			**598.40**	**726.19**				
	DG SET RATING IN KVA			**1 x 600 KVA**	**1 x 750 KVA**				
	SELECTED RATING IN KVA AS PER FIRE REQ			**1 X750 KVA**					
	TOTAL LOAD - ALL LT SERVICES								
	TOTAL CONNECTED LOAD FOR ALL L.T. SERVICES - KW					**12,407.76**			
	TOTAL ACTUAL LOAD FOR ALL L.T. SERVICES - KW					**4,842.34**			
	TOTAL DEMAND LOAD WITH OVERALL DIVERSITY OF 80% FOR ALL L.T. SERVICES - KW					**3,873.88**			
	CONSIDERING PF @0.8 FOR TRANSFORMER RATING IN KVA					**4,842.34**			
	RECOMMENDED FOR 4NOS, 1250 KVA TRANSFORED TO BE INSTALLED								

03.RECIPENT OF POWER SUPPLY TO THE PREMISES:-

It is understood that the complex will be supplied power from Reliance Energy (confirmation required from client). Even if the power supply in the REL network is very stable, as per governing codes and considering the criticality, DG sets of suitable capacity are proposed to back up essential services loads only. However a confirmation is required from client whether to have DG backup for Apartments. Some critical loads such as emergency lighting, head end equipment of ELV systems; etc. shall be additionally backed up using UPS/ Inverter system.

The estimated power for the entire project inclusive of external area is as follows.
Residential ,Apartment =**3873.88KW @ 0.8 PF 4842.34= KVA Power** will be drawn at 11/22KV, 3 Phase, 50 Hz, AC, effectively grounded system, from the Utility and stepped down to 3 Phase, 415V AC through Step down transformer By Supply Company. Three phase LT meter shall be provided for each
Apartment as well as for Common area services and the meters shall be located in the **Meter room on Ground floor.**

LOCATION OF TRANSFORMER:

The electrical power distribution for the complex shall be catered by developer’s substation at ground floor for which the metering system will be provided by the utility company.
Sufficient space for housing utility substation shall be provided within the premises by the developer.
The Utility substation shall house all Oil free equipment, details and
Specifications of which shall be as per Utility company standard. However confirmation is
Required to be taken from Utility Company before proceeding with this scheme.

11KV / 0.415KV Transformer & 11KV HT panel


UNIVERSAL
TRANSFORMERS

Low Voltage Distribution – Till meters by SEB

From transformer, LV panels within substation shall be installed by SEB. From this LV panel following scheme is adopted: for Apartments / Resi common

Cables from substation LV panel shall come to SFU in meter room from which cables shall go to independent meters for each of above. Meter rooms for tower planned at Ground floor to accommodate all the meters for LV services. The meters shall be mounted in 3 stacks in the meter room

Low voltage distribution – From meters onwards

Apartments

Mains from these meters shall go to respective apartment. For apartment the Mains shall be terminated in apartment distribution board from which further wiring shall be done within apartment for light points / plugs etc.

Common services – Residential Common

As we have opted for going for multiple LV services for common areas, the meter for the same shall be located at Ground lvl meter room. Along with this meter necessary MCB / MCCB shall be provided. From these meters the cables shall go to LV panels – 1 main panel for each service and further to main panel – sub panels / distribution boards.

All these panels shall be part of LV panel room at Ground floor. From these panels cables shall be laid till necessary distribution boards and / or starters for equipment's. From this last mile point wiring shall be carried out.

Low Voltage Distribution-Common loads.

The switchboards will be specified for safety, operation and life in line with the load and nature of the building. LV switchboards shall be planned at Ground floor, in dedicated room close to USS for common service. Typically following LV panels shall be required:

1. D.G. load distribution panel
2. ATS switches
3. Ventilation panel
4. Lighting panel
5. Utility panel
6. Lift panels
7. Ventilation panels
8. External lighting panel
9. Amenities panel
10. APFCR panel
11. FFTG panel

From the panel the cables shall go to distribution boards / starter panels located in basement for particular zone – lighting / raw power/ pumps / fans etc.
The LV switchboards will be provided with spare breakers (approximately 20%).
The main LV distribution switch panels will comply with category Form 3b construction and be manufactured to IEC 60439 1. It is generally expected that all LV distribution panels will be bottom entry/top exit, and that access for maintenance and future modifications will all be carried out from the front of the panels.

Life safety i.e. ventilation and FFTG panel shall be provided direct power from D.G. set in addition to normal power.

Power Factor Control – For all common services

The power factor of the installation is proposed to be maintained around 0.95 to unity.
The power factor control shall be through automatic power factor control relay that will switch on and off the capacitors as and when required

Metering

1) Apartment

By SEB directly at Ground lvl meter room.

2) Residential common

By SEB directly at Ground lvl meter room.

For energy management, sub metering shall be provided for each utilities like lighting / plumbing / ventilation / external lighting in the sub LV panels for common areas.

Small Power Distribution

The distribution boards will be located throughout the building to serve local lighting and power requirements.

Distribution boards will mainly be 3 phase, 4 pole, allowing for ease of load sharing across the phases. Distribution boards will be located in dedicated electrical cupboards and plant rooms and sized adequately to serve the immediate vicinity with allowance for 20% spare capacity.

Emergency Generator Supply

Power back up is provided for following:

Residential common areas

Ratings:

It can be seen in the load sheet that the requirement for emergency load (fire + ventilation) is lesser than normal load. Hence the generators for Apartment tower shall be rated as per normal load which ultimately shall cater to emergency load also.

1) 1 x 750 KVA DG set for Apartment common area

Location / Space requirements:

The generators are planned at Ground floor. The space requirement shall be 9.5 x 4.5 x 5.0 M space for tower area generator including necessary margins.

Brief Specs:

The D.G. set shall be with acoustic enclosure as per latest CPCB guidelines (75 dB at 1 mtr in free field condition). The generators as mounted @ ground floor shall be radiator cooled with air being the cooling medium. The D.G. set shall be prime rated / with inbuilt fuel day storage tank / Control panel with always ON condition breaker with AMF relay for auto start stop option– as the case may be with manual mode option and necessary protection features.

Scope of Standby Supply

As the L.T Power is fed to the Residential Apartments and the load shedding of these apartments is negligible to an extent. Hence, it is envisaged that no Apartment should be given the DG back.

All lighting, power, convenience power, Lifts, Plumbing Fire pumps, and Pressurization System and Ventilation Fans shall be supplied by DG set equipped with Sync. panel and ATS panels Change over Panels will switch over the above loads onto DG supply within 15-20 seconds. In case of repair / Maintenance or operational difficulty with any of DG set, these shall be manually interchangeable to meet the critical loads. Ac load of common area shall not be supplied from DG.

Standby power generation is required to support life safety systems – in case of fire - throughout the building which shall include but not be limited to the following elements:

- Essential/emergency lighting common areas
- Lifts (Fire lifts)
- Fire pumps and associated equipment
- Smoke ventilation and associated equipment (Common Areas)
- Aircraft warning lights

In addition, standby power generation typically supports essential applications to ensure that the building functions in a manner that is conducive to the operator’s final requirements in the event of mains power failure or disruption from the electricity network supply.



Noise Treatment

The DG set will be incorporated into a dedicated plant room and acoustically (silenced canopy type) treated to reduce the breakout of noise during operation. The exhaust silencer (including provision for future exhaust soot filters) and air intake attenuators for each set will be contained within the plant room. Low noise (residential) exhaust flues will also be provided.

Flue gas exhausts / Stack height

Stack height for exhaust piping from D.G. sets shall be as per CPCB norms as follows:

1.6mtrs above terrace if within Building.

2. H = h + 0.2 x sq rt KVA where by H = stack height / h = building height / KVA D.G. set rating. 30mtrs < 800kva

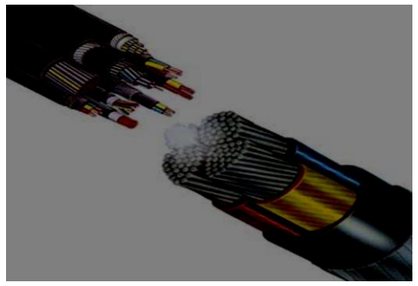
3.30mtrs > 800kva

DG SELECTION		
SR.NO.	Description	D.G Detail
1	750 KVA D.G SET	1no
2	D.G Rating	750KVA
3	Installation	Outdoor
4	Continuous O/P rating	600KW
5	Length	8000mm
6	Width	3100mm
7	Height	4300
8	Static Weight	14ton
9	Fuel Consumption/hr.	157lts/hr
10	Inbuilt Day Tank Considered	990 lts.
11	Stack height	1.6mtrs above terrace

As the D.G. sets is planned @ ground level, the stack shall be taken to terrace & left at 6mts above terrace.

The load assignment across the 3 phases will be as evenly distributed as possible to prevent load imbalance.

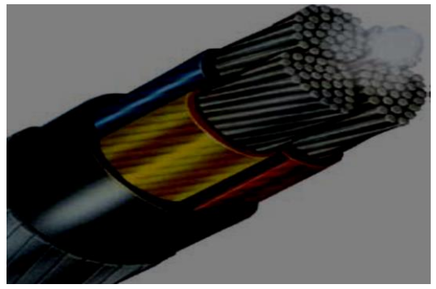
CABLES



The cables lay fully buried in ground or partly in trench and partly in ground shall be armored type. Cables are laid fully in rack/tray/hook or laid in G.I. pipes, shall be also armored type.

The installation work shall be carried out in a neat workman like manner by skilled, Experienced and competent workmen particularly with experience in jointing Termination of aluminum / copper conductor cables.

Cables runs shall be uniformly spaced properly supported and protected in an approved manner. All bends in runs shall be well defined and made with due consideration to avoid sharp bending and linking of the cable. The minimum bending radius of cables shall not be less than twelve times the overall diameter.



Laying of Cables on Racks / Trays / Brackets / Hooks

All power cables in trenches and on structures shall be laid on racks and shall be Clamped by means of single or multiple galvanized MS saddles. The saddles shall be Placed at an interval of 1000 mm. in both horizontal and vertical straight runs, at Each bend and turnings from horizontal to vertical direction and vice versa.

Multi-core control cables shall be laid touching each other on trays and wherever Required may be taken in two layers. Ladder type cable racks shall be selected from three sizes viz. 300mm. 450mm. And 600mm. Ladder. Type trays shall be painted after fabrication. Vertical spacing between cable racks/trays shall be 250 mm. Power cables of different voltage grades shall be laid in separate racks / brackets / hooks. Control cables as well as signal and communication cables shall be laid in separate trays. However, in cases where smaller size power cables (below 16sq.mm) of fewer numbers cables provided suitable vertical barriers are installed between them. Order of laying of various cables in racks/trays brackets/hooks shall be such that control cables are located at the bottom-most tier and 1100 V grade cables at top tier. In case of duplicate feeders of same consumer, these shall be laid in two separate racks/brackets.
Where there is possibility of mechanical damage cable rack / trays shall be adequate protected by sheet steel covers.
For future installation of cables, provision shall be made to keep 20% space as spare on each tray / rack / bracket.

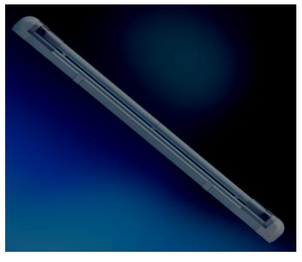
Power Cables:
All power cables will be of Aluminum or copper. The minimum size of conductor will be 4.0 Sqm.
Power cables for 11KV/22KV application will be 11/22kV grade, 3C 150/240/300 Sq.mm. Al, AR, XLPE insulated multi core, conforming to IS-7098 pt II.

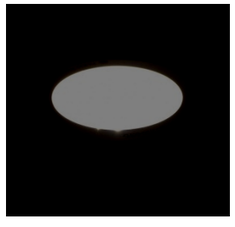
Power cables for 415V applications will be 1100V grade, Al, XLPE insulated, single/ multicore conforming to IS-7095-pt I
Cables for DC application will be single core conforming to IS-7098 pt

The size of copper conductor cable is 2c x 2.5sqmm to 4cx16sqmm & aluminum conductor is up to 4c x16sqmm.

COMMON AREA LIGHTS & POWER DISTRIBUTION.

Lighting and socket outlets of common areas like basement /corridor/Lift lobby, electrical rooms shall be fed from respective floor common area DB which is fed from respective floor distribution panel. The sensitivity of the RCD/ELCBs used for lighting and power load, For lighting load we recommend to use 30 ma ELCB but wherein for power load we recommend to use 300 ma ELCB.
100% of common area lighting has been considered as emergency lighting, which is fed from common area D.G. Supply located at ground floor D.G room.
Car park lighting & power are fed from common area DB.
For concealed wiring medium gauge PVC conduits will be used.
For lighting circuit wiring, FRLS PVC sheathed 2.5 sq.mm and 1.5 sq. mm copper wire shall be used
For power circuit wiring, FRLS PVC sheathed 2.5 and 4 sq.mm copper wire shall be used depend upon the load pattern.
Fire Lift Panel it is proposed with single incomer to feed the Lifts.
Standalone minimum light points are proposed on Solar.
Lobby staircase / passage lights on solar power energy as per the MOEF compliance.



Recommended Illumination Levels
The general lighting of various spaces shall be planned by the Interior Designer/ Lighting Consultant. The recommended illumination levels as per National Building Code are given below for general guidance:

Space	**Recommended Type of Lamps**	**Illumination Level Lux**

1 Corridors	Fluorescent / CFL	50 – 100
2 Lobby	Fluorescent/ CFL	(As per Interior Lighting Design)
3 Car Parking	Fluorescent	30 – 50
4 Service areas	Fluorescent	150 – 200
5 Staircases	Fluorescent	70-100
6 Inside Flat	(As per Interior Lighting Design)	

Lighting:

The lighting installation will be designed in accordance ECBC standard and/or local prevailing code requirements. Any particular Client or Architect requirements will need to be relayed and agreed upon.
High efficacy energy efficient lamps and light sources will be primary choice on selection throughout the project.
Common lamp sources will be used where possible to simplify maintenance and reduce the range of spare lamps stocked.
Lighting to the different areas of the buildings is covered under the relevant sections of this report.

Lighting within the car parking areas, service corridors and plant rooms will be surface mounted or suspended fluorescent IP55 corrosion resistant linear fluorescent luminaires with protective diffusers.

Specialist lighting design for the public areas like entrance / lobbies / amenities etc. will be designed by the lighting consultant.

The lighting consultant will be responsible for meeting any relevant lighting levels and energy efficiencies to meet environmental standards aspired. The demarcation between specialist lighting area and MEP Consultants responsibility needs to be confirmed.

Lighting Levels
Lighting levels for the various areas are tabulated above and meet the National Building Code of India recommendations, also tabled is the Light Power Density recommended by ASHRAE which is being used as a guide for LEED certification.
As previously mentioned the lighting allowance within the building load has a higher allowance to allow flexibility of the final design. For lighting and power density for the breaker sizing and distribution being considered to be referred to the table “Light power Density” given in the design criteria section.

Lighting Controls
Where appropriate lighting control systems will be installed to maximize energy efficiency.

Area	Light fixtures Recommended	Control Method	Dimming/Scene setting
Plant and service areas	Compact Fluorescent Light fixtures /T5 lights	Local switching	No
Car parking areas	Compact Fluorescent Light fixtures /T5 lights	Local switching with Timers through MCB's. Note : Emergency light always ON	No
Lobbies / passages	Compact Fluorescent Light fixtures/T5 lights	Local switching with Timer	No
Stairs	Compact Fluorescent Light fixtures/T5 lights	Local switching	No
Entrance lobbies	As per lighting designer	Local switching with Timer	No
Public area like gym, spa, amenities, business center etc.	As per lighting designer	Local switching + dimming if require	Yes if required as per interior.
Landscape lighting	As per lighting designer	Timer (astronomical type)	No

Emergency Lighting

The emergency lighting system will be designed to provide safe passage from the building in the event of a mains failure and will be sized to power up 10-15% of the lighting load. Emergency lighting will have centralized control where possible for ease of monitoring and maintenance.

The lighting will be designed to local authority regulations and NFPA 5000. A minimum of 10 Lux will be provided on the center line of escape routes, with routes up to 2m wide 50% of the route will be lit to 5 Lux. The emergency lighting system will be capable of continuous operation for a minimum of 1 ½ hours (90 minutes).

All areas within each building will be provided with maintained illuminated emergency exit signage which complies with the aforementioned standard to indicate escape routes and exits. All emergency lighting will be coordinated with egress routes to external ground, access to plant rooms, firefighting equipment and main plant areas.

Lightning Protection IEC 62305

IEC 62305 deals with the protection, in and around a structure, against physical damage and injury to living beings due to touch and step voltages.
It usually consists of both external and internal lightning protection system.

a) Intercept a lightning flash to the structure (with air-termination system)
b) Conduct the lightning current safely towards earth (using a down conductor system)
c) Disperse the lightning current into the earth (using an earth-termination system)

Reduce the dangerous current flowing through bodies by insulating exposed conductive parts and/ or by increasing the surface soil resistivity. Reduce the occurrence of dangerous touch and step voltages by physical restrictions. It is important to note that although the value of the voltage associated with lightning is proportional to the length of the strike, it is not of critical concern as the main effects are related to the stored charge and the discharge current of the strike.

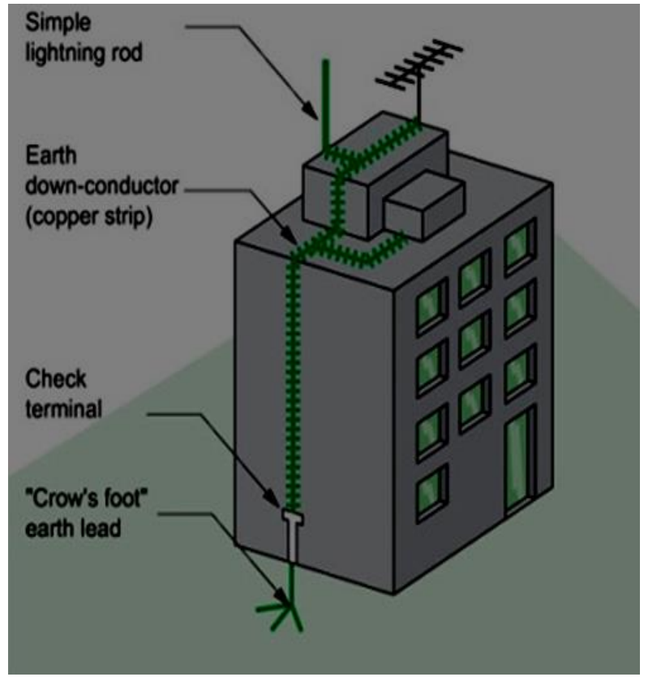
Elements External LPS

1) Interception of direct strikes :-
Air-termination system
2) Conduction of the lightning current safely towards earth :
- down-conductor system
3) Dispersion of the current into the earth :
- effective earth-termination system

CRITICAL WEIGHTING FACTORS

1. What is the use of the structure?
2. What is the construction type of the structure i.e. brick, re-in forced concrete etc.?
3. Dimensions of structure (L x W x H in meters)
4. No. of Service Lines feeding the structure
   Power, single / three phase, overhead / underground
   Telecom, how many lines, overhead / underground
   Metallic water pipe
   Metallic gas pipe
   Metallic sewerage pipe
   Metallic data lines
   Any other metallic service entering the structure

5. Length of Service Lines (from LV side of the transformer to the main LT / panel board)
6. Location
7. Environment (urban, suburban, rural)
8. How many transformers are feeding the structure?
9. Are the transformers remote or inside the electrical room in the structure itself?



10. Special Hazards (low, average, high level of panic)
11. How many people are occupying the structure and for many hours in a year?
12. Type of finished surface inside the structure (concrete, asphalt, wood, carpet, ceramic, marble etc) (&)
13. Any Fire protection provisions? (Manual, automatic extinguishing system)
14. Risk of Fire (high, ordinary, low)
15. Soil Resistivity
16. Any Spatial screening? (any reinforcing bars / stanchions within frame work of structure)
17. What is building façade / cladding?
18. Any details of service lines?
Screened / unscreened cable
Routing
19. Flash Density
20. Name & Address of the project.

Air Termination System

3 basic protective methods for determining position of air termination system

Rolling sphere method
Protective angle method
Mesh method

Building structure
Living beings
Equipment

The LPS will be comprising four main elements as follows:
Air terminal network
Down conductor network
Earth termination.
Equipotential bonding on façade of building.

Air termination:

The early streamer is a newer technology where by the claim is to generate upward leader which shall attract the downward leader towards it in a prescribed path. Hence the whole network of multiple arrestors and grid is not required. The streamers have different radius of coverage – max 65 mtrs. After this radius additional streamer is required. The streamers are usually going up to app. 5 mtrs from top of terrace. From each streamer copper flexible wire shall go down to earth pit at basement / ground level.

Down Conductors:

From each streamer max 2 runs of copper flexible wire 70 sq. mm or copper tape of 25 x 3 mm strip shall go down to earth pit at basement / ground level. This is very convenient from execution point of view with building profiles which are wider till stilt levels and converge to form tower at upper levels.

Earth Termination:

The earth termination network will be provided by earth pits located at Ground level / basement as the case be. The earth pits will be separate from the other power / neutral earthing allowing the lightning protection down conductors to be suitably connected to earth. The earth rod will be solid copper. Resistance of the system to comply with BS EN 62305 and local code requirements which talk of total resistance to be below 10 ohms for LA system.
Test links points local to the pit will be provided and clearly identified and accessible by maintenance staff.
These points will enable the overall earth resistance of the system to be tested as well as providing facilities
connecting additional earth pits to the system should post construction tests prove these to be necessary.

Earthing System

Earthing will be provided in accordance with the requirements of BS 7430, BS 7671 and/or IS 3043, whichever is deemed more stringent. The distance between 2 earth pits shall be 2 meters wherever possible. The earthing system will be designed to protect against the risk of an electric shock and to protect equipment/systems.
The following elements will be connected to the building's main earth system:
Earth mat (consisting of the building reinforcement structure)
Generator star points
Lightning protection system
Building structure
Switchgear
Specialist equipment (security, lifts, telecommunications etc.)
The earthling system will be connected to the general mass of earth by connection to the building structural foundations.

Each LV switch room will be fitted with a wall mounted main earth bar, for general connection of earthling systems within the area. The earth bar will incorporate a proprietary link facility to enable disconnection for testing. The LV earthing system has separate earth pits.
Extent of the clean earth requirement to specialist systems to be determined however recommended that a separate “clean” earthing installation will be provided to the incoming telephone services room.
Chemical earthing shall be adopted as they are maintenance free for 15 years.

The final arrangement of the site earthing system will be subject to discussions and approval by the local electricity authority.
Cables selections for earthing to be in line with fault current characteristics
The final arrangement of the site earthing system will be subject to discussions and approval by the local electricity authority.

Sr. No.	Description	No. Of GI Earth pits allocated	No. Of CU Earth pits allocated
1	HT PANELS	----	----
2	TRANSFORMERS	---	---
3	D G SETS	2	2
4	METER ROOM / LT panel room	12	
5	16LIFTS FOR BOTH WINGS	32	
6	LIGHTING ARRESTORS		4
7	LV SYSTEMS		8
	Total	**46**	**14**

Aircraft Warning Lights

Aircraft warning lights shall be provided to alert aircrafts of the building structure. The system will be designed to the International Civil Aviation Organization (ICAO) guidelines and the local Civil Aviation Authorities and will generally comprise:
Roof mounted medium intensity red obstruction luminaire giving flashes at the rate of 40 per minute. The luminaires will have an effective intensity of 1,600 candelas and a lamp life of approximately 32,000 hours.
Intermediate building mounted low intensity dual lamp luminaires with the facility to automatically switch lamps in the event of a lamp failure. The low intensity luminaires will be mounted at intermediate levels down the structure not exceeding 45 meters to the approval of the regional local Aviation Authorities.
All luminaires will be supplied with 230 Volt A.C. power connected to the emergency maintained system.



Aircraft use collision avoidance lighting systems to warn other aircraft of their presence. These lights include landing lights, red or white flashing beacons, wingtip strobes, and wingtip navigation lights. The wingtip navigation lights are required to consist of a red

light on the left wingtip and a green light on the right wingtip. Landing lights are used during the descent and approach to landing, and at other times if deemed necessary by the flight crew or operator.

Extra Low Voltage Systems:

ELV System:

ELV system shall be planned similar to electrical system for providing following services to each apartment and common area :

1. Wired telephone connectivity.
2. DTH television connectivity – (can be independent terrace mounted dish for each residence).
3. Wired broadband connectivity to each residence.
4. Intercom facility
5. Security system – video from entrance gate to house.

As opposed to conventional scheme of providing copper co-axial/ RG cables routed through entire project with multiple vendor dependent scheme, it is proposed to have IBS (In Building Solution) where in IBS provider will lay common ELV infrastructure using OFC using either GPON or KNX or equivalent technology and provide the multiple choice of vendors and connectivity to villas using same infrastructure. The scheme becomes highly viable considering limited numbers of players in the project area, project size and cost of infrastructure to accommodate such requirements.

Standard codes and brief specs for materials:

A. APPLICABLE IS STANDARDS

1.	METERS (MEASURING) FOR ANALOG METERS	IS:1248-1986
2.	INSTALLATION AND MAINTENANCE OF SWITCH GEARS	IS:3072-1975
3.	CODE OF PRACTICE FOR EARTHING	IS:3043
4.	H.D. AIR BREAKER, SWITCH GEARS AND FUSES FOR VOLTAGE NOT EXCEEDING 1000 VOLTS	IS:4047-1977
5.	SELECTION, INSTALLATION AND MAINTENANCE OF FUSES UP TO 650 VOLTS	IS:8106-1966
6.	GENERAL REQUIREMENTS FOR SWITCH GEAR AND GEAR FOR VOLTAGE NOT EXCEEDING 1000 VOLTS	IS:4237-1967
7.	DEGREE OF PROTECTION PROVIDED BY ENCLOSURES FOR LV S/GEARS	IS:2147-1962
8.	INSULATED CONDUCTOR RATING	IS:8084-1972
9.	ENCLOSED DISTRIBUTION FUSE BOARDS AND CUT-OUTS FOR VOLTAGE NOT EXCEEDING 1000 VOLTS	IS:2675-1983
10.	MINIATURE CIRCUIT BREAKER	IS:8828-1978
11.	FUSE WIRE USED IN RE-WEARABLE TYPE ELECTRIC FUSES UP TO 650 VOLTS	IS:9926-1981
12.	PVC INSULATED ELECTRIC CABLES HEAVY DUTY	IS:1554 (PART I)
13.	RECOMMENDED CURRENT RATING FOR CABLES	IS:3961(PART II)
14.	COPPER CONDUCTOR IN INSULATED CABLES AND CORES	IS:2982
15.	CONDUCTOR FOR INSULATED ELECTRIC CABLES AND FLEXIBLE CORDS	IS:8130
16.	MILD STEEL WIRES, STRIPS AND TAPES FOR ARMOURING CABELS	IS:3975
17.	PVC INSULATION AND SHEATH OF ELECTRIC CABLES	IS:5831
18.	ALUMINIUM CONDUCTOR FOR INSULATED CABLES	IS:1753
19.	PVC INSULATED & PVC SHEATHED SOLID ALUMINIUM CONDUCTOR CABLES OF VOLTAGE RATING NOT EXCEEDING 1100 VOLTS	IS:4288

20.	RECOMMENDED CURRENT RATING FOR CABLE	IS: 961
21.	CODE OF PRACTICE FOR ELECTRICAL WIRING INSTALLATION SYSTEM VOLTAGE NOT EXCEEDING 650 VOLTS	IS: 732
22.	CODE OF PRACTICE FOR FIRE SAFETY OF BUILDINGS GENERAL)ELECTRICAL INSTALLATION	IS: 1646
23.	RIGID STEEL CONDUITS FOR ELECTRICAL WIRING	IS:1653
24.	FITTINGS FOR RIGID STEEL CONDUITS FOR ELECTRICAL WIRING	IS:2667
25.	FLEXIBLE STEEL CONDUIT FOR ELECTRICAL WIRING	IS:3480
26.	ACCESSORIES FOR RIGID STEEL CONDUITS FOR ELECTRICAL WIRING	IS:3837
27.	PVC INSULATED CABLES (WIRES)	IS:694
28.	RIGID NON-METALLIC CONDUITS FOR ELECTRICAL WIRING	IS:2509
29.	FLEXIBLE (PLAYABLE) NON-METALLIC CONDUITS FOR ELECTRICAL INSTALLATION	IS:6946
30.	THREE PIN PLUGS AND SOCKETS	IS:1293
31.	CONDUCTORS FOR INSULATED ELECTRICAL CABLES AND FLEXIBLE CODES	IS:8180
32.	SPECIFICATION FOR CONDUIT FOR ELECTRICAL INSTALLATION	IS:9537-1980
33.	ACCESSORIES FOR NON-METALLIC CONDUITS FOR ELECTRICAL WIRING	IS:3419
34.	SWITCHES7	IS:3854
35.	PLUGS	IS:6538
36.	SHUNT CAPACITORS FOR POWER SYSTEMS	IS:2834-1954
37.	HRC CARTRIDGE FUSES AND LINKS UP TO 660 VOLTS	IS:2208
38.	GENERAL AND SAFETY REQUIREMENT FOR LIGHTING FITTINGS	IS:1913-1969
39.	CODE OF PRACTICE FOR LIGHTING PUBLIC THOROUGH FARES	IS:2944-1981
40.	WATERPROOF ELECTRIC LIGHTING FITTINGS	IS:3528
41.	WATER TIGHT ELECTRIC LIGHTING FITTING	IS:3553-1966
42.	MILD STEEL TUBULAR AND OTHER WROUGHT STEEL PIPE FITTING	IS:1239-1958
43.	LUMINARIES FOR STREET LIGHT	IS:2149-1970
44.	HRC FUSES HAVING RUPTURING CAPACITY OF 90 KA	IS:9224
45.	EXHAUST FAN	IS:2312-1967
46.	CLASS I CEILING FAN	IS:374-1979
47.	DANGER NOTICE BOARDS	IS: 2551

Additionally We Shall Follow:

a. National Electricity Act of 1910 and rules issued there under revised up to date.

b. Special Attention should be given to Rule No. 50.

c. Regulations for electrical equipment in building issued by The Bombay Regional Council of insurance Association of India.