MEP DESIGN BASIS REPORT FOR

RESIDENTIAL DEVELOPMENT, TOWER 01 & 02, THANE

(R0 – 25.06.2021)

TEAM:

PROJECT	**AT THANE**
CLIENT	LODHA **LODHA GROUP** LODHA EXCELUS BUILDING, APOLLO MILLS COMPOUND NM JOSHI MARG, MAHALAXMI, MUMBAI - 400 011
ARCHITECT	M Q A **MANDVIWALA QUTUB & ASSOCIATES (MQA)** 207, TURF ESTATE, SHAKTI MILLS COMPOUND LANE, OFF, DR E MOSES RD, MAHALAKSHMI, MUMBAI, MAHARASHTRA 400011
MEP CONSULTANT	PDA Pankaj Dharkar & Associates MEP & Green Building Consultants **PANKAJ DHARKAR & ASSOCIATES** 302, TRADE AVENUE, 3RD FLOOR, 260 SUREN ROAD, OFF GURUNANAK PETROL PUMP, ANDHERI EAST , MUMBAI 400093
STRUCTURAL CONSULTANT	JW CONSULTANTS LLP **JW CONSULTANTS LLP** RUPAREL IRIS, 2ND FLOOR,NEAR MAGNET MALL, TULSI PIPE ROAD, MATUNGA (W),MUMBAI, MAHARASHTRA - 400 016 INDIA.

DATE OF DBR	25.06.2021
REVISION NO.	R0
ORIGIN	Sagar

INTRODUCTION

PREFACE:

LODHA GROUP is developing multi-tenant residential project at Thane. Renowned architect M/s MANDVIWALA QUTUB & ASSOCIATES is design architects of the project who has created landmark developments in country. One of most experienced firm, M/s JW CONSULTANTS is structural consultant for the project. PANKAJ DHARKAR & ASSOCIATES (PDA) has been appointed as MEPF consultant for the project.

The aim of this design basis report is to provide sufficient information various services, bulk capacity estimates, spatial planning of the MEP services, basis of design, distribution and transfer strategy of various services , system engineering, various system options with cost benefit analysis, approach to sustainability and way forward for detail design of the project.

Scope of Services

The MEPF scope of services includes the following:

The MEPF scope of services generally includes the following:
Utility Bulk load demand calculation for electrical power, water requirement, sewage disposal, rain water harvesting.
Electrical power distribution
Electrical load management strategy & backup power distribution
Electrical extra low voltage power distribution
Earthing & Lightning protection
General lighting Philosophy of tower common areas & basement.
Domestic water services (including recycled water) distribution
Black & Grey water distribution
Storm water disposal/Rain water harvesting
Fire engineering passive concepts
Active fire engineering concepts
Fire hydrant & Sprinklers
Ventilation System
Smoke management system
Relevance of applicable codes & interpretations
Fire Alarm & Voice Evacuation System
Access Control System
IP Based CCTV Surveillance System

Design Objectives

To evolve sustainable & cost efficient MEP engineering services.
MEP Services design will be aimed to be:
Sustainable
Energy efficient
Upgradeable
Modular

Flexible
Maintainable

EXECUTIVE SUMMARY

- Belmondo is residential development project located in Thane with two basements and four podium with towers sitting on Ground with landscape area on top podium level.
- Top podium/Stilt we are using for part transfer of Tower drainage & main transfer of drainage will be done from Basement 01 ceiling to existing STP.
- In general, building services of the project are spread over the towers & non tower areas. Primarily basement 01 & basement 02 is used for high side services of PHE viz. water, fire tanks. Electrical meter room for both the towers are planned on ground floor and podium 01.LV room is planned for 2 towers at single location at ground level. Electrical high side services like generators are planned in ground level and substations are also planned on Ground level.
- Double stack drainage is planned for sewer disposal, while water supply would be primarily through gravity flow from overhead water tanks, boosted water supply would be considered for top 5 floors. Also option of single stack with partial ventilation has been worked out.
- In line with sustainable practice, Metering philosophy will be evolved around monitoring the water consumption.
- One to one Split (Dx system) with sleeve for drain and copper piping will be done for apartment.
- Ventilation requirement for various spaces have been carefully thought of to suit the various code and authority requirement. Various FLS related equipment are proposed for smoke extract, pressurization basement lobbies, escape staircases and fire lift wells. These systems are not proposed with standby arrangement to optimize the cost which will call for regular maintenance and up keeping of such equipment. Car parking basements are provided with maximum 3000 sqmtr water curtain compartments. Separate basement smoke extract system have been designed with jet fans and smoke rated axial fans as per the code and local CFO requirements.
- For both the basements mechanical ventilation is for car park area in Normal operations is planned at 6 ACPH & for fire operation at 12 ACPH. 2.5% Natural ventilation opening is provided for individual zone of each basement i.e for 2 basements we have considered aggregate 5% ventilation opening on ground floor.
- Electrical power distribution for the project is divided mainly in two parts viz. catering to need of apartment load and common area loads. This approach requires multiple services and multiple level of distribution and has been planned out of constraint of local regulations and within frame work of code. Metering Philosophy is based on Conventional state Electricity power distribution methodology with Individual LT meters for Apt and Multiple LT meters for common areas. Dedicated distributions of emergency services have been conceptualized keeping in consideration local requirement of switching off the non-emergency load in case of fire/disaster. DG backup is provided for emergency services only.
- Low side power distribution for the project have been planned to cater through cables. Low side power distribution for common areas shall be thoughtfully done considering switchgear coordination and fault level calculations. Metering philosophy incorporates identifying various load centers and provide for BMS integrated load monitoring, recording and creation of historical models to monitor building energy consumption to the best level as designed. For Metering Schedule Refer to Electrical Load sheet.
- Fire survival (FS) cables are proposed for FLS emergency services required to be operated under fire conditions while rest of the cables and wires shall be of FRLS category.

- Roof area is used for solar hot water plant which will serve single toilet of each apartment of top 5 floors as per lodha policy.

- Special emphasis given to Lightening protection and system is designed as per the latest IS/IEC 62305 standard to create network of down conductors and grid grounding of lightening currents. Surge protection is conceptualized at entry points of utilities. Extensive earthing systems have been thought to differentiate the networked neutral earth. Foundation Earthing for functional earthing have been planned as per the local codes. Foundation Earthing to be done at Basement level.

- Common area and external lighting design is aimed to have best of industry efficiency with extensive use of LED, efficient light sources and various control strategies based on the occupancy and Timer based control.

- Fire suppression systems have been designed as per the NBC 2016 and prevailing CFO's requirement while keeping the global practices in consideration. Conventional water based hydrant and sprinkler system has been proposed to cater to most of the non-water sensitive areas & for water sensitive area hand held extinguishers & for LT panel & lift panel fire truce system.

- One set of multi stage single outlet pumps are proposed for fire water, one set will be installed in pump room at basement 01 which will serve up to 70 m head and other set of pump will be installed at terrace level which will pump through top Transfer pump will be used to pump water from UGT to fire OHT fire tank. Two fire tanks of 200000 ltr capacity are proposed for tower T1 & T2 in basement 01.

- Drencher system to be provided on the periphery of fire check floor and car parking floors (above ground level) of the building and to be connected to main sprinkler pump through deluge valve.

- Fire alarm and detection system has been planned as per NBC 2016 the local CFO requirement. Integrated PA system has been proposed for the project. Entire FAS system proposed is fully analogue addressable system with integrated digital voice evacuation system.

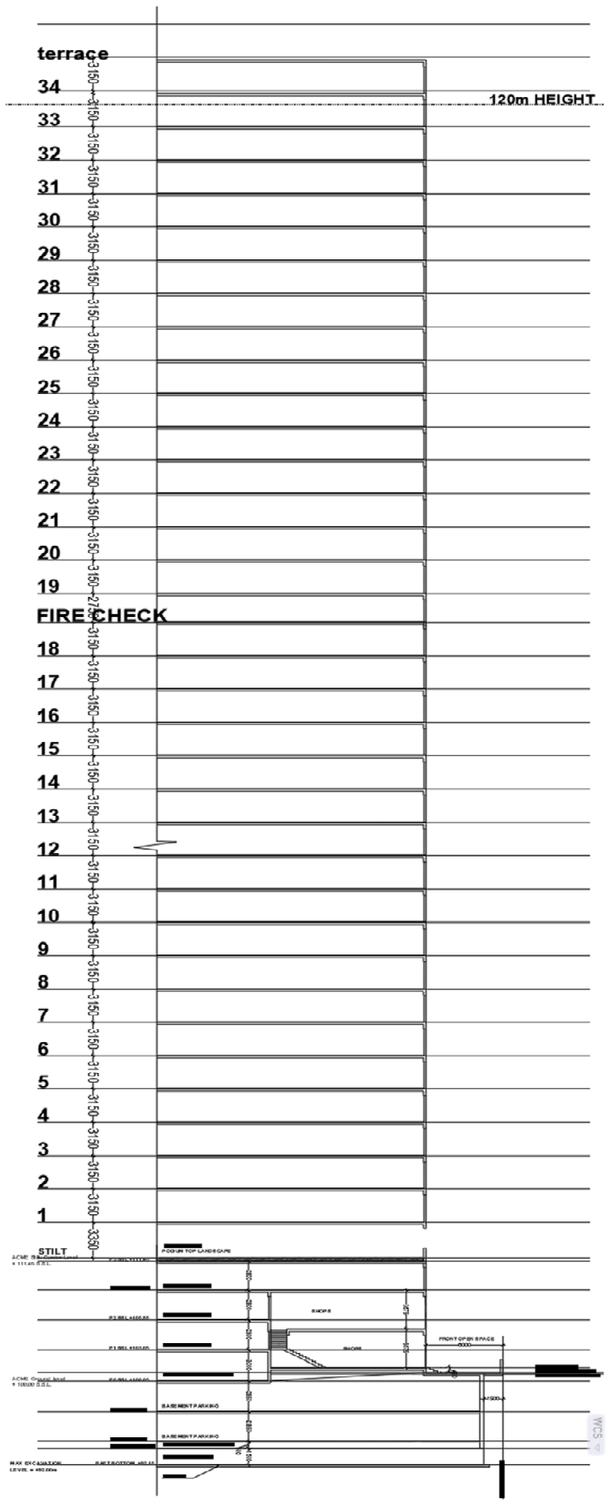
- CCTV and Access control system scheme developed, covers the critical area surveillance and authorized circulation in the complex in general.

Project Description:-
Belmondo is a Residential Development located at Thane. The project consists of 2 residential towers.
Tower consist 2 Basement, Ground floor (Podium 0), 3 Podiums, Stilt floor (Podium top landscape) with 34 typical habitable floor and te

TOWER T01
Tower 01 is a Residential Tower with 6 units to a core, rising to 34 habitable floors above the stilt.
Each habitable floor has a slab to slab height of 3.15 mts. 2 BHK – 105 Nos & 3BHK – 105 Nos.

TOWER T02
Tower 02 is a Residential Tower with 6 units to a core, rising to 34 habitable floors above the stilt.
Each habitable floor has a slab to slab height of 3.15 mts. 2 BHK – 175, 3 BHK - 35





DESIGN BASIS

Considerations for MEP systems			
Name of the developer		M/s Lodha Group.	
Name of the property		Belmondo, Thane	
Location		Thane.	
No.of Towers		2 Towers	
No.of Apartments		420	
	Design Parameters	Consideration's as per discussion with Client	
	MEP SERVICES		
1	HVAC		
A	Cooling Load Parameters		
1	Ambient Design conditions		
	Summer	DBT : 43.3 °C WBT :23.9°C (ISHRAE Weather Data)	
	Monsoon	DBT : 35.0 °C WBT :28.3 °C (ISHRAE Weather Data)	
2	Inside Design Temperature	23 Degree +-2	
3	Air Conditioning System	One to one Split (Dx system)	
		condensate drain will be connected to toilet trap ,Wall/Beam sleeves will to provide Electrical Point will be provided for pre decided condenser location	
		Entrance Lobbies of both Towers are Air Conditioned with DX system. (Client to confirm).	
		LMR AC / Ventilation to be finalized post discussion with lift vendor	
B	Ventilation system		
	Apartments		
	Toilet ventilation	Options: A. Combination of 50 CFM Propeller fan for toilets which are at external side and centralized duct toilet exhaust with duct in each shaft is planned for internal toilet B. Combination of 50 CFM Propeller fan for toilets which are at external side and Inline fan with duct exhausting on external façade is worked out as option.	
	Common areas		
	Car parking Ventilation in Basement	Basement 02 – Mechanical Ductless ventilation at 6 ACPH + 2.5% natural ventilation opening for fresh air intake Basement 01 – Mechanical Ductless ventilation at 6 ACPH + 2.5% natural ventilation opening for fresh air intake	
	Smoke Extraction for Basement	Smoke extraction at 12 ACPH in basement 02 with Jet Fans & Axial Fans Smoke extraction at 12 ACPH in basement 01 with Jet Fans & Axial Fans	
	Pump room ventilation	15 ACPH fresh air & Exhaust through axial fans	
	Common toilet ventilation	15 ACPH Through wall mounted propeller fans, exhausting to outside	
	DG ventilation	15 ACPH Through wall mounted propeller fans, exhausting to outside	
	LT panel room	15 ACPH Through wall mounted propeller fans, exhausting to outside	
	OWC Room	15 ACPH Through inline fans, exhausting to outside	
	ELV room (UPS+server+ Telephone- for common areas)	15 ACPH Through wall mounted propeller fans, exhausting to outside	
	LMR	Air conditioning at 27 deg.c (dedicated system with 24 hours operation) or Ventilation as per LIFT vendor	

C	FLS systems		
	Staircases Pressurization	Below Ground Pressurized at 50 Pascal, Above Ground Naturally ventilated .Except 01 Staircase of tower 01 above ground.	
	Lift lobbies	Below Ground Pressurized at 25 Pascal, Above Ground Naturally Ventilated.	
	Fire Lift lobbies	Pressurized at 25 Pascal	
	Fire lift well	Pressurized at 50 Pascal	
2	Electrical		
A	Lighting design parameters	Recommended Illumination As per NBC 2016 below for General Guidance:	
	Lux levels	200 for Apartment	
		100 for entrance and typical floor lobbies	
		100 for Staircases	
		200 for Plant room/Services Area/BOH Areas	
		50 for parking areas	
		30 for Ramp	
		For Convenience Shop and Clubhouse as per Interior lighting Design	
		For All other Areas not mentioned above As per NBC 2016.	
	Lighting Power Density	0.5 W/Sq.ft (For typical floor lobby and Entrance lobby)	
		0.3 W/sqft for car parking basement	
		1.1 W/sqft for services areas	
B	Power Load		
	Total diversified lighting and power density for electrical load	0.5 W/sqft for lighting and 0.5 W/sqft power for Typical lobby (Without Air conditioning)	
C	Lighting source considered		
i	Lobbies	LED	
ii	Car Parking	LED with Timer	
iii	Service areas	LED	
iv	Staircases	LED	
v	Façade , Interior & Landscape Lighting	Light fixture As per Façade/Interior/Landscape Lighting Design.	
D	Power distribution		
	Distribution Sub- Station	Proposed substation will be of 11/0.415kV. (To be confirmed by client)	
	Apartment	LT power supply 415v+/-5% through dedicated Individual EB meter, installed in meter room	
	Common areas like parking, Utilities, Lift lobbies, entrance lobbies and others	Multiple LT metering with cap of 150kw of Max demand per LT meter.	
E	Back up strategy	DG supply back up for emergency services only. Additionally backup by separate UPS for Emergency lighting and ELV loads.	
F	Authority Meters Metering philosophy	Apartments/shops/Convenience Shops—Single Phase/ Three Phase LT meters installed on Ground/Podium 1/Podium 2 Level	

		Meter room. Amenity/ Common Areas – Three phase LT meters installed on Ground & Podium 1 Level Meter room.	
G	DG Meters Metering philosophy	Shops / Amenity/ – Three phase LT meters installed in Ground floor Meter room.	
H	Earthing Provisions	Earthing system complying to IS 3043 : 2018	
		Foundation Earthing proposed for functional earthing.	
I	Lightening protection system	As per IS/IEC 62305 using Building steel reinforcement as Natural Down conductors.	
J	Aviation lights	As per ICAO (International Civil Aviation Organization) Standard.	
K	Cables	Fire Survival cables for Fire & Life safety equipment's, Fire Retardant Low Smoke cables for all other panels and DB's.	
4	PHE		
A	Water requirement		
i	Occupancy		
	2 BHK	4 Person / Apt (As per LODHA Policy)	
	3 BHK	5 Person / Apt (As per LODHA Policy)	
ii	Daily domestic water requirement LPCD	110 LPCD (As per LODHA Policy)	
iii	Daily flushing water requirement LPCD	45 LPCD(As per LODHA Policy)	
B	Water requirement (Commercial)		
1	Daily domestic water requirement Full Time Person LPCD	25 LPCD	
2	Daily flushing water requirement Full Time Person LPCD	20 LPCD	
3	Daily domestic water requirement Visitor LPCD	5 LPCD	
4	Daily flushing water requirement Visitor LPCD	10 LPCD	
5	Landscape	7 liter/m^2 of total landscaped area	
C	Water storage	1 Day requirement stored in UG tank & 0.5 day requirement stored in OH tank	
D	Water supply distribution		
i	System proposed	Top 3 Floors HYPN & Rest of the Floors Gravity	
E	Water supply distribution (Commercial)		
i	Shop & Retail	Gravity – Through OHT on top of T1	
ii	Tower Common areas & Non Tower area	Gravity	
F	Drainage system		
I	Toilet	200mm Sunk for All toilets	
2	Kitchen	600 x 300 Pocket Sunk.	
3	Balcony	Clear 75mm Sunk with underslung Piping	
4	Utility	200mm depth sunk	
	Fire Fighting		

i	Building system	Fire hydrant and sprinkler throughout the building, water curtain system for basement compartmentation as per IS / NBC 2016.	
ii	Fire Water Tank	A. Under ground: 200 cu.m (For fire hydrant & sprinkler system) for Tower 1 Under ground: 200 cu.m (For fire hydrant & sprinkler system) for Tower 2 Under ground: 100 cu.m (For fire hydrant & sprinkler system) for Tower G (Provision only for UGT) Under ground: 100 cu.m (For fire hydrant & sprinkler system) for Tower H (Provision only for UGT) B. Overhead: 30 cu.m at terrace level of each tower (Tower 1 & 2).	
iii	All mechanical areas	Sprinkler system	
	Substation/Panel room and all electrical areas	Substation - Hand held fire extinguishers (Co_2 type and ABC type) Panel room - Hand held fire extinguishers (Co_2 type and ABC type) LT panel & lift panels - Fire truce system	
iv	Design standards	As per NBC 2016	
v	Fire Control Room	As per NBC 2016 shown on ground floor.	
6	Fire alarm and PA system		
i	Fire Alarm System	Addressable fire Alarm System	
ii	PA system	Integrated voice evacuation system	
7	CCTV system		
i	Building system	NVR based IP CCTV Cameras.	
8	Access control	Boom barriers at entry points. CCTV/ELV Room	

ELECTRICAL

Introduction

The services system for this Project, has been conceptualized based on the master plan drawings and relevant IS / BS codes relevant for electrical system design and energy efficient devices to produce concept which is integrated as a whole. Total conceptual design is done from the point of view of energy efficiency and power distribution to provide clean power to equipment's and other sensitive equipment's. Wherever required modern state of the art control systems are envisaged for power optimization.

BASIS OF DESIGN

System Characteristics:

1	**UTILITY SUPPLY:**	
(i)	Utility company	To be Confirmed by client.
(ii)	Consumer Type	RESIDENTIAL
(iii)	Metering Type	LT
(iv)	Incoming Supply	11 KV, 3 phase 3 wire (MV) (To be confirmed by Client)
(v)	Voltage	415V, 3 phase for L.T. Supply
(vi)	Frequency	50 Hz
(vii)	Earthing	Solidly Earthed
2	**SUPPLY VARIATION:**	
(i)	Voltage variation	+/- 6 %
(ii)	Frequency variation	+/- 3 %
3	**SHORT CIRCUIT LEVEL AT 415V:**	
(i)	Main Supply Bus	To be calculated based on Distribution Transformer Rating.
(ii)	Distribution board	10KA for 1 sec
4	**VOLTAGE DROP:**	
(i)	Main Supply Bus to Motor terminal	Not exceeding 3% (running) and 10% (starting)
(ii)	Main Supply Bus to Other load terminal	Not exceeding 5%

Design Conditions Load calculation:

All electrical equipment shall be designed for humid sub-tropical climatic conditions. The ambient temperature and relative humidity to be considered for design of electrical equipment shall be 45oC to 50oC and 75% to 91% R.H. respectively. However, both the conditions will not occur simultaneously.

Light & small Power Density:-

Sr. No.	Space	LPD w/sqft below following	Small power Density (w/sqft)
1	Entrance Lobbies	1.0-1.5	0.5-1
2	Amenity area	1-1.5	2-2.5
3	Gymnasium / Club Level	2	2-2.5

4	Floor Lobby & Corridors	0.50	0.5
5	Ground level Car parking areas	0.1-0.20	0.1

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

Source of design data:

The following standards and codes shall be followed / referred during detailed design of the services:
National Building Code of India – 2016
Relevant codes of Bureau of Indian Standards
Relevant codes of Indian Standards
NEC, National Electric Code of India
Local Supply norms (To be provided by Laisioning agent)

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.

3 BHK FLAT																			
							6A socket			16A POWER									
	Description	Light Point	Wall Bracket Light	Ceiling Fan	Bell Buzzer	Exhaust Fan	General	HOB	Water filter Point	Fridge Point	Washing M/C Point	Oven	Geyser pt.	AC Point	TV point	Internet Point	Telephone Point	Intercom / VDP	Load	KW
	Load per point	**60**	**60**	**60**	**20**	**60**	**100**	**100**	**100**	**600**	**1000**	**2000**	**2000**	**1500**	**100**					
	3 BHK FLAT																			
1	Living/Dining room	3	2	2	1		6							1	1	1	1	1		
2	Deck	1																		
3	Passage	2																		
4	M. Bedroom	2	2	1			4							1	1					
5	Toilet 1	1	1			1	1						1							
6	Bedroom 2	2	1	1			4							1	1					
8	Bedroom 3	2	1	1			4							1	1					
7	Toilet 3	1	1			1	1						1							
9	Common Toilet	1	1			1	1						1							
10	Kitchen	2		1		1	1	1	1	1		1								
11	Utility	1									1									
12	Study/Multipurpose Room	1		1			1													
	TOTAL QUANTITY	**19**	**9**	**7**	**1**	**4**	**23**	**1**	**1**	**1**	**1**	**1**	**3**	**4**	**4**	**1**	**1**	**1**		
	Total load (w)	**1140**	**540**	**420**	**20**	**240**	**2300**	**100**	**100**	**600**	**1000**	**2000**	**6000**	**6000**	**400**				**20.86**	KW
	TOTAL CONNECTED LOAD		**20.86**																	

	TOTAL MAX. DEMAND LOAD	**5.0**												**DIVERSITY%**		**0.24**		
	TOTAL NUMBER OF POINTS	**82**																

ELECTRICAL LOAD SHEET - TYPICAL APARTMENTS

2 BHK FLAT

	Description	Light Point	Wall Bracket Light	Ceiling Fan	Bell Buzzer	Exhaust Fan	6A socket			16A POWER				AC Point	TV point	Internet Point	Telephone Point	Intercom / VDP	Load	KW
							General	HOB	Water filter Point	Fridge Point	Washing Machine	Oven	Geyser pt.							
	Load per point	**60**	**60**	**60**	**20**	**60**	**100**	**100**	**100**	**600**	**1000**	**2000**	**2000**	**1500**						
	2 BHK FLAT																			
1	Living/Dining room	3	2	2			6							1	1	1	1	1		
2	Deck	1																		
3	Passage	2			1															
4	M. Bedroom	2	2	1			4							1	1					
5	Toilet 1	1	1			1	1						1							
6	Bedroom 1	2	1	1			4							1	1					
7	Toilet 2	1	1			1	1						1							
8	Kitchen	2		1		1	1	1	1	1		1								
9	Utility	1									1									
	TOTAL QUANTITY	**15**	**7**	**5**	**1**	**3**	**17**	**1**	**1**	**1**	**1**	**1**	**2**	**3**	**3**	**1**	**1**	**1**		
	Total load (w)	**900**	**420**	**300**	**20**	**180**	**1700**	**100**	**100**	**600**	**1000**	**2000**	**4000**	**4500**	**0**				**15.820**	KW
	TOTAL CONNECTED LOAD		**15.82**																	
	TOTAL MAX. DEMAND LOAD		**3.8**									**DIVERSITY%**		**0.24**						
	TOTAL NUMBER OF POINTS		**64**																	

ELECTRICAL LOAD SHEET - PROJECT - ACME LODHA - SD STAGE - R0

Sr. No.	Description	Qty. / Sq. Ft	Qty. / Sq. Mtr	Unit Load in Watt	Total Load in KW	Load Factor	Demand Load in KW	Essential Load factor	Load on DG - Normal	Fire Load factor	Load on DG - Fire
	ALL L.T. SERVICES										
	AS PER MSEDCL										
A	**TOWER 1,2 APPARTMENT LOAD**										
1	2 BHK Apartments-T1		6,566	75.00	492.47	0.40	196.99				
2	3 BHK Apartments-T1		10,711	75.00	803.30	0.40	321.32				
3	2 BHK Apartments-T2		9,038	75.00	677.81	0.40	271.13				
4	3 BHK Apartments-T2		7,140	75.00	535.54	0.40	214.21				
	TOTAL CONNECTED / ACTUAL LOAD				**2,509.13**		**1,003.65**				

B	**Common Area Lighting & Power_ Tower-1_LT Meter-01**				-		-		-		-
1	Lift Lobby Lighting	27,565		0.5	10.34	0.80	8.27	0.80	8.27		
2	Lift Lobby Power	27,565		0.5	13.78	0.40	5.51	0.40	5.51		
3	**Refuge Area Power**	**9,125**		**0.1**	**0.91**	**0.50**	**0.46**	**0.50**	0.46		
4	Terrace area	7,987		0.1	0.80	0.30	0.24	0.30	0.24		
5	**Lifts**										
	Passenger Lifts=3NOS, (1 Nos. Fire Lift considered)	3.00		25,000.000	75.00	0.80	60.00	0.80	60.00		-
6	**Plumbing Load**										
	Booster Pump	1.00			1.10	0.60	0.66	0.60	0.66		
	Total Load				**101.93**		**75.14**		**75.14**		**-**
C	**Fire Emergency Load_ Tower-1_Fire Meter-01**				-		-		-		-
1	Lift Lobby Lighting	27,565		0.5	3.45	0.80	2.76	0.80	2.76	1.00	3.45
2	Staircase Lighting	172.00		18.0	3.10	0.80	2.48	0.80	2.48	1.00	3.10
3	**Refuge Area Ltg**	**9,125**		**0.5**	**4.56**	**0.80**	**3.65**	**0.80**	3.65	**1.00**	4.56
4	**Lifts**										
	Passenger Lifts=4NOS, (1 Nos. Fire Lift considered)	1.00		25,000.000	25.00	0.80	20.00	0.80	20.00	1.00	25.00
5	**Ventilation load**										
	Staircase/liftlobby Pressurization	1.00		14,800.00	14.80	1.00	14.80			1.00	14.80
	Fire Lift well Pressurization Fan	1.00		27,500.00	27.50	1.00	27.50			1.00	27.50
	Total Load				**78.40**		**71.18**		**28.88**		**78.40**
D	**Fire Fighting Load_ Tower-1_Fire Meter-02**										
1	**Fire Fighting Loads**										
	Main fire hydrant and sprinkler pumps	1.00			470.00	1.00				1.00	380.00
	Jockey pumps	1.00			21.00	0.80	16.80	0.80	16.80		
	Total Load				**491.00**		**16.80**		**16.80**		**380.00**
E	**Common Area Lighting & Power_ Tower-2_LT Meter-02**				-		-		-		-
1	Lift Lobby Lighting	31,446		0.5	11.79	0.80	9.43	0.80	9.43		
2	Lift Lobby Power	31,446		0.5	15.72	0.40	6.29	0.40	6.29		
3	**Refuge Area Power**	**9,125**		**0.1**	**0.91**	-	-	-	-		
4	Terrace area	8,148		0.1	0.81	0.30	0.24	0.30	0.24		
5	**Lifts**										
	Passenger Lifts=4NOS, (1 Nos. Fire Lift considered)	4.00		25,000.000	100.00	0.80	80.00	0.80	80.00		

6	**Plumbing Load**										
	Booster Pump	1.00			1.10	0.80	0.88	0.60	0.66		
	Total Load				**130.34**		**96.85**		**96.63**		**-**
F	**Fire Emergency Load_ Tower-2_Fire Meter-03**				-		-		-		-
1	Lift Lobby Lighting	31,446		0.5	3.93	1.00	3.93	0.80	3.14	1.00	3.93
2	Staircase Lighting	172.00		18.0	3.10	0.80	2.48	0.80	2.48	1.00	3.10
3	**Refuge Area Ltg**	**9,125**		**0.5**	**4.56**	**0.80**	**3.65**	**0.80**	3.65	**1.00**	4.56
4	**Lifts**										
	Passenger Lifts=1NOS, (1 Nos. Fire Lift considered)	1.00		25,000.00	25.00	0.80	20.00	0.80	20.00	1.00	25.00
5	**Ventilation load**										
	Staircase/liftlobby Pressurization	1.00		18,500.00	18.50	1.00	18.50			1.00	18.50
	Fire Lift well Pressurization Fan	1.00		22,000.00	22.00	1.00	22.00			1.00	22.00
	Total Load				**77.09**		**70.56**		**29.27**		**77.09**
G	**Fire Emergency Load_ Tower-1_Fire Meter-04**										
1	**Fire Fighting Loads**										
	Main fire hydrant and sprinkler pumps	1.00			455.00	1.00					380.00
	Jockey pumps	1.00			21.00	0.80	16.80	0.80	16.80		
	Total Load				**476.00**		**16.80**		**16.80**		**380.00**
H	**All Common Area Load-Tower 1,2_LT Meter-03_LT METER-03**										
1	Podium 3 Lighting & Power	63,712		0.300	19.11	0.80	15.29	0.80	15.29		
2	Podium 2 Lighting & Power	58,061		0.300	17.42	0.80	13.93	0.80	13.93		
3	Podium 1 Lighting & Power	58,061		0.300	17.42	0.80	13.93	0.80	13.93		
4	Ground Floor Lighting & Power	57,512		0.300	17.25	0.80	13.80	0.80	13.80		
5	Basement -2 Lighting & Power	61,527		0.300	18.46	0.80	14.77	0.80	14.77		
6	Basement -1 Lighting & Power	61,527		0.300	18.46	0.80	14.77	0.80	14.77		
7	Stilt floor Lighting & Power	16,953		0.300	5.09	0.80	4.07	0.80	4.07		
8	Plumbing load	1.00			23.25	0.60	13.95	0.60	13.95		
9	Ventilation - normal mode	1.00			18.11	0.80	14.48	0.80	14.48	0.80	14.48
10	OWC load	1.00			15.00	0.80	12.00		-		
	Total Load				**169.56**		**131.00**		**119.00**		**14.48**
I	**All Common area Fire Emergency Load_Fire Meter 5**										
1	Podium 3 Lighting	63,712		0.100	0.64	1.00	0.64	1.00	0.64	1.00	0.64
2	Podium 2 Lighting	58,061		0.100	0.58	1.00	0.58	1.00	0.58	1.00	0.58
3	Podium 1 Lighting	58,061		0.100	0.58	1.00	0.58	1.00	0.58	1.00	0.58
4	Ground Floor Lighting	57,512		0.100	0.58	1.00	0.58	1.00	0.58	1.00	0.58

5	Basement -2 Lighting	61,527		0.100	0.62	1.00	0.62	1.00	0.62	1.00	0.62
6	Basement -1 Lighting	61,527		0.100	0.62	1.00	0.62	1.00	0.62	1.00	0.62
7	Stilt floor Lighting	16,953		0.100	0.17	1.00	0.17	1.00	0.17	1.00	0.17
8	External Lighting	1.00		5,000.00	5.00	0.80	4.00	0.80	4.00	0.80	4.00
9	Plumbing load	1.00			35.50	0.60	21.30	0.60	21.30	0.80	28.40
10	Car Park Ventilation -(Normal+Fire mode)	1.00			102.00		50.70		50.70	1.00	102.00
11	ELV	1.00		15,000.00	7.50	1.00	7.50	1.00	7.50	1.00	7.50
	Total Load				**153.77**		**87.27**		**87.27**		**145.67**
J	**Electric Vehicle Charging_LT METER-4**										
1	Electric Car Charging	34		7,500.00	255.0	0.60	153.00	0.60	153.00		
	Total Load				**255.00**		**153.00**		**153.00**		**-**
K	**Top Podium & Amenity Floor Load LT METER-5**										
1	Top Podium Landscape lighting Load	LS		1,500.00	1.50	0.80	1.20	0.80	1.20		
2	**Amenity**										
	Amenity Ltg,	16,990.04	1,579.00	1.00	16.99	0.80	13.59	0.80	13.59		
	Amenity Power	16,990.04	1,579.00	1.00	16.99	0.80	13.59	0.80	13.59		
	Amenity AC	16,990.04	1,579.00	2.30	39.08	0.80	31.26	0.80	31.26		
	Total Load				**74.56**		**59.65**		**59.65**		**-**
L	**SHOPS LOAD**										
1	Shops Ground Level		756	150.000	113	0.66	74.84	0.66	74.84		
	Total load for SHOPS				**113.40**		**74.84**		**74.84**		**-**
	TOTAL LOAD FOR ALL COMMON SERVICES				**2,121.06**				**757.28**		**681.17**
	TOTAL ACTUAL LOAD FOR ALL COMMON SERVICES						**853.09**				
	TOTAL LOAD FOR APPARTMENT - TOWER G & H				**5,680.96**						
	TOTAL ACTUAL LOAD FOR APPARTMENT - TOWER G & H						**1,755.65**				
	TOTAL LOAD FOR ALL COMMON SERVICES FOR RESIDENTIAL- TOWER G & H				**632.31**				**195.48**		**316.41**
	TOTAL ACTUAL LOAD FOR ALL COMMON SERVICES - RESIDENTIAL- - TOWER G & H						**231.38**				
	HIGH SIDE EQUIPMENT CALCULATIONS										

	D.G. SET CALCULATION FOR RESIDENTIAL COMMON - WITHOUT APPARTMENT LOADS								**IN NORMAL CASE**		**IN FIRE CASE**
	LOAD ON DG SET - IN KW WITH 80% DIVERSIFIED LOAD								**605.83**		**544.93**
	LOAD IN KVA @ 0.8 PF								**757.28**		**681.17**
	EQUIPMENT LOADING @110%								**833.01**		**749.28**
	DG SET RATING IN KVA								**1 x 1000KVA**		**1 x 750KVA**
	SELECTED RATING IN KVA AS PER REQ								**1 X1000**		
TOTAL LOAD - ALL LT SERVICES											
	TOTAL CONNECTED LOAD FOR ALL L.T. SERVICES - KW						**10,943.45**				
	TOTAL ACTUAL LOAD FOR ALL L.T. SERVICES - KW						**1,084.47**				
	TOTAL DEMAND LOAD WITH OVERALL DIVERSITY OF 70% FOR COMMON AREA LOAD - KW						**759.13**				
	TOTAL ACTUAL LOAD FOR APT - KW						**2,759.31**				
	TOTAL DEMAND LOAD FOR COMMON AREA AND APT - KW						**3,518.43**				
	TOTAL MAXIMUM DEMAND IN KVA @0.95 PF						**3,703.61**				
	TRANFORMER TO BE LOADED @ MAX 0.9 LOADING FACTOR						**4,115.13**				
	SELECTED TRANSFORMER RATINGS						**4X1000KVA**				

RECIPIENT OF POWER SUPPLY TO THE PREMISES:-

The estimated power for the entire project inclusive of external area is as follows.
Total Maximum demand for whole project = 3518 KW @ 0.95 PF =3703 KVA Power will be drawn at 11 KV (To be confirmed by client), 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/single phase LT meter shall be provided for each Apartment/Shops & Common area has been proposed.
The meters shall be located in the Meter room on Ground/Podium 1 & 2 level.

LOCATION OF TRANSFORMER:

The electrical power distribution for the project shall be catered by substation located, on Ground floor. Total of 2 nos substation are been proposed for Entire Project. Refer Electrical Load sheet for Substation configuration and Transformer Selection.
Sufficient space for housing utility substation shall be provided within the premises by the developer.
The equipment, details and Specifications of Utility substation shall be as per Utility company standard.

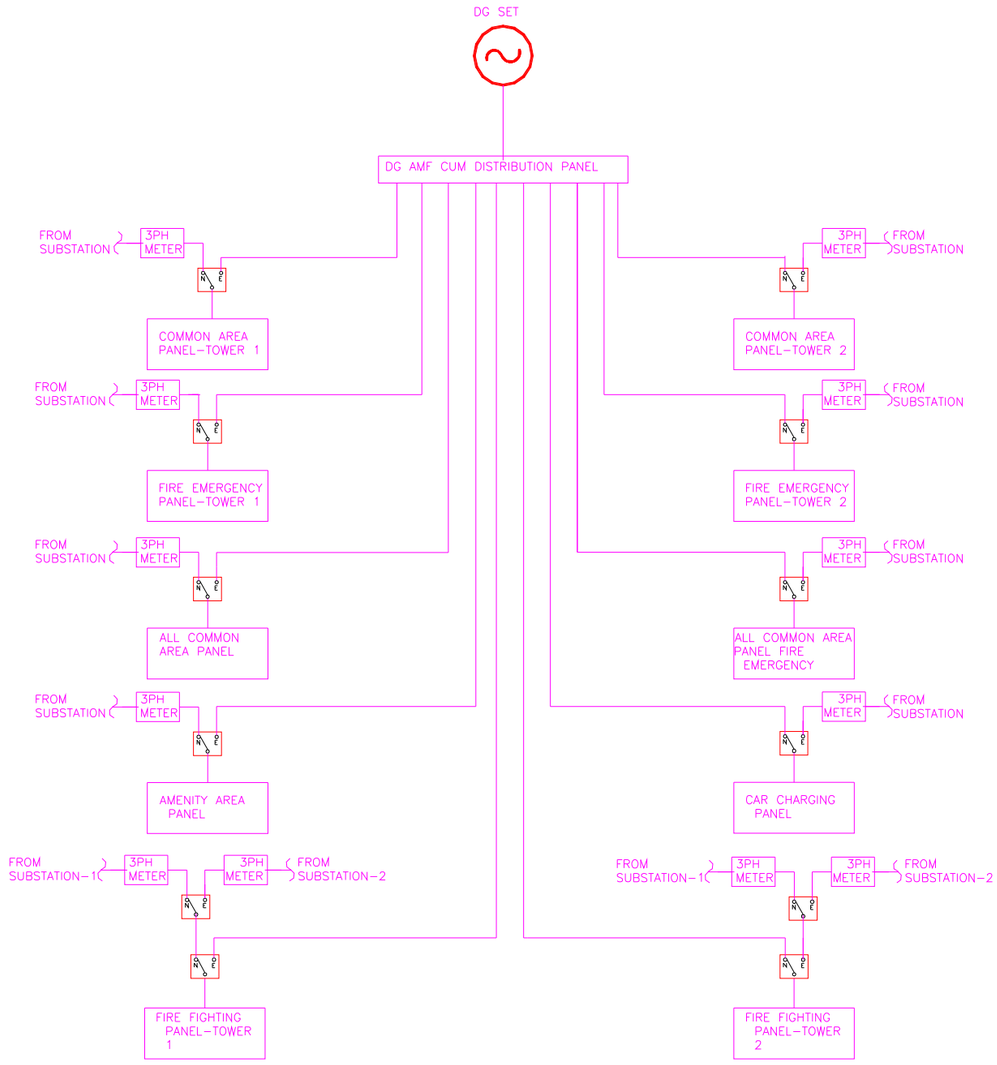
Sub-Station and Incoming Power supply:
Grid power of SEB shall be HT power made available for the project at 11 KV. (To be confirmed by Client)
Substation installation shall be as per SEB standards and shall be handed over after commissioning for future Maintenance and repairs and shall be in the SEB custody.
SEB will supply L.T supply to all the Residential apartments through its substation suggested currently at Ground.
The substation shall accommodate transformers / HT panels / Feeder Pillar.
Low Voltage Distribution – Till meters as per SEB Standards

From transformer, LV panels within substation shall be installed as per standards of SEB. From this LV panel following scheme is adopted:

For Apartments / Resi common

Cables from substation MV panel shall come to SFU in meter room from which cables shall go to independent meters for each of above. There are dedicated meter rooms for each tower planned at Ground floor and Podium 1 & 2 level to accommodate all the meters for LV services. Along with this meter necessary MCB / MCCB shall be provided. The meters shall be mounted in 2 stacks in the meter room.

Power Flow Diagram:



Low voltage distribution – From meters onwards

Apartments

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

Common services –

As we have opted for going for multiple LV services for common areas, the meter for the same shall be located at 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 Podium 2 level. 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 and other levels for common service. Typically following LV panels shall be required:

DG AMF. Cum Load Distribution Panel
Ventilation panel
Lighting panel
Utility panel
Lift panels
External lighting panel
Amenities panel
APFCR panel
FFTG panel

From the panel the cables shall go to distribution boards / starter panels of 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/ IEC 61439. It is generally expected that all LV distribution panels will be top entry/top exit, and that access for maintenance and future modifications will all be carried out from the front of the panels.

The Emergency panel shall be planned for the Life safety i.e. ventilation and FFTG panel. In case of fire the normal supply shall be shut down and the Life safety equipment will get direct power from D.G. set. These equipment shall have D.G power in addition to normal power. The equipment / load which shall be run in fire case has been mentioned in the above mentioned load calculation.

All electrical cables traveling for common services are FRLS (Halogen free fire resistance type, low smoke, and non-toxic and non-black smoke type cable).
For Fire and Life safety Equipment's, Fire Survival cables are considered for following:
From FFTG panel to Booster pump
From ventilation Panel to Life safety Fan equipment.
From Common Emergency lighting Panel to All Emergency Lighting DB

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. Capacitors shall be of MPP Type.

Metering
All type of apartments - By SEB at proposed meter room.
Residential common - By SEB directly at Ground & Basement floor meter room.
For energy management, sub metering shall be provided for each utility 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.

Distribution boards will be:
Provided with outgoing Miniature Circuit Breakers or Residual Current Circuit Breakers with/without Overcurrent (MCBs, RCBs, and RCBOs) to suit final circuit.
Provided with top, bottom or side entry/exit for LV cables and connections
Local indication on incomer and breakers for open closed and trip.
Manufactured to BS EN 60439 1 or local prevailing code, whichever is more stringent.

Generally small power services to the buildings will be distributed in electrical cable trays mounted in ceiling voids and in shafts and in conduits for final distribution to accessories and outlet points. In order to aid rewire ability, conduits will be surface mounted where installed in ceiling voids and concealed in the building fabric where located in visible areas and floor screed. Single and multicore FRLS (Flame Retardant Low Smoke) cabling will be used for final circuits and sub mains.
The system will be fully tested in accordance with BS 7671, “Requirements for Electrical Installations” and applicable local codes of practice.

Emergency Generator Supply

All lighting, power, convenience power, Lifts, Plumbing, Fire pumps, and Pressurization System and Ventilation Fans shall be supplied by DG set equipped with DG AMF cum distribution panel. DG AMF cum distribution Panel 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.

Ratings:
The DG backup power is considered for all emergency services. As per the Load calculation attached in this report DG set rating is as follows:
1 x 1000KVA.
The D.G. sets shall be with air cooled radiator. Flue gases shall be taken till required level as per statutory norms from which they shall be released in atmosphere.

Location / Space requirements:

The generators are planned at Ground floor with Acoustic Enclosure. DG hatch of required size shall be planned for DG loading /unloading on grd level. The space requirement shall be as follows:

1000 KVA DG SET 8.0 x 3.0 x 3.2 M space for each generator including necessary margins. (On Ground level)

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 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 and load distribution panel – as the case may be with manual mode option and necessary protection features.

Scope of Standby Supply

All lighting, power, convenience power, Lifts, Plumbing Fire pumps, and Pressurization System and Ventilation Fans shall be supplied by DG set equipped with AMF cum Distribution Panel. Panel 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.
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
All Utilities
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 shall be acoustically (silenced canopy type) treated to reduce the breakout of noise during operation. The Low noise residential exhaust silencer with exhaust flue pipe and air intake attenuators shall also be provided.

Flue gas exhausts / Stack height

1. **11 mtr stand-alone chimney as per lodha policy.**

It should be cross checked with Environment consultant as to what shall be applicable for this building. Normally if the DG are mounted within building foot print the stack is left at topmost podium level. In case of DG sets away from building (applicable to this project) the stack height normally is kept as 5mtrs.We shall require inputs from Environment consultant on exact stack height to be considered.

CABLES

Power Cables:
All power cables from 16 mm sq. mm to 300 sq. mm size will be of Aluminum and below 10 sq. mm will be of copper. The minimum size of conductor will be 2.5 Sq. mm. Power cables for 11KV/6.6KV application will be 11/22/6.6KV grade, 3C x150/240/300 Sq.mm. Al, AR, XLPE insulated multi core, conforming to IS-7098 pt. II. Power cables for 415V applications will be 1100V grade, Al, AR, XLPE insulated, single/ multi core conforming to IS-7095-pt I. Cables for DC application will be single core conforming to IS-7098 pt. I.

Lighting Cables: For supply to lighting DBs/PDBs/lighting panels 3.5C Al, Ar, cables will be used. For Light point mains, wires will be FRLS PVC of 2 x 2.5 sq. mm +1 x 1.5 sq. mm. For power point (first point) wire, 2 x 4 sq. mm + 1 x 2.5 sq. mm (mainly for A/C. and Geyser) will be used. For power point (second point) wire, 2 x 2.5 sq. mm + 1 x 2.5 sq. mm will be used.

Control Cables:
Control cables will be 1100V grade, multi core, stranded copper, PVC insulated, armored with minimum conductor of 1.5 Sqmm cross section. For CT secondary circuit a minimum of 2.5Sqmm will be used. All control cables will be armored /screened.

Cable sizing criteria:
Short circuits withstand.
For 11/22/6.6KV power cables the fault withstand value will be 1.0sec.
Power cables down the line protected by circuit breakers with high set instantaneous over current protection will be sized for short time withstand value of 0.2 sec. when power cables are protected by fuses, the I2t value of the chosen cable will be two times the let through energy of the fuse.
Alternately, 0.1 sec. withstands.
Current Rating: Cables will be sized for continuous current rating for a ref. design ambient of 40 degree centigrade with de-ration for grouping.
Voltage Drop: Voltage drop during full running of the equipment will be 2% up to the effective bus and further 3% to the equipment terminals, keeping the overall drop limited to 6%.



Voltage Dip: Voltage dip for sizing of cables for motor start shall be limited 10%.Cable sizes will be appropriately chosen to limit the dip to the above.

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 100/300 mA ELCB (As per Load).100% of common area lighting has been considered as emergency lighting, which is fed from D.G. Supply located at ground floor.
Car park lighting & power are fed from all 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. The Mains and primary point of the Lighting circuit wiring shall be 2.5 sq.mm copper and secondary point wiring through 1.5 sq.mm copper wire.

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.



Basement Lighting



Landscape / infra Light



Shafts / Mechanical Areas



Staircase

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	LED	100 – 150
2 Lobby	LED	(As per Interior Lighting Design)
3 Car Parking	T5 LIGHT FITTING	50 – 75
4 Service areas	T5 LIGHT FITTING	150 – 200
5 Staircases	LED	100-150
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 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.

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	Control Method	Dimming/Scene setting
Plant and service areas	Local switching	No
Car parking areas	Local switching with Timers through MCB’s. Note : Emergency light always ON	No
Lobbies / passages	MCB controlled	No
Stairs	MCB controlled	No
Entrance lobbies	Local switching	No
Public area like Club house, amenities etc.	Local switching + dimming if require	Yes if required as per interior.
Landscape lighting	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 20-25% 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) – though for our requirement it is suggested as 30 mins from inverter and rest by D.G. back up.

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.

The emergency lighting system will be by means of static inverter – UPS if in case as the requirement is large for an inverter, located in strategic locations of every building and a separate Inverter shall be planned for all common area except the tower portion, to support chosen normal ambient fittings in the event of local circuit failure.

These static online UPS systems will comprise of maintenance free lead acid batteries, charger, inverter and control equipment. The size of the units can only be determined on completion of the lighting design and receipt of luminaries' specifications from specialist designer.

Lightning Protection
The building height is app. 120 mtrs and lightning protection becomes a very important part of the building. As per the usage of building the building shall by all possibilities fall under class 1 protection level for -

Building structure
Living beings
Equipment

The building will be provided with a non-isolated Lightning Protection System (LPS) that complies to IS/IEC 62305 and local statutory requirements. IS/IEC 62305 classifies the risk of this building as class 1 the highest level.
The LPS will be designed to protect against damage to the following:
- Building structure
- Living beings
- Equipment

The LPS will comprise a 'Faraday Cage' system comprising four main elements as follows:
- Air terminal network
- Down conductor network
- Earth termination network
- Bonding

The LPS will need to be interconnected to the structure and other building systems to achieve one equipotential system. The LPS will therefore need to be bonded to the following:
- Structural exposed metal parts

- Internal systems (i.e. power, telecoms, satellite)
- Incoming services (for example water mains pipework)
- External conductive parts (i.e. facade, metal window frames, etc.) and lines connected to the structure
- Internal conductive parts (i.e. pipework, containment, etc.)
- Lift guide rails
- Testing facilities

Air termination:
Air termination network will comprise of Vertical Air rods and Horizontal Tapes. The entire area of the roof must be protected with roof conductors placed in a grid pattern to form a mesh of 5x5 meters. Aluminium tapes will be used for this purpose. Any joints within the tape are to be bolted or welded. Air rods will be located on the roof to which will not exceed the building height limitations and will be located at strategic points on the roof as in services dwg. The air rods will give enhanced protection to the building.
The air termination network will bonding the structure at the upper roof levels located at corners, exposed points and edges in accordance with IS/IEC 62305. Test points to be provided at the roof and ground levels for testing purposes.

Down Conductors:
The building will have down conductors spaced out at every 10 meters around the periphery of the building.
The down conductors will be part of structural building elements. All down conductors to be terminated at the roof level and at ring earth on Basement level.
Ring conductors to be allowed for structures taller than 60 meters to avoid the dangers of side flashes. Ring conductors will be spaced at every 20 meters from 60 to 120 meters; and above 120m at every 10 meters. Ring conductors used will be Aluminium tapes, tape color to match the architectural finish of the building.
Ring conductors when passing through the curtain walling must be bonded to it with special bimetallic clamps to avoid corrosion. All ring conductors must be bonded to all the down conductors at each specified levels. Saddles for the ring conductors to be spaced at 1000mm hole centers.
Close coordination will also be required with the façade designers to integrate the lightning protection network into the façade rather than developing separate systems.

Ring Conductors:
The building heights are more than 60 mtrs and as per IS/IEC 62305, ring conductors shall be provided along the perimeter of building at every 20 mtrs till terrace parapet of the building for side strike protection. The ring conductors shall be connected to column rebars down conductors.

Earth Termination:
The earth termination network will be provided by foundation earthing located at Basement Level. Type B arrangement shall consist of either a ring electrode or a foundation earth electrode as per IS/IEC 62305. 75x6mm GI Strip shall be used for Foundation Mesh earthing. Resistance of the system to comply with IS/IEC 62305 and local code requirements.
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
Surge suppression and diverters will be required to be installed.

Earthing System

The earthing system for this project is proposed based on IS 3043:2018. An integrated foundation earthing system has been proposed to cater the fault current . An added advantage of the foundation earth electrode is the elimination of the requirement of additional earth pits for the electrical system. As per IS 3043: 2018 the same mat can be used for the grounding of an electrical system provided that the
length of conductor is calculated as per the required current density. A T-T-NS System is preferred for commercial or residential structures. 2 risers whose sizes are calculated for the HT fault current can be tapped from the foundation earth electrode and connected to a main earthing bus bar. All further Neutral connections to Transformers and DGs along with the PE conductors of the electrical system may be
tapped from this Main earthing bus bar (MEBB). The foundation earth electrode must be installed as a closed ring in the strip foundation or floor slab and thus primarily serves the purpose of functional equipotential bonding. A foundation earth electrode of mesh size less than or equal to 20mx20m is preferred for equipotential bonding. If the foundation earth electrode is to be used as the earth termination of an LPS then a foundation earth electrode with a mesh size not greater than 10mx10m is required.

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
Generator star points
Lightning protection system
Building structure
Switchgear
Specialist equipment (security, lifts, telecommunications etc)

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. 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.

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

Sr.no	Description	As per standard local practice	Min. reqmt. (generally acceptable)	Remarks
1	Substation – SEB side	Foundation Earthing	Foundation Earthing	To be confirmed with SEB
2	Transformer- Neutral	8	8	Considered as provisional
3	DG Neutral	2	2	Considered as provisional
4	D.G. Body	Foundation Earthing	Foundation Earthing	
5	Lifts (8nos.)	Foundation Earthing	Foundation Earthing	To be cross checked with lift vendor for independent earth pit for each lift.
6	Lighting Arrester – 4 earth pits per tower	Foundation Earthing	Foundation Earthing	Depends on the system adoption
7	ELV Services – 2 per Tower	Foundation Earthing	Foundation Earthing	
8	Common load panels	Foundation Earthing	Foundation Earthing	
9	LT meters (2 Per Meter room)	Foundation Earthing	Foundation Earthing	
10	Electrical Shaft (12 Nos.)	Foundation Earthing	Foundation Earthing	
11	SPARE – 2 per Tower	Foundation Earthing	Foundation Earthing	

	TOTAL	--	---	

Aircraft Warning Lights (As per Civil Aviation NOC, if appl)

Aircraft warning lights shall be provided if mandated by ICAO. The Building height is approximately 120 m, in such case Aircraft warning light must be install on the top of the Building. The system will be designed to the International Civil Aviation Organization (ICAO) guidelines and the local Civil Aviation Authorities.



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 :

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

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.

WATER MANAGEMENT PUBLIC HEALTH AND SANITATION

Project Brief:

a) The report is based on the architectural plan 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.
c) The project comprises of 2 nos. of tower, amenity area and commercial area.

b. Climatic Data

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

c. Water Quality

The quality of water from all the sources shall be checked. The major source of fresh water will be Thane Municipal Corporation. Client to furnish water test reports for the same. The short fall in requirement of water shall be supplemented through tankers. Suggestion regarding the treatment of water required will be given from the water test report.

d. Drainage and Storm Water Connection

The pipe size and invert levels for nearby existing network sewers and storm water drains shall be furnished by client for final design of sewage and storm water disposal.
Sewage Treatment Plant will be installed for disposal of soil and waste and the recycled water will be used for flushing and gardening.
Maximum intensity of rainfall – 100 mm/hr.
Sources of water supply will be Municipal Corporation, tankers & STP recycled water.
Disposal system for waste water and sewage will be through – Sewage Treatment Plant.
All the surface & terrace rain water runoffs will be drained through well designed storm water disposal system after adopting suitable rain water harvesting system.
Total 155 liters/person/day water is assumed for all the units. (Break up is as, 110 lpd for domestic water and 45 lpd for flushing water)
Water efficient and low flow fixtures will be used in toilets.
Dual piping system will be adopted for water supply – for domestic water and flushing water.
Single stack system or Double stack with Partially ventilated system will be provided for the disposal of soil and waste water from the entire building.
Sewage and waste generated will be connected to Existing Sewage Treatment Plant and recycled water will be used for flushing and irrigation.

3.0 Water management system Infrastructure Requirements:

Overall the Water management system consists of:
Water Supply
Solar Hot Water System – Generation & Distribution
Sewerage Disposal System
Connection to Existing Sewage Treatment Plant
Storm Water Drainage System
Rain water Scheme

3. A. Water Supply:

The main source of domestic water supply will be water supplied by Thane Municipal Corporation, the quality of water from corporation will be assured. Suggestion for the water treatment can be given from the water test report for available water. Balance water requirement will be supplemented from 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:

Domestic Water:

The potable water available from Municipal Corporation shall be termed as Domestic water which will be first stored in firefighting tank. Overflow of firefighting tank to be connected to Domestic tank from where it will be pumped to Overhead domestic tank.

Drinking Water:
We used Domestic water as a drinking water, tenant shall be put RO inside the flat / high intensity ultraviolet unit for sterilization at consumption point, and will be used for Kitchens and drinking facility.

Recycled / Flushing Water:
Water recycled from Sewage treatment plant shall be supplied to WC and Urinal is termed as Flushing water. Same water shall be used for Irrigation purpose.
Refer following tables for the total water requirement for the project

WATER REQUIREMENT FOR LODHA

DESIGN DATA : **Date:- 16.06.2021**

DAILY WATER REQUIREMENT FOR VARIOUS SERVICES :

It is estimated that the daily requirement of water for the entire project, based on the number of flats and for other services will be as follows:

No.	Description	Total No. Flats	Persons/flat	Total Pax	Domestic Water		Flushing Water		Total Water Requirement
					LPCD	LPD	LPCD	LPD	Liters
A	B	C	D	E = CxD	F	G = ExF	H	I = ExH	J = G + I
1	**Residential Tower 1**								
	2 BHK	105	4	336	110	36,960	45	15,120	52,080
	3 BHK	105	5	420	110	46,200	45	18,900	65,100
	Servant (@ 1 person per flat)	210	1	168	110	18,480	45	7,560	26,040
	Guest and visitors (@ 1 person per flat)	210	1	168	110	18,480	45	7,560	26,040
	Drivers (@ 1 driver per flat)	210	1	168	15	2,520	25	4,200	6,720
	TOTAL	210		1,260		122,640		53,340	175,980
2	**Residential Tower 2**								
	2 BHK	175	4	560	110	61,600	45	25,200	86,800
	3 BHK	35	5	140	110	15,400	45	6,300	21,700
	Servant (@ 1 person per flat)	210	1	168	110	18,480	45	7,560	26,040
	Guest and visitors (@ 1 person per flat)	210	1	168	110	18,480	45	7,560	26,040
	Drivers (@ 1 driver per flat)	210	1	168	15	2,520	25	4,200	6,720
	TOTAL	210		1,204		116,480		50,820	167,300
3	**Commercial**								
	Shop / Retail	1473	1/ 10 sq.mtr	118	25	2946	20	2357	5,303
	Visitors	1473	1/ 7 sq.mtr	168	5	842	10	1683	2,525
	Wastage					500		300	800

	Total Water Requirement for Shop / Retail					**4,288**		**4,340**	8,628
	Total Water Requirement				**say…**	**243,408**		**108,500**	**351,908**

Tank Capacities

TANK CAPACITIES					
Sr. No	**Description**	**Total no. of Compartments**	**Capacity of each compartment in cum**	**Total Capacity in cum**	**Remarks**
	Tower 1 & 2				
A	**Main Water storage Tanks @ Basement**				
1	Fire Water tank	2	200	400	
2	Domestic water tank	2	122	243	
B	**In Sewage Treatment Plants**				
5	Flushing water tank	2	54	109	
C	**Over Head Tanks at Terrace floor level**				
	Tower - 1				
1	Fire Water tank	1	30	30	
2	Domestic water tank	1	61	61	
3	Flushing Water Tank	1	29	29	
	Tower - 2				
1	Fire Water tank	1	30	30	
2	Domestic water tank	1	58	58	
3	Flushing Water Tank	1	25	25	
Note: One day of total storage is considered for the calculation of Domestic & Flushing underground Tank capacities and Half day Storage is considered for Domestic & Flushing Overhead tank calculation.					

Water Treatment and Receipt of Water:

Water from Municipal / tankers will be brought to the firefighting tank & its overflow to Domestic water tank.

The water received everyday shall be randomly checked for physical, chemical and microbial analysis to ensure that water quality is maintained. If required, then WTP can be planned after receiving water test report.

Water Distribution and Supply System:

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

One set Vertical inline pumps will be installed in the Pump room, which will transfer domestic water from underground tank to overhead tanks provided on terrace of the respective tower.

The above system of domestic water supply is applicable to all the Towers.
Domestic water supply for Top 5 floors will be supplied by means of Hydro-pneumatic (Terrace Booster) for adequate pressure at fixtures.
One set Vertical pumping system will be installed for each individual building in STP plant to transfer recycled water to the flushing OHT of respective Tower & Irrigation purpose.

Zoning for Domestic for Tower 1 & 2

Sr. No.	Zoning	Levels Considered in Zoning	Location of Ring Main	System of Water Supply
1	Zone – 1	30th Floor to 34th Floor	Terrace level	Hydropneumatic
2	Zone – 2	24th Floor to 29th Floor	Terrace level	Gravity
3	Zone – 3	18th Floor to 23rd Floor	Terrace level	Gravity
4	Zone – 4	13th Floor to 17th Floor	Terrace level	Gravity
5	Zone – 5	7th Floor to 12th Floor	Terrace level	Gravity
6	Zone – 6	1st Floor to 6th Floor	Terrace level	Gravity

Zoning for Flushing for Tower 1 & 2

Sr. No.	Zoning	Levels Considered in Zoning	Location of Ring Main	System of Water Supply
1	Zone – 1	30th Floor to 34th Floor	Terrace level	Gravity
2	Zone – 2	24th Floor to 29th Floor	Terrace level	Gravity
3	Zone – 3	18th Floor to 23rd Floor	Terrace level	Gravity
4	Zone – 4	13th Floor to 17th Floor	Terrace level	Gravity
5	Zone – 5	7th Floor to 12th Floor	Terrace level	Gravity
6	Zone – 6	1st Floor to 6th Floor	Terrace level	Gravity

3. B. Hot Water System – Generation and Distribution:

Individual Storage/instant electrical heater will be given in the respective toilet wherever required for the hot water. The geysers shall be provided in all toilet except in kitchen for all towers. The hot water distribution line within the toilets shall be suitably insulated to avoid heat loss.
In each unit a single toilet shall be provided with Solar Water Heating system.

Zoning for Solar Hot Water for Tower 1 & 2

Sr. No.	Zoning	Levels Considered in Zoning	Location of Ring Main	System of Water Supply
1	Zone – 1	30th Floor to 34th Floor	Terrace level	Hydropneumatic

3. C. Metering strategy:

Metering approach shall be as follow

i. Main meter on Municipal inlet line.
ii. Main meter on Tanker Water inlet.
iii. Sub meter for each Tower for Domestic and Flushing water use.
iv. Sub meter for Irrigation purpose.
v. Sub meter for Water-body (Provision for future use).
vi. Sub meter for Commercial Shops for Domestic and Flushing water use

Water Supply Piping Schedule:

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

Sr. no	Service	Location	Proposed 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	C-PVC SDR 11 (90 Deg.C rating)	Nitrile Rubber
3	Flushing Water Supply Pipes	In toilets	C-PVC SDR 11	Not required
4	Domestic Cold & Flushing Water Supply Pipes	In shafts Vertical down take	UPVC SCH 40 PIPES / FITTINGS SCH 80	Not required
5	Domestic Cold & Flushing Water Supply Pipes	Ring-mains at terrace	G.I. 'C' Class	Not required
6	Domestic Cold Water Supply Pipes	Plant Room piping.	G.I. 'C' Class	Not required
7	Domestic & Flushing Water Supply Pipes	Pump Discharge header from pump room @ UGT to OHT.	G.I. 'C' Class	Not required
8	Solar Water Supply Pipes on roof	Plant Room piping.	G.I. 'C' Class	Not required
9	Domestic Hot Water Supply Pipes	In shafts Vertical down take	C-PVC SDR 11	Nitrile Rubber
10	Irrigation / Car wash water supply pipes.	Site Specific	UPVC SCH 40 PIPES / FITTINGS SCH 80	Not required
11	Air-conditioning drain pipe	In shaft and apartment	UPVC SCH 40 PIPES / FITTINGS SCH 80	Insulation on pipe in apartment only.

3. D. Sewerage Disposal System:

General

Treated sewage and wastewater will be collected through pipe network within the building and transferred to in existing STP for further processing
The recycles water will be used for flushing and irrigation purpose.

Sewerage Disposal

The waste water and soil water will be collected from toilet blocks / kitchen to main drainage network.
From toilets and kitchen, wastewater will be collected into gully traps and through chamber it will be connected to main drainage line.

Last three floors will have a separate downtake for all the shafts.
From kitchens, the waste water generated will be passed through gully traps and through chamber it will be connected to main drainage line & finally to the STP.
The main drainage line will discharge the soil and wastewater to sewage treatment plant for aerobic and / or anaerobic decomposition.
Treated water will be used for flushing and landscape features like fountain and water body. Excess treated water will be collected in collection tank and finally disposed off into drain / nala.

Metering
One meter to be installed near STP for mereting puspose for Sewage line.

Sewage Generation
The capacity of the sewage treatment plant shall be designed on the basis of following Building design calculations

SEWAGE GENERATION FOR LODHA ACME OZONE									
DESIGN DATA :								**Date:-**	**16.06.2021**
DAILY SEWAGE GENERATION :									
No.	**Description**	**Total No. Flats**	**Persons/flat**	**Total Pax**	**Grey Water Generation**		**Black Water Generation**		**Total Sewage Generation**
					LPCD	**LPD**	**LPCD**	**LPD**	**Liters**
A	**B**	**C**	**D**	**E = CxD**	**F**	**G = ExF**	**H**	**I = ExH**	**J = G+ I**
1	**Residential Tower 1**								
	2 BHK	105	4	420	94	39,270	45	18,900	58,170
	3 BHK	105	5	525	94	49,088	45	23,625	72,713
	Servant (@ 1 person per flat)	210	1	210	94	19,635	45	9,450	29,085
	Guest and visitors (@ 1 person per flat)	210	1	210	94	19,635	45	9,450	29,085
	Drivers (@ 1 driver per flat)	210	1	210	15	3,150	25	5,250	8,400
TOTAL		210		1,575		130,778		66,675	197,453
2	**Residential Tower 2**								
	2 BHK	175	4	700	94	65,450	45	31,500	96,950
	3 BHK	35	5	175	94	16,363	45	7,875	24,238
	Servant (@ 1 person per flat)	210	1	210	94	19,635	45	9,450	29,085
	Guest and visitors (@ 1 person per flat)	210	1	210	94	19,635	45	9,450	29,085
	Drivers (@ 1 driver per flat)	210	1	210	15	3,150	25	5,250	8,400
TOTAL		210		1,505		124,233		63,525	187,758
3	**Commercial**								
	Shop / Retail	1473	1/ 10 sq.mtr	147	21	3130	20	2946	6076
	Visitors	1473	1/ 7 sq.mtr	210	4	894	10	2104	2999
	Wastage								

	Total Sewage Generation for Shop / Retail					**4,024**		**5,050**	**9,075**
	Total Sewage Generation				**say…**	**259,034**		**135,250**	**394,285**

Drainage piping schedule:

Sr. No.	Service	Location	Proposed Material
1	Soil, Waste & Kitchen internal to flat	Internal to flat	UPVC SWR CLASS 'B'
2	Basin, shower, etc. waste pipes up-to p-trap / floor trap / stack	Throughout site	AGRI PIPES & FITTINGS
3	Soil, Waste & Kitchen stacks	All shafts and throughout site	UPVC SWR CLASS 'B'
4	Soil & Waste pipes Suspended (Bottom Floor)	Suspended / at ceiling	CI PIPE SPUN TYPE / HDPE PE 100
5	Rain Water Stacks	All shafts	UPVC SWR CLASS 'A'
6	Vent Stacks	All Shafts	UPVC SWR CLASS 'A'
7	Drainage and Rain water pipes below ground	Throughout site	DWC (Double Wall Corrugated) Pipe
8	Swimming Pool and water feature drain pipes	Site Specific	UPVC SCH 40 PIPES / 80 FITTINGS
9	Sump Discharge Pipe	Basement ceiling	GI 'B' CLASS

D. Podium Parking Drainage Disposal System:

There shall be Two Possible option for parking floor drainage

1. Point drain System
2. Saucer Drain System

Point Drain System
In point drain system Slab will be sink to a particular point and that sink point will be provided with drain outlet at ceiling level of the immediate bottom floor through network of pipes.

Advantages of the system
- ❖ This system requires less floor finish.

Disadvantages
- ❖ Challenging to cast at site.
- ❖ No of drain outlet points will be increased
- ❖ Water ponding situation can be arise due improper slope.

Saucer Drain System
In this system Slab will be sloped at one direction and a small deep curvature will be formed at end of slope. Through drain pipe connected at bottom of saucer floor it will be drained off.
Advantages of the system
- ❖ It's very easy to cast at site due to one directional slope.
- ❖ No Water ponding situation arises.

Disadvantages

- ❖ Floor finish needs to be increased.

We would like to have Saucer drain as preferable option due to its proper functioning and easy to cast situation at site.

E. Storm Water Disposal System:

Design Criteria

Maximum intensity of rainfall is considered as 100 mm/hr.
Average Co-efficient of Run-off is taken as 0.80.
Co-efficient of Run-off for paved area including internal road is taken as 0.95
Co-efficient of Run-off for green belt area is taken as 0.25
Co-efficient of Run-off for terrace area is taken as 0.95

Storm Water Disposal from Terraces

Rain water pipes / spouts will be provided from terraces to ground level for taking out the rainwater.
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.
The rainwater from the terraces will be disposed off through suitable vertical drop pipes and stored in tanks at Basement level.

Storm Water Disposal from Ground level

A channel network will be provided at the ground level connected with rain water harvesting and over flow connected to external storm water drainage network.
Storm water sumps of suitable capacity will be provided in the Basement in coordination with the structural consultant and architect.
A grating at the main entrance will be provided to prevent entry of outside rainwater to the premises.

F. Rain Water Collection and Harvesting: (Required Soil investigation Report of Monsoon season)

Design Criteria

Broadly, there are two options for rain water harvesting:

100% percolation / infiltration of the rain water to raise the sub-soil water levels and no reuse.
Maximum possible storage of rain water falling in our premises and re-using the same for flushing and irrigation, surplus water to be used for percolation / infiltration.

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 option doesn't give the immediate benefit of water to the society, but over a period of time maintains or increases the water table of the area.

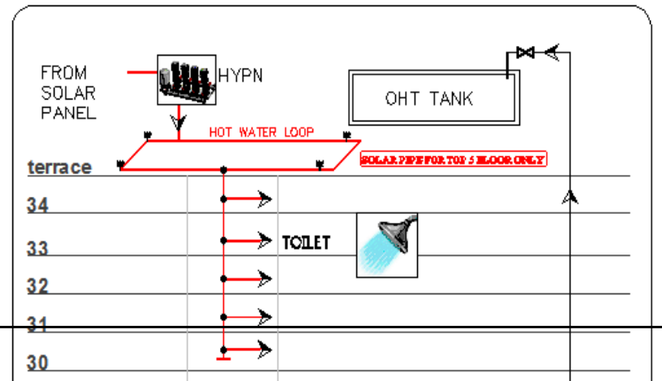
Second option of storage of rain water and then re-using the same with suitable treatment is more advantageous in the present scenario where we are facing shortages of water. The stored rain water can be re-used for flushing and irrigation. In this case, the initial rains are allowed to drain away in the harvesting well or city drainage so as to clean the storm water network and achieve clearer and better quality of rain water for usage.

As per MOEF guidelines we tend to consider the both the option storing & recharging.

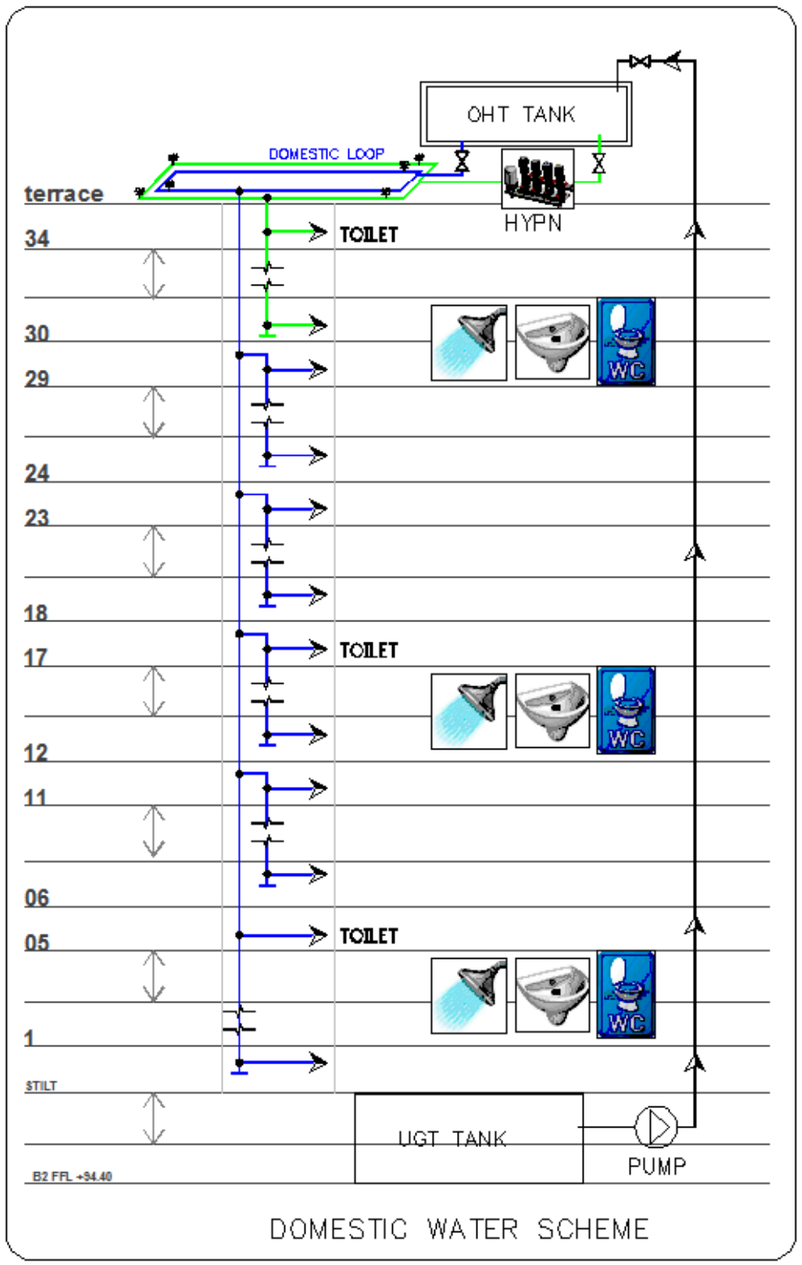
G. Sanitary Fixtures and Water management system Fittings:

The best quality sanitary fixtures as approved by architect will be used.
Water saver taps, push type fittings for basins / sinks / urinals shall be used
Low volume dual flush cisterns shall be used to reduce water consumption.

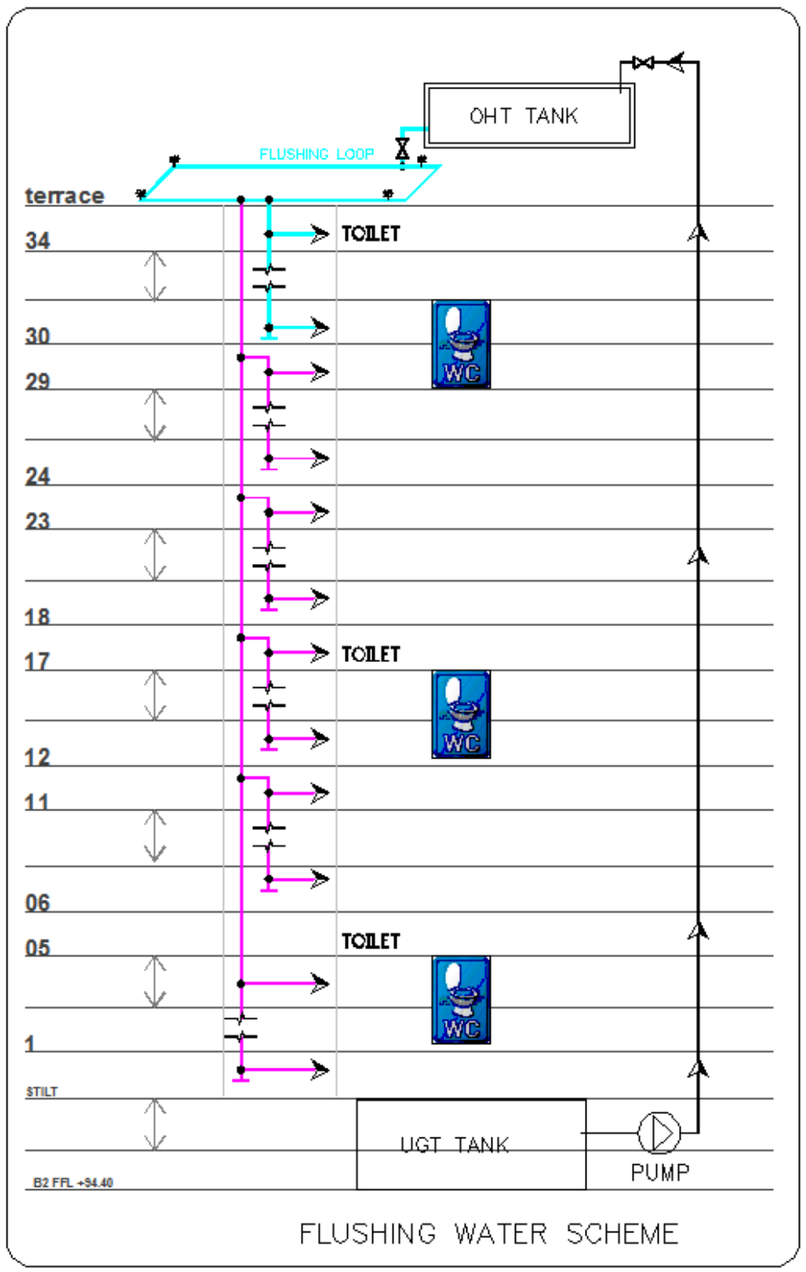
H. Block diagram:



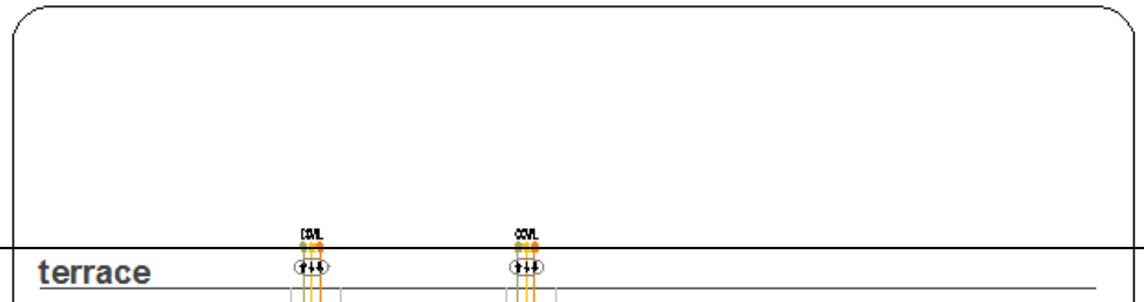
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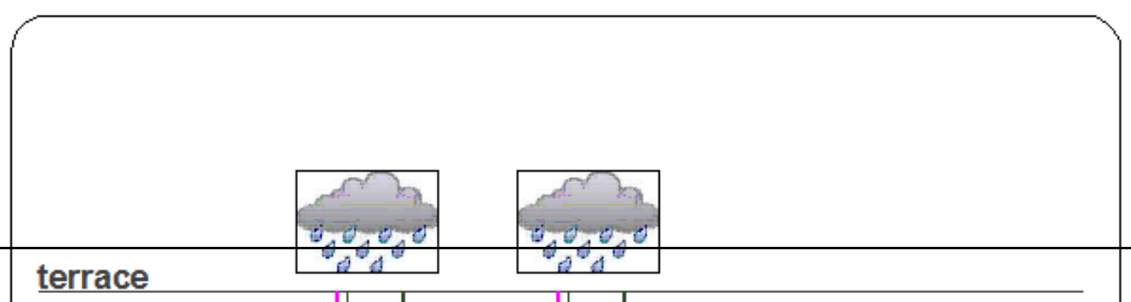


DOMESTIC WATER SCHEME



FLUSHING WATER SCHEME





a) Terrace Rain Water drainage system

CODES:

STANDARDS

IS : 325	Three phase induction motors
IS : 554	Dimensions for pipe threads where pressure tight joints are required on the threads.
IS : 779	Specification for water meters (domestic type)
IS : 1172	Code of basic requirements for water supply drainage and sanitation
IS : 1367 (Part- 1)	Technical supply conditions for threaded steel fasteners : Part 1 introduction and general information.
IS : 1367 (Part- 2)	Technical supply conditions for threaded steel fasteners: Part 2 product grades and tolerances.
IS : 1726	Specification for cast iron manhole covers and frames
IS : 1742	Code of practice for building drainage.
IS : 2064	Selection, installation and maintenance of sanitary appliances - Code of practice.
IS : 2065	Code of practice for water supply in buildings.
IS : 2104	Specification for water meter boxes (domestic type)
IS : 2373	Specification for water meters (bulk type)
IS : 2379	Color code for identification of pipe lines
IS : 2527	Code of practice for fixing rainwater gutters and down pipes for roof drainage.
IS : 3114	Code of practice for laying of cast iron pipes
IS : 4111 (Part 1)	Code of practice for ancillary structures in sewerage system : Part 1 manholes
IS : 4127	Code of practice for laying glazed stoneware pipes.
IS : 4853	Recommended practice for radiographic inspection of fusion welded butt joints in steel pipes
IS : 5329	Code of practice for sanitary pipe work above ground for buildings.
IS : 5455	Cast iron steps for manholes.
IS : 6159	Recommended practice for design and fabrication of material prior to galvanizing
IS : 7558	Code of practice for domestic hot water installations
IS : 8321	Glossary of terms applicable to plumbing work
IS : 9668	Code of practice for provision and maintenance of water supplies and firefighting.
IS : 9842	Preformed fibrous pipe insulation
IS : 10221	Code of practice for coating and wrapping of underground mild steel pipelines
IS : 10234	Recommendations for general pipeline welding.
IS : 10446	Glossary of terms relating to water supply and sanitation.
IS : 11149	Rubber Gaskets

IS : 11790	Code of practice for preparation of butt-welding ends for pipes, valves, flanges and fittings.
IS : 12183 (Part 1)	Code of practice for plumbing in multistoreyed buildings : Part 1 Water supply
IS : 12251	Code of practice for drainage of building basements
IS : 5572	Code of practice for sanitary pipe work
IS : 6700	Specification for design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages.
IS : 8301	Code of practice for building drainage
BSEN : 274	Sanitary tapware, waste fittings for basins, bidets and baths. General technical specifications.

FIRE ENGINEERING

Introduction

The purpose of this report is to provide the client and the design team with an appreciation of the key fire safety provisions necessary within the TOWER at this stage in the development's design. This report will also subsequently be used for submission to the Chief Fire Officer (CFO) for his consideration when issuing a No Objection Certificate (NOC) for the project.

The overall fire safety concepts for the TOWER 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 TOWER, 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 TOWER's proposed fire-fighting strategy.

Design Assumptions and Fire Safety Systems Design Criteria

The basic parameters for the fire safety design of RESIDENTIAL TOWER will be therefore be the following local fire safety codes;

- National Building Code of India, Volume 1, Part IV Fire & Life Safety 2016
- Practicing Engineers Architects and Town Planners Association (India) in Association with Fire Brigade Handbook on Fire Safety in High Rise and Special Type TOWERs 1999

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

Fire Alarm System	NFPA 72, National Fire Alarm Code, 2002 Ed & CFO
Sprinkler System	As per NBC, IS 15105 & CFO
Stand pipe and hose reel system	As per NBC 2016
Portable Fire Extinguishers	As per NBC 2016
Emergency Lighting	As per NBC 2016
Fire resistance of elements	As per NBC 2016
Fire Service Access & Facilities	As per NBC 2016
Fire-fighting Lifts	As per NBC 2016
Car Park Ventilation	As per NBC 2016

TOWER Classification

In accordance with Ref [1], RESIDENTIAL DEVELOPMENT will be classified as Group A 'residential'. The TOWER will comprise residential use flats.

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

Fire Safety Approvals Process

In order to gain local approval of the fire safety design of the TOWER, the following procedure requires to be followed via the local architects;

The DC Regulations 1991 (Rule 43), require that the development must obtain a Clearance/No Objection Certificate (NOC) from The Chief Fire Officer (CFO).

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 TOWER, 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 Department will not issue an Occupation Certificate for the TOWER 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.

Fire Safety Systems

Firefighting tank requirement

The requirement of Under Ground tank is 200 cu.m for each Tower at Basement level and Overhead tank is 30 cu.m on top of each Tower as per NBC 2016.

Sprinkler Protection

The building will be protected throughout (inc. basement levels) by an approved and supervised automatic sprinkler system, to be designed and installed in accordance with IS15105.

As per NBC – 2016 the underground water tank for Hydrant & Sprinkler System shall be provided. A Siamese connection will be provided near all Fire Department vehicle set down areas.

Rooms containing other types of electrical equipment should be sprinkler protected or provided with an alternative fire suppression system. Such alternative fire suppression systems should be installed in accordance with the appropriate standard.

Sprinkler Areas covered

Areas Covered	Temperature Rating	Sprinkler Type	Response
Mechanical Room	68°C	Pendent	Standard
Apartment	68°C	Side Wall	Standard

Areas Covered	Temperature Rating	Sprinkler Type	Response
Apartment Kitchen	79°C	Side Wall	Standard
Entrance Lobby	68°C	Concealed	Standard
Parking	68°C	Pendent	Standard
Typical Floor Lobby	68°C	Pendent	Standard
Amenity	68°C	Concealed (As per ID)	Standard
Commercial Shops	68°C	Pendent	Standard

Sprinkler System for Parking floor & Fire Check floor

Drencher system to be provided on the periphery of fire check floor and car parking floors of the building and to be connected to main sprinkler pump through deluge valve.

External Fire Hydrants

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

Internal Fire mains (Standpipe System)

Internal fire mains will be provided within the TOWER to assist in fire-fighting operations for both the above and below ground floors (ie. from the lowest to the highest storey within the TOWER). The system will be provided as per NBC 2016 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).

Parking floor will be provided with single headed landing valve at every 30m travelling distance.

Pumping System shall be as per the following.

For TOWER 1

Pumping System at Basement floor

- 2850 LPM Electrical Driven Multistage Single-outlet Main Pump for Hydrant.
- 2850 LPM Electrical Driven Multistage Single-outlet Main Pump for Hydrant (Standby).
- 2850 LPM Electrical Driven Multistage Single-outlet Main Pump for Sprinkler.
- 2850 LPM Electrical Driven Multistage Single-outlet Main Pump for Sprinkler (Standby).
- 180 LPM Electrical Driven Multistage Single-outlet Jockey Pump for Hydrant.
- 180 LPM Electrical Driven Multistage Single-outlet Jockey Pump for Hydrant (Standby).
- 180 LPM Electrical Driven Multistage Single-outlet Jockey Pump for Sprinkler.
- 180 LPM Electrical Driven Multistage Single-outlet Jockey Pump for Sprinkler (Standby).
- 2850 LPM Electrical Driven Multistage Single-outlet Transfer Pump for Overhead Fire Tank filling (1W + 1 S).

Pumping System at Terrace floor

- 2850 LPM Electrical Driven Multistage Single-outlet Main Pump for Hydrant.
- 2850 LPM Electrical Driven Multistage Single-outlet Main Pump for Hydrant (Standby).
- 2850 LPM Electrical Driven Multistage Single-outlet Main Pump for Sprinkler.

- 2850 LPM Electrical Driven Multistage Single-outlet Main Pump for Sprinkler (Standby).
- 180 LPM Electrical Driven Multistage Single-outlet Jockey Pump for Hydrant.
- 180 LPM Electrical Driven Multistage Single-outlet Jockey Pump for Hydrant (Standby).
- 180 LPM Electrical Driven Multistage Single-outlet Jockey Pump for Sprinkler.
- 180 LPM Electrical Driven Multistage Single-outlet Jockey Pump for Sprinkler (Standby).

For TOWER 2

Pumping System at Basement floor

- 2850 LPM Electrical Driven Multistage Single-outlet Main Pump for Hydrant.
- 2850 LPM Electrical Driven Multistage Single-outlet Main Pump for Hydrant (Standby).
- 2850 LPM Electrical Driven Multistage Single-outlet Main Pump for Sprinkler.
- 2850 LPM Electrical Driven Multistage Single-outlet Main Pump for Sprinkler (Standby).
- 180 LPM Electrical Driven Multistage Single-outlet Jockey Pump for Hydrant.
- 180 LPM Electrical Driven Multistage Single-outlet Jockey Pump for Hydrant (Standby).
- 180 LPM Electrical Driven Multistage Single-outlet Jockey Pump for Sprinkler.
- 180 LPM Electrical Driven Multistage Single-outlet Jockey Pump for Sprinkler (Standby).
- 2850 LPM Electrical Driven Multistage Single-outlet Transfer Pump for Overhead Fire Tank filling (1W + 1 S).

Pumping System at Terrace floor

- 2850 LPM Electrical Driven Multistage Single-outlet Main Pump for Hydrant.
- 2850 LPM Electrical Driven Multistage Single-outlet Main Pump for Hydrant (Standby).
- 2850 LPM Electrical Driven Multistage Single-outlet Main Pump for Sprinkler.
- 2850 LPM Electrical Driven Multistage Single-outlet Main Pump for Sprinkler (Standby).
- 180 LPM Electrical Driven Multistage Single-outlet Jockey Pump for Hydrant.
- 180 LPM Electrical Driven Multistage Single-outlet Jockey Pump for Hydrant (Standby).
- 180 LPM Electrical Driven Multistage Single-outlet Jockey Pump for Sprinkler.
- 180 LPM Electrical Driven Multistage Single-outlet Jockey Pump for Sprinkler (Standby).

The transfer have been considered for Upper zone to cater the requirement in case of fire for each Tower.

Hose Reel System

A hose reel system will be installed within the TOWER 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 TOWER is predominately for use by the TOWER'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.

Fire Extinguishers

Portable fire extinguishers are to be provided throughout all areas of the TOWERS in accordance to NBC 2016 & IS 2190.

In our project ABC type & CO2 type extinguisher shall be used in Typical as well as Parking floors.

Fire Truce system for Panels.

As per NBC 2016 Electrical distribution panel and lift panels shall be provided with CO2/inert gas flooding system for all panel compartments with a cylinder located beside the panel.

These systems has linear detection tubing which is installed throughout the panels and cableways. This tubing can not only quickly and accurately detect a fire but also suppress it before it can damage adjacent components.

These systems do not need complex electronic detectors or panels and operate simply using pneumatics.

This alleviates the need for separate power supplies or battery backups and also makes the entire system fail safe with minimal moving parts. Electrical fire suppression systems use the detection tubing which is installed throughout the enclosure and connected to the cylinder valve. The tubing is then charged with nitrogen and this pressure is utilized to hold back the extinguishant in the cylinder.

Should a high temperature or fire occur then the pressurized tubing will burst and the extinguishant will be deployed directly from the burst hole onto the fire.

This effectively means the fire has formed the discharge nozzle so it is always exactly in the right location.

A switch is also added to the system and is held closed by the pressure. Should the tubing burst or the pressure be lost for any reason then the switch will open and this signal can be used to isolate the power and raise an alarm.

Smoke Ventilation to Lifts

All lift shafts will be provided with permanent vents at the head with a minimum clear area of 0.2 m^2 and will open into pressurized lobbies.

Fire Service Access & Facilities

Fire Fighting Philosophy

The philosophy to be adopted for fire-fighting within the TOWER will be such that sufficient internal provisions are included within the design in order that a ‘relatively’ safe environment within the TOWER 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.

Perimeter/External Access

For Towers, require that an open space/courtyard be provided around the entire perimeter of the TOWER, a minimum of 8 m on either side, to allow sufficient Fire Service vehicle access to the TOWER (this may however be Confirmed as per the requirement of CFO).

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

However, the fighting strategy for the tower is that All fire-fighting will occur from within the TOWER (i.e. 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 TOWER. The largest fire appliance that the Fire Service have available to them has a maximum working height of 60m and therefore the vast proportion of the TOWER 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 TOWER. 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 TOWER (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 TOWER will be paved up to a minimum of 6m from the TOWER and the paving will be capable to supporting the weight of the a Fire Appliances up to 48 metric tons with a point load of 10kgs. Per cm2. The paved space will be free of obstructions and motor able.

Exit Signs

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

Emergency Lighting

Common area Emergency lighting will be provided throughout the TOWER in accordance with NBC. The lighting will be powered from a source independent on that for the TOWER'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 TOWER 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 staircase so that each flight of the stairs receives direct light
- Near any fire-fighting equipment (eg. fire extinguishers/hoes reels etc.)

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

The horizontal luminance at floor level on the center line 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.

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 TOWER 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.

Fire Doors

Sr. No.	NRC Part 4 (2016) Clause No.	Description	Fire Resistance requirements	
			Fire Wall	Fire Door
1	4.2.7	Lift lobby Entrance	120min	120min
2	4.4.2.4.3.2 (h2)	Staircase Entrance	120min	120min
3	4.2.19 ©	Basement Car- Parking Exit Discharge	120min	120min
4	4.4.2.3.4 (d)	Doors / Windows assemblies within 3.0m from external staircase	60min	60min
5	4.2.19	Doors provided in Exit passageways		120min
6	5.1.1 (g)	Fire Hose Cabinet	NR	NR
7	2.24	Naturally ventilated exit staircase A-4	NR	NR
8	6.1.2 (d)	Stores, Engineering work-shops laboratories	120min	120min
9	6.1.2 (d)	Area of High Hazard	120min	120min
10	4.4.2.5.(g)	Pressurized Staircase (Internal)	120min	120min
11	E-6	Fire pump House	120min	120min
12	J-6.2	Fire Compartments	120min	120min
13	6.3.2 (G-12)	Exit Access compartment to another compartment at compartment intersection	120min	120min
14	3.4.5.5	Refuge Chutes (Areas)	60MIN	60MIN
15	3.4.5.4	Electrical Shaft -Duct Doors (Inspection Doors)	120min	120min
16	4.4.2.5.(Note)	Fire stairs at each level of high rise building	120min	120min
17	3.4.5.4	Plumbing shaft inspection /Maintenance door	30min	30min
18	3.4.6.3	LT panel /MV Panel room	120min	120min
19	3.4.6.3	Dry type substation (Transformer)	120min	120min
20	3.4.6.4	DG Set room	120min	120min
21	3.4.6.3.1	Oil filled Transformers with oil capacity more than 2000 litters	240min	240min
22	4.4.2.4.3.2 (h-2)	Access to Exit Staircase	120min	120min
23	G-3 (b)	Food serving areas shall be separated from kitchen /cooking areas	60min	60min
24	G-3 (a)	Open kitchen cooking areas shall be separated from sitting areas	60min	60min
25	2.24	Fire Tower/ Firefighting shaft	120min	120min

26	E-4	All horizontal Exits	120min	120min
27	3.4.8.2.2	All AHU Rooms	120min	120min
28	3.4.12(b)	Fire Command Centre (FCC)	120min	120min
29	6.4.2.2)e)	Car parking areas adjacent to shops, food Courts of Multiplexes at upper levels (D-6)		
30	6.7.1.1	The areas having storage, manufacturing, hazardous activities such as paint store, oil storage, spray booths, etc. shall be separated from non-hazardous area like administrative office, staff canteen, etc.	120min	120min

HVAC

1.1 Design Objectives

- To evolve sustainable and energy efficient design and engineering of HVAC system.

1.2 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.

2.0 Design Criteria

- The TOWER is expected to be catered with varied need of air conditioning. The systems are conceptualized to cater such needs with inherent features mentioned in subsequent Paragraph.
- The systems provided for this project shall meet the following parameters while satisfying all local design weather conditions and code requirements.
    - Outside Temp. : DBT : 43.3 °C WBT :23.9°C - Summer
DBT: 35 °C WBT: 28.3°C - Monsoon
    - Inside Design : 23°C±2 / Not more than 60% RH
    - Ventilation Rate for Air conditioning : ASHRAE 62.1 standard 2007
    - Ventilation Rate for Mechanical Areas :-

Car parking Ventilation in Basement	Basement 02 – Mechanical Ductless ventilation at 6 ACPH + 2.5% natural ventilation opening for fresh air intake Basement 01 – Mechanical Ductless ventilation at 6 ACPH + 2.5% natural ventilation opening for fresh air intake
Smoke Extraction for Basement	Smoke extraction at 12 ACPH in both basements with Jet Fans & Axial Fans

Pump room ventilation	15 ACPH fresh air & Exhaust through axial fans
Common toilet ventilation	15 ACPH Through wall mounted propeller fans, exhausting to outside
DG ventilation	15 ACPH Through wall mounted propeller fans, exhausting to outside
Substation	15 ACPH Through wall mounted propeller fans, exhausting to outside
LT panel room	15 ACPH Through wall mounted propeller fans, exhausting to outside
OWC Room	15 ACPH Through wall mounted propeller fans, exhausting to outside
ELV room (UPS+server+ Telephone- for common areas)	15 ACPH Through wall mounted propeller fans, exhausting to outside

Pressurization System:-

- Staircase below Ground : Pressurized at 50 Pa
- Staircase Above Ground : Cross Ventilated. Except tower 01 staircase.
- Lift lobbies below Ground :Pressurized at 25 Pa.
- Lift Well : Pressurized at 50 Pa.

SYSTEM SELECTION:-

One to one Split (Dx system) for Apartment.

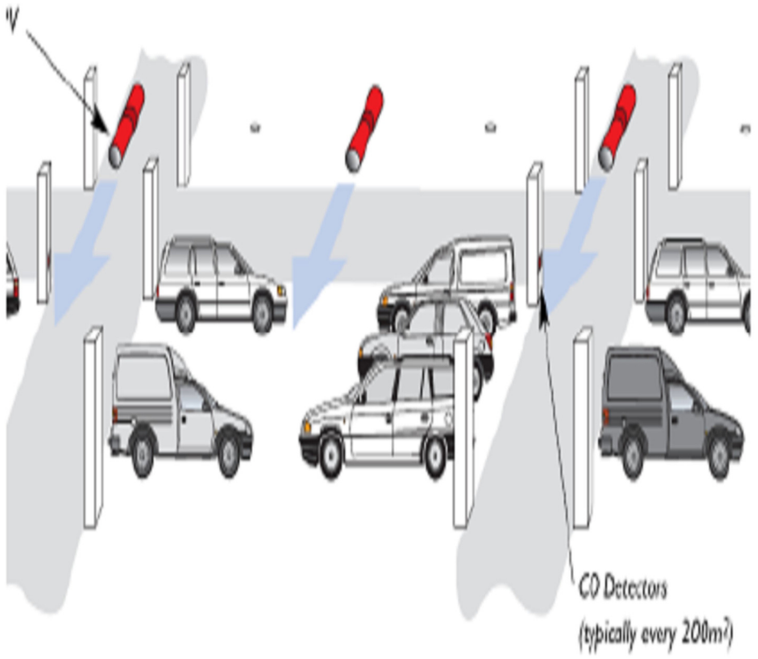
Cooling Load Summary for Typical floor Apartment:

HEAT LOAD SUMMARY SHEET											
Sr. No.	**Description**	**TEMP. (C)**	**Height (Ft.)**	**Area (Sq. Ft.)**	**Occupancy**	**Equipment Load (kW)**	**Lighting Load (W / Sq. Ft.)**	**Fresh Air CFM**	**Heat Load TR**	**Dehumidified Air (CFM)@ 52 ADP**	**Equipment Selected. (TR)**
TYPICAL FLOOR											
TOWER 01 -APARTMENT (01/06/05)											
1	LIVING ROOM		10	226	3	0.25	1.00	29	1.60	922	2
2	M.BEDROOM		10	151	2	0.25	1.00	19	1.50	908	1.5
3	BEDROOM 02		10	118	2	0.25	1.00	17	1.30	775	1.5

	SUB -TOTAL.			495	-	1	-	65	4	2605	5
TOWER 01 -APARTMENT (02/03/04)											
1	LIVING ROOM		10	324	3	0.25	1.00	34	2.10	1238	2
2	M.BEDROOM		10	167	2	0.25	1.00	20	1.40	830	2
3	BEDROOM 02		10	100	2	0.25	1.00	16	0.90	500	1
4	MULTIPURPOSE ROOM		10	43	1	2.00	1.00	13	0.50	290	0.8
	SUB -TOTAL.			634	-	3	-	83	5	2858	5
TOWER 02 -APARTMENT (01/02/06)											
1	LIVING ROOM		10	202	3	0.25	1.00	27	1.50	838	1.5
2	M.BEDROOM		10	116	2	0.25	1.00	17	1.00	565	1
3	BEDROOM 02		10	100	2	0.25	1.00	16	0.90	500	1
	SUB -TOTAL.			418	-	1	-	60	3	1903	4
TOWER 02 -APARTMENT (03/04/05)											
1	LIVING ROOM		10	202	3	0.25	1.00	27	1.50	838	2
2	M.BEDROOM		10	116	2	0.25	1.00	17	1.20	696	2
3	BEDROOM 02		10	100	2	0.25	1.00	16	0.90	516	1
	SUB -TOTAL.			418	-	1	-	60	4	2050	4
GRAND TOTAL				**1965**		**5.00**	**-**	**268**	**16.30**	**9416**	

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 Fresh opening for natural ventilation as per CFO NOC and axial type 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 250 deg. C for a period of two hour (as per NBC 2015).
- Car parking areas shall be planned for 6 air changes/hr for normal ventilation and 12 air changes/hr for fire conditions as per CFO NOC.
- 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 to be done by contractor and numbers will be based on the velocity restrictions.
- Jet fans also shall be suitable for fire rating with smoke temperature of 250 deg.C for period of 2 hours.
- 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 - 1 parking level to grade level.

LOBBY PRESSURIZATION (Below Ground Floor/Firemen's lift Lobby)

All enclosed lobby below Ground floor shall be pressurized in event of fire, positive pressure of 25 pascal to be maintain in lobby which is affected by fire. Fans for lobby pressurization is located at top podium level. The lobby on the floor where the fire has occurred will pressurized by lift lobby pressurization fan. Lift lobby pressurization will maintain the following conditions.

- 25 Pa Pressure across all closed door on the lift lobby
- Air Flow velocity of 1 m/sec across open doors leading into the lift lobby considering 1 lift lobby door open.

STAIRCASE PRESSURIZATION (Below Ground Floor)

All stair cases below ground floor are proposed to be pressurized as per NBC norms. The Provision of 0.5m opening at each landing external stair cases to be provided (as per NBC requirement) in consultation in with liaison architect. 1 fan will be provided for each staircase and the fan will operate in a fire condition, and will be located at top podium level adjacent to the stairwell.
Stair pressurization will maintain the following conditions

- 50 P pressure across doors on the staircase
- An Air flow velocity of 1 m/sec across 2 open single doors.
- Stairwell in the building will be pressurized and the stairwell pressurization fans will be activated by the fire alarm control panel.

STAIRCASE PRESSURIZATION (Above Ground Floor)

One stair case near apartment 01 of tower 01 above ground floor is proposed to be pressurized as per NBC norms since cross ventilation is possible in this staircase. The Provision of 0.5m opening at each landing external stair cases to be provided (as per NBC requirement) in consultation in with liaison architect. 1 fan will be provided for the staircase and the fan will operate in a fire condition, and will be located at terrace level adjacent to the stairwell.
Stair pressurization will maintain the following conditions

- 50 P pressure across doors on the staircase
- An Air flow velocity of 1 m/sec across 2 open single doors.
- Stairwell in the building will be pressurized and the stairwell pressurization fans will be activated by the fire alarm control panel.

LIFTWELL PRESSURIZATION FOR FIRE LIFTS

Fire Mans lifts are proposed to be pressurized. 1 fan will be provided for fire lift and fan will operate in a fire condition, and will be located at roof level. Lift well pressurization will maintain the following conditions

- 50 Pa pressure across doors on the staircase
- An Air flow velocity of 1 m/sec across 1 open single doors.
- Lift well pressurization fans will be activated by the fire alarm control panel. Pressure relief dampers of a counter weight type will be provided at the top level, to relieve the lift well of excess pressure with a set point of 50 Pa.

Mechanical Ventilation System for Common Areas:

- 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.

Ventilation for electrical shaft

- Fire damper with grill will be installed at each level above fire door of electrical shaft for ventilation. In normal condition fire damper will be in open state for proper ventilation of shaft and in case of fire the fire damper will close so as not allowing transfer of smoke/fire through electrical shaft.

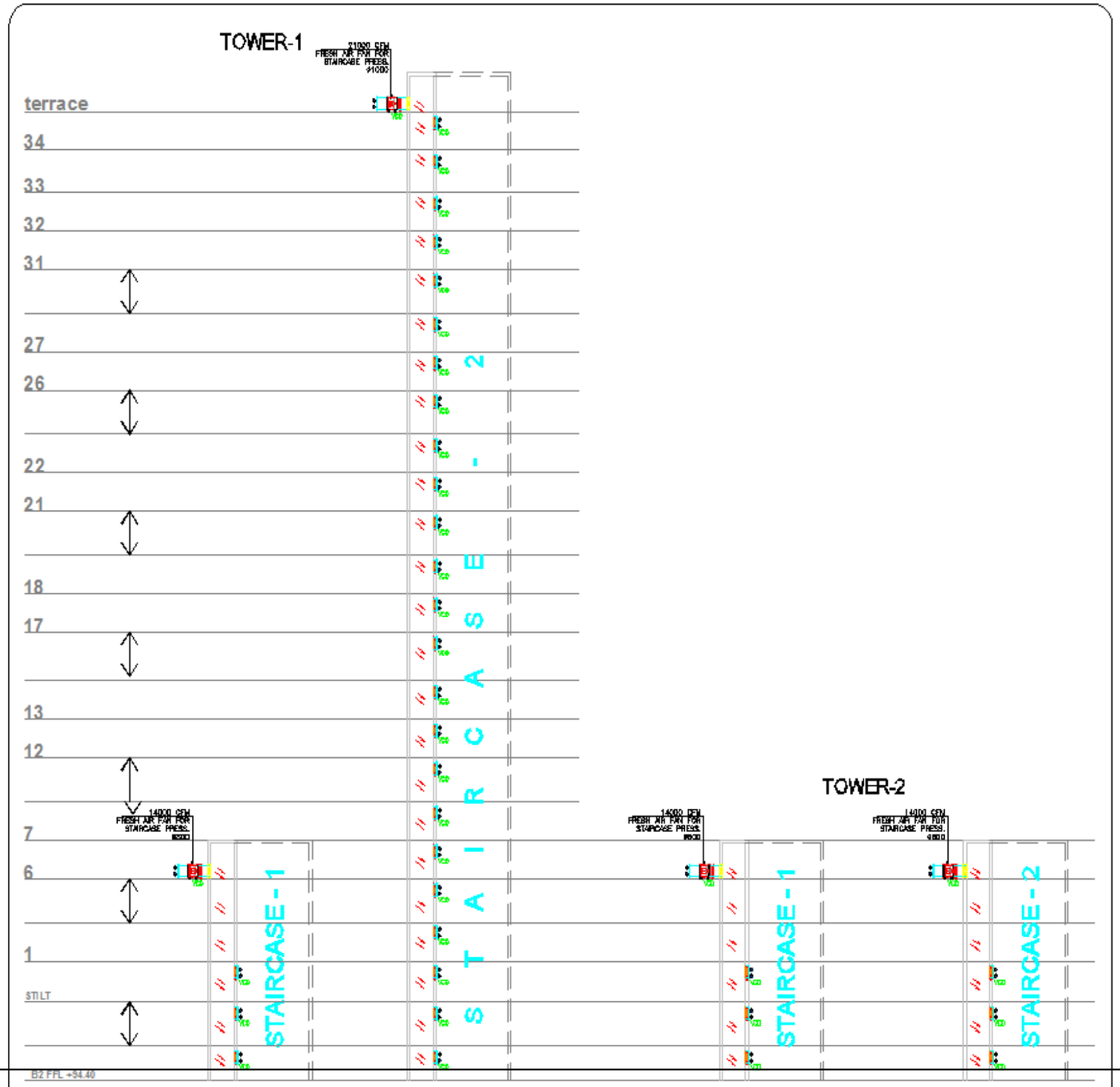
Typical Apartment Toilet Ventilation

2 options has been worked out for toilet ventilation of typical apartment.

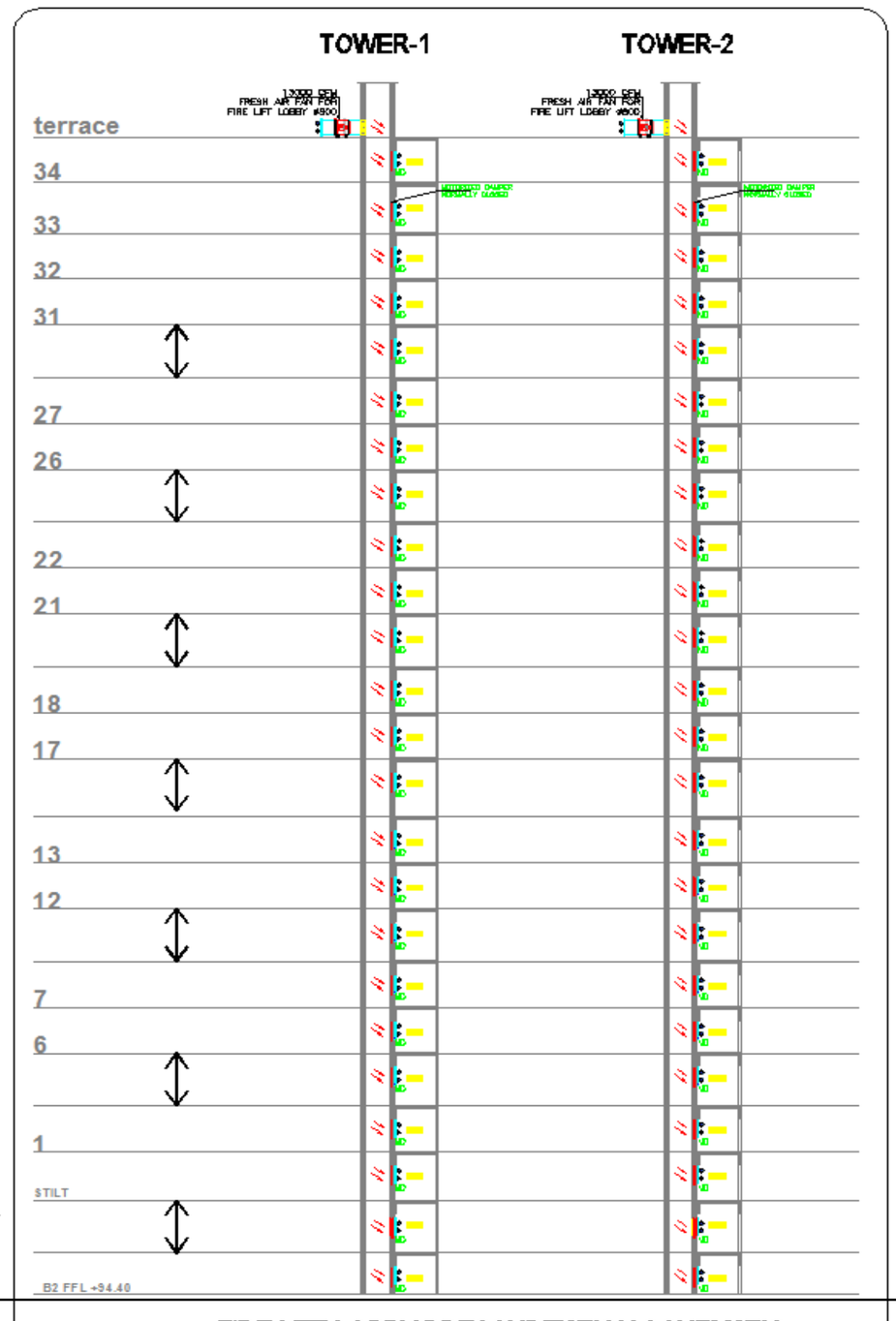
Combination of 50 CFM Propeller fan for toilets which are at external side and centralized duct toilet exhaust with duct in each shaft is planned for internal toilet

Combination of 50 CFM Propeller fan for toilets which are at external side and Inline fan with duct exhausting on external façade is worked out as option.

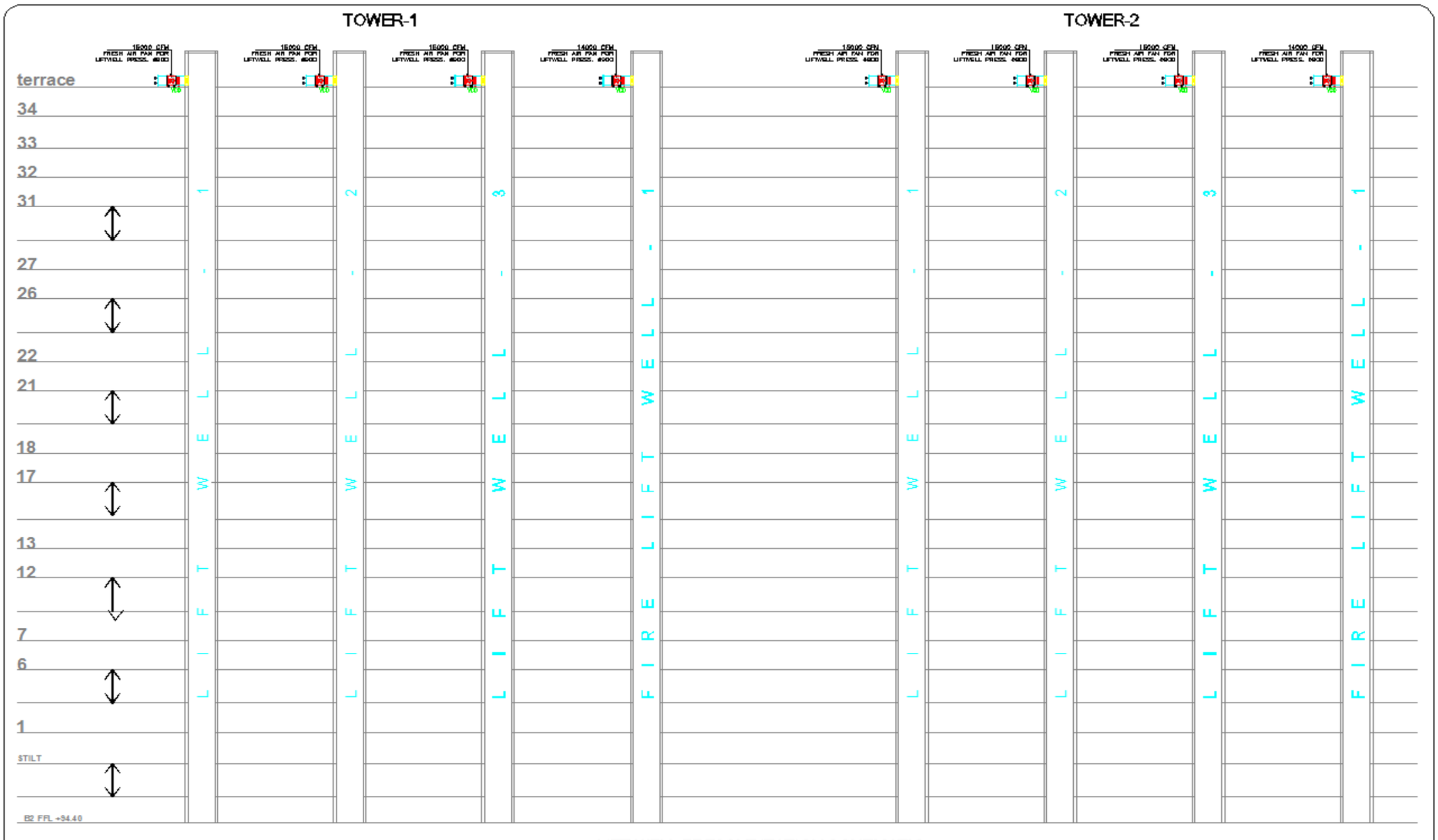
BLOCK DIAGRAM



STAIRCASE PRESSURIZATION SCHEMATIC



FIRE LIFT LOBBY PRESSURIZATION SCHEMATIC



LIFT WELL PRESSURIZATION SCHEMATIC

STANDARDS & CODES

Following STANDARDS & CODES will be applicable for the project

1. ANSI/ASHRAE STANDARD 34-2001	:	Number designation & safety classification of refrigerants
2. ANSI/ASHRAE STANDARD 41.1-86-2001	:	Measurements guide
3. ARI 110-2002	:	Air conditioning & refrigerating equipment nameplate voltages
4. ASHRAE 1991	:	Terminology of Heating Ventilation Air conditioning & Refrigeration.
5. ASME STANDARD PTC 19.2-1987 PART II	:	Instruments & apparatus pressure measurements
6. IEC STANDARD 60038	:	IEC Standard voltages
7. ISA STANDARD RP 31.1	:	Recommended Practice, Specification, Installation,& Calibration of Flow meters
8. SMACNA-1990	:	HVAC Systems-Duct Design
9. SMACNA- 1985	:	HVAC air duct leakage test manual
10. SMACNA- 1985	:	HVAC duct construction standards-Metal & flexible I edition
13. SMACNA-1989	:	HVAC duct system inspection guide
14. SMACNA- 1989	:	Rectangular industries duct construction
15. SMACNA- 1977	:	Round industries duct construction
16. ANSI/ASHRAE/52.1-1992	:	Gravimetric & Duct spot procedure for testing air Cleaning devices used in general ventilation for removing particulate matter
17. BS 6540, Part 1	:	Methods of test for atmospheric dust spot efficiency & synthetic dust weight arrestance
18. ANSI/ASHRAE 55-1992	:	Thermal environmental conditions for human occupancy
19. CTI-ATC 105-1990	:	Acceptance test code for water cooling towers, Mechanical draft, natural draft, fan assistant type evaluation of results and thermaltesting of results and thermaltesting of wet and dry cooling towers. (1990)
20. CTI-ATC 128-1981	:	Code of measurement of sound from water cooling towers
21. SMACNA 1984	:	Energy conservation guidelines
22. SMACNA 1991	:	Energy recovery equipment and Systems, air to air
23. ANSI/ASHRAE-51-1985 ANSI/AMCA-210-1985	:	Laboratory methods for testing fans for rating
24. ANSI-UL-555-1990	:	Fire dampers

25. NFPA	:	Fire protection hand book 17th edition
26. TEMA 1988	:	Standards of tubular exchanger manufacturers association 7th edition
27. ASME/ANSI B-31.5/1987	:	Refrigeration piping
28. ANSI/ASME A-13.1/1981 (R 1985)	:	Scheme for identification of piping system
29. ANSI/ASHRAE 34-1992	:	Number designation and safety classification of refrigerants
30. ASHRAE	:	Refrigeration oil
31. ANSI/UL/1963-1991	:	Refrigerant recovery recycling equipment, 1989
32. ANSI/ASHRAE/111-1988	:	Practices for measurement, testing and balancing of TOWER, heating, ventilation, air conditioning and refrigeration system.
33. SMACNA	:	HVAC Systems- Testing, adjusting and balancing
34. ANSI/ASHRAE 62-1989	:	Ventilation for acceptance indoor air quality and balancing, 1983
35. ASHRAE 90-1-1989	:	Energy Efficient Design of New TOWERs except low rise residential TOWERs
36. ASHRAE 15-1994	:	Safety code for Mechanical Refrigeration
37. ASHRAE 100-1989	:	Guideline 1-1989 –Commissioning of HVAC systems.

FIRE ALARM & VOICE EVACUATION SYSTEM & IP BASED CCTV SYSTEM

SCOPE OF WORK

The design of Engineering Services undertaken include following:

1. Fire Alarm & PA System
2. CCTV System

BROAD CONCEPT OF SERVICES

The Services Systems for the project has been conceptualized based on the experience and acceptable International design standards. Effort shall be made to conceal all services and still provide access to these for accommodating changes in requirement in future. Conservation of energy, optimization of resources, eco-friendliness and State of the art technology shall be the key factors in the design concept to ensure least downtime and reduce maintenance hassles.

Every effort shall be made to design, layout and install equipment in locations, which will tend to encourage routine preventive maintenance by providing easy access for operation personnel. Manual isolation will be provided to enable servicing, expansion or renovation of any part of the system without interrupting the services in adjacent areas.

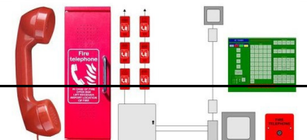
ELV SERVICES OFFERED IN DIFFERENT BUILDINGS

SR. NO.	BUILDING NAME	SERVICES OFFERED FOR DIFFERENT BUILDINGS		
		FIRE ALARM SYSTEM	PA SYSTEM	CCTV SYSTEM
1	TOWER 1 WITH BASEMENTS, PODIUM & 34 FLOORS	ADDRESSABLE FIRE ALARM	INTEGRATED PA SYSTEM	IP BASED SYSTEM
2	TOWER 2 WITH BASEMENTS, PODIUM & 34 FLOORS	ADDRESSABLE FIRE ALARM	INTEGRATED PA SYSTEM	IP BASED SYSTEM

FIRE ALARM & DIGITAL VOICE EVACUATION SYSTEM

The intent of this document is to give a detailed description about the Fire Alarm integrated with digital voice evacuation system proposed for the Tower 1 & 2 of Lodha Project, Thane, Mumbai.

The basic system specification is as per NFPA (National Fire Alarm Code) and National Building Code 2016.



SYS **PLANNING**



The proposed fire alarm system shall be intelligent analogue addressable type. All Fire Alarm devices shall be connected to Main fire alarm panel already installed in the building with the extension of Loop Cards in the same panel. Digital Voice Evacuation (Public Address) System is integrated with fire alarm system to automatically announce emergency / evacuation message in case of fire. Additional Amplifier required for the PA system will be considered and will be installed with the existing system. The system is also used to make any general public announcement manually / play music. The message can be announced zone wise. Furthermore -

- The Loop Card of fire alarm panel shall must have a minimum capacity of 125 devices and must be compatible to the existing system.
- In case of fire, FAS shall activate the PA system for announcement.
- The cable used for fire alarm system shall be flexible / armored FRLS in conformance to BIS standards.

GENERAL NOTE: All the fire alarm panels of every building /block will connect over a RS 485 / fibre optic network to provide real time alerts in the fire command or ELV Room.

DESIGN CODES AND STANDARDS

Standards will include but not limited to the following:

- NFPA 72
- BS 5839 Parts 1,2,5 and 8
- NBC 2016
- Local Authority Having Jurisdiction.



MAIN COMPONENTS OF FIRE ALARM & PUBLIC ADDRESS SYSTEM

ANALOGUE ADDRESSABLE SMOKE DETECTOR

Analogue Addressable Photoelectric Smoke Detector, sensitivity range of 0.5% to 2.35% /ft. with Detector base shall be provided in all the areas / floors Detector Spacing shall be in line with NFPA 72 / IS 2189 requirements, but shall not exceed 7.5 meters between two detectors center to center for low airflow Applications in smooth ceilings.

ANALOGUE ADDRESSABLE HEAT DETECTOR

Analogue Addressable Heat detector shall be Rate of Rise cum Fixed temperature detector. Detector Spacing shall be in line with NFPA 72 / IS 2189 requirements, but shall not exceed 7.62 meters between two detectors.

ANALOGUE ADDRESSABLE MULTI CRITERIA DETECTOR

Analogue Addressable multi criteria shall detect thermal and optical smoldering smoke in a particular area and respond to fire alarm panel. Sensitivity range of 0.5% to 2.35% /ft. with Detector base shall be provided in all the areas / floors. Smoke detector shall be complete with MS Powder coated Junction Box for mounting on Surface / on False Ceiling / Below False Floor as per site requirement. Detector Spacing shall be in line with NFPA 72 / IS 2189 requirements, but shall not exceed 7.5 meters between two detectors center to center for low airflow applications in smooth ceilings.

MANUAL CALL POINT (MCP)

Manual call points are installed or mounted near to the emergency exit door, entry and working area etc. for easy access and egress during emergency conditions. It shall be operated by means of thumb pressure / or pull down lever. The design for manual call/pull station shall be such that no person shall require to travel more than 30 meters to activate a call point. Manual call point should be fixed at 1.2 to 1.5meters from finished floor level.

SOUNDER CUM STROBES

Sounder cum Strobes shall be located near to all exits, and all areas as per code requirements. Exclusive cabling from Monitored PSU of Fire Alarm Panel, looped to Notification appliances, programmed through Control Modules. Sound Pressure level shall meet the requirements in line with NFPA-72, 2010 edition, section 18.4.3, 18.4.4, and 18.4.5. The Strobes intensity shall be in line with the NFPA 72 requirement, and the Hooter cum strobe shall be placed in such a fashion that there shall be no area blind to the light being emitted by the strobe on an open floor plate. It has multiple candela taps including 15, 30, 75, or 110

CONTROL MODULE

Addressable Control Modules shall be used for interface with Access Control, Lift control, Door control, Sounder cum Strobes etc.

MONITOR MODULE

Addressable Monitor Modules shall be provided for Monitoring of Third Party Systems, such as Panic Bar system, flow switches, butterfly valves etc.

SHORT CIRCUIT ISOLATORS

The Isolator shall be designed to provide protection against short circuit faults on Analogue Addressable system loop. The isolator shall be fixed between every 20 Detectors. The isolator shall protect the loop in the event of a short circuit by disconnecting the section of the loop where the short circuit shall occur.

VOICE COMMUNICATION SYSTEM

Audio amplifiers shall be sized to provide ½ Watt minimum per attached audio speaker. Each audio amplifier shall have 20% minimum spare capacity when attached to the speakers necessary to meet audio requirements. FACP shall incorporate a spare automatic backup audio amplifier equal in size to the largest individual amplifier.

PA SPEAKERS

Speaker can be ceiling or wall mounted with multiple wattage taps including ¼, ½, 1 watt, 2 and 6 watts at 25 volts.

FRLS CABLE

Fire alarm and detection Cable shall be Flexible / Armored FRLS type cable in conformance to BIS Standards as per under spec:

2 Core x 1.5 mm2, Multi stranded AT Copper, FRLS Flexible/Armored cable, RED in Color. All the fire alarm cabling shall be zero halogen low smoke rated and shall be listed for fire alarm use or recommended by the manufacturer. The cable shall be laid on surface with GI saddle-spacers every 0.3 meters, and shall be complete with GI Junction Boxes, lugs, cable

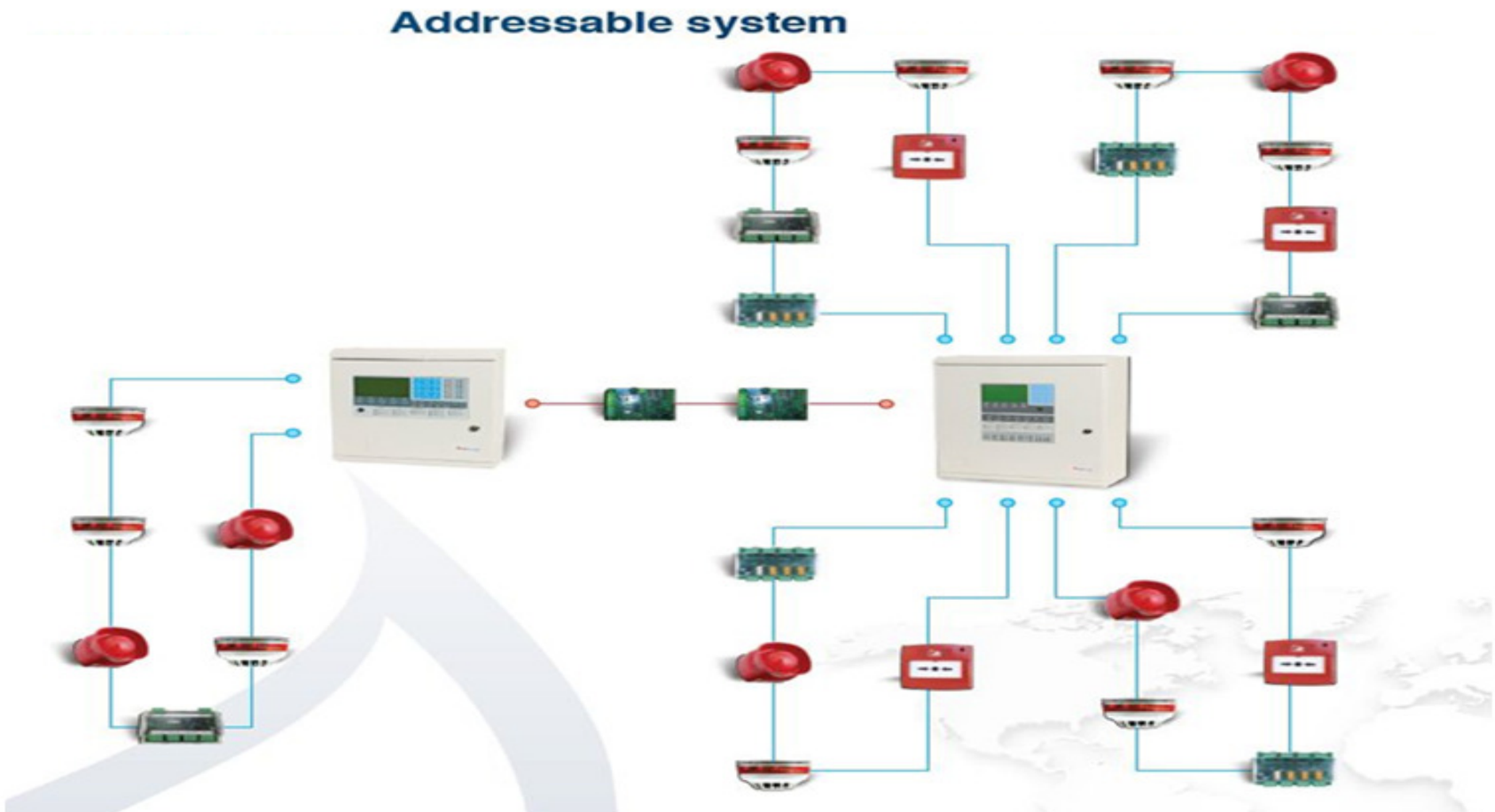
compression glands, cable tags and Ferruling as required for proper installation. For vertical movement of cable in Cable shafts, a GI Perforated Cable tray with cover is considered for c







CONNECTIVITY LAYOUT WITH DIFFERENT FIRE ALARM DEVICES



FIRE ALARM SYSTEM CAUSE & EFFECT MATRIX

FIRE ALARM SYSTEM OPERATION LOGIC																				
All floors	**EFFECTS**	**FIRE ALARM SYSTEM**	Alarm signal to Fire Alarm Panel	Alarm signal to Repeater Panel	Activate Hooter cum strobe on Affected Floor Area	Activate Hooter cum strobe at one below and one above Floor Area	All Hooters cum strobe activation at all floors	All Hooter cum strobe silence	**MECHANICAL SYSTEM**	Start Smoke Exhaust Fans at Terrace	Start Lift well Pressurisation fans	**PA SYSTEM**	Alert message on affected Zone .	Evacuation message on affected Zone	Alert message on one above and one below Zone	Evacuation message on one above and one below Zone.	Evacuation message on all Zones	**ELEVATOR SYSTEM**	All Lifts to HOME	Lift signals (Buttons) disabled
CAUSES																				
SERVICE DESCRIPTION																				
Smoke/Heat Detector In Alarm																				
First Knock at One Floor			√	√	√								√		√					
Second Knock on the same Floor			√	√	√	√				√	√			√		√			√	√
Second Knock at another floor			√	√			√			√	√						√		√	√
Manual Call Point Activation			√	√			√			√	√			√		√			√	√
Activation of Sprinkler Valve Flow Switch			√	√	√	√				√	√			√		√				
Press Alarm Silence button on FAP.								√												
Press Alarm Reset on FAP								√												
Device in trouble			√																	

Alert Message / Evacuation Message in case of Emergency

The Emergency Command Center digital message generator provides messages each with up to certain seconds of record time. The same is provided with factory recorded messages which can be changed in the field. The prerecorded messages (male / female voice) may be:

Different Messages could be:

“Attention, please. This signal tone you have just heard indicates a report of an emergency in this building. If your floor evacuation signal sounds after this message, walk to nearest stairway and leave the floor. While the report is being verified, occupants on other floors should await further instructions.”

“May I have your attention, please? May I have your attention, please? A fire has been reported in the building. A fire has been reported in the building. Please proceed to the stairways and exit the building. Do not use the elevators.”

“May I have your attention, please? May I have your attention, please? There has been a fire reported in the building. Please proceed to the nearest exit and leave the building.”

TYPICAL FLOOR PLAN FOR FIRE ALARM SYSTEM



SYMBOL	DESCRIPTION
	HEAT DETECTOR
	SMOKE DETECTOR WITH RESPONSE INDICATOR
	SMOKE DETECTOR
	LPG DETECTOR
	HOOTER CUM STROBE
	MANUAL CALL POINT
MM	MONITOR MODULE
CM	CONTROL MODULE
	WALL MOUNT SPEAKER
	TELEPHONE JACK


3 BHK
RERA C.A. = 1193 SQ.FT.
TARGET AREA 1200 SQFT
3 BHK
RERA C.A. = 1193 SQ.FT.
TARGET AREA 1200 SQFT
3 BHK
RERA C.A. = 1181 SQ.FT.
TARGET AREA 1200 SQFT
3 BHK
RERA C.A. = 1193 SQ.FT.
TARGET AREA 1200 SQFT
2 BHK
2 BHK
2 BHK
2 BHK

CCTV SURVEILLANCE SYSTEM

The purpose of the electronic surveillance, using camera system is for asset protection, area monitoring, people recognition and surveillance detection or counter surveillance. The CCTV system should IP based. IP CCTV System can send / receive data via computer network. NVR Based recording system will be used to handle the recording, video & alarm management. The objective is to provide high degree of Electronic surveillance to the premises. The purpose is to monitor & supervise the sensitive areas for security purposes, as well for audit Record and information to officials on unwanted, untoward incidents. It is also essential to have recordings to be stored for 15 days at full HD resolution at 24 X 7 Recording at 25 FPS of all critical areas to facilitate investigations in case of a reported case.
The Components of this system are

- IP Cameras (Indoor / Outdoor)
- NVR Based Video Recorder
- Networking Components / POE Switches
- Racks
- Cat 6 cable
- Power Supplies

A digital camera "views" the scene in front of it, broadcasts the video images as a digitized signal over a LAN line (Local Area Network) where it's then transmitted to a computer or server. The server in turn manages all of this information. Depending upon the software used to manage the digital images; it can record, display or retransmit the images to any monitoring station.

Type of Cameras Suggested

- Fixed Lens IR night vision Dome - For Lift Lobbies / common corridors etc.
  Full HD, 2 MP, Fixed Lens 2.8 / 3.6 mm, H.265, 25/30 FPS @ 1080 P

- Varifocal Lens IR night vision Dome - For Corridors / other common areas etc.
  Full HD, 2 MP, Vari Focal Lens 2.8 mm to 12 mm, H.265, 25/30 FPS @ 1080 P

- Bullet Cameras IR night vision – For Entry / Exit
  Full HD, 2 MP, Vari Focal Lens: 3.6.0 mm to 12 mm, H.265, IP66 rated, 25/30fps@1080P (1920 ×1080), Support ICR for day time and night time operation, Zoom ratio :2.4x Optical (Motorized zoom/ Motorized focus)



DOME CAMERA



BULLET CAMERA



VARIFOCAL DOME CAMERA



Design Requirements:

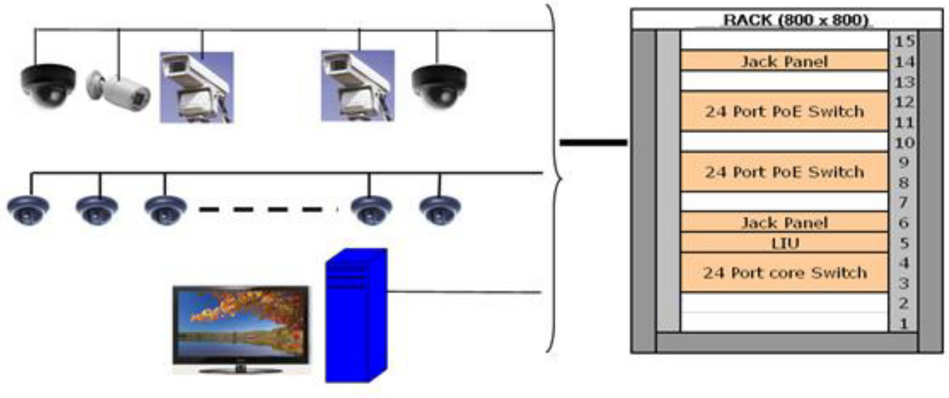
CCTV system should be IP based with network video recorders with inbuilt HDD for storage.

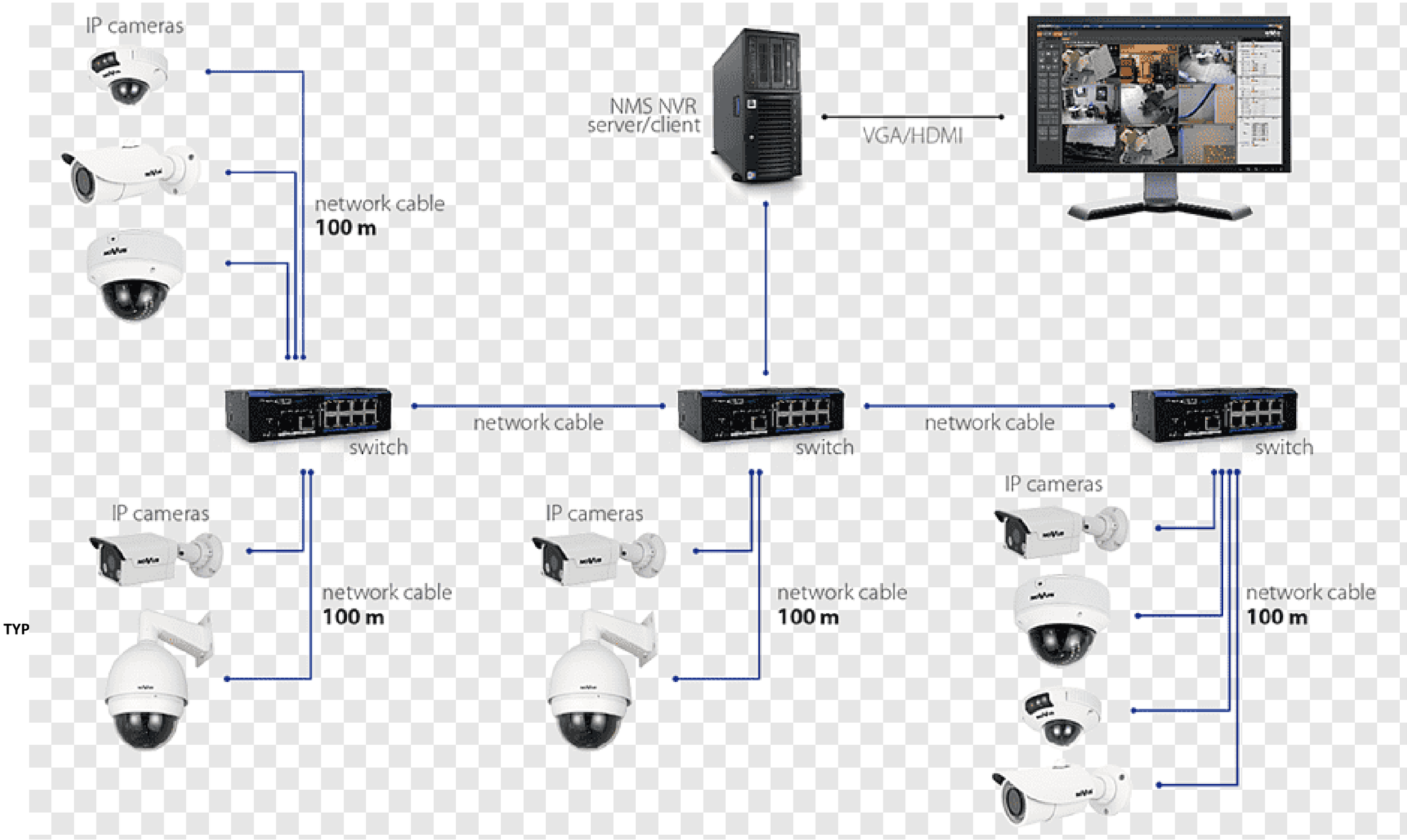
- Digital video management recorders
- The system should have centralized monitoring and controlling from the main ELV Control room.
- Cameras to connect on IP network. All these IP connected cameras will be connected to NVR.
- Closed circuit television should provide full coverage for all desired and 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.
- External cameras should have weatherproof housing for protection. Lighting requirement to various locations also to be considered for camera design, cameras should work in 0 LUX 25mtr IR .
- 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.
-

LAN Switch Specific Requirement

24 port layer 2 and 3 switch with 10/100/1000 POE Manage Switches with IP multicast snooping and data-driven IGMP support and with 1000baseT FO uplink ports and all related termination accessories. (As per requirement)

SCHEMATIC OF IP CCTV SYSTEM




IP cameras
network cable
100 m
NMS NVR
server/client
VGA/HDMI
switch
network cable
switch
network cable
switch
IP cameras
network cable
100 m
IP cameras
network cable
100 m
IP cameras
network cable
100 m

TYP

Advantages of IP CCTV System

1. Scalability: with utilizing edge processing, and individual camera licensing, it is possible to scale from a single camera up to thousands.
2. Redundancy: It is possible to record simultaneously to a redundant server / NVR. This offers an additional safety net to recover footage in the event of damage/corruption to data on the main Server / NVR
3. Power: IP cameras can be powered by a number of methods. If the IP camera is replacing an analog camera, the existing power source can be reused or Ethernet cables which allow for Power over Ethernet (PoE) can be deployed.

Remote Access: You can login into a secure server remotely, using a web-based interface to view real-time footage on PCs or Macs, as well as on mobile devices such as the iPhone, iPad, and Android-based devices. Programs such as TeamViewer also allow for remote support and end-user training.

List of Annexure Attached

1. **Apartment Cable Schedule**
2. **Typical Earthing Scheme**
3. **LPS-Risk Analysis report**