



A Navratna CPSE

NBCCINDIA)LIMITED

DETAILED PROJECT REPORT

FOR

**CONSTRUCTION/RECTIFICATION OF BALANCE
WORKS/LEFT OUT WORKS OF LEISURE VALLEY,
VERONA HEIGHT-PHASE – 2, PLOT NO. GH-02, TECH
ZONE-IV, AT GREATER NOIDA (UP)**

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BRIEF HISTORY

NBCC has been appointed by the Hon. Supreme Court to construct and complete stalled Amrapali “Leisure Valley Project” of Amrapali Group vide order dated 23.08.2019 in write petition (C) No. 940/2017.

Amrapali “Leisure Valley” was started in 2010 on plot of 97.88 acres at Sector GH-02, Tech Zone - 4 Greater Noida (UP). Amrapali Leisure Valley project is strategically located on 100 Mtr Road at the second round about in GH-02, Tech Zone-IV Greater Noida West.

The project comprises of multistoried apartments, which are G+33 storeyed which has 2, 3 and 4 BHK flats, also the site sprawls on 52 acres of site area, offering beautifully designed spacious villas which are G+2 storeyed. The land has been allotted by Greater Noida Authority.

This Phase of the Project having amenities like swimming pool, kids pool, nursery school and parks. The residents will have access to essential facilities like jogging track, Badminton court basketball and tennis court, billiards & club rooms to enable to lead a healthy lifestyle .There is a 100M green belt between the road and the site.

This phase of the project includes multistoried Towers containing 2 BHK, 3 BHK & 4BHK Dwelling Units. There are 24 No. of Towers with configuration 1B+2P+G+33 respectively.

1. CLIMATIC CONDITIONS

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature (°C)	14.4	17.1	22.8	28.6	33.3	34.1	31	29.6	29.1	25.9	20.2	15.7
Min. Temperature (°C)	7.6	10.1	15.2	20.8	26.1	28.4	27	26	24.5	18.8	11.8	8.1
Max. Temperature (°C)	21.3	24.2	30.4	36.5	40.6	39.9	35	33.3	33.8	33	28.7	23.4
Avg. Temperature (°F)	57.9	62.8	73.0	83.5	91.9	93.4	87.8	85.3	84.4	78.6	68.4	60.3
Min. Temperature (°F)	45.7	50.2	59.4	69.4	79.0	83.1	80.6	78.8	76.1	65.8	53.2	46.6
Max. Temperature (°F)	70.3	75.6	86.7	97.7	105.1	103.8	95.0	91.9	92.8	91.4	83.7	74.1
Precipitation / Rainfall (mm)	22	8	15	3	6	34	212	247	146	43	5	8

The precipitation varies 244 mm between the driest month and the wettest month. The variation in temperatures throughout the year is 19.7 °C.

2. LOCATION Located at 28.4744° N, 77.5040° E

3. AREA Area of Plot –97.88 Acres

4(A).DWELLING UNITS / FLATS &AREAS (PHASE –II)

S.NO	Tower No.	No. of Units											
		4BHK+5 T+SER	3BHK +3T	3BHK +3T	3BHK + 2T (TYP-1)	3BHK + 2T (TYP-2)	3BHK + 2T	3BHK + 2T	2 BHK +2T+ S	2 BHK +2T+ S (TYP-1)	2 BHK +2T+ S (TYP-2)	2BHK +2T	2BHK +2T
F.A.R AREA (SQ.FT.)		1460	1147	970	911	862	856	947	850	778	768	711	673
1	A						136			68			68
2	B						136			68			68
3	C								136				
4	D					68						136	
5	E			68	136								
6	F			68	136								
7	G					68						136	
8	H									68		68	136
9	J									102		34	68
10	K			68	136								
11	L	68	68										
12	M	68	68										
13	N	68	68										
14	P							102		34		68	
15	Q							136		68		68	
16	R										68	136	
17	S							136					
18	T										68	136	
19	U									102		34	68
20	V									102		34	68
21	W					68						136	
22	X						136			68			68
23	Y						136			68			68
24	Z			68	136								
TOTAL		204	204	272	544	204	544	374	136	748	136	986	612
UNIT AREA		297840	233988	263840	495584	175848	465664	354178	115600	581944	104448	701046	411876

PHASE -II
BUILT UP AREA

PROJECT : LEISURE VALLEY PHASE -2		
PLOT AREA :	67403	sqm
Total Built up Area (Typical) :	5744688	sqft
Total Built up Area (Tower Basement) :	157616	sqft
Total Built up Area (Non Tower Basement) :	605615	sqft
Total Built up Area (Tower Podium) :	157585	sqft
Total Built up Area (Non Tower Podium) :	714493	sqft
MMR	24843	sqft
TOTAL	7404840	sqft

5(A) - CURRENT STATUS – TOWERS

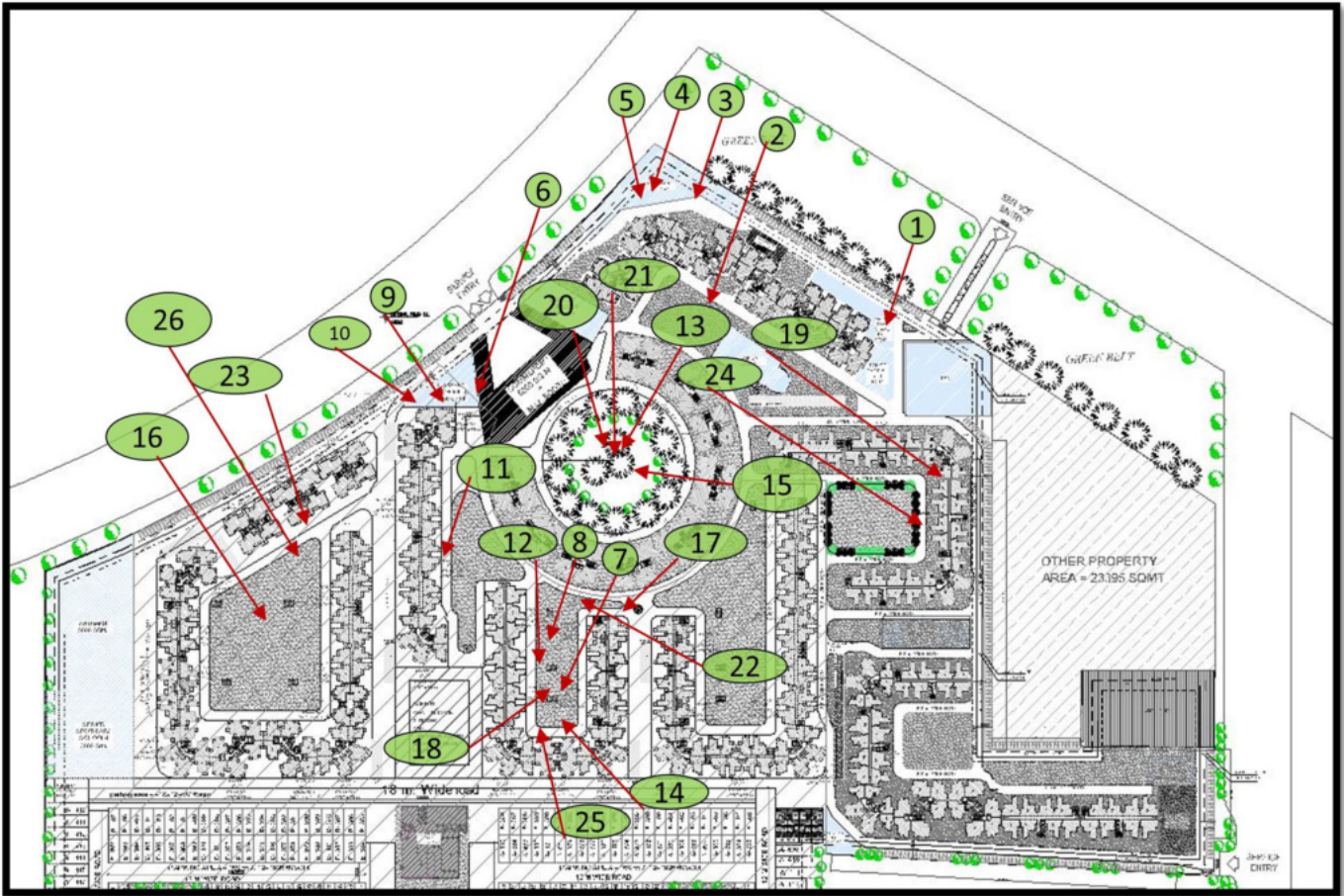
AMRAPALI LEISURE VALLEY HIGH RISE TOWERS

TOWER	NO OF FLOOR	FLOOR ROOF SLAB	BEAM	COLUMN	BRICK WORK	EXTERNAL PLASTER	INTERNAL PLASTER	DOOR FRAME	WATER SUPPLY	SEWERAGE+ DRAINAGE	CONDUITING WALL	SWITCH BOX	EXT PAINT	WATER TANK
A	B+2P+G+33	3RD FLOOR		4TH FLOOR	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
B	B+2P+G+33	4TH FLOOR	5H FLOOR	5TH FLOOR	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
C	B+2P+G+33	4TH FLOOR		5TH FLOOR	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
D	B+2P+G+33	1ST FLOOR		2ND FLOOR	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
E	B+2P+G+33	2ND PODIUM	GROUND FLOOR	GROUND FLOOR	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
F	B+2P+G+33	GROUND FLOOR	SHUTTERING	1ST FLOOR	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
G	B+2P+G+33	3RD FLOOR		4TH FLOOR	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
H	B+2P+G+33	4TH FLOOR			NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
J	B+2P+G+33	9TH FLOOR			NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
K	B+2P+G+33	7TH FLOOR		8TH FLOOR	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
L	B+2P+G+33	6TH FLOOR		7TH FLOOR	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
M	B+2P+G+33	6TH FLOOR		7TH FLOOR	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
N	B+2P+G+33	6TH FLOOR		7TH FLOOR	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL

AMRAPALI LEISURE VALLEY HIGH RISE TOWERS

TOWER	NO OF FLOOR	FLOOR ROOF SLAB	BEAM	COLUMN	BRICK WORK	EXTERNAL PLASTER	INTERNAL PLASTER	DOOR FRAME	WATER SUPPLY	SEWERAGE+ DRAINAGE	CONDUITING WALL	SWITCH BOX	EXT PAINT	WATER TANK
P	B+2P+G+33	GROUND FLOOR			NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
Q	B+2P+G+33	GROUND FLOOR			NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
R	B+2P+G+33	2ND PODIUM		GROUND FLOOR	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
S	B+2P+G+33	GROUND FLOOR		1ST FLOOR	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
T	B+2P+G+33	2ND PODIUM		GROUND FLOOR	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
U	B+2P+G+33	GROUND FLOOR			NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
V	B+2P+G+33	GROUND FLOOR			NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
W	B+2P+G+33	12TH FLOOR	SHUTTERING	13TH FLOOR	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
X	B+2P+G+33	14TH FLOOR	SHUTTERING	15TH FLOOR	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
Y	B+2P+G+33	16TH FLOOR		17TH FLOOR	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
Z	B+2P+G+33	16TH FLOOR		17TH FLOOR	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL

5(B) - SITE PICTURES



No's showing location of various materials at site etc.



(6)RM.C PLANT



DHARAM – KANTA (2)



CEMENT STORE (3)



CONCRETE PUMP (4)



(5)



SITE OFFICE



D.G (7)



BAR CUTTING MACHINE (8)



LIGHT POLE (9)



(10)



TOWER CRANE (11)



TRANSIT MIXER (11)



BAR CUTTING MACHINE (12)



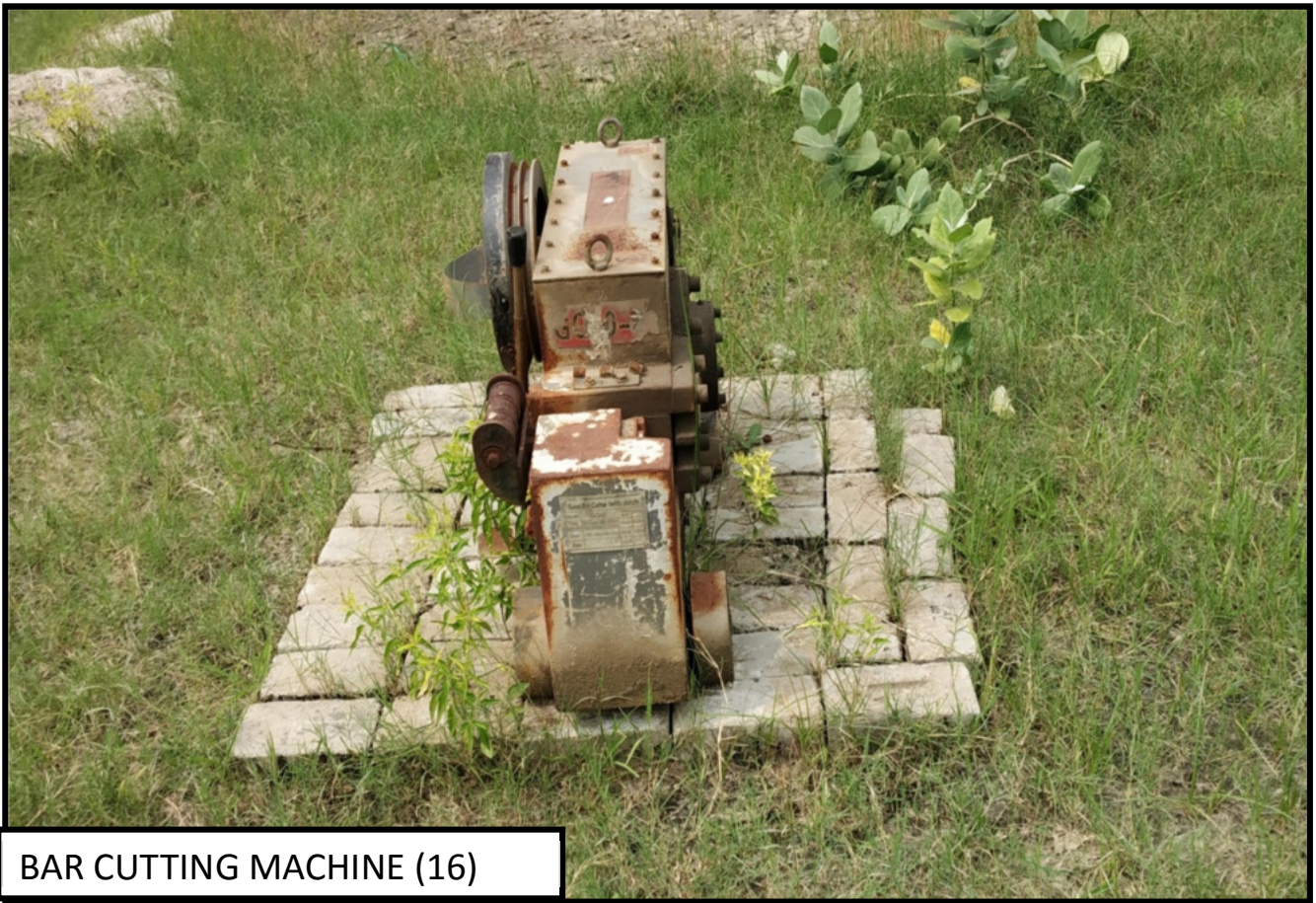
ELECTRICAL PANEL (13)



CONCRETE PUMP (14)



TRANSFORMER (15)



BAR CUTTING MACHINE (16)



(17)

NOTE 5 PRO
AL CAMERA





(20)



(21)



(22)









6. MATERIAL /EQUIPMENTS STATUS

ITEM	NOS	CONDITION
R.M.C. PLANT	1	FOUND IN OBSOLETE STAGE,
		ALL THE CONTROL AND INSTRUMENTATION SYSTEM FOUND MISSING
CONCRETE PUMP	2	FOUND IN OBSOLETE STAGE
ELECTRICAL TRANSFORMER(400KVA)	2	FOUND IN DAMAGED STATE
D.G SETS (125KVA)	2	
CANOPY(WITHOUT DG SETS)	3	
LIFTING CRANE (18MT)	1	HYDRA
TOWER CRANE	5	
TRANSIT MIXER	1	DAMAGED
WEIGH BRIDGE (100 MT)	1	NON FUNCTION
BAR BANDING MACHINE	4	DAMAGED
BAR CUTTING MACHINE	7	DAMAGED
EXCEVATOR BIG	1 (JCB)	
EXCEVATOR BOB CUT	4 (TEREX)	Skid Steer Loader
FUEL PUMP-1	1	DAMAGED
TRANSFORMER 400 KVA	2	DAMAGED

7.0 SPECIFICATIONS AS PER BUILDER BROUCHRE – TOWERS

SPECIFICATION FOR AMRAPALI VERONA HEIGHT PHASE-02				
1	Living/dining room	Floors	Vitrified tiles	ISI MARK
		External door and windows	Flush doors with teak ply and melamine polish & UPVC Window	
		Fixture and fitting	Switches	ISI MARK
		Walls	OBD paint	ISI MARK
		Internal doors	Hardwood frame with skin door shutter	
		Ceiling	Designer POP	
2	Master bedroom	Floors	Wooden laminated	
		External door and windows	Flush doors with teak ply and melamine polish & UPVC Window	
		Fixture & fitting	Switches	ISI MARK
		Walls	OBD paint	ISI MARK
		Internal doors	Hardwood frame with skin door shutter	
		Ceiling	Designer POP	
3	Bedroom	Floors	Vitrified tiles	ISI MARK
		External door & windows	Flush doors with teak ply and melamine polish & UPVC Window	
		Fixture & fitting	Switches	ISI MARK
		Walls	OBD paint	ISI MARK
		Internal doors	Hardwood frame with skin door shutter	
		Ceiling	Designer POP	
4	Toilet (Master bedroom)	Floors	Anti skid vitrified / ceramic tiles	ISI MARK
		External door & windows	UPVC	
		Fixture & fitting	ISI fitting & standard chinaware fixture & fitting for geyser water supply	CP FITTINGS -ISI MARK
		Walls	Designer ceramic tiles	ISI MARK
		Internal doors	Hardwood frame with skin door shutter	
		Ceiling	Grid ceiling	
5	Toilet (Other bedroom)	Floors	Anti skid vitrified/ceramic tiles	ISI MARK
		External door & windows	UPVC	
		Fixture & fitting	ISI fitting & standard chinaware fixture & fitting for geyser water supply	CP fitting-ISI MARK
		Walls	Designer ceramic tiles	ISI MARK
		Internal doors	Hardwood frame with skin door shutter	
		Ceiling	Grid ceiling	

6	Kitchen	Floors	Anti skid vitrified tiles	ISI MARK
		External door & windows	UPVC	
		Fixture & fitting	Semi Modular Box kitchen, counter in granite stone, individual R.O system & fixture & fitting for geyser water supply	CP fitting-ISI MARK
		Walls	Designer ceramic tiles	ISI MARK
		Internal doors	Hardwood frame with skin door shutter	
		Utility	Single sink	Stainless steel (ISI standards)
7	Study room (if applicable)	Floors	Vitrified tiles	ISI MARK
		Fixture & fitting	Switches	ISI MARK
		Walls	Paint	ISI MARK
		Ceiling	POP	
		External door & windows	UPVC	
8	Balconies	Floors	Ceramic tiles floors/terrazzo tiles	ISI MARK
		Walls and Ceiling	OBD paint	
9	Entrance Lobby of Tower	Floors	Combination of different colour of marble/stone in pattern	
		Walls	Granite tiles cladding upto 3 ft. and texture paint above elevators	
		Ceiling	POP	

SPECIFICATION
VERONA HEIGHT -COMMUNITY CENTER & NURSERY SCHOOL

1	Community Center- Reception & Functional Areas including Banquet Hall	Floors	Vitrified tiles	ISI Mark
		Walls	Plastic Paint	ISI Mark
		Ceiling	POP & GYP Board Ceiling	ISI Mark
		AC	Yes (Ductable Splits)	ISI Mark
2	Nursery School- Reception & Functional Areas including Conference Hall	Floors	Vitrified tiles	ISI Mark
		Walls	Plastic Paint	ISI Mark
		Ceiling	POP & GYP Board Ceiling	ISI Mark
3	Common Areas/Staircase	Floor	Granite Flooring	ISI Mark
		Wall & Ceiling	Plastic Paint	ISI Mark
		Railing	M.S. duly painted	
4	Kitchen/Pantry	Walls	Designer ceramic tiles	ISI Mark
		Floor	Combination of anti skid ceramic tiles / Vitrified Tiles	ISI Mark
		Counter	Granite working Platform	
		Fitting & Fixtures	CP fitting, stainless steel sink double bowl	ISI Mark
5	Toilet's	Walls	Designer ceramic tiles	ISI Mark
		Floor	Combination of anti skid ceramic tiles / vitrified tiles	ISI Mark
		Fitting & Fixtures	CP Fitting Chinaware fixture	ISI Mark
		Water	Hot and cold water pipeline provision	
6	Doors	Frame	Hard Wood doors frames with paint finish	ISI Mark

			Internal Doors polished flush & skin doors	ISI Mark
			Hardware-Aluminium	ISI Mark
7	Windows		UPVC with Float Glass	ISI Mark
8	Electricals		Modular Switches, Wires (Copper)	ISI Mark
9	Fans		Ceiling/Wall	ISI Mark
10	Tube lights		Ceiling/Wall Mounted	ISI Mark
11	Fancy Lights		Ceiling	ISI Mark

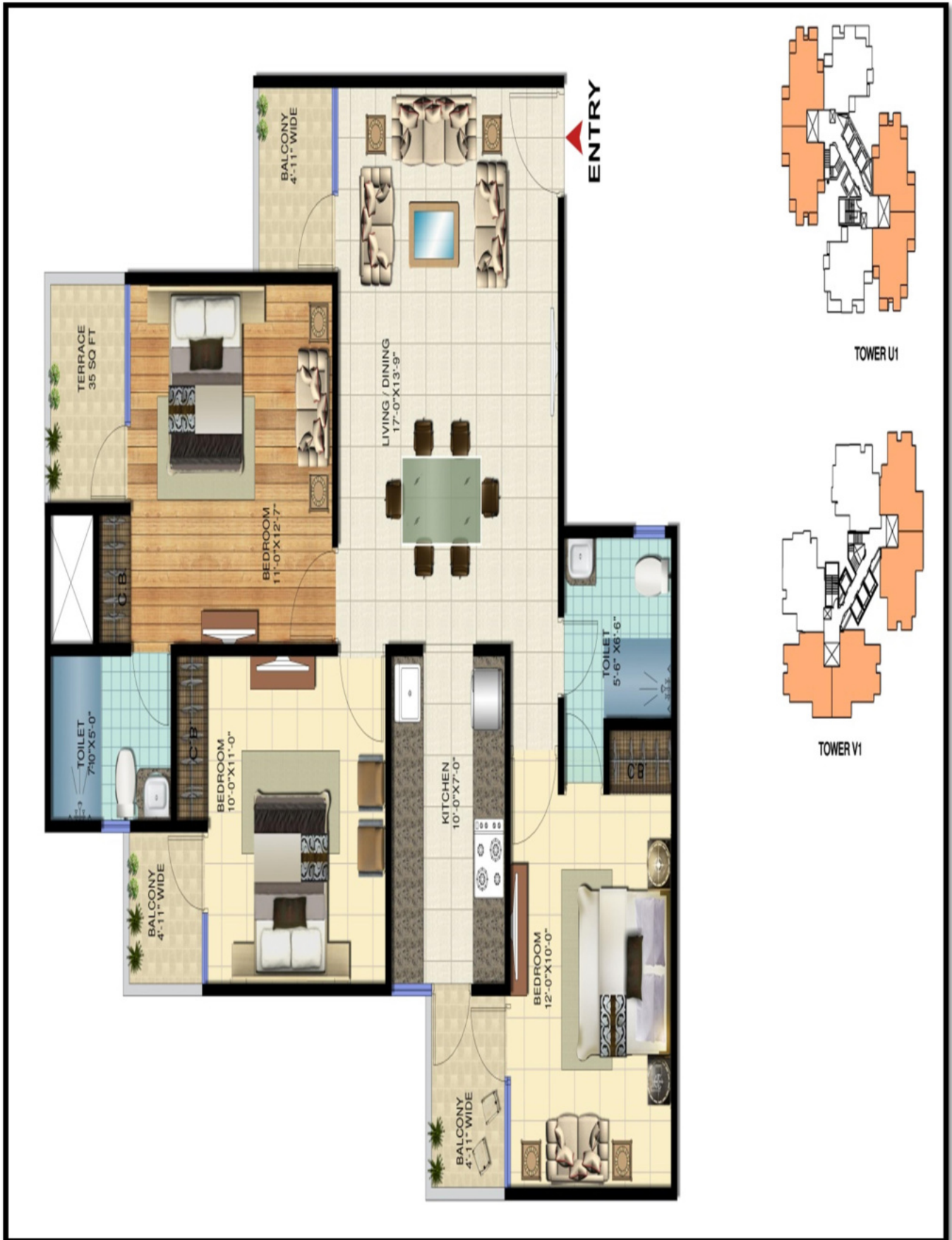
.2BHK+2TOILET+STUDY TYPE-I (1065)



2BHK+2TOILET (895SQ.FT)



3BHK+2TOILET (895)
SUPER AREA – 1300 SQFT (TYPE-1)



3BHK+2TOILET

SUPER AREA – 1300 SQFT (TYPE-6)



3BHK+2TOILET

SUPER AREA – 1300 SQ.FT (TYPE-7)



3BHK+3TOILET (1450 SQ.FT) TYPE-2



4BHK+5TOILET+SER (2135 SQ.FT) TYPE-2



1. CIVIL WORKS

i) Structure

The structural work for Phase II has started in all 24 towers. The concept of Leisure Valley-Verona Height-02 was designed & constructed as Conventional Construction (Column, Beam, Slab as well as Shear Wall & Flat Slab and Pre-cast Technology for Towers as-mentioned further - CONVENTIONAL TECHNOLOGY for Towers-(W,X,Y,Z , P,Q,R,S,T,U,V (11Towers) & PRE_CAST TECHNOLOGY-For Towers- A to N (13 Towers) with Good Quality Form Work . The Configuration of Tower & Non-Tower designed and construction comprises of 1 basements +2 Podium +G+33 Storeys besides Non-Tower having 2 basements & 2 Podium to house Car parking, Ancillary facilities etc as per Architectural drawings&location mentioned in the drawing. Elevations of Precast & Cast-in situ towers should be in architectural harmony. If Agency/Bidder has to convert precast towers in cast-in situ towers then agency/bidder has to create a proper element to have a proper harmony in the elevation of the towers etc. Elevation of the towers has to be approved by NBCC.

2. ELECTRICALWORKS

i) Reference Standards

The Following Standards and codes shall be followed / referred during detailed design of the services:

Local By-laws

National Building Code – 2016

Energy Conservation Building Codes 2007-Revised Version April 2011 Relevant codes of Indian Standards

CPWD Guidelines

NFPA 72 National Fire Alarm and Signalling Code Central Pollution Control Boards - Latest amendments International Electro Technical Commission (IEC)

ii) Scope of Work ofPhase-II

- HT Panels
- Transformers
- Main LT Panels, Common area Panels, Lift Panels, PlumbingPanels,
- Fire Fighting Panels, External LightingPanels
- Rising MainsSystem
- Meter boards excludingmeters
- CapacitorPanels
- Diesel Generator Sets with associated works (for standby source ofpower)
- HT & LT Cabling System ie laying, termination, cable tray etc
- Earthing System
- Lightning ProtectionSystem
- External LightingSystem
- Close Circuit TelevisionSystem
- BoomBarriers

- Internal Electrification of common areas ie basement, Corridor, Staircase, Lift shafts including lighting Fixtures
- Elevators
- Uninterrupted Power Supply

iii) Substations Equipment Details(Phase-II)

Substation equipment details are as follows :

S.no.	Item Description	Qty. (Nos.)
1	33kV VCB HT Panel	7
2	(2000 kVA x3+1600 kVA x5 + 1000 kVA x 1 +800 kVA x 3 +630 kVA x 2 + 500 kVA x 1)nos, 33/0.433 kV Transformers with Off Circuit Tap Changer	15
3	600 kVAx2+1x750 kVA+500kVA x 3 + 400kVAx1+300kVAx1, 415V Silent type Radiator cooled DG Set	8
4	(500 x2+400 x5+250X1+200x3+160 x2+125x1)kVAR APFCR Panel	14
5	Main LT Panels	7

iv) Sources of Electrical PowerSupply

It is envisaged that incoming power supply shall be available at 33 kV Voltage level thru independent feeder from Local supply Authority.

Metering shall be done at the metering room.

v) HT Power DistributionScheme

Single point power supply connection shall be received through 2 pole structures with G.O.D.O arrangement at site plan for the Phase-1& 2 of the Leisure Valley society along with HT meter situated near entrance gate.

Power supply shall be received through an underground 33kV HT cable from GODO switch in the Electrical Sub Station: Phase-1& 2 thru metering panel. The Sub Station of Phase-1 &2shall consist of 33kV, seven (7)nos. VCB HT Panel board to be placed in the HT Panel Room

This HT Panel shall feed fifteen (15) nos. Transformers

vi) Emergency PowerSupply

As Electricity is of the utmost important for any building operation, hence 50% power backup is proposed through Radiator cooled silent type DG Sets. We proposed 50% power Backup for as per requirement of apartment's owner for limited back up & Common Area services such as including

Common Area Lighting & Power load, Basement Lighting, Fire Fighting Load, Plumbing & STP Load, Ventilation Loads etc.

For power backup to the flats, two (2) nos. 600 kVA +One(1) Nos 750 KVA + Three(3) Nos 500 kVA +one(1) Nos 400 kVA + one(1)nos 300 kVA, 415V, Silent type, Radiator cooled DG Sets are proposed on Site Plan with adequate ventilation/Exhaust as per recommendation of DG Set manufacturer and CPCBNorms.

All DG Sets shall directly feed to Main LT Panel.

Flue pipes from DG set shall be taken vertically through structure up to terrace level and let out as per the requirement of local by-laws or CPCB latest amendment up to date.

We have not been proposed for HSD yard, it is proposed to provide barrels for Diesel storage for DG set beyond the allowable 990 litres Day oil Tank in DGroom.

vii) DG Set Control & Operation

The DG sets shall start automatically in case of failure of normal supply.

Return of the system to normal and stopping of the DG sets after restoration of mains

supply. The AMF Panel shall be part of Main LT Panel.

viii) LT Power Distribution Scheme

LT Power supply from the Transformers & DG Sets will be connected to the Main LT Panels thru AI Conductor, XLPE insulated, Armoured Cables. The Main LT Panels shall be placed in the basement.

The Auto Mains Failure signal to DG set shall be provided thru the Main LT Panels.

LT Power feed from the Transformers & DG Sets & to be connected to the Main LT panels placed at basement. The Auto Mains Failure signal to DG set shall be provided thru Main LT Panel.

Power from the Main LT panel shall feed power to Each Tower, Each Zone of Ventilation Panels, Plumbing Panels, STP, and Fire-Fighting Panels by XLPE/Fire Survival insulated Aluminium/Copper Conductor, and Armoured Cable.

Tower panel shall feed power to common area panel & rising mains of suitable ratings. Each rising mains shall feed power to Meter boards placed on the respective floor. All meter boards shall have dual supply Energy (kWH) meters. The Energy meters shall be provided by RWA. All major electrical loads/ panels shall be fed directly from Main LT Panel like-

Tower Panels

Ventilation Panel

Fire-Fighting

Panel Plumbing

Panel STP

External Lighting Panel

FS Cables for life saving services i.e. Fire-Fighting System, Fire Alarm System, Lifts, Ventilation, and Exit Signs etc. shall be used.

All Feeders up to 630A shall be Moulded Case Circuit Breakers and above 630A shall be Air Circuit Breakers.

Main Distribution Boards shall incorporate moulded case circuit breakers. Final distribution boards shall incorporate miniature circuit breakers. Sub Distribution Boards (SDB's) shall be located on areabasis.

Final Distribution Boards shall be fed from these MDB's & SDB's by means of either PVC insulated Aluminium/copper cables or PVC insulated copper wires in appropriately sized MS/PVC conduits.

A dedicated electrical room along with associated riser shaft for ELV services is proposed for each floor, public areas and common areas. Shielding shall be provided where necessary to curb the effects of electromagnetic radiation on LV System. 15 – 20% spare capacity over maximum demand shall be provided in all services including cables. All riser shaft openings at each floor shall be sealed and all floor wall penetration shall be sealed by using fire sealant as per NBC of 2016.

ix) Power Factor Improvement

Automatic power factor compensating multiple capacitor units shall be provided to maintain power factor around 0.99 lag to have effective savings in energy cost.

Contact control switching arrangement to automatically switch ON/OFF the capacitor units to achieve the pre-set power factor. Capacitor in banks form shall be provided in the capacitor panel.

x) System Earthing

The earthing system shall be based on the IS standard and shall conform to latest amendment up to date. The earthing conductors proposed to be used are follows -

Copper for neutral earthing Galvanised Iron (GI) for body earthing

Separate and distinct earth stations with insulated electrode shall be provided for the following system:

HT Panels

Main LTpanels

UPS (Body & Neutral)

ELV System (i.e. EPABX, Fire Detection and Alarm System, CCTV System etc.) Elevators / Elevators Panel

External Lighting Feeder Pillars

Neutral & Body of transformers Neutral & Body of DG sets

Earthing for light and power points shall be carried out with insulated copper earth wire running throughout the length of the circuit and shall be terminated at equipment, fixtures etc. with effective bonding to main earthinggrid.

All the pits and main earthing bars are to be connected to each other to make a common earthing electrode grid. If the resistivity of the soil is very high then, earthing calculations shall

be done by Electrical contractor to ensure that the conductivity is maintained at less than 1 Ω .

xj) UPS PowerBackup

We proposed to provide UPS with 30 minutes battery backup for some critical loads such as head end equipment of ELV System, security system, data networks, fire alarm & Emergency Lighting etc.

xii) Recommended IlluminationLevels

Lighting fixtures to be provided in common areas i.e. basement/podium, staircase, lift lobby, corridor etc. In flats, lighting fixtures will be in flat owner scope.

In all the areas LED type lighting fixtures are proposed.

The illumination level shall be provided in the common areas as per NBC-2016.

Exit Signs shall be with self-contained 3 hours duration maintenance free luminaries back-up with standby source of the power. Exit signs shall not exceed 5 W per face.

xiii) Lightning ProtectionSystem

The lightning protection system shall be provided as per NBC-2016.

xiv) Surge VoltageProtection

Surge Protection Devices at main LT Panel incoming feeders (Stage I / Class B) & Distribution Boards (Stage II / Class C) for the protection of Building electrical and Electronics system from the effect of Lightning discharges, line induced transient surge voltage or switching surges.

xv) Brief Outline Specifications for MajorEquipment's:

The equipment proposed to be used in the Sub Station and the power distribution network including the internal wiring and distribution equipment shall generally be based on the following.

The selection of equipment shall be based on the design fault levels, current carrying capacities and other system parameters.

Equipment	Specifications	
Transformers	Outdoor Type (ONAN)	33,000/433 volt step down transformers with off load tap changing links in steps of +5% to -10%.
433 volt Switchgear	Incoming/Outgoing	Air Break Circuit Breakers & Moulded case circuit breakers.
33 kV Cables	Aluminium conductor	33,000 volt grade XLPE insulated and
		sheathed earthed armoured cables

Equipment	Specifications	
LT Switch Board / MCC Panels	Aluminium Bus bar	Form Separation as per Specifications.
Distribution Boards	Incoming	One RCCB Breaker sensitivity 30 mA per phase
	Outgoings	Miniature Circuit Breakers 10 kA for all light and power circuits

Equipment	Specifications	
Sub mains from local switchboards to final DB's	Cables up to 10 sq mm	1100 volt grade XLPE insulated and sheathed copper conductor cables
	Cables above 10 sq mm	1100 volt grade XLPE insulated and sheathed aluminium conductor cables.
	Wiring in conduit	1100 volt grade FRLS insulated copper conductor wires in PVC conduit
Internal Wiring	Lighting and Power	Wiring shall exclusively be with 1100 volt grade FRLS PVC insulated copper conductor wires in PVC recessed conduit
	Lighting circuits (Common Areas)	3 x 2.5 sq mm (P+N+E)
	6 amp 230 volt outlets (Common Areas)	3 x 2.5 sq mm (P+N+E)
	16 amp 230 volt socket outlets (Common Areas)	3 x 4.0 sq mm (P+N+E)
	32 amp 230 volt sockets	3 x 6.0 sq mm (P+N+E)
Switches and accessories	Switches and accessories	Moulded plate switches or as per Interior Designer(ID)
	Socket outlets	Moulded plate socket outlets universal type to accept 2/3 pin plugs of most International Standards or as per ID consultants.
	Special areas	In wet areas e.g. kitchens etc. the switches and accessories shall be conforming to the IP standards (weather-proof) or as per facility Planning consultant.

xvi) Elevators Schedule (For Phase-II)

Elevator equipment shall be supplied and installed in accordance with ANSI / ASME.A17.1 /CENEN 81-1(JIS) including latest supplement and local code requirements, whichever is more stringent. No degradation of ANSI / ASME.A17.1/CENEN 81-1(JIS) requirement shall be allowed simply on the basis of local code requirement. Details of elevators required are as follows :

S.No.	Description of Floors	Total Lifts required	Approx. Travel Height (Mtr.)	No. of Openings
1	1B+2P +G+1st to 33 Floors	75	118	37

All elevators shall be Gearless type. Interiors of all passenger elevators shall be designed by the interior designer and bare car shall be provided with 25mm recess for flooring by others.

xvii) Cabling Infrastructure for FTTH (Only Provision in Shaft)

- a) Provision of Structured Cabling Infrastructure for FTTH (Fibre to the Home) shall be based on Fibre cable. The cabling requirements shall be based upon a structured cabling system main Rack to ONT box of each floor of Tower.
- b) Telephone Cable: The Cat-6, UTP cable that runs from the floor ONT to each flat comprises of 4 pairs of wires.
- c) TV Cable: co-axial TV cable RG-6 grade, 0.7 mm solid copper conductor PE insulated, shielded with fine tinned copper braid and protected with PVC sheath shall be used.

Note: No high end equipment's and hardware have been considered.

xviii) Security Systems Including CCTV

The requirements of security system vary as per the requirement along with its geographical location.

a) Outdoor surveillance

The outdoor area includes all entry or exit paths shall be put under video surveillance where the cameras shall have virtual boundaries. Apart from virtual boundaries, video analysis software shall analyse the video of any sort of exceptions like, cars moving in too fast, cars suddenly stops etc. the video cameras shall be connected to a control software which shall activate various devices like boom barriers etc.

b) CCTV For Internal Surveillance

Close circuit television shall be used for internal surveillance of Tower i.e. Entry/Exit of Towers & Basement Area. The cameras shall be IP and hence the images may be stored in servers and viewed from only server computers.

Closed Circuit TV System (CCTV) following spaces shall be provided with cameras: Tower Entry Exit Area

Main Entrance Lobby Side

Main building Basement entrance & Exit Main lift lobby

Car park ramp, entrance and exit only Near Boom Barrier Entry/Exits Parking's Sides. Etc.

xix) BoomBarriers

The boom barriers shall be fitted at all the entrances/exits where the vehicular access is required. All boom barrier shall be operated my manually push button.

xx) Appendix

(1) IS: 732-1989	Code of practice for electrical wiringinstallations.
(2) IS: 8061-1976	Code of practice for design, installation andmaintenance of service lines up to and including 415V
(3) IS: 8884-1978	Code of practice for installation of electric bells andcall system.
(4) IS: 5578-1985	Guide for marking of insulated conductor.
(5) IS: 11353- 1985	Guideforuniformsystemofmarkingandidentification of conductors and apparatus terminals.
(6) IS: 5728-1970	Guide for short-circuitcalculations.
(7) IS:7752(Part-1)-1975	Guideforimprovementofpowerfactorinconsumer Installation: Low and medium supply voltages.
(8) IS:3646(Part-1)-1966	Codeofpracticeforinteriorillumination:Principlesfor good lighting and aspects of design.
(9) IS:3646(Part-2)-1966	Code of practice for interiorillumination Schedule of illumination and glare index.
(10) IS: 2672- 1966	Code of practice for corridorlighting.
(11) IS: 10118(Part-1)-1982	Code of practice for selection, installation and maintenance of switchgear and control gear: General.
(12) IS:10118(Part-2)-1982	Code of practice for selection, installation and maintenance of switchgear and control gear.
(13) IS:10118(Part-3)-1982	Code of practice for selection, installation and maintenance of switchgear and control gear: Installation.
(14) IS:10118(Part-4)-1982	Code of practice for selection, installation and maintenance of switchgear and control gear:Maintenance.
(15) IS: 3043- 1987	Code of practice for earthing.

(16) IS:5216(Part-1)-1982	Guide for safety procedures and practices in electrical work: General.
(17) IS:4237- 1983	General requirements for switchgear and controlgear for voltages not exceeding 1000 V AC or 1200 V DC.
(18) IS:6875(Part-1)-1973	Control switches (switching devices for control and auxiliary circuits including contactor relays) for voltages up to and including 1000 V AC and 1200 DC: General requirements and tests.
(19) IS:4064(Part-1)-1978	Air break switches, air break dis-connectors, air-break switch dis-connectors and fuse-combination units for voltages not exceeding 1000 V AC or 1200 DC: General requirements.
(20) IS: 8828- 1978	Miniature air break circuit breakers for voltages not exceeding 1000 volt.
(21) IS: 13032-1991	Miniature circuit breaker boards for voltages up to and including 1000 volts AC.
(22) IS: 12640-1988	Residual current operated circuit breakers.
(23) IS: 2959- 1985	Contactors for voltages not exceeding 1000 V AC or 1200 V DC.
(24) IS:8623(Part-1)-1977	Factory built assemblies of switchgear and control gear for voltages up to and including 1000 V AC and 1200 V DC: General requirements.
(25) IS:8623(Part-2)-1980	Factory assemblies of switchgear and control gear for voltages up to and including 1000 V AC and 1200 V DC: Particular requirements for bus bar trucking system (bus ways).
(26) IS: 694-1990	PVC Insulated cables for working voltages up to and including 1100 V
(27) IS:1554(Part-1)-1988	PVC insulated (heavy duty) electric cables: For working voltages up to and including 1100 V.
(28) IS:3961(Part-5)-1968	Recommended current ratings for cables: PVC insulated light duty cables.
(29) IS:9537(Part-2)-1981	Conduits for electrical installations Rigid steel conduit.
(30) IS: 3480-1966	Flexible steel conduits for electrical wiring.
(31) IS: 2667-1988	Fittings for rigid steel conduits for electrical wiring.
(32) IS: 3837-1976	Accessories for rigid steel conduits for electrical wiring.
(33) IS:5133(Part-1)-1969	Boxes for enclosure of electrical accessories: Steel and cast iron boxes.

(34) IS: 371- 1979	Ceiling roses.
(35) IS: 3854-1988	Switches for domestic and similar purposes.
(36) IS: 4615-1968	Switch socket outlets (non-interlocking type).
(37) IS: 4160-1967	Interlocking switch socket outlet.
(38) IS:1293- 1988	Plugs and socket outlets of rated voltage upto and including 250 volts and rated current up to and including 16 amperes.
(39) IS: 2309-1989	Code of practice for the protection and allied structures against lightning.
(40) IS:9537(Part-1)-1980	Conduits for electrical installations: General requirements.
(41) IS:1180	Distribution Transformer
(42) IS:7098	XLPE insulated Power cable

3. PLUMBINGSYSTEM

i) Works to Be Done Scope of the Work

- External Water Supply Including source development, storage of water, treatment and disinfection of water, distribution of water to individual buildings.
- External Sewerage system, including collection of sewer & waste water from toilets, Kitchen etc. and disposal to Sewerage treatment plant.
- External Storm water drainage system including collection of rain water from terrace, Road area,
- green area etc. through drain and disposal to Rain water harvesting pit to recharge the ground water level.
- External Irrigation system for gardening of green area.
- Internal Plumbing work including supply the water to all fixtures from overhead water tanks by gravity, disposal of soil / waste water from toilet, kitchen etc. up to sewer manhole and disposal of rain water from terrace & balcony up to catch basin / storm water manhole.
- Preparation of cost estimation and tender documentation for plumbing works.
- Preparation of plumbing drawings.

ii) Design Brief

- Concept is designed according to Group housing requirement.
- The design of system in accordance of NBC – 2016requirement.
- Services for the entire buildings are planned in such a way that total domestic water demand of the buildings is met through the tube wells/ municipal supply.
- Domestic / flushing water shall be stored in the underground water tanks and after treatment supplied to the domestic / flushing overhead tanks by mono-block/Hydro-Pneumatic pumping system.
- The water supply to toilets, kitchen etc. is supply by gravity feed system and is adequately controlled.
- Individual geyser provision shall be providing for hot water requirement in all toilets and kitchen of residential towers.
- Pipe material for domestic, flushing & hot water supply (In shaft, terrace & External) shall be Upvc SH. 80 & for internal shall be Cpvc.
- Two pipe systems is planned for sewage and waste collection from building through down stacks and in basement, single/double pipe system shall go to the STP along the basement ceiling level or through the site sewerage manhole.

- All down take pipes shall be exposed/enclose.
- Upper Floors EWC are connected to vertically soil pipe, then soil pipe connected to sewer pipe in basement ceiling, whereas waste pipe from shower/ Wash basin/ sink is connected to floor trap and floor trap connected to vertically waste pipe, then waste pipe also connected to sewer pipe in basement ceiling after that it will go to STP through the basement ceiling level.
- All toilet pipes running through the ceiling to connect vertical soil & wastepipe.
- Provided Sewerage treatment plant based on MBBR technology with capacity of STP (Phase-II - 820KLD).
- All pipe sizing, locations are subject to detail design and planning of scheme based on layout and working on drawing.
- Rain Water from the various roofs will be drained through rains water vertical down take uPVC pipes. These vertical down take pipes will be located at suitable locations in side the shafts or embedded inside the wall. All the terraces will be sloped in a slope of 1:100. Slopping towards down vertical pipes. Rain Water khurras will be of suitable size with MS/CI grating shall be provided at roof with each rain water vertical down take. The vertical down take pipe shall be connect in basement ceiling horizontal rain water pipe to outside the basement and connect to external drainage.

The following table gives an idea about the diameter of pipe required for draining out rainwater based on rainfall intensity and roof area:

Sizing of rainwater pipe for roof drainage

S. No.	Diameter Of pipe (mm)↓	rainfall in mm/h →	Roof Area, in sqm. For average rate of rainfall in mm/h					
			50	75	100	125	150	200
1	50	Roof Area →	29.70	19.80	14.85	11.88	9.90	7.42
2	65		57.23	38.15	28.61	22.89	19.08	14.31
3	75		81.84	54.56	40.92	32.74	27.28	20.46
4	100		168.00	112.00	84.00	67.20	56.00	42.00
5	125		293.48	195.66	146.74	117.39	97.83	73.37
6	150		462.95	308.64	231.48	185.18	154.32	115.74

mm/ h - millimetres per hour; m - meters Source: National Building Code

- We provide storm water design as quick disposal of rain water without flooding by providing the close network of drain system with Rain water harvesting system to recharge the groundwater.

- Garden hydrant shall be provided in green area for irrigation use and water supply for irrigation shall be use from the STP treated water.
- The design philosophy is to make building as a efficiency building inaccordancewith design compliance to relevant standard, code and local bio laws full filling all functions requirements of the building.

iii) *Distribution of Water Supply*

- Municipal / Bore well Water shall be collect into fire water tank, over flow from fire water tank shall be collect into raw water tank and after filtration, filter water shall be collect into treated water tanks from raw water tank.
- From treated water tank water shall be supplied to overhead water tank by pumping.
- Domestic water supply shall be supplied to toilets, kitchen / pantry area etc, from overhead domestic water tank by gravity.
- From STP, flushing Water shall be collect into underground flushing water tank and from here flushing water shall be supplied to overhead flushing water tank by pumping.
- Flushing water supply shall be supplied to all toilets for cistern from overhead flushing water tank by gravity. Flushing water shall be also use for irrigation use by separate pumping system from underground flushing tank.

iv) **Estimated Water Demand**

PHASE – II

“ANNEXURE–A: WATER LOAD SHEETS”

WATER REQUIREMENT CALCULATIONS (ZONE-1)									
sl. no	Description	No. of units	Unit Population	Built up Area	Population	Unit Water Consumption	Total Water Required	Recycle Water Requirement	Total Recycle Water
				(Sq M)	(person)	(liters)	(liters)	(liters)	(liters)
1	Apartments (Zone-1: Towers A /B /C /D /E/F/G/H /J/ K /L/M/N)	3536	4.5		15912	135	2148120	45	716040
2	Club				1600	45	72000	20	32000
3	Floating Population				1600	15	24000	10	16000
4	Staff				800	45	36000	20	16000
5	Filter Backwash						50000		0
6	Make-Up water for swimming pool						10000		0
7	Horticulture			11000		7	77000	100%	77000
						total	24,17,120		8,57,040
SUMMARY OF WATER REQUIREMENT									
Total Permanent Population						=	15912	persons	
Total Domestic Water Requirement						=	24,17,120	lit/day	
Total Flushing Water Requirement (A)						=	7,80,040	lit/day	
Total Horticulture Water Requirement (B)						=	77,000	lit/day	
Total Recycle Water Requirement (A+B)						=	8,57,040	lit/day	
<u>Net Domestic Water Requirement</u>						=	15,60,080	lit/day	
Total Sewage Load (total domestic water required- horticulture- s.pool make up-filter backwash)						=	22,80,120	lit/day	
Net Sewage Flow-		80% of total sewage load				=	18,24,096	lit/day	
Sewage Treatment Plant capacity required						=	1830	KLD	610 kld x 3
Total recycle water required						=	8,57,040	liters	
Net water balance (to discharge into drainage system)						=	9,67,056	liters	
UGT Capacity (for Domestic Use)=16 hrs storage						=	10,40,053	liters	1040KL
UGT Capacity (for Fire Fighting)						=			300KL
Total UGT Capacity (Domestic + Fire)						=			1340KL

WATER REQUIREMENT CALCULATIONS (ZONE-2)								
Description	No. of units	Unit Population	Built up Area	Population	Unit Water Consumption	Total Water Required	Recycle Water Requirement	Total Recycle Water
			(SqM)	(persons)	(liters)	(liters)	(liters)	(liters)
Apartments (Zone-2: Towers P/Q/R /S/T/U /V)	1428	4.5		6426	135	867510	45	289170
Club				1500	45	67500	20	30000
Floating Population				1500	15	22500	10	15000
Sta				750	45	33750	20	15000
Filter Backwash						50000		0
Makeup water for swimming pool						10000		0
Horticulture			9500		7	66500	100%	66500
					total	11,17,760		4,15,670
SUMMARY OF WATER REQUIREMENT								
Total Permanent Population				=	6426	persons		
Total Domestic Water Requirement				=	11,17,760	lit/day		
Total Flushing Water Requirement(A)				=	3,49,170	lit/day		
Total Horticulture Water Requirement(B)				=	66,500	lit/day		
Total Recycle Water Requirement (A+B)				=	4,15,670	lit/day		
<u>Net Domestic Water Requirement</u>				=	70,2,090	lit/day		
Total Sewage Load (total domestic water required - horticulture - s.pool make up - filter backwash)				=	99,1,260	lit/day		
Net Sewage Flow-	80% of total sewage load			=	7,93,008	lit/day		
Sewage Treatment Plant capacity required				=	793	KLD	400 kld x 2	
Total recycle water required				=	4,15,670	liters		
Net water balance (to discharge into drainage system)				=	3,77,338	liters		
UGT Capacity (for Domestic Use)=16hrs storage				=	4,68,060	liters	475KL	
UGT Capacity (for Fire Fighting)				=			165KL	
Total UGT Capacity (Domestic + Fire)				=			640KL	

v) Filtration System

Filtration is a physical and chemical process for separating suspended and colloidal impurities from water by passing through a porous bed, usually made of gravel and sand or other granular material.

Dual Media Filter (D.M.F.) + Activated Carbon Filter (A.C.F.) Water containing a TDS of 500 mg/l is acceptable for potable use.

Potable water shall be treated with a filter to remove suspended solids, odour and bacteria to 99.9%. Systems include sand, resin, charcoal/carbon and ultraviolet sterilization. Treated water shall be used for domestic use.

The detailed water treatment system can be worked out once the raw water characteristics are available.

SEWAGE TREATMENT PLANTS (PHASE –II)

Capacity of S.T.P = 400 KLD X 2 NOS + 610 KLD X 3 NOS

Design of sewage treatment plant would conform to all local regulations.

The system would be complete with the following minimum main components:

- Sewage treatment plant
- Pumphouse
- All piping, fittings, valves, hangers, etc., to complete the mechanical installation.
- Treatment including filters, softeners & UV.

The plant would be based on 5 day B.O.D. (Biochemical Oxygen Demand) of capacity. The technology of STP would be MBBR.

4. FIRE FIGHTING SYSTEM

i) Fire Hydrants

External hydrants locate within 2m to 15m from the building, and with a spacing of 45-50m between them. The hydrants are placed within protective structures to avoid damage from vehicle movement. Fire department connections, capable of directly feeding the ring mains or static fire reserve tanks, are also provided near the main entrance.

Fire department connections shall also be provided on the external wall of the property near the main entrance. These comprise of 3/4 Nos. 63 mm diameter male outlets capable of directly feeding the ring mains through non return valves or directly filling the static fire reserve tanks.

Internal standpipe fire hydrant system is provided with landing valve, hose reel, first aid hose reels, complete with instantaneous pattern short gunmetal pipe.

ii) Fire Hose Cabinets

The hose cabinet to accommodate the Hose Pipes, Branch Pipe, Nozzle and Hydrant Outlets

shall be fabricated from 2 mm thick or 14 mm gauge aluminium sheet. The overall size shall be 2100x900x715 mm, or as per the Architectural details. In case of Internal Hydrants this shall accommodate the Hose Reel equipment also. This shall have lockable centre opening glazed doors. Where the niche for wet riser is provided with shutters, separate hose cabinet as above may be dispensed with.

The hose cabinet shall be painted red and stove enamelled. The words "Yard Hydrant", "Hydrant" etc. shall be painted in white (or red on the glass) in 75 mm high letters. All horizontal surfaces shall be sloped adequately with water discharge holes. Vents shall also be located on sides of the Box.

iii) Extinguishers

Hand held extinguishers shall be located so that the maximum travel distance is not more than 23 metres and would generally be located in or adjacent to the fire hose reel cabinet. Extinguishers used shall match the class of fire and in general shall be the 10lb dry chemical type ABC type. Hands held fire extinguishers would be located adjacent to particular hazards and contain an extinguishing media suitable for that hazard.

iv) Sprinkler Protection

A fully automatic fire sprinkler system shall be provided to basement and building ht. is more 45 m areas as required by the relevant code. One sprinkler shall be located for an area of 3m x 3m.

Density and area of coverage shall be maintained as per NFPA Guidelines or IS: 15105. To meet the residual pressure of at least 103 kPa at the highest sprinkler, it is proposed to install PRVs/ Orifice plates at specific locations on the Sprinkler risers.

The sprinkler system shall be provided with control valves, flow and flow switches at suitable locations and connected to control module of the fire alarms system for its monitoring and annunciation in case of activation. Inspector's test valve assembly with sight glass is provided at remote end with discharge piped to drain outlet/pipe.

v) Water Curtain System in Basement

For Basement car parking, compartmentation shall be required as per NBC, and hence a separate longitudinal pipe fixed with Spray Nozzle at interval of 2.5m spacing or less as per design in basement shall be given. It shall be auto controlled by Deluge valve installed in an accessible place with instructions.

- As per NBC the basement area to be compartmented by means of water spray curtains of each 3000 Sqm. Area.
- K value of water curtain nozzle should be 'K-23'.

Minimum 60 min. additional fire water storage required in underground fire water tank for this system considering the largest compartment's perimeter out of all compartments of basement.

vi) Gas Suppression System

Fire suppression system is fire detection and quenching system. This is proposed for flooding system in LT panel, Transformer & server room etc. with Novec 1230. The Cylinder Valve Assembly must be UL/FM approved with Seamless CCOE approved cylinder and an undertaking from manufacturer must be submitted with the tender to comply the same.

vii) Fire Pump, Jockey Pump

For fire fighting, Water is drawn from fire reserve tanks by electrically driven jockey pumps, fire hydrant pump. A standby diesel engine driven pump for both the fire hydrants system is also provided. All pumps shall have separate suction line from the fire suction header. Delivery from the pumps is connected to the respective hydrant system. The function of pumps shall be to maintain 3.5 Kg/Sq.cm at the farthest hydrant. Diesel engine driven fire pump is of the same capacity and is back up for the electrically operated fire hydrant, as per fire regulations. This will be operated in case of total electrical power or electrical pump failure. Independent Jockey pump for hydrant system operate intermittently in order to take care of hydraulic losses in the system and maintain the minimum pressure respectively in wet risers system. Fire pumps rating / duty is in accordance to NBC-2016 guidelines and also caters for future expansion requirement.

<p>Electric Motor Driven Hydrant & Sprinkler Pump (2 No.)</p> <p>Flow : 2850LPM</p> <p>Head (approx.) : 140 M</p>
<p>Diesel Engine Driven Fire Pump [Stand by pump] (1 No.)</p> <p>Flow : 2850LPM</p> <p>Head (approx.) : 140 M</p>
<p>Electrical Motor Driven Jockey Pump (2 No.)</p> <p>Flow : 180LPM</p> <p>Head (approx.) : 140 M</p> <p>Electric Motor Driven Curtain Pump (1 No.)</p> <p>Flow : 1620LPM</p> <p>Head (approx.) : 50 M</p>

viii) Plumbing Indian Standard and Code as Mention Below

- (i) National Building Code 2016
- (ii) CPWD Specifications & guidelines
- (iii) Applicable IS Codes & Standards:

Vitreous Chinaware-	-	IS: 2556 - 1994 (Part - I)
	-	IS: 2556 - 1994 (Part -II)
	-	IS: 2556 - 1994 (Part -III)
Ball Valve	-	IS: 1703 -2000
Cistern Brackets	-	IS: 775 -1970
Toilet Seat Cover	-	IS: 2548 –1996
Vitreous China Cistern	-	IS: 2326 -1987
Sand Cast Iron Pipes and Fittings	-	IS: 1729 -2002
Spun Cast Iron Pipes and Fittings	-	IS: 3989 -1984
GI Pipes	-	IS: 1239 -2004
Galvanising for GI Pipes	-	IS: 4736 -1986
Pipe Threads	-	IS: 554 -1999
Malleable Iron Fittings	-	IS: 1879 -2010
Cast Iron Sluice Valves	-	IS: 780 -1984
Full Way Valves	-	IS: 778 -1984
Brass Ferrule	-	IS: 2692 -1989
Stone Ware Gully Trap	-	IS: 651 - 2007
RCC Pipes	-	IS: 458 - 2003
Cast (Spun) Iron Fittings	-	IS: 1538 -1993
Pig Lead	-	IS: 782 - 1978
Induction Motors	-	IS: 4691-1985
Code for Measurements	-	IS: 1200 – 1992
UPVC Pipes and Fittings	-	IS: 4984 -1995
Specification for Caulking Lead	-	IS: 782 –1978
Code of Practice for laying of concrete	-	IS: 783 – 1985

- (iv) SP 35 – Plumbing Standard
- (v) WHO standard for water quality
- (vi) Static & mobile Pressure vessel act / Indian explosives act

Fire Fighting Indian Standards and Codes

Standard	Topics
Fire Extinguishers	
IS: 15683:2006	Portable chemical fire extinguishers, soda acid type
IS: 15683:2006	Portable chemical fire extinguishers, water type (gas cartridge)
IS: 15683:2006	Portable chemical fire extinguishers, Dry Powder (Cartridge type)
IS: 2190: 1992	Code of practice for selection, installation and maintenance of portable first - aid fire extinguisher (third revision)
Alarm systems and other systems and media	
IS: 2175: 1988	Heat sensitive fire detectors for use in automatic electric fire alarm system (second revision)
IS: 2189: 1988	Code of practice for selection, installation and maintenance of automatic fire detection and alarm system (second revision)
IS: 3844: 1989	Code of practice for installation of internal fire hydrants in multi- storey buildings.
Accessories, Hoses, Hydrants	
IS: 636: 1988	Non-percolating flexible fire fighting delivery hose (third revision)
IS: 884: 1985	First-aid hose reel for fire fighting (first revision)
IS: 901: 1988	Couplings, double male and double female, instantaneous pattern for fire fighting (third revision)
IS: 902: 1992	Suction hose couplings branch pipe, nozzles and nozzle spanner (third revision)
IS: 908: 1975	Fire hydrant, stand post type (second revision)
IS: 909: 1992	Underground fire hydrant sluice-value type (third revision)
IS: 5290: 1983	Landing valves (second revision)
IS: 8423: 1977	Controlled percolating hose for fire fighting
Fire Safety in Buildings	
IS 13039:1991	Code of practice for provision and maintenance of external hydrant system
IS 13716:1993	Code of practice for fire safety
IS 2189:1999	Code of practice for selection, installation and maintenance of automatic fire detection and alarm system (<i>second revision</i>)
IS 15105:2002	Design and installation of fixed automatic sprinkler fire extinguishing system
	National Building Code 2016

5. HVACSYSTEM

i) Overview of HVACDesign

Ventilation services, systems have been conceptualized with provided architectural drawings, design standard and critical parameter as per ASHRAE/ISHRAE/NBC standards and guidelines to produce a concept design which is an integrated whole.

The services of working areas of the building shall be concealed. Vertical shafts, floor cut-outs and floor fill have been proposed accordingly all through the building. Apart from the latest state of the art technology available, fire safe, energy efficient and fail safe systems with least maintenance requirements are also major consideration for selection of systems and equipment.

ii) Preamble

Leisure Valley Building is proposed from 2 nos. Basement +2 nos Podium and many type of Tower.

Basement should be mechanical ventilation with the help of Axial Fans, Jet Fans Louver, VCD and fire damper etc. Total Basement/Podium area mention in ventilation calculation.

All mechanical equipment such as Axial Fans, Jet Fans shall be provided with energy efficient motors in order to achieve energy savings.

iii) SystemDescription

Ventilation System

- i We are proposing mechanical ventilation system for Basement & Podium floors. The Fans shall be axial flow fan type. Purposed basement shall be provided air distribution with the help of jetfan.
- ii We are purposed axial flow fans for Lift well, liftboy and staircase pressurization.
- iii Mechanical ventilation in utility area like. Pump room, LT Panel room, STP etc. fan is provided as per ASHRAE required. Purposed utility area shall be provided ventilation system with the help of Duct, Grille and Damperetc.
- iv All fans shall be fire rated according toNBC.

iv) System Proposed

- i. Mechanical ventilation system- for Basement,Podium&Services area.
- ii. Smoke control & smoke evacuation system.
- iii. Staircase, Lift well and Lift lobby Pressurization system
- iv. Fire sealant around ducts / pipes and cables when passing through wall /floor and other openings.

v) *HVAC Design Codes & Conditions*

- ADC1062: GRD- Test Code for Grilles, Registers and Diffusers
- AABC (Associated Air Balance Council)
- ADC (Air Diffusion Council)
- ADC-01- Directory of ADC Certificate Products
- AMCA (Air Moving and Control Association)
- AMCA 210 – Design and Testing of Fans
- AMCA 500 – Test Methods for Louvers, Dampers and Shutters
- ARI (American Refrigeration Institute)
- ARI210- Unitary Air Conditioning Equipment
- ARI650- Standard for Air Outlets and Inlets
- ASHRAE 62-1999: This standard provides guidelines to the ventilation for acceptable indoor Air Quality
- ASHRAE 70- Method of testing for rating the airflow performance of outlets and inlets
- ASHRAE 105: This standard provides method of measuring and expressing building energy performance
- ASHRAE 111- Practices for measuring, testing and balancing a building heating, ventilation, Air conditioning and refrigeration systems
- ASHRAE Standard 129-1997: This standard describes a test method for evaluating an air distribution systems ability to provide required levels of ventilation air to the building occupants.
- ASHRAE90.1-2007
- ASHRAE55-2004
- ASHRAE 62.1-2010 for Fresh Air
- ASME (American Society of MechanicalEngineers)
- ASME B-31.5- Refrigeration piping
- ASME A-13.1- Scheme for identification of piping system
- ASTM (American Society of Testing and Materials)
- ASTM A 53- Standard specification for pipe, steel, black and hot dipped, zinc- coated, welded and seamless
- ASTM A 90- Standard test method for weight of coating on zinc coated (Galvanized) iron or steel articles
- ASTM A 527- Standard specification for steel sheet, zinc-coated (Galvanized) by the Hot-Dip process, Lock-forming Quality

- ASTM A 666- Standard specification for Austenitic stainless steel, sheet, strip, plate, and flatbar.
- ASTM B 62- Standard specification for composition bronze or Ounce metal castings
- ASTM B 88- Standard specification for seamless copper watertube
- ASTM B 280- Standard specification for seamless copper tube for Air conditioning and Refrigeration fieldservice
- ASTM C 552- Standard specification for cellular Glass thermal insulation
- ASTM E 477- Testing duct linear materials and prefabricated silencers for acoustical and airflow performance
- ISO (International Standards Organization)
- ISO 9001- Quality systems- Model for quality assurance in design, development, production, installation and servicing
- ISO 9003- Quality systems- Model for Quality assurance in final inspection and test
- ISO 9004- Quality Management and Quality system elements-guidelines
- NEMA (National Electrical Manufacturers Association)
- NEMA 250- Enclosures for Electric Equipment (1000 volts maximum)
- NFPA (National Fire Protection Association)
- NFPA 90A- Standard for the Installation of ventilation systems
- National Fire Protection Association (NFPA), latest edition
- Carnegie Mellon Design Standards, December 1998release
- SMACNA (Sheet Metal and Air Conditioning Contractors National Association,Inc.)
- HVAC Systems, Testing, adjusting and balancing
- SMACNA 06- HVAC duct construction standard – Metal andFlexible
- SMACNA, Duct Construction Standards,2005
- UBC refers to the state adopted international conference of building official's uniform building code, 1994 edition or the year indicated.
- International Building Code,2009
- International Mechanical Code2009
- International Energy Conservation Code2009
- National Building Code of India - 2016(NBC)
- Relevant Bureau of Indian Standards (BIS)codes
- Indian Society of Heating, Refrigeration, and Air Conditioning Engineers (ISHRAE) HandBook

vi) Mechanical Ventilation System

The following areas shall be provided with dedicated ventilation system with the number air changes, or CFM per Sq. ft, for each space as identified herewith:

- Relative Pressure: Slight positive pressure (for air conditioned areas)
- Basement Ventilation @12 air change per hours.
- Toilet Ventilation @ 6-10 air changes per hour.
- D.G. Ventilation @ 60 CFM per KVA for supply and exhaust or as per (If DG set installed in basement or included Area.)
- S.T.P. @ 30 air changes per hour Ventilation.
- Pump room/LTRoom @ 10 to 12 air changes per hour Pump room Ventilation.
- Lift Well/staircase 50pa positive pressure in case of fire Staircase/lift well Pressurization

vii) Design Parameters

Design parameters for duct design shall be:

- Maximum flow velocity : 1500 Ft. /Min (450M/Min)
- Maximum Friction : 0.8inch WG/100ft. Run (1cm WG/100MRun)
- Maximum Velocity at Supply Air Outlet : 500 Ft. /Min. (150M/Min.)

viii) Ductwork

- The conditioned air from the Fan would be distributed through G.I. ducts. The ducts would be factory fabricated from G.I. material in coil form to reduce the number of longitudinal joints.
- The ducts would be fabricated generally as per SMACNA standards, as applicable.
- The duct connectors would be of preformed G.I. C&S cleats, 4-bolt slip on flange or TDC flange with built in sealant.
- The main duct branches would be provided with motorized fire dampers & opposed blade volume control dampers and smaller branches with splitter dampers to adjust the flow rate during commissioning.

ix) Basement Ventilation System

- Basement shall be ventilated @12 ACPH with the help of Jet Fans & Axial Fans and compartment shall be maximum 3000 sqm or less as per NBC, further fresh/Make-up Air and Exhaust Air shall be provided with the help of cut-outs/ shafts/ Fan Rooms. We are purposed 25 nos. of zone in 1st/2nd Basement, 29 nos. of zone in Podium-1 & 2. We are providing Exhaust air/Fresh air separately and also providing water curtain inside the zone area. Water curtain to be scope of Firefighting.
- L.T. Panel Room, Pump room, STP, and toilets would be provided with a mechanical ventilation system to provide a fume free/heat free environment.
- The toilets would be provided with a Propeller/Inline fan, and single uses toilet shall be ventilated through propeller fan. The exhaust air would be collected through G.I. ducts

installed in a vertical shaft and carried out the Building. The Toilet doors are proposed with louvers at bottom for fresh air intake.

x) Pressurization System

- As per the fire safety requirements, the fire-escape staircases and Lift shafts and Lift Lobbies would be provided with pressurization fans so as to provide positive air pressure thus ensuring that in the event of fire, no smoke can enter these staircases. These fans would start automatically controlled from fire panel in case of fire.
- All fire escape staircases shall be provided open able window 1mx1m of above floors and Basement stair shall be pressurization with the help of axial fans. Consisting of supply air fans installed on Ground Level. Fans shall be sized for fire escape stairwell, and/or to maintain minimum positive pressure of 50 Pa across the door.
- Supply air fans serving stairwell shall be provided with motorized damper at fan discharge to prevent humid fresh air entering into staircase well. These dampers shall be interlocked with fan motor and open upon getting signal from the smoke sensor.
- Lift wells and Lift lobbies also shall be provided with pressurization by supplying the air through supply air fans installed on roof top. Minimum pressure of 50 Pa has to be kept in lift shaft during fire action.
- The pressurization fans get activated upon sensing of smoke in common passagers/ lift lobby

xi) Smoke Control

- Complete HVAC system shall be on DG emergency power supply back-up. Proper smoke control measures are necessary for any building as smoke inhalation is the primary killer in building fires. Smoke migrates away from the fire through stair wells, elevator shafts and other passages.
- Automatic Fire Dampers shall be provided in all the supply/return air ducts wherever, they cross over from one fire zone to another. All these automatic fire dampers shall be integrated with the fire panel for automatic operation in case of fire.
- Fan shall be used to pressurize elevator shafts, Lift well. The fire escape staircases shall also be pressurized. The stairwells shall act as a smoke free escape route for the occupants in case of a building fire. Elevator shafts shall be maintained at a positive pressure in case of fire. Pressurization fans shall be placed so as to eliminate any possibility of short circuiting fan intake with smoke exhaust during a building fire.
- All exhaust fans shall be 'H' Class, 250°C 2-hour fire rated. Fresh air supply fan and pressurization fans motor insulation shall be 'F' Class.

xii) Axial/Centrifugal/Propeller/Inline Fans

Fans shall be provided for mechanical ventilation systems - Motor control centres complete with motor, motor mount, belt driven/direct driven/plug fan and vibration isolation type and for 120- minute fire resistivity suspension arrangement as per approved for construction shop drawings.

Axial/Centrifugal Fan shall be used for Ventilation in case of normal and fire both shall be UL Listed. For fire ventilation, Fan should be fire rated for 250 deg. Up to 2 hours and UL listed in accordance with "Power Ventilators for Smoke Control Systems". Propeller/Inline Fan shall be used for normal ventilation of toilets, stores etc. Axial flow fan shall also be used for pressurization fresh air/exhaust air requirements etc.

Basement +Podium Ventilation Calculation And Pressurization Calculation Mention Below.

VENTILATION CALCULATION																		
S.No.	Description	Area (Sqm.)	Height (ft)	Ventilation Rate(ACPH)	Air Quantity (CFM)	Exhaust Air System					Exhaust Air Louver Area@3.5m/s	Supply Air System					Fresh Air Louver Area@3.5m/s	
						Ex. Fan (CFM)	Type	Fan Qty. (Nos.)	Fan Static (mm WG)	Power (BHP)		Air Quantity (CFM)	Sup. Fan (CFM)	Type of Fan	Fan Qty. (Nos.)	Fan Static (mm WG)		Power (BHP)
	BASEMENT-1&2																	
1	Zone-1	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
2	Zone-2	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
3	Zone-3	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
4	Zone-4	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
5	Zone-5	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
6	Zone-6	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
7	Zone-7	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
8	Zone-8	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
9	Zone-9	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
10	Zone-10	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
11	Zone-11	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
12	Zone-12	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
13	Zone-13	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68

VENTILATION CALCULATION

S.No.	Description	Area (Sqm.)	Height (ft)	Ventilation Rate(ACPH)	Air Quantity (CFM)	Exhaust Air System					Exhaust Air Louver Area@3.5m/s	Supply Air System					Fresh Air Louver Area@3.5m/s	
						Ex. Fan (CFM)	Type	Fan Qty. (Nos.)	Fan Static (mm WG)	Power (BHP)		Air Quantity (CFM)	Sup. Fan (CFM)	Type of Fan	Fan Qty. (Nos.)	Fan Static (mm WG)		Power (BHP)
14	Zone-14	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
15	Zone-15	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
16	Zone-16	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
17	Zone-17	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
18	Zone-18	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
19	Zone-19	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
20	Zone-20	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
21	Zone-21	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
22	Zone-22	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
23	Zone-23	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
24	Zone-24	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
25	Zone-25	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
	Total louver Area	70000									192.00							192.00

VENTILATION CALCULATION

S.No.	Description	Area (Sqm.)	Height (ft)	Ventilation Rate(ACPH)	Air Quantity (CFM)	Exhaust Air System					Exhaust Air Louver Area@3.5m/s	Supply Air System					Fresh Air Louver Area@3.5m/s	
						Ex. Fan (CFM)	Type	Fan Qty. (Nos.)	Fan Static (mm WG)	Power (BHP)		Air Quantity (CFM)	Sup. Fan (CFM)	Type of Fan	Fan Qty. (Nos.)	Fan Static (mm WG)		Power (BHP)
	Podium 1 & 2																	
1	Zone-1	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
2	Zone-2	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
3	Zone-3	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
4	Zone-4	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
5	Zone-5	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
6	Zone-6	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
7	Zone-7	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
8	Zone-8	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
9	Zone-9	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
10	Zone-10	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
11	Zone-11	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
12	Zone-12	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
13	Zone-13	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68

VENTILATION CALCULATION

S.No.	Description	Area (Sqm.)	Height (ft)	Ventilation Rate(ACPH)	Air Quantity (CFM)	Exhaust Air System					Exhaust Air Louver Area@3.5m/s	Supply Air System					Fresh Air Louver Area@3.5m/s	
						Ex. Fan (CFM)	Type	Fan Qty. (Nos.)	Fan Static (mm WG)	Power (BHP)		Air Quantity (CFM)	Sup. Fan (CFM)	Type of Fan	Fan Qty. (Nos.)	Fan Static (mm WG)		Power (BHP)
14	Zone-14	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
15	Zone-15	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
16	Zone-16	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
17	Zone-17	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
18	Zone-18	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
19	Zone-19	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
20	Zone-20	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
21	Zone-21	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
22	Zone-22	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
23	Zone-23	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
24	Zone-24	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
25	Zone-25	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
26	Zone-26	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
27	Zone-27	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
28	Zone-28	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68

VENTILATION CALCULATION

S.No.	Description	Area (Sqm.)	Height (ft)	Ventilation Rate(ACPH)	Air Quantity (CFM)	Exhaust Air System					Supply Air System					Fresh Air Louver Area@3.5m/s		
						Ex. Fan (CFM)	Type	Fan Qty. (Nos.)	Fan Static (mm WG)	Power (BHP)	Exhaust Air Louver Area@3.5m/s	Air Quantity (CFM)	Sup. Fan (CFM)	Type of Fan	Fan Qty. (Nos.)		Fan Static (mm WG)	Power (BHP)
29	Zone-29	2800	13.5	12	81346	42000	AF	2	35	29.44	7.68	81346	42000	AF	2	35	29.44	7.68
30	Pump Room	660	13.5	12	19173	10000	AF	1	25	4.95	1.8	19173	10000	AF	1	25	4.95	1.8
31	STP	1650	13.5	30	119841	60000	AF	1	25	31.00	11.31	119841	60000	AF	1	25	31.00	11.31
32	LT Panel Room	630	13.5	12	18303	9800	AF	1	25	4.74	1.74	18303	9800	AF	1	25	4.74	1.74
	Total louver Area	84140									237.57							237.57

I. PILOGUE

The tabulated sheet showing the extent of various works completed is being attached herewith. Thus the budgetary estimates corresponding to the incomplete and pending works, and rectification works have been worked out on basis of CPWD schedule of rates and market rates for the rehabilitation of complete **Amrapali Leisure Valley-Phase 2 (Verona Height)** project, taking the basis of joint inspection report and physical status of work at site.

II. ANNEXURES

Annexure –I – Brief Scope ofWorks

Annexure –II – GFC Drawings as made available from the Amrapali Architects

Annexure –III – Joint InspectionReport

ANNEXURE 1

Drawings

Joint Inspection Report