From Director General

Fire Service, Haryana Panchkula

To **M/s** Meta Design Solutions Pvt Ltd

Sector 23A Gurugram

Memo No. FS/2025/40 dated : 13/09/2025

Subject : Approval of fire fighting scheme 15 mtrs. and Above from the fire safety point of view for Group A-Residential Building at meas. 3075.72 Sq. mtrs. in Sector 23A, Gurugram of M/s Meta Design Solutions Pvt. Ltd. :

Reference your Transaction Id 050262523003731 dated: 30/08/2025 on the subject cited above.

Your case for the approval of fire fighting scheme has been examined by the team of Fire Station Officers, Gurgaon Sector-29, .The means of escape and Fire Protection system were checked and found as per the National Building Code of India, Part- IV guidelines.Therefore your proposed fire fighting scheme is hereby approved as per following detail from the fire safety point of view with the following conditions:-

Tower Name	*Floor Detail*	*Terrace Height of Last Livable Floor(In Meters)*	*Ground Coverage*
01	G to 14	47.8 Mt.	1229.791 Sq. Mt.

Tower Name	*Basement Level*	*Basement Area*	*Basement Remarks*
	Upper Basement	1697.464 Sq. Mt.	-
	Middle Basement	1697.464 Sq. Mt.	-
	Lower Basement	1697.464 Sq. Mt.	-

1) The proposed fire fighting scheme is approved as submitted in the building plan subject to the approval of building plan by the competent authority.
2) The approval of fire scheme by this office doesn't absolve the firm from his responsibility from all consequences, in case of fire due to any deficiencies or anything left out in the scheme submitted by you.
3) Overhead & underground water tanks provided for firefighting shall be so constructed in such a way that the domestic water tank shall filled from overflow of the fire Water tanks.
4) As soon as the installations of fire fighting arrangements are completed, the same may be got inspected/ tested and clearance should be obtained from this office.
5) If the infringement of Byelaws remains un- noticed the Authority reserves the right to amend the Plans/Fire Fighting Scheme as and when any such infringement comes to notice after giving an opportunity of being heard and the Authority shall stand Indemnified against any claim on this account.
6) If you fail to comply with any of the above terms & conditions you will be liable to be punished as per Chapter-III Section 31 Sub-Section 1 & 2 of Fire Act 2009 i.e. imprisonment for a term which may extend to three month or fine which may extend to five thousand rupees or both.
7) The staircase shall be made with the specified material enabling it non-slippery.
8) The above Fire Fighting Scheme is valid for Five Year from the date of issue of this letter.
9) If the gap between ceiling and false ceiling is more than 800 mm then upright sprinkler and detectors above false ceiling & pendent sprinkler below false ceiling shall be installed in the building

Remarks:- Revised Fire Fighting Scheme

Joint Director (Technical)

Panchkula

Exercising the power of Director,Fire Services,Haryana

Digitally signed by GULSHAN KALRA
Date: 2025.09.13 19:54:44 +05:30
Reason: Digital Verification

RAMKUNWAR AND ASSOCIATES

FIRE PROTECTION, FIRE ALARM & MECHANICAL VENTILATION CONSULTANT

Ref :- 2025/3119

Date: 26/08/2025

TO WHOMSOEVER IT MAY CONCERN

This is certified that the design of the fire fighting scheme of Revised Group Housing (Category A4) for M/S Meta Design Solutions Pvt. Ltd. at Sec – 23 A Gurugram has been designed as per the provision of the National Building Code of India 2016 part – IV & relevant IS codes. All provisions are marked to tackle any eventuality of fire.

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PERFORMA FOR HARYANA FIRE SERVICE

1	Name & address of the building	REVISED BUILDING FOR GROUP HOUSING (GH1) AREA MEASURING 0.75989 ACRES IN SEC – 23 A GURUGRAM. BEING DEVELOPED BY M/S META DESIGN SOLUTIONS PVT. LTD.
2.	Type of occupancy	RESIDENTIAL BUILDING (CATEGORY – A4). MERCANTILE BUILDING (CATEGORY – F).
3	No. of Blocks/Towers	SINGLE BLOCK.
4	Height of building	47.8 M
5	Permissible Height	UNLIMITED
6	Number of Floors	3 BASEMENT + G.F. + 14TH FLOOR.
7	Covered area at Ground Floor	(EXISTING) 1228 SQM. (SHOP). (PROPOSED) 1229.791 SQM. (SHOP).
8	Typical Floor area/area at each Floor	(EXISTING) 1ST FLOOR = 1118.004 SQM. (SHOP). 2ND FLOOR = 838.327 SQM. (RESIDENTIAL). 3RD FLOOR = 835 .522 SQM. (RESIDENTIAL). 4TH TO 9TH FLOOR = 715.171 SQM. EACH FLOOR (RESIDENTIAL). 10TH TO 14TH FLOOR = 482.328 SQM. EACH FLOOR (RESIDENTIAL). (PROPOSED) 1ST FLOOR= 897.142 SQM (SHOP). 2ND TO 8TH FLOOR = 875.945 SQM. EACH FLOOR. (RESIDENTIAL). 9TH FLOOR = 750.474 SQM (RESIDENTIAL). 10TH FLOOR = 511.808 SQM. EACH FLOOR. (RESIDENTIAL). 11TH TO 14TH FLOOR = 509.932 SQM. EACH FLOOR (RESIDENTIAL).
9	No of basements	3 NOS. BASEMENT (EXISTING) UPPER BASEMENT LEVEL=-3.9 M MIDDLE BASEMENT LEVEL =-8.4 M LOWER BASEMENT LEVEL = -12.9 M
10	Basement floor area if any	(EXISTING) UPPER, MIDDLE & LOWER BASEMENT = 1742.703 SQM. EACH BASEMENT. (PROPOSED) UPPER, MIDDLE & LOWER BASEMENT = 1697.464 SQM. EACH BASEMENT.
11	Total plot area	3075.75 SQM

Check list according to HFS Act 2009/HBC-2017/NBC-2016

S. NO	Minimum standards on fire prevention and fire safety (clause/code/BIS)	HBC-2017/NBC-2016 requirement	PROVISIONS PROPOSED
1.	Access to fire appliances(4.6/NBC-3)		
	• Road width	Required 12 M wide Road.	18 0. M WIDE ROAD.
	• Gate width	Required 6 M wide Entry Gate.	6 M WIDE ENTRY & EXIT GATE & SERVICE GATE.
	• Width of internal road	Required 6 M Wide Motor Able Fire Tender Moment Road & 9 M Turning Radius	YES, EXISTING 6 M WIDE MOTORABLE FIRE TENDER MOMENT ROAD & 9 M TURNING RADIUS.
	Remarks, if any:		

For MetaDesign Solutions Pvt. Ltd.

Authorised Signatory
Owner Sign

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2.	**Size (Width) Number, type & arrangement of exits** Travel distance(4.4.2.2/NBC-4)	**Residential Building** 30 m – Without Sprinkler 45 m – With Sprinkler **Commercial** 30 m – Without Sprinkler 45 m – With Sprinkler	**28.01 M** **24.38 M**
	Dead end travel distance (4.4.2.2(C))	Residential Building = 15 m Mercantile building = 15 m	**ZERO** **ZERO**
	Number of staircase (4.4.2.1/NBC-4) • Upper floors	Required minimum 2 Nos. staircase If Area more than 500 Sqm.	**YES PROPOSED 2 NOS.**
	• Basements	Required minimum 2 Nos. staircase If Area more than 500 Sqm.	**YES PROPOSED 2 NOS. EACH BASEMENT.**
	Width of staircases (4.4.2.4.3.2/NBC-4) • Upper Floors	**Residential Building** Required 1250 mm wide. **Mercantile Building** Required 1500 mm wide.	**1250 MM WIDE - 2 NOS.**
	• Basements	**Residential Building** Required 1250 mm wide. **Mercantile Building** Required 1500 mm wide.	**1250 MM WIDE = 2 NOS. EACH BASEMENT.**
	Provisions of staircase (4.4.2.4.3/NBC-4)	Required	**YES PROPOSED**
	Firefighting shaft / fire tower (2.24 & E2/NBC-4)	Required	**YES PROPOSED.**
	No. of continuous staircases to terrace [4.4.2.4.3.2-h4/NBC-4]	Required	**YES ALL STAIRCASE CONTINUE TO TERRACE.**
	Ramp , if any (width) (4.4.2.4.3.5/NBC-4)	As specified	**YES PROPOSED RAMP 4 M WIDE & 1:10 SLOPE EACH BASEMENT.**
	Protection of exits (4.4.2.5/NBC-4)	Required	**YES PROPOSED**
	• Fire check door (4.4.2.4.3.2-h2/NBC-4)	Required	**YES PROPOSED**
	• Pressurization (4.4.2.5(b) & E2/NBC-4)	Required 50 Pascal.	**STAIRCASE PRESSURIZED IN EACH BASEMENT 50 PASCAL.**
	Width of corridor (4.4.1 & 4.4.2.4.2/NBC-4)	As specified	**G.F. & 1ST = 1250 MM WIDE EACH FLOOR.**

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For MetaDesign Solutions Pvt. Ltd.

Owner Sign
Authorised Signatory

	Door size(4.4.2.4.1/NBC-4) Remarks. If any:	Residential Building – 1.0 M	1.0 M WIDE
3.	**Compartmentation (4.5/NBC-4)** • No. of fire compartmentations at the basement level • Type of compartmentation a) By fire resisting wall of 02 hrs. rating b) By fire curtain of 02 hrs. rating • Fire check door **Remarks, If Any :-**	Required If the Basement Area More Than 3000 Sqm. Yes/No Yes/No Required	NOT PROPOSED BECAUSE BASEMENT AREA IS LESS THAN 3000 SQM. NOT PROPOSED. NOT PROPOSED. YES PROPOSED.
4.	**Smoke Management System (3.4.8,4:6/ Annex F NBC- 4)** Mechanical/Natural • Basements Air Changes (12ACPH) • Upper Floors Air Changes(12ACPH) **Remarks, If Any :**	Required 12 ACPH. Required	MECHANICAL VENTILATION PROPOSED EACH BASEMENT 12 ACPH NATURAL VENTILATION PROPOSED.
5.	**Fire Extinguishers (5.1/NBC-4/IS 2190)** Total numbers on each floor Remarks. If any:	Required @200 Sqm Or 15 M C/C	4 KG ABC & 4.5 CO2 EXTINGUSHER PROPOSED LOWER BASEMENT TO UPPER BASEMENT = 5 SETS EACH BASEMENT. G.F. = 3 SET. 1ST FLOOR TO 14TH FLOOR = 2 SET EACH FLOOR
6.	**First-aid Hose Reels (5.1 / NBC-4/ IS 884)** Total number on each floor Remarks. If any:	Required 1 no for 1000 sq. m Area	HOSE REEL PROPOSED IN LOWER BASEMENT TO 14TH FLOOR = 2 NOS EACH FLOOR. TERRACE = 2 NOS. TOTAL HOSE REEL = 38 NOS.
7.	**Automatic Fire Detection and Alarming System (4.9 / NBC-4 / IS 2189)** Type of detectors Above false ceiling. If any Remarks. If any:	Required Smoke/Heat Detector. As specified	SMOKE DETECTOR PROPOSED IN ELECTRICAL SHAFT & EACH BASEMENT. NOT PROPOSED
8.	**MOEFA (4.9/NBC-4/IS 2189)**	Required	YES PROPOSED
9.	**Public Address System (3.4.12/NBC-4)**	Required	YES PROPOSED
10.	**Automatic Sprinkler System (5.1.3 / NBC-4 / IS-15105)** • Basement • Upper Floor • Sprinkler above false ceiling • Fire Service Inlet	 Required Required As specified Required	 YES EXISTING EACH BASEMENT YES EXISTING EACH FLOOR. NOT PROPOSED YES PROPOSED

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11.	**Internal Hydrants (5.1 / NBC-4 / IS 3844)**		
	• Size of Riser/Down Comer	Required 150 mm dia wet riser @ 30 m Travel Distance or 50 M C/C.	YES PROPOSED IN 150 MM DIA WET RISER = 2 NOS. 150 MM DIA SPRINKLER RISER = 1 NO.
	• Number of Hydrants per Floor	Required 1 No. for 1000 sq. Area	LOWER BASEMENT TO 14TH FLOOR = 2 NOS EACH FLOOR. TERRACE = 2 NOS.
	• Total no. of Hydrants in the premises	Required	TOTAL INTERNAL HYDRANT = 38 NOS.
	• Hose boxes near landing valve	Required	YES PROPOSED
	• Fire Service inlet	Required	YES PROPOSED
	Remarks. If any:		
12.	**Yard Hydrants (5.1/NBC-4/IS-13039)**		
	• Total numbers of yard hydrants	Required yard hydrant @ Less Than 45 m C/C.	YES EXISTING 6 NOS YARD HYDRANT @ LESS THAN 45 M C/C.
	• Hose box	Required	YES PROPOSED
	Remarks. If any:		
13.	**Pumping arrangements (5.1.2.2/22&23 of table 7/NBC4)**		
	Ground Level		
	• Number Of Pump Sets	Required 6 Nos. Pumps	YES EXISTING 6 NOS PUMPS.
	• Discharge Of Main Pump (LPM)	2280 LPM Main Pump 1 No.	2280 LPM MAIN PUMP - 1 NO.
	• Head Of Main Pump	As Per Calculation	100 M
	• Sprinkler Pump Output (LPM)	2280 LPM Sprinkler Pump 1 No	2280 LPM SPRINKLER PUMP - 1 NO.
	• Head of Sprinkler Pump	As Per Calculation	100 M
	• Jockey Pump Output (LPM)	180 LPM Jockey Pump 1 Nos	180 LPM JOCKEY PUMP - 2 NOS
	• Head Of Jockey Pump	As Per Calculation	100 M
	• Diesel Pump Output (LPM)	2280 LPM Diesel Pump 2 Nos	2280 LPM DIESEL PUMP - 1 NOS.
	• Head Of Diesel Pump	As Per Calculation	100 M
	• Water Curtain Pump Output (LPM)	As Per Calculation	900 LPM WATER CURTAIN PUMP - 1 NOS.
	• Head Of Diesel Pump	As Per Calculation	60 M
	• Pressure At Terrace Level	As Per Building Height Minimum Of 3.5 Kg Pressure at the Terrace Level	AS PER BUILDING HEIGHT MINIMUM OF 3.5 KG PRESSURE AT THE TERRACE LEVEL
	• Direct Access to The Pump House from Ground Level	Required	YES PROPOSED
	Terrace level		
	• Discharge of pump	Not Required	NOT PROPOSED

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	Remarks ,if any		
14.	**Captive water storage for firefighting (5.1.2.1/NBC-4/ IS 15105)**		
	Underground tank capacity Draw off connection Fire service inlet Access to tank	Required U.G. Tank 150 KL + Water Curtain. Required Required Required	YES EXISTING U.G. TANK 200 KL. YES EXISTING YES EXISTING YES EXISTING
	Overhead tank capacity	Required 10 KL Terrace Tank.	YES EXISTING 10 KL TERRACE TANK.
	Remarks ,if any:		
15.	**Exit signage (3.4.7 / NBC-4)**	Required	YES PROPOSED
16.	**Provision of lifts (E-3/ NBC-4)**		
	Fireman's lift switch	Required	YES PROPOSED
	• Pressurization of lift shaft • Pressurization of lift lobby	Required 50 Pascal Required 30 Pascal.	EACH LIFT SHAFT IS FULLY PRESSURIZED 50 PASCAL. LIFT LOBBY PRESSURISED IN BASEMENT 30 PASCAL.
	Remarks ,if any :		
17.	**Standby power supply (3.4.6.2,3.4.6.4/NBC-4)**	Required	YES PROPOSED
18.	**Refuge area (E-4/NBC part-4)**	Required at 60 M Height & Above	NOT PROPOSED BECAUE BUILDING HIEGHT IS LESS THAN 47.8 M.
	• Level • Direct access to nearest staircase	-	-
	Remarks ,if any :		
19.	**Fire command center (3.4.12/NBC-4)**	Required Minimum 16 Sqm.	YES EXISTING FIRE COMMAND CENTRE. SIZE = 5.53 M X 4.88 M = 26.98 SQM.
	Proposed Location	Required Near Entrance of Building.	YES EXISTING FIRE COMMAND CENTRE IN G.F. NEAR ENTRANCE OF BUILDING
	Provision of fire safety officer (4.10/ NBC-4)	Required	YES PROPOSED
	Remarks ,if any		
20.	Provision of Helipad (E-8 / NBC-4)	Not Required	NOT PROPOSED
21.	Special fire protection systems for protection of special risks, if any 3.4.6,3.4.9,4.7,4.8 (Special risks-transformer/Sub-station , electrical panel , petroleum products, boiler room, LPG/PNG installation , lighting etc. ,if any)	Required	(EXISTING) 1) GAS FLOODING SYSTEM IN LT PANEL AND LIFT PANEL. 2) 22.5 KG ABC FIRE EXTINGUISHER FOR LT ROOM AND HT ROOM. 3) 50 LTRS. AFFF FOARM TROLLY BASED FIRE EXTINGUISHER FOR TRANSFORMER AND D.G. SET. LT AND HT ROOM, TRANSFORMER, AND D.G. SET OUTSIDE THE BUILDING.

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Architect Sign

For MetaDesign Solutions Pvt. Ltd.
Authorised Signatory
Owner Sign

DECLARATION

I,_____, S/W/D/O SH_____

the Architect of the building (Name) _____

proposed at (Location) _____

do hereby solemnly affirm and declare as follows:

1. That I am duly registered with _____

Building Authority having registration number _____ .

My office address is _____

And contact number is _____ .

2. That the aforesaid building has been planned and designed strictly as per the provisions of HBC-2017 / National Building Code of India.
3. The fire life safety provisions in the aforesaid building have been planned as per the provisions of National Building Code of India 2016 and relevant code of standards.

Signature of owner/occupier

Name: _____

Date: _____

Place: _____

Signature of Architect

Name: _____

Stamp:

Verified by Local/Building Authority:
Name:
Designation:
Stamp:

Date: _____

Place _____

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For MetaDesign Solutions Pvt. Ltd.

Authorised Signatory

Owner Sign

QUESTIONNAIRE
FOR HIGH RISE BUILDINGS
HARYANA FIRE SERVICE .

Sr. No.	Particulars	Requirement as per NBC 2016 part IV	EXISTING	PROPOSED	REMARKS
1.	Name of the building	As per sanctioned	M/S META DESIGN SOLUTION PVT. LTD.	M/S META DESIGN SOLUTION PVT. LTD.	NO CHANGED
1. (A)	Classification of the building	As per sanctioned	RESIDENTIAL BUILDING (CATEGORY – A4). MERCANTILE BUILDING (CATEGORY – F).	RESIDENTIAL BUILDING (CATEGORY – A4). MERCANTILE BUILDING (CATEGORY – F).	NO CHANGED
2.	Address of the building	As per sanctioned	GROUP HOUSING (GH1) AREA MEASURING 0.75989 ACRE IN SEC – 23 & 23A GURUGRAM.	REVISED GROUP HOUSING (GH1) AREA MEASURING 0.75989 ACRE IN SEC – 23 & 23A GURUGRAM.	NO CHANGED
3	Name and address of Builder / Promoter	As per sanctioned	M/S META DESIGN SOLUTION PVT. LTD.	M/S META DESIGN SOLUTION PVT. LTD.	NO CHANGED
4.	Name and address of Owners/Occupiers of Individual Flats.	As per sanctioned	M/S META DESIGN SOLUTION PVT. LTD.	M/S META DESIGN SOLUTION PVT. LTD.	NO CHANGED
5.	Plot area	As per sanctioned	3075.75 SQM.	3075.75 SQM.	NO CHANGED
6.	Covered area at ground lvl.	As per sanctioned	1228 SQM. (SHOP).	1229.791 SQM. (SHOP).	G.F. AREA INCREASED 1228 SQM. TO 1229.791 SQM.
7.	Height of the building	As per sanctioned			
a)	Overall height	As per sanctioned	50.4 M	50.65 M	MUMTY HEIGHT INCREASED 50.4 M TO 50.65 M.
b)	Height up to the highest occupied Floor (at terrace Lvl.)	As per sanctioned	47.4 M	47.8 M	TERRACE HEIGHT INCREASED 47.4 M TO 47.8 M.
8	Number of Basements (Please indicate level below : below grade in each case	As per sanctioned	3 NOS. BASEMENT UPPER BASEMENT LEVEL = -3.9 M.	- - -	NO CHANGED NO CHANGED NO CHANGED

Verified that fire Fighting Scheme is as per NBC Part-IV, revised 2016

FSO Gurugram FSO Gurugram

For MetaDesign Solutions Pvt. Ltd.

Authorised Signatory

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ARCHITECT
CA/2017/78637

Architect's Sign

Owner's Sign

			MIDDLE BASEMENT LEVEL = -8.4 M. LOWER BASEMENT LEVEL = -12.9 M.	-- - - -	NO CHANGED NO CHANGED NO CHANGED NO CHANGED
9.	No. of Floors	As per sanctioned	3 BASEMENT + G.F. + 14TH FLOOR.	- -	NO CHANGED
10.	Area of Basement	As per sanctioned	UPPER BASEMENT = 1742.703 SQM. - MIDDLE BASEMENT = 1742.703 SQM. - LOWER BASEMENT = 1742.703 SQM. -	UPPER BASEMENT = 1697.464 SQM. - MIDDLE BASEMENT = 1697.464 SQM. - LOWER BASEMENT = 1697.464 SQM. -	UPPER BASEMENT AREA DECREASED 1742.703 SQM. TO 1697.464 SQM. MIDDLE BASEMENT AREA DECREASED 1742.703 SQM. TO 1697.464 SQM. LOWER BASEMENT AREA 1742.703 SQM. TO 1697.464 SQM.

Certified that fire Fighting Scheme is as per N.B.C. Part-IV, revised 2016

FSO Gurugram | FSO Gurugram | JD(T) Gurugram

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Architect's Sign

For MetaDesign Solutions Pvt. Ltd.

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11.	Covered Area of Typical Floor (Total)	As per sanctioned	1ST FLOOR= 1118.004 SQM (SHOP). - - 2ND FLOOR =838.327 SQM (RESIDENTIAL). 3RD FLOOR = 835 .522 SQ.M (RESIDENTIAL). - - - - 4TH TO 9TH FLOOR = 715.171 SQM. EACH FLOOR (RESIDENTIAL). 10TH TO 14TH FLOOR = 482.328 SQM. EACH FLOOR (RESIDENTIAL). - - -	1ST FLOOR= 897.142 SQM (SHOPS) - - 2ND TO 8TH FLOOR = 875.945 SQM. EACH FLOOR. (RESIDENTIAL) - - - - - 9TH FLOOR = 750.474 SQM. (RESIDENTIAL) - 10TH FLOOR = 511.808 SQM. EACH FLOOR (RESIDENTIAL) - 11TH TO 14TH FLOOR = 509.932 SQM. EACH FLOOR. (RESIDENTIAL).	1ST FLOOR AREA DECREASED 1118.004 SQM TO 897.142 SQM. - 2ND FLOOR AREA INCREASED 838.327 SQM TO 875.945 SQM. 3RD FLOOR AREA INCREASED 835.522 SQM TO 875.945 SQM. 4TH TO 8TH FLOOR AREA INCREASED 715.171 SQM TO 875.945 SQM. - 9TH FLOOR AREA INCREASED 715.171 SQM TO 750.474 SQM. - 10TH FLOOR AREA INCREASED 482.328 SQM TO 511.808 SQM. 11TH TO 14TH FLOOR AREA INCREASED 482.328 SQM. TO 509.932 SQM. -
12.	If Basement extended beyond line, please indicate the load bearing strength of the roof of basement.	45 Ton	YES EXTENDED BASEMENT 60 TON	YES EXTENDED BASEMENT 60 TON	NO CHANGED
	Occupancy (Use) please mention separately for basement and Floor)		EACH BASEMENT FOR PARKING AND SERVICES	EACH BASEMENT FOR PARKING AND SERVICES	NO CHANGED
(a)	Sanctioned Floors	As per sanctioned	G.F. & F.F = COMMERCIAL EACH FLOOR 2ND FLOOR TO 14TH FLOOR = RESIDENTIAL	- - - -	NO CHANGED

Certified that fire Fighting & Detection as per N.B.C. Part-IV, revised 2016

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For MetaDesign Solutions Pvt. Ltd.

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(b)	Actual Floors	As per sanctioned	G.F. & F.F = COMMERCIAL EACH FLOOR 2ND FLOOR TO 14TH FLOOR = RESIDENTIAL	- - - -	NO CHANGED
14.	Parking areas		BASMENT PARKING	BASMENT PARKING	
15.	Details of surrounding property /features.				
	Compass Direction in Relation to the	Type of Property	Distance from boundary wall	Distance from boundary wall	
	NORTH	18 M WIDE ROAD			
	SOUTH	18 M WIDE ROAD			
	EAST	30 M WIDE SECTOR ROAD.			
	WEST	OTHER LAND			
16.	Approach to proposed building, width of the road and connecting roads, if any	Required 12 M wide road	18 M WIDE ROAD.	-	NO CHANGED.
17.	Please give details of water available exclusively for firefighting.	Required 150 KL U.G. Tank + Water Curtain Required Terrace Tank 10 KL.	U.G. FIRE TANK 200 KL PROPOSED. TERRACE TANK 10 KL.	- - - -	NO CHANGED
18.	Has wet riser (s) been provided? If so, please indicate the number of riser and internal dia. of each	Required 100 mm Down Comer/Wet Riser @ 1000 SQM	YES PROPOSED 100 MM DIA WET RISER PROVIDED 100 MM DIA – 1 NO. WET RISER. PROPOSED 2ND FLOOR TO TOP FLOOR. G.F. & 1ST FLOOR = 2 NOS. LOWER TO UPPER BASEMENT = 3 NOS. EACH BASEMENT.	YES PROPOSED 150 MM DIA WET RISER = 2 NOS. 150 MM DIA SPRINKLER RISER = 1 NO.	WET RISER DIA CHANGED BEFORE 100 MM DIA & NOW 150 MM DIA.
19	Has any dry riser been provided? If so, please give details.	N.A.	NOT PROPOSED	NOT PROPOSED	NO CHANGED

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20	Has any down-comer been provided? If so, please give details	Not Required	NOT PROPOSED	NOT PROPOSED	NO CHANGED
21.	Please indicate the present arrangement for replenishment.	Not Mandatory	YES PROPOSED GOVT SUPPLY/ WATER TANKER SUPPLY.	YES PROPOSED GOVT SUPPLY/ WATER TANKER SUPPLY.	NO CHANGED
22.	Is a public or other water storage facility available nearby? If so, please give the capacity and distance from your building, also please indicate if it is readily accessible.	N/A	N/A	N/A	NO CHANGED
23	Please give any other information that you can regarding availability of water supply for firefighting.	Required	YES. DOMESTIC WATER STORAGE TANK (IN CASE OF EMERGENCY).	YES. DOMESTIC WATER STORAGE TANK (IN CASE OF EMERGENCY).	NO CHANGED
24.	Have internal hydrants been provided. If so, please indicate:	Required	YES PROVIDED	YES PROVIDED	NO CHANGED
a) b)	No. of hydrants on each Floor; Have these hydrants single or twin outlets. No of hydrants on each basement including	Required @ 1000 sqm as per N.B.C. Part-IV, revised 2016	SINGLE HYDRANT VALVE PROPOSED 2ND FLOOR TOTERRACE FLOOR – 1 NO EACH FLOOR. LOWER TO UPPER BASEMENT = 3 NOS EACH BASEMENT. G.F. & 1ST FLOOR = 2 NOS EACH FLOOR. TOTAL INTERNAL HYDRANT = 27 NOS.	YES PROPOSED LOWER BASEMENT TO 14TH FLOOR = 2 NOS EACH FLOOR. TERRACE = 2 NOS. TOTAL INTERNAL HYDRANT = 38 NOS.	TOTAL NOS. OF INTERNAL HYDRANT INCREASE BEFORE 27 NOS. AND NOW 40 NOS.
25.	Have First Aid Hose Reels been provided? If so, please indicate:	Required	YES PROPOSED	YES PROPOSED	NO CHANGED

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a)	No. of reels on each floor including basement (s)	Required each landing valve	YES PROPOSED LOWER TO UPPER BASEMENT = 3 NOS EACH BASEMENT. G.F.& 1ST FLOOR = 2 NO EACH FLOOR. 2ND FLOOR TO TOP FLOOR = 1 NO. TOTAL HOSE REEL = 27 NOS	LOWER BASEMENT TO 14TH FLOOR = 2 NOS EACH FLOOR. TERRACE = 2 NOS. TOTAL HOSE REEL = 38 NOS.	TOTAL NOS. OF INTERNAL HYDRANT INCREASE BEFORE 27 NOS. AND NOW 38 NOS.
b)	Bore and length of hose reel tubing on each reel drum.	Required 19 mm of 36.5 Meter	YES PROPOSED	YES PROPOSED	NO CHANGED
c)	Size (bore) and type of nozzle fitted to each hose reel.	Required 63 mm G.M. Nozzle	YES PROPOSED	YES PROPOSED	NO CHANGED
d)	Is the hose reel connected directly to the riser or to the hydrant outlet?	Required Directly Connected to Riser	YES PROPOSED	YES PROPOSED	NO CHANGED
26	Have fire hose been provided near each hydrant? If so:	Required	YES PROPOSED	YES PROPOSED	NO CHANGED
a)	The type of hoses	Required RRL Delivery Hose ISI Mark	YES PROPOSED	YES PROPOSED	NO CHANGED
b)	The size (bore) of hoses	Required 63 mm	YES PROPOSED	YES PROPOSED	NO CHANGED
c)	The length of each hose.	Required 15 meter	YES PROPOSED	YES PROPOSED	NO CHANGED
d)	Total number of hoses provided near each hydrant.	Required 2 Nos.	YES PROPOSED	YES PROPOSED	NO CHANGED
27	Have branch pipes been provided? If so, please indicate:	Required	YES PROPOSED	YES PROPOSED	NO CHANGED
a)	The type of branch pipes	Required G.M Standard Branch Pipe ISI Mark	YES PROPOSED	YES PROPOSED	NO CHANGED
b)	The Size of nozzle fitted to each branch.	Required 63 mm.	YES PROPOSED	YES PROPOSED	NO CHANGED

Fire Fighting System is as per N.B.C. Part-IV, revised 2016

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28 (A)	Is the Basement used for car parking or storage has it been sprinkler?	Required if the area more than 200 sqm.	BASEMENT USER FOR PARKING AND SERVICES AND SPRINKLER PROPOSED.	- - -	NO CHANGED
b)	Whether segregation/ compartmentalization of the basement has been provided. If so please detail)	Required if the basement area more than 3000 sq.m	NOT PROPOSED BECAUSE BASEMENT AREA IS 3000 SQM	- -	NO CHANGED
29.	Is the building equipped with automatic fire detection and alarm (AFA) system?	Required	YES PROPOSED	YES PROPOSED	NO CHANGED
a)	The type of detectors used	Smoke Detector required In Electrical Shaft & Each Basement	SMOKE DETECTOR PROPOSED IN ELECTRICAL SHAFT & EACH BASEMENT.	SMOKE DETECTOR PROPOSED IN ELECTRICAL SHAFT & EACH BASEMENT.	NO CHANGED
b)	The standard to which	Required BS 5839	YES PROPOSED	YES PROPOSED	NO CHANGED
c)	The code to which the installation confirms.	Required IS :2175 IS 2189	YES PROPOSED IS : 2175 & 2189.	YES PROPOSED IS : 2175 & 2189.	NO CHANGED
30.	Have manual call boxes been installed in the building for raising an alarm in the event of an outbreak of fire? If so, please give details	Required as Per NBC part -4	YES PROPOSED	YES PROPOSED	NO CHANGED
30.	Have public address system been installed in the building with loudspeakers on each floor?	Required as Per NBC part -4	YES PROPOSED	YES PROPOSED	NO CHANGED
31	Has an intercom system been provided between the various floors and the fire control room in entrance lobby?	Required as Per NBC part -4	YES PROPOSED	YES PROPOSED	NO CHANGED
32	Has fire control room been provided between the various floors and the fire	Required Near Entrance of Building. Required Minimum 16 Sqm.	FIRE COMMAND CENTRE G.F. NEAR ENTRANCE OF BUILDING SIZE 5.53 X 4.88 = 26.98 SQM.	- - -	NO CHANGED

Certified that fire fighting Scheme is as per N.B.C. Part-4 Provided

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	control room in the entrance door			- -	
33	How many staircases have been provided in the building? Please indicate in each case :	Required minimum 2 Nos Staircase If Area more than 500 Sqm.	YES PROPOSED G.F. & 1ST FLOOR = 4 NOS 2ND FLOOR TO TOP FLOOR = 2 NOS 2 NOS EACH BASEMENT	YES PROPOSED G.F. TO TERRACE = 2 NOS. - - -	2 NOS. STAIRCASE DECREASED IN UPPER FLOOR. - - NO CHANGED.
a)	The width of the staircase	Residential Building Required 1250 mm wide Mercantile Building Required 1500 mm wide	YES PROPOSED IN UPPER FLOOR G.F. & 1ST FLOOR = 1250 MM WIDE - 2 NOS 1500 MM WIDE – 2 NOS 2ND FLOOR TO TOP FLOOR = 2 NOS.	YES PROPOSED IN UPPER FLOOR G.F. TO TERRACE = 1250 MM WIDE 2 NOS. - - - BASEMENT 1250 MM WIDE = 2 NOS. EACH BASEMENT.	2 NOS. STAIRCASE DECREASED IN UPPER FLOOR.
b)	The width of treads	Residential Building Required 250 mm wide Mercantile Building Required 300 mm wide	300 MM WIDE STAIRCASE EACH	300 MM WIDE STAIRCASE EACH.	NO CHANGED
c)	Riser of the staircase	**Residential Building** Required 150 mm wide **Mercantile Building** Required 150 mm wide	150 MM WIDE STAIRCASE EACH FLOOR	150 MM WIDE STAIRCASE EACH FLOOR.	NO CHANGED
d)	If the treads are of the non-slip type.	Required	ANTI-SKID TYPE WITHOUT POLISHED / SAND BLAST	ANTI-SKID TYPE WITHOUT POLISHED / SAND BLAST	NO CHANGED
34	What is the average occupant load per floor?	**Mercantile Building** G.F. = 3 person per Sqm F.F = 6 person per person	G.F. = 1228/3 = 409 PERSON 1ST FLOOR = 1118.004/6 = 186.33 PERSON 2ND FLOOR = 818.327/12.5 = 67	G.F. = 1229.791/3 = 410 PER PERSON. 1ST FLOOR= 897.142/6 = 150 PER PERSON	AVERAGE OCCUPANT LOAD PER FLOOR CHANGED.

Certified that the Lighting Scheme is as per N.B.C. Part-IV, revised 2016

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		Residential Building = 12.5 per person Sqm - - - -	PERSON (RESIDENTIAL) 3TH FLOOR = 835 .522/12.5 = 7 PERSON (RESIDENTIAL 4TH TO 9TH FLOOR = 715.171/12.5 = 57 SQM. EACH FLOOR. 10TH TO 14TH FLOOR = 482.328 /12.5 = 39 PERSON EACH FLOOR (RESIDENTIAL)	2ND TO 8TH FLOOR = 150 PER PERSON875.945/12.5 = EACH FLOOR. 9TH FLOOR = 750.474/12.5 = 10TH FLOOR = 511.808/12.5 = EACH FLOOR. 11TH TO 14TH FLOOR = 509.932/12.5 = EACH FLOOR	
35	How many lifts have been installed in the building? Please indicate in each case:	Minimum 1 Number Required.	BASEMENT= 3 NOS. G.F. TO 14 FLOOR = 3 NOS.	BASEMENT= 3 NOS. G.F. TO 14 FLOOR = 3 NOS.	NO CHANGED
a)	The Floors between which the lift run.	Basement To Top Floor	B.F. FLOOR TO TERRACE LEVEL	B.F. FLOOR TO TERRACE LEVEL	NO CHANGED
b)	The type of door fitted to the lift car and at each landing.	S.S. Sliding type center opening automatic	S.S. SLIDING TYPE CENTER OPENING AUTOMATIC	S.S. SLIDING TYPE CENTER OPENING AUTOMATIC	NO CHANGED
c)	Fire resistance rating of lift car and landing doors if known.	Car Lift = 2 Hr Rated. Lift Well = 2 Hr Rated.	CAR LIFT = 2 HR RATED. LIFT WELL = 2 HR RATED.	CAR LIFT = 2 HR RATED. LIFT WELL = 2 HR RATED.	NO CHANGED
d)	Floor area of the lift car.	Minimum 1.4 sq. M per Lift Less than 60 m in Residential Building	1850 X2200 – 2NO 2000X 2730 = 1 NO	1850 MM X 2100 MM = 2 NOS. 2000 MM X 2550 MM = 1 NO.	FLOOR AREA OF EACH LIFT CHANGED.
e)	Loading capacity of each lift car.	Sufficient for 8 passengers Less than 60 m in Residential Building	12 PERSON (840 KG) EACH LIFT	12 PERSON (840 KG) EACH LIFT	NO CHANGED
f)	Has communication system been installed in the lift for car?	Required	YES	YES	NO CHANGED
g)	Has a "Fireman's" switch been installed in the lift for grounding it in the event of fire?	Required	YES	YES	NO CHANGED

Lifts (Passenger Lifting Scheme is as per N.B.C. Part-IV, revised 2016

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36	Have any stationary fire pump(s) been installed for pressurizing the wet riser? If so, please indicate:	Required	YES	YES	NO CHANGED
a)	The number of pumps	Required 6 Nos. pumps	PROPOSED 6 NOS PUMP	PROPOSED 6 NOS PUMP	NO CHANGED
b)	The size of suction and delivery of each pump	150/100 = Main Pump - 1 No. 150/100 = Diesel Pump - 1 No. 150/100 = Sprinkler Pump- 1 No. 100/100 = Jockey Pump - 2 Nos As Per Calculation = Water Curtain - 1 No	150/100 = MAIN PUMP - 1 NO. 150/100 = DIESEL PUMP – 1 NO. 150/100 = SPRNKLER PUMP- 1 NO. 100/100 = JOCKEY PUMP - 2 NOS 100/100 WATER CURTAIN – 1NO	150/100 = MAIN PUMP - 1 NO. 150/100 = DIESEL PUMP – 1 NO. 150/100 = SPRNKLER PUMP- 1 NO. 100/100 = JOCKEY PUMP - 2 NOS 100/100 WATER CURTAIN – 1NO	NO CHANGED
c)	The output of each pump	2280 LPM = Main Pump - 1 No. 2280 = Diesel Pump - 1 No. 2280= Sprinkler Pump- 1 No. 180 LPM = Jockey Pump - 2 Nos As Per Calculation = Water Curtain - 1 No	2280 LPM = MAIN PUMP - 1 NO. 2280 LPM = DIESEL PUMP – 1 NO. 2280 LPM = SPRINKLER PUMP- 1 NO. 180 LPM = JOCKEY PUMP - 2 NOS. WATER CURTAIN 900 LPM- 1 NO.	2280 LPM = MAIN PUMP - 1 NO. 2280 LPM = DIESEL PUMP – 1 NO. 2280 LPM = SPRINKLER PUMP- 1 NO. 180 LPM = JOCKEY PUMP - 2 NOS. 900 LPM = WATER CURTAIN – 1 NO.	NO CHANGED
	The maximum head against which the pump can operate at the output mentioned at (c)	Required As per Building height minimum 3.5 kg Pressure at Terrace Level	90 M HEAD EACH PUMP WATER CURTAN HEAD 60 M	100 M HEAD EACH PUMP WATER CURTAN HEAD 60 M.	HEAD CHANGED EACH PUMP 90 M TO 100 M.
e)	Is the pump automatic in action?	Required	YES PROPOSED	YES PROPOSED	NO CHANGED
37	Has a standby source of power supply been provided	Required	YES PROPOSED	YES PROPOSED	NO CHANGED

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	?If it is through a generator, please indicate :				
a)	The capacity (output)	Required	500 KV –2 NOS	500 KV –2 NOS	NO CHANGED
b)	The functions that can be maintained simultaneously by the use of generator, such as operating lift(s) fire pumps emergency lighting etc.	Required	YES PROPOSED LIFT , FIRE PUMP & EMERGENCY LIGHTING AND PRESSURIZATION FAN	YES PROPOSED LIFT , FIRE PUMP & EMERGENCY LIGHTING AND PRESSURIZATION FAN	NO CHANGED
c)	Is the generator automatic in action or has to be started manually?	Required	YES PROPOSED	YES PROPOSED	NO CHANGED
38	Has any yard hydrant been provided from the building's fire pump?	Required Yard Hydrant @ Less Than 45 M C/C.	YES PROPOSED 6 NOS YARD HYDRANT @ LESS THAN 45 M C/C.	- - -	NO CHANGED
39	Where more than one lifts are installed in a common enclosure, have individual lifts been separated by fire resisting walls or 2 hours fire rating?	Required	YES PROPOSED	YES PROPOSED	NO CHANGED
40	Has the lift shaft (s), lift lobby or stairwell been pressurized?	Required Lift Well & Staircase = 50 Pascal. Lift Lobby = 30 Pacal.	EACH LIFT WELL & STAIRCASE FULLY PRESSURIZED 50 PASCAL EACH. LIFT LOBBY PRESSURIZED IN BASEMENT 30 PASCAL.	EACH LIFT WELL & STAIRCASE FULLY PRESSURIZED 50 PASCAL EACH. LIFT LOBBY PRESSURIZED IN BASEMENT 30 PASCAL.	NO CHANGED
41	Have the lift lobbies and staircases been effectively enclosed to prevent fire/smoke entering them from outside at any floor?	Required	YES PROPOSED	YES PROPOSED	NO CHANGED
42	Have all exists and direction of travel to each exit been	Required As per NBC Part-4	YES SELF ILLUMINATED SIGNAGES	YES SELF ILLUMINATED SIGNAGES .	NO CHANGED

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	sign-posted with illuminated signs?				
43	Is the building centrally air-conditioned? If so, please indicate.	As Specified	YES	YES	NO CHANGED
a)	The material used for construction of ducts and its fittings.	As Specified	GSS RECTANGULAR DUCTING COMPLETE WITH FITTINGS BRACING SUPPORTS, ALL ACCESSORIES OF SAME MATERIAL GSS AND ALUMINIUM DUCTING IN CORRIDOR	GSS RECTANGULAR DUCTING COMPLETE WITH FITTINGS BRACING SUPPORTS, ALL ACCESSORIES OF SAME MATERIAL GSS AND ALUMINIUM DUCTING IN CORRIDOR	NO CHANGED
b)	The type of lining used for ducts, if any	As Specified	DUCT ACOUSTIC INSULATION WITH FIBERGLASS INSULATION OF DENSITY 32 KG/CUM IN VARIOUS DUCTS COMPLETE WITH ALL ACCESSORIES & FINISHES AND THICKNESS OF INSULATION IS 25 MM DUCT INSTALLATION CROSS LINKED POLYETHYLENE (XLPE) 9/13 MM THICK NITRILE RUBBER INSULATION CLASS O (FIRE RATED)	DUCT ACOUSTIC INSULATION WITH FIBERGLASS INSULATION OF DENSITY 32 KG/CUM IN VARIOUS DUCTS COMPLETE WITH ALL ACCESSORIES & FINISHES AND THICKNESS OF INSULATION IS 25 MM DUCT INSTALLATION CROSS LINKED POLYETHYLENE (XLPE) 9/13 MM THICK NITRILE RUBBER INSULATION CLASS O (FIRE RATED)	NO CHANGED Certified that fire Fighting Scheme is as per N.B.C. Part-IV, revised 2016 FSO Gurugram FSO Gurugram DD(T) Gurugram
c)	The type of lagging used, If any for insulating any portion of the duct; Please also indicate how the lagging is secured.	As Specified	NOT PROPOSED	NOT PROPOSED	NO CHANGED
d)	If false ceiling is provided, please given information as at 43 above.	As Specified	FALSE CEILING TO TRUE CEILING BETWEEN HEIGHT IS 700 MM EACH FLOOR IN CORRIDOR.	FALSE CEILING TO TRUE CEILING BETWEEN HEIGHT IS 700 MM EACH FLOOR IN CORRIDOR.	NO CHANGED

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e)	If plenum is used a return air passage has it been protected with fire detectors? Please give details.	As Specified	YES, FIRE DAMPERS ARE USED IN RETURN AIR DUCTS	YES, FIRE DAMPERS ARE USED IN RETURN AIR DUCTS	NO CHANGED
44	Is the ducting for each floor? Is the ducting for each floor effectively isolated or is it continuous on more than floors?	As Specified	YES, AHU HAS BEEN USED FOR:- FRESH AIR UNITS: ALL FLOORS	YES, AHU HAS BEEN USED FOR:- FRESH AIR UNITS: ALL FLOORS	NO CHANGED
45	Where are the switchgear and transformers located? If inside the building, please indicate:	Required	SWITCHGEAR AND TRANSFORMER OUT SIDE THE BUILDING	SWITCHGEAR AND TRANSFORMER OUT SIDE THE BUILDING	NO CHANGED
a)	If the switchgear and transformers have been housed in separate compartments, effectively separate from each other and from other portions of the buildings by a four hours, fire resistive wall?	Required	YES PROPOSED	YES PROPOSED	NO CHANGED
b)	What pre-cautions have been taken to prevent a possible fire in the transformers from spreading?	Required	1) GAS FLOODING SYSTEM IN LT PANEL AND LIFT PANEL. 2) 22.5 KG ABC FIRE EXTINGUISHER FOR LT ROOM AND HT ROOM. 3) 50 LTRS. AFFF FOARM TROLLY BASED FIRE EXTINGUISHER FOR TRANSFORMER AND D.G. SET.	1) GAS FLOODING SYSTEM IN LT PANEL AND LIFT PANEL. 2) 22.5 KG ABC FIRE EXTINGUISHER FOR LT ROOM AND HT ROOM. 3) 50 LTRS. AFFF FOARM TROLLY BASED FIRE EXTINGUISHER FOR TRANSFORMER AND D.G. SET.	NO CHANGED

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			LT AND HT ROOM, TRANSFORMER, AND D.G. SET OUTSIDE THE BUILDING.	LT AND HT ROOM, TRANSFORMER, AND D.G. SET OUTSIDE THE BUILDING.	
46	Where electrical cables, telephone cables, dry/wet risers/down comers pass through a floor or wall have the spaces (apertures) around the cables/pipes been effectively sealed/plugged with non-combustible, fire-resistant material?	Required	ELECTRICAL CABLES, TELEPHONE CABLES, DRY/WET RISERS/DOWN COMERS PASS THROUGH A FLOOR OR WALL HAVE THE SPACES (APERTURES) AROUND THE CABLES/PIPES BEEN EFFECTIVELY SEALED/PLUGGED WITH NON-COMBUSTIBLE, FIRE-RESISTANT MATERIAL	ELECTRICAL CABLES, TELEPHONE CABLES, DRY/WET RISERS/DOWN COMERS PASS THROUGH A FLOOR OR WALL HAVE THE SPACES (APERTURES) AROUND THE CABLES/PIPES BEEN EFFECTIVELY SEALED/PLUGGED WITH NON-COMBUSTIBLE, FIRE-RESISTANT MATERIAL	NO CHANGED
47	Is the building Sprinkler.	Required	YES PROPOSED	YES PROPOSED	NO CHANGED
48	Ventilation-				NO CHANGED
a)	Whether Natural ventilation is relied upon? If so, give detail of the vents for the stairwell lift lobby and lift shaft	Required	LIFT LOBBY NATURAL VENTILATED IN EACH UPPER FLOOR.	LIFT LOBBY NATURAL VENTIALTED IN EACH UPPER FLOOR.	NO CHANGED
b)	Whether Mechanical ventilation has been proposed? If so give detail of the proposed system indicating the no. of air changers for the basement and upper floors.	Required 12 ACPH.	MECHANICAL VENTILATION 12 ACPH PROPOSED IN EACH BASEMENT.	MECHANICAL VENTILATION 12 ACPH PROPOSED IN EACH BASEMENT.	NO CHANGED
C)	Whether mechanical ventilation is coupled with automatic detection system ? Please give details of the system.	Required	YES PROPOSED	YES PROPOSED	NO CHANGED

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49	Please indicate the number and type of fire extinguishers provided at various locations and the arrangement for the maintenance of the extinguishers	Required @ 15 M C/C OR 200 Sq m Each D	4 KG ABC & 4.5 CO2 EXTINGUSHER PROPOSED 3RD BASEMENT TO F.F. = 7 SETS EACH FLOOR. 2ND FLOOR TO TOP FLOOR = 9 SET EACH FLOOR.	4 KG ABC & 4.5 CO2 EXTINGUSHER PROPOSED LOWER BASEMENT TO UPPER BASEMENT = 5 SETS EACH BASEMENT. G.F. = 3 SET. 1ST FLOOR TO 14TH FLOOR = 2 SET EACH FLOOR.	NO CHANGED
50	Please indicate if all fire extinguishers near the ISI certification mark.	Required	YES (IS : 15683)	YES (IS : 15683)	NO CHANGED
51	Are the occupants of the building systematically trained in fire prevention, use of fire extinguishers If so, please give details.	Required	WILL BE TRAINED	ALREADY OCCUPIED.	NO CHANGED
52	Does an emergency organization exit in the building? If so, please given details and append a copy of the emergency (Fire) orders.	Required	WILL BE PREPARE	ALREADY OCCUPIED.	NO CHANGED
53	Has a qualified Fire Officer been appointed for the building either individually or jointly with other building(s).	Required	YES WILL BE APPOINTED	ALREADY OCCUPIED.	NO CHANGED
54	Has the building been protected against lightening? If so, does the lightening protect confirm to any code? Please indicate details	Required	YES PROPOSED (IEC 62305)	YES PROPOSED (IEC 62305)	NO CHANGED

Certified that fire Fighting Scheme is as per N.B.C. Part IV, revised 2016

FSO Gurugram FSO Gurugram (T) Gurugram

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& Mechanical Ventilation System
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55	Whether Fire Movement Road around the building has been provided/duly mark in the drawings	Required 6 M Wide Motor Able Fire Tender Moment Road & 9 M Turning Radius	YES, PROVIDED 6 M WIDE MOTORABLE FIRE TENDER MOMENT ROAD & 9 M TURNING RADIUS	YES, PROVIDED 6 M WIDE MOTORABLE FIRE TENDER MOMENT ROAD & 9 M TURNING RADIUS	NO CHANGED
56	Whether the refuge area has been provided? If so the floor on which provided and the total area provided floor - wise	Required More Than 60 M In Residential Building	NOT PROPOSED	NOT PROPOSED	NO CHANGED

Certified that fire Fighting Scheme is as per N.B.C. Part-IV, revised 2016

FSO Gurugram FSO Gurugram FSO Gurugram

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STAIRCASE PRESSURIZATION (1ST FLOOR + 14TH FLOOR)

Staircase door size (Single Leaf)

Width (W) =1.25 m

Height (H) =2.1m

Staircase Door Area = W x H = 2.1x1.25 = 2.625 Sqm.

Leakage area (based on 5mm gap all around the door & between Single leaf of the door)

=(2 x 2.1 + 2 x 1.25)x 0.005 =0.0335 Sqm.

No. of Landings = 14

Effective leakage area through doors = 0.0335 x 13 = 0.4355 Sq. m

Total air leakage through doors Q1 =0.839 x A(Effective large area) x √P(Pressure Differential Index)

Pressure Differential Index = √50 = 7.07 (Differential Pressure of 50 Pa is based on NBC 2016Part IV Fire & Safety) =0.839 x 0.4355 x 7.07

Q1= 2.5832 cu. m/sec

Air flow through one open door considering an egress velocity of 1m/sec

Q2 =1 x 2.625= 2.625 cu. m /sec

Total air quantity required=Q1+ Q2

2.625 + 2.5832 = 5.2082 cu. m/sec

Total air quantity required considering 10% air leakage through ducts = 5.2082 x 1.10cu.m/sec

= 5.7290 cu. m/sec

Total air quantity required for lift well pressurization = 5.7290 x 2118.8= 12138.8070 =

(1cu.m/sec = 2118.8cfm) Say = 12200 CFM

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LIFT LOBBY PRESSURIZATION (1ST FLOOR + 14TH FLOOR) (FIRE TOWER LOBBY & NON – FIRE TOWER LIFT LOBBY)

Lift lobby door size (Single Leaf)

Width (W) =1.25 m

Height (H) =2.1 m

Lift lobby Door Area = W x H = 1.25 x 2.1= 2.625 Sqm.

Leakage area (based on 5mm gap all around the door Single leaf of the door)

=(2 x 2.1 + 2 x 1.25)x 0.005 =0.0335 Sq.m

No. of Landings = 14

Effective leakage area through doors = 0.067 x 13 = 0.871 Sqm.

Total air leakage through doors Q1 =0.839 x A(Effective large area) x VP(Pressure Differential Index)

Pressure Differential Index = √30 = 5.47 (Differential Pressure of 30 Pa is based on NBC 2016 Part IV Fire & Safety) =0.839 x 0.871 x 5.47

Q1 = 3.9973 cu. m/sec

Air flow through one open door considering an egress velocity of 1m/sec

Q2 =1 x 2.625 = 2.625 cu. m /sec

Total air quantity required=Q1+ Q2

2.625 + 3.9973 = 6.6223 cu. m /sec

Total air quantity required considering 10% air leakage through ducts = 6.6223 x 1.10cu.m/sec

= 7.2845 cu. m/sec

Total air quantity required for lift Lobby = 7.2845 x 2118.8 = 15434.4771 CFM =

(1cu.m/sec = 2118.8cfm) Say = 15500 CFM.

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DESIGN BASIC REPORT

FOR

REVISED BUILDING FOR GROUP HOUSING (GH1) AREA MEASURING 0.75989 ACRES IN SEC – 23 A GURUGRAM.

BEING DEVELOPED BY M/S META DESIGN SOLUTION PVT. LTD.

CLIENT:

M/S META DESIGN SOLUTION PVT. LTD.

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PROJECT DESCRIPTION

Revised Building for Group Housing (GH1) Area Measuring 0.75989 Acres in Sec – 23 A Gurugram. Being Developed By M/S Meta Design Solution Pvt. Ltd.

The developments fall under Building classification '– Residential Building (Category- A4), Mercantile Building (Category – F).

SL. NO.	BLOCK NOS.	PROPOSED	HEIGHT OF BUILDING UP TO TERRACE FLOOR LEVEL.	NO. OF FLOORS
1.	Single Block	(Existing) **Basement** Upper, Middle & Lower Basement = 1742.703 Sqm. Each Basement. **Ground Floor** 1228 Sqm. (Shop). **Typical Floor** 1st Floor = 1118.004 Sqm. (Shop). 2nd Floor = 838.327 Sqm. (Residential). 3rd Floor = 835 .522 Sqm. (Residential). 4th To 9th Floor = 715.171 Sqm. Each Floor (Residential). 10th To 14th Floor = 482.328 Sqm. Each Floor (Residential).	**47.8 M.**	**3 Basement + G.F.+ 14th Floor.**
		(Proposed) **Basement** Upper, Middle & Lower Basement = 1697.464 Sqm. Each Basement. **Ground Floor** 1229.791 Sqm. (Shop). **Typical Floor** 1st Floor= 897.142 Sqm (Shop). 2nd To 8th Floor = 875.945 Sqm. Each Floor. (Residential). 9th Floor = 750.474 Sqm (Residential). 10th Floor = 511.808 Sqm. Each Floor. (Residential). 11th To 14th Floor = 509.932 Sqm. Each Floor (Residential).		

- **Objective**: To design a sustainable, comfortable, and modern residential complex that meets the needs of the community while adhering to local regulations and promoting environmental stewardship.

2. Site Analysis

- **Location and Context**: Situated in a prime location in Gurugram, Haryana, the site offers easy access to major roads, public transportation, schools, hospitals, and shopping centers. The site's proximity to these amenities enhances its attractiveness for potential residents.
- **Site Characteristics**:
  - **Topography**: A comprehensive topographical survey reveals a flat terrain suitable for high-rise construction, minimizing the need for extensive grading.
  - **Climate**: Gurugram has a composite climate with hot summers, cold winters, and a monsoon season. Design considerations must include shading, insulation, and ventilation to manage temperature extremes.
  - **Soil Conditions**: Geotechnical investigations indicate suitable soil for high-rise construction, with recommendations for pile foundations due to the soil's load-bearing capacity.
  - **Existing Infrastructure**: Analysis of existing road networks, utilities (water, sewer, electricity), and surrounding land uses to integrate seamlessly with the urban environment.

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3. Regulatory Framework
   - **Local Building Codes and By-Laws**: Compliance with Haryana Building Code, 2017, and additional guidelines by the Department of Town and Country Planning (DTCP), Haryana.
   - **Development Control Regulations**:
     - **Floor Area Ratio (FAR)**: The project will maximize the permissible FAR to optimize the number of units while ensuring compliance with building height restrictions.
     - **Setbacks and Open Space**: Adherence to required setbacks and open space regulations to provide adequate light, ventilation, and fire safety access.
   - **Environmental Regulations**: The project will meet the Environmental Impact Assessment (EIA) guidelines, implement effective water management systems, and adhere to noise pollution norms.
4. Design Philosophy
   - **Architectural Style**: The design will feature a blend of contemporary architecture with local cultural elements, utilizing modern materials such as glass, steel, and composite panels to create a visually appealing and functional residential complex.
   - **Space Planning**:
     - **Residential Units**: 3 BHK + SPR units designed to cater to various family sizes and preferences, ensuring optimal use of space and privacy.
     - **Public and Common Areas**: Design of community spaces, landscaped gardens, children's play areas, and multipurpose halls.
   - **Vertical Transportation**: Efficient placement of elevators and stairwells to ensure minimal waiting times and maximum convenience for residents.
5. Structural Design Considerations
   - **Foundation and Superstructure**:
     - **Foundation Design**: Foundations will be used as to support the high-rise structures based on soil conditions and load requirements.
     - **Structural System**: Reinforced concrete frame structure with shear walls for seismic resistance, following IS Codes (Criteria for Earthquake Resistant Design of Structures) suitable for Zone IV.
   - **Material Selection**: Use of high-strength concrete and corrosion-resistant steel to enhance durability and reduce maintenance costs.
6. Building Services
   - **Water Supply and Drainage**:
     - **Water Supply**: Design of a reliable water supply system with adequate storage and pressure management to meet daily and emergency needs.
     - **Sewage and Drainage**: Efficient sewage treatment plant (STP) and storm water drainage systems to handle peak flow and prevent waterlogging.
   - **Electrical and Lighting**:
     - **Power Supply**: A well-planned electrical distribution network with backup generators and renewable energy sources, such as solar panels, for common areas.
     - **Lighting**: Use of LED fixtures and motion sensors in common areas to reduce energy consumption.
   - **HVAC Systems**: Ventilation and air conditioning systems designed for energy efficiency and indoor air quality.
7. Sustainability and Green Building Practices
   - **Energy Efficiency**: Implementation of energy-efficient design strategies such as building orientation, high-performance glazing, and insulation to minimize energy use.
   - **Water Conservation**: Rainwater harvesting, greywater recycling systems, and low-flow fixtures to reduce water consumption.
   - **Waste Management**: Provision for waste segregation, recycling, and composting within the complex.
   - **Green Building Certification**: Targeting IGBC or GRIHA certification for sustainability and environmental performance.
8. Safety and Security
   - **Fire Safety**: Design will comply with the National Building Code of India, including the provision of fire exits, hydrants, sprinklers, and alarm systems in all buildings.
   - **Seismic Safety**: Structural design and construction practices will adhere to earthquake-resistant standards, suitable for seismic Zone IV.
   - **Security Measures**: Comprehensive security systems, including CCTV surveillance, access control, and 24/7 security personnel, will be implemented.

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9. **Landscaping and Open Spaces**
   - **Green Spaces**: Creation of landscaped gardens, green roofs, and vertical gardens to enhance aesthetics and provide natural cooling effects.
   - **Recreational Areas**: Dedicated spaces for sports, jogging tracks, and meditation zones to promote a healthy lifestyle.
   - **Water Features**: Incorporation of aesthetically pleasing and sustainable water features, considering water conservation and maintenance.
10. **Parking and Transportation**
   - **Parking Facilities**: Multi-level parking with provisions for electric vehicle (EV) charging stations and designated visitor parking.
   - **Traffic Management**: Internal road layout designed for smooth traffic flow, pedestrian safety, and emergency vehicle access.
11. **Cost Estimation and Budgeting**
   - **Preliminary Cost Estimation**: Comprehensive analysis of construction costs, including materials, labor, contingencies, and compliance with local regulations.
   - **Phasing and Scheduling**: Detailed project timeline outlining design, approval, construction phases, and handover milestones.
12. **Conclusion**
   - **Summary**: Reaffirmation of the project's goals, design principles, and commitment to quality and sustainability.
   - **Next Steps**: Outline the progression to detailed design development, including architectural plans, engineering studies and community engagement.

This Architectural Design Basis Report specify strategies considered for the planning, design, and development of a high-rise group housing project in Gurugram, ensuring that the project meets the highest standards of safety, sustainability, and resident satisfaction.

Revised Building for Group Housing (GH1) Area Measuring 0.75989 Acres in Sec – 23 A Gurugram. Being Developed By M/S Meta Design Solution Pvt. Ltd.

It Consist of Following Floor Plans.

- **Category Of Building:** Residential Building (Category- A4), Mercantile Building (Category – F).
- **G.F. & F.F** = Commercial Each Floor
- **2nd Floor To 14th Floor** = Residential

SECTION- I: FIRE FIGHTING & FIRE PROTECTION SYSTEMS REQUIRED:

1) Portable Fire Extinguishers
2) Wet Risers
3) Yard Hydrants
4) Automatic sprinklers.
5) Existing UG Water tank 200 KL for fire sprinkler, hydrant & Water Curtain.
6) Existing O.H. Tank 10 KL.
7) Existing One no. Multi stage pump for Hydrant System capacity 2280 LPM & 100 -meter head.
8) Existing One no. Multi stage pump for Sprinkler System capacity 2280 LPM & 100 - meter head.
9) Existing One No. Multi stage pump Diesel Engine Driven Standby pump, capacity 2280 LPM & 100 -meter head.
10) Existing Two nos. Multi stage Jockey pumps, capacity 180 LPM & 100 -meter head each (For Hydrant & Sprinkler).
11) Existing One no. Multi stage Water Curtain Pump, capacity 900 LPM & 60 -meter head each (For Hydrant & Sprinkler).
12) Passive Fire Protection
13) Addressable Fire Alarm System with detectors (multi criteria, CO, Heat etc.), I/o modules, strobes etc.
14) Digital Evacuation (public address) system – integrated with Fire alarm system in each Floor
15) Auto Glow Signage
16) Fire Door

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BASIC/CONCEPT OF DESIGN:

The Fire protection system shall be consisting of Yard Hydrant system, Wet Riser system, Fire Hose Reel system, Portable Fire extinguisher, system and Automatic Sprinkler system. Other systems and the building construction shall be as per the requirements of Local Chief Fire Officer.

Connection for hydrant and sprinkler shall receive from centralized fire-fighting pump room and equipped with sprinkler & hydrant system as per NBC -2016 & IS codes. Trolley mounted and portable fire extinguisher shall provide at all electrical room & server room.

SYSTEM DESCRIPTION

Fire electrical multi stage and single outlet pump shall provide adequate flow for catering the requirement of the hydrant system. Diesel engine driven fire pump shall be provided for ensuring operation & performance of the system in case of total electrical failure. Jockey pumps shall compensate for pressure drop and line leakage in the hydrant and sprinkler, installation.

Individual suction line (Sprinkler, Hydrant) shall be drawn from the fire reserve tanks at the basement level and connected to independent fire suction header. The electric fire pumps, diesel engine driven fire pumps and the jockey pumps shall all draw from this suction header.

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

YARD HYDRANT & INTERNAL WET RISER SYSTEM

Yard Hydrant system comprises of Stand post type, single headed hydrant valves around the buildings spaced as per NBC – 2016 / CFO. Each hydrant valve is also provided with a self-standing Fire hose cabinet to house, Fire Hoses of 63 mm diameter, Branch pipes and nozzles and hydrant wrench. The yard hydrants are connected to pump set by underground fire main (sized to suit site requirement) of MS Heavy grade pipe. This main is normally in a ring layout (looped), protected with wrapping and coating to prevent from corrosion, and provided with sufficient number of isolation valves for maintenance purposes. Multistage and single outlet fire pump shall be used for the building. The valves shall be able to isolate not more than 50% of any ring around the building.

The yard hydrant shall be located within 2 m to 15 m from the building to be protected such that they are accessible and may not be damaged by vehicle movement. A spacing of about 45 m has been kept between two hydrants for all around the building.

The Wet riser system consists of Wet riser of minimum 150mm diameter, and many such risers are located as required by NBC – 2016 / CFO. This system consists of Single headed hydrant valve at each landing or exit, with fire hose cabinet housing Hoses of 63 mm diameter, Branch pipe and nozzle. For other levels, The Hydrant valve and Fire hose cabinets shall be provided based on the area to be covered, access distance from cabinet to the remote areas and hose lengths to be provided. Hose Reel system for first aid fire-fighting by the occupants is connected to the wet risers. 2 Nos. Zone Internal Wet Riser System.

SPRINKLER SYSTEM

Automatic sprinkler system shall be provided in each basements & upper floors standard types of sprinklers. The sprinkler system shall be designed as per NBC – 2016 / Local CFO and Sections or zones are divided for ease of maintenance and identification of the area of operation. The sprinkler pump shall be suitable for automatic operation when there is a drop of pressure in the system. Upright sprinklers and pendent sprinklers (Quick response) are to be located for every 9- 12 square meters of floor / ceiling area approximately and this coverage is reduced as per NBC-2016 & IS: 15105:2021 as per the site conditions and obstructions. Extended coverage sidewall sprinklers can be spaced as per their listed coverage (or) spacing. A listed Extended coverage – Standard Response sprinkler can cover a floor area of approximately 3m X 4m. Each zone of sprinklers has been provided with Zone control valves, which are of indicating type, with flow switch and a test & drain valve. All zone control valves shall be connected to a separate sprinkler riser.

MS Pipes shall be as per IS 1239 heavy grade or IS 3589 with minimum thickness of 6 mm. Fittings and valves shall be rated for the pressure of the system. Other valves like automatic air release valves, pressure relief valves shall be provided as required to complete the system. 2 nos zone for sprinkler system.

ICV DETAIL

One number ICV Shall Be Provided Each Floor Including Each Basement.

FLOW SWITCH

One number flow switch with butterfly valve shall be provided each floor.

FIRE WATER SOURCE

For MetaDesign Solutions Pvt. Ltd.

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Static fire water storage tank for fire protection system has been provided at underground of 200 Kl capacity. Fire department connection shall also be provided on the external wall of the property near the main entrance gate. These shall comprise of 4 nos. 63 mm dia. male outlet capable of directly feeding the ring mains through non-return valve or directly filling the static fire storage tanks. These shall be mounted in specially identified boxes. 10 cum capacity overhead water tank shall be provided on terrace.

Fire department connections shall be provided to supply the wet risers and sprinkler risers (by fire department) and to supply and draw water from underground water tank. The tank shall be divided into two compartments as required by standards and piping / valve arrangements shall be as per the NBC – 2016.

FIRE WATER CALCULATION

As per the NBC - 2016 building shall be classified in Group Housing.

1. Fire Water Requirement (sprinkler, hydrant, Water curtain) Existing 200 Kl (As per the NBC - 2016)

Existing U.G. Water Tank capacity shall be provided 200 KL & Existing overhead tank 10 KL.

MODE OF OPERATION

Fire pumps should be Existing multi stage pump of (1 No. of main electrical hydrant LPM, 1 No. main electrical sprinkler, 1 No. common diesel pump & 2 Nos. of Jockey pumps & 1 No. of Water Curtain Pump are provided in the pump room for the sprinkler & hydrant system and the Hydrant system, Sprinkler and diesel pump shall be having the capacity to supply 2280 LPM each and 2 nos jockey pump shall be having capacity to supply 180 LPM each & 1 No. of Water Curtain Pump shall be having capacity to supply 900 LPM. The residual pressure in the hydrant pipe network shall be kept maximum at 7.0 kg/cm2 and minimum at 3.5 kg/cm2. In the event of fire, when one of more valves are opened, water from the jockey pump will compensate water demand. If the water demand is not able to be met by above, the relevant pressure fall in the header shall start the AC Motor driven fire pump through pressure switches, automatically. In case of failure of electricity, the standby diesel pump set shall start automatically.

However, shutting down of the pumps shall be manual except for the jockey pump which shall start & stop automatically through pressure switches. The setting of the pressured switches shall be adjustable so that any desirable sequence of starting may be achieved at site. Piping and instrumentation wiring shall be done accordingly to take care of this. The terrace tank shall also be connected to the Hydrant system riser.

In addition to auto start arrangements, the main pump shall also have an overriding manual starting facility by push button arrangement in case of an emergency.

PIPING SYSTEM (Class C)

- Pipes and fittings for internal & External Fire Hydrant system and sprinkler, system shall be manufactured from approved grade of mild steel as per IS codes & NBC or NFPA.
- Nozzle shall be of bronze as per NFPA.
- Fire hose pipe shall be made of controlled percolated hose. Hose shall be provided with instantaneous spring lock type couplings. Rubber lined hose shall be provided.
- Grooved Fittings shall be used to connect pipes from 50 NB & above in Pump Room & Sprinkler System. Threaded fitting shall be used for below 50 NB pipes.

VALVES

a) All valves (butterfly, non-return valve, ball valve) shall be grooved confirming to the IS codes & NBC and shall have minimum 12 bar working pressure.

b) **Alarm Check Valve** – Grooved End Alarm Check Valve should be installed in Wet Pipe Sprinkler System areas. The Alarm Valve shall confirm to UL/FM approval and shall have a pressure rating of minimum 16 bar.
Body: Ductile iron, ASTM A-536 Grade 65-45-12
Clapper: Aluminum bronze UNS-C95500
Shaft: Stainless 17-4
Clapper Seal: EPDM, ASTM D2000
Seat O-Rings: Nitrile
Springs: Stainless steel (300 Series)

c) **PRV**
PRV shall be provided where inlet pressure is required to be reduced as per NFPA/NBC requirement.

HAND APPLIANCES/FIRE EXTINGUISHERS:

Fire Extinguishers shall be strategically placed in technical rooms and electrical rooms as per requirement. Portable fire Extinguisher of AFFF (Aqueous film forming foams) 9 Liters foam, 6 Kg Dry Chemical Powder (DCP) type and Trolley mounted dry powder type capacity50 kg fire extinguishers have been provided throughout the building as per NBC – 2016/ Local CFO. Portable fire extinguishers have been provided throughout the building as per NBC – 2016/Local CFO.

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One number of 4. 5kg capacity CO2 type extinguisher and one number of 4.0 kg ABC type portable fire extinguishers are provided (or) inside hose reel cabinets.
Electrical transformers, switchgear, motors and of electrical apparatus, minimum 2 Nos. dry powder or CO2 type / sand buckets extinguisher shall be additionally provided as PER IS(5.1 / NBC-4 / IS 2190) @ 200 sq m Each or 15 m c/c

EQUIPMENTS AND ACCESSORIES

HYDRANT & SPRINKLER PUMP

- Existing One no. Multistage Main Fire pump for Hydrant System capacity 2280 LPM & 100 - meter head.
- Existing One no. Multistage Main Fire pump for Sprinkler System capacity 2280 LPM & 100 - meter head.
- Existing One No Multistage Diesel Engine Driven Standby pump, capacity 2280 LPM & 100 - meter head.
- Existing Two nos. Multistage Jockey pumps, capacity 180 LPM & 100 -meter head Each (For Hydrant & Sprinkler).
- Existing One no. Multi stage Water Curtain Pump, capacity 900 LPM & 60 -meter head each (For Hydrant & Sprinkler).
- Fire pump controller
- Yard Hydrants single headed
- Self-standing fire hose cabinet for yard hydrants
- Fire connection (breeching inlet)
- Valves and accessories
- Internal Hydrants (Single headed)
- Hose Reel
- Portable fire extinguishers
- Internal Fire hose cabinets
- Automatic Air release valves
- Upright sprinklers, standard response, standard coverage
- Pendent sprinklers, standard response, standard coverage
- Sidewall sprinklers, Standard response, extended coverage
- Zone control valve assembly
- Underground piping with wrapping and coating
- Aboveground piping with painting and supports
- Spare sprinkler cabinets
- Alarm check valve assembly

2.3 SUCTION HEADER CALCULATION

Pumps working (Q) = 1 No. Hydrant pump + 1 No. Sprinkler pump + 1 No. water curtain pump
= 2280 + 900+ 2280 = 5460 LPM = 0.091 cum/s
Maximum velocity(v) = 2 m/s
Suction Header Dia. (m) = $\{Q \times 4/(\pi \times V)\}^{1/2}$ = {0.091 X 4/(3.14X2)2 } = 0.364/2.505 =
= 0.0145 mm say 150 mm

2..3.1 DELIVERY HEADER CALCULATION

Pumps working (Q) = 1 No. Hydrant pump + 1 No. Sprinkler pump
=2280+2280 = 4560 LPM = 0.76 cum/s
Maximum velocity(v) = 2 m/s
Delivery Header Dia. (m) = $\{Q \times 4/(\pi \times V)\}^{1/2}$
= 0.092 = 92 mm, SAY 100 mm

2..3.2 DELIVERY HEADER CALCULATION OF WATER CURTAIN

Pumps working (Q) = 1 No. Water curtain Pump
= 900 = 900 LPM = 0.015 cum/s
Maximum velocity(v) = 2 m/s
Delivery Header Dia. (m) = $\{Q \times 4/(\pi \times V)\}^{1/2}$ = (0.015X4/(3.14X2)2)
= 0.024 = 50 mm, SAY 50 mm

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FIRE SUPPRESSION SYSTEM

Critical facilities such as Electrical room, Control room, data processing rooms, telecommunications room, process control rooms, Record room, LT& HT panels etc. shall be equipped with fire suppression system (Novec - 1230).

SYSTEM DESCRIPTION AND OPERATION

A. The system shall provide a Novec – 1230 minimum design concentration of 7% by volume for Class A hazards in all areas and/or protected spaces, at the minimum anticipated temperature within the protected area. System designs shall not exceed 10.5% for normally occupied spaces, adjusted for maximum space temperature anticipated, with provisions for room evacuation prior to agent release.

B. The system discharge time shall not exceed 10 seconds in accordance with the NFPA 2001 Standard for Clean Agent Fire Extinguishing Systems

C. The system shall be complete in all ways. It shall include a mechanical and electrical installation, all detection and control equipment, agent storage containers, Novec - 1230 agent, discharge nozzles, pipe and fittings, manual release and abort stations, audible and visual alarm devices, auxiliary devices and controls, shutdowns, alarm interface, advisory signs, functional checkout and testing, training and any other operations necessary for a functional UL Listed and/or FM approved FM-200 Clean Agent Suppression System.

D. The system(s) shall be actuated by a combination of ionization/photoelectric smoke detectors installed for maximum area coverage of 250 sq. ft. (23.2 m2) per detector, in both the room, and above ceiling protected spaces. If the air flow is one air change per minute, photoelectric detectors only shall be installed for maximum area coverage of 125 sq. ft. (11.6 m2) per detector.

E. Detectors shall be Cross-Zoned detection requiring two detectors to be in alarm before release.

F. Automatic operation of each protected area shall be as follows:

a. Actuation of one (1) detector, within the system, shall:
- Illuminate the "ALARM" lamp on the control panel face.
- Energize an alarm bell.
- Transfer auxiliary contacts, which can perform auxiliary system functions such as: Operate door holder/closures on access doors, Transmit a signal to a fire alarm system, Shutdown HVAC equipment.
- Light an individual lamp on an optional annunciator.

b. Actuation of a 2nd detector, within the system, shall:
- Illuminate the "PRE-DISCHARGE" lamp on the control panel face.
- Energize a pre-discharge horn/strobe device.
- Shut down the HVAC system and/or close dampers.
- Start time-delay sequence (not to exceed 60 seconds).
- System abort sequence is enabled at this time.
- Light an individual lamp on an optional annunciator.

c. After completion of the time-delay sequence, the Novec - 1230 Clean Agent system shall discharge and the following shall occur:
- Illuminate a "SYSTEM FIRED" lamp on the control panel face.
- Shutdown of all power to high-voltage equipment.
- Energize a visual indicator(s) outside the hazard in which the discharge occurred.
- Energize a "System Fired" audible device. (Optional)

The system shall be capable of being actuated by manual discharge devices located at each hazard exit. Operation of a manual device shall duplicate the sequence description above except that the time delay and abort functions shall be bypassed. The manual discharge station shall be of the electrical actuation type and shall be supervised at the main control panel.

EMERGENCY ASSEMBLY POINT

An area at an appropriate place in the allowed/required setbacks shall be earmarked with a proper board as "ASSEMBLY POINT" for the occupants to assemble after evacuation during practice drill and in an emergency.

BACKUP POWER SUPPLIES

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

SMOKE VENTILATION TO LIFTS

All lift shafts will be provided with permanent vents at the head with a minimum clear area of 0.2m2 and will open into pressurized lobbies.

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Lift lobbies is Shall Be Pressurized in each basement.

EXIT SIGNS

Self-illuminating exit signs will be provided on all floors.

EMERGENCY LIGHTING

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

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

Near each intersection of corridors

At each exit door

Near each change in direction of escape route

- Near each staircase so that each flight of the stairs receives direct light
- Near any change in floor level
- Outside each final exit
- Near each fire alarm call point or emergency communication device
- Near any fire-fighting equipment (e.g., fire extinguishers/hose reels etc.)
- To illuminate exit signage
- Note: 'Near' is taken to be within 2m (measured horizontally)

The horizontal luminance at floor level on the 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 non-combustible 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 opening between the floors of a building shall be suitably enclosed or protected as necessary to provide reasonable safety to the occupants while using the means of egress by preventing spreads of fire, smoke, or flames through vertical openings from floor, thus allowing occupants to complete their safe use of the means of egress.

SECTION- II:

MECHANICAL VENTILATION

MECHANICAL VENTILATION & PRESSUIRIZATION CALUCLATION SHEET: -

BASIS OF DESIGN (VENTILATION SYSTEM):

- **Car Park Exhaust (Emergency):** The total exhaust in case of fire or distress call should permit 12 Air Changes Per Hour as per NBC norms.
- **Car Park Exhaust (Normal):** The normal exhaust in basement should permit 6 Air Changes Per Hour.
- **Zoning in Basement:** Zoning shall be done in basement. Each Zone shall have an area less than equal to 3000 Sqm. Each Zone shall have an independent ventilation system.
- **Car Park Fresh Air (Normal +Emergency) :(Lower Basement)** The fresh air shall be directly brought in through Ramps coming from Ground Floor and through suitably sized and selected cutouts in each zone. Preferably, wherever possible, fresh air shall be supplied at floor level. The fresh air shaft shall have louvers at floor level.
- **Car Park Fresh Air (Normal +Emergency) :(Middle Basements)** the fresh air for lower basements (B2 etc.) shall be brought in mechanically through suitably sized fans and selected cutouts. Preferably, wherever possible, fresh air shall be supplied at floor level.
- **Car Park Fresh Air (Normal +Emergency) :(Upper Basements)** the fresh air for lower basements (B3 etc.) shall be brought in mechanically through suitably sized fans and selected cutouts. Preferably, wherever possible, fresh air shall be supplied at floor level.
- **DG Room Ventilation:** The DG Room shall be mechanically ventilated, with a slight positive pressure to assist Engine Breathing. To achieve this, we shall supply 30 CFM/ KVA (of DG Capacity) Fresh Air (Through Air washer) and exhaust 28 CFM/ KVA (of DG Capacity) through axial fans. (In case of water- cooled DG sets)
- **STP Ventilation:** The STP area shall be mechanically ventilated at 30 air changes per hour. The exhaust shall be done through axial fans and fresh air shall be supplied through axial fans.

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- **Pump Room Ventilation:** The Pump Room shall be mechanically ventilated at 20 air changes per hour. The ventilation shall be done through axial fans and suitably sized ducts and cutouts.
- **Lift Lobby Pressurization:** Each Lift lobbies shall be pressurized. The pressurization shall be done to achieve a +30 Pascal Pressure Differential in the lift lobby as per NBC (Part-4 – Fire and Life Safety – Subhead- C-1.5, Page No-65). This ensures that in case of fire in the building, the persons in the lift lobby are able to get down to ground floor level without being affected by the smoke from the fire at any floor. The detailed calculation is done below to calculate the exact CFM required for pressurization.

LIFT LOBBY PRESSURIZATION (3 BASEMENT)

Lift lobby door size (Single Leaf)
Width (W) =1.25 m
Height (H) =2.1 m
Lift lobby Door Area = W x H = 1.25 x 2.1= 2.625 Sqm. x 2 = 5.25 Sqm.
Leakage area (based on 5mm gap all around the door Single leaf of the door)
=(2 x 2.1 + 2 x 1.25)x 0.005 =0.0335 Sq.m x 2 = 0.067
No. of Landings = 3
Effective leakage area through doors = 0.067 x 2 = 0.134 Sqm. x 2 = 0.268 Sqm.
Total air leakage through doors Q1 =0.839 x A(Effective large area) x √P(Pressure Differential Index)
Pressure Differential Index = √30 = 5.47 (Differential Pressure of 30 Pa is based on NBC 2016 Part IV Fire & Safety)
=0.839 x 0.268 x 5.47

Q1 = 1.2299 cu. m/sec

Air flow through one open door considering an egress velocity of 1m/sec

Q2 =1 x 5.25 = 5.25 cu. m /sec

Total air quantity required=Q1+ Q2

5.25 + 1.2299 = 6.4799 cu. m /sec

Total air quantity required considering 10% air leakage through ducts = 6.4799 x 1.10cu.m/sec
= 7.1279 cu. m/sec

Total air quantity required for lift Lobby = 7.1279 x 2118.8 = 15102.6675 CFM =
(1cu.m/sec = 2118.8cfm) Say = 15200 CFM.

- **Lift well Pressurization:** All Lift wells shall be pressurized. The pressurization shall be done to achieve a 50 Pascal Pressure Differential in the lift shaft as per NBC (Part-4 – Fire and Life Safety – Subhead- C-1.5, Page No-65). This ensures that in case of fire in the building, the persons in the lift are able to get down to ground floor level without being affected by the smoke from the fire at any floor. The detailed calculation is done below to calculate the exact CFM required for pressurization.

LIFT WELL PRESSURIZATION (3BASEMENT + G.F. + 14 FLOOR)

Lift Well door size (Double Leaf)
Width (W) =0.9m
Height (H) =2.1m
Lift Well Door Area = W x H = 2.1x0.9 =1.89 Sq m
Leakage area (based on 5mm gap all around the door & between two leaf of the door)
=(3 x 2.1 + 2 x 0.9)x 0.005 =0.0405 Sq m
No. of Landings =18
Effective leakage area through doors = 0.0405 x17 = 0.6885 Sq. m
Total air leakage through doors Q1 =0.839 x A(Effective large area) x √P(Pressure Differential Index)
Pressure Differential Index = √50 = 7.07 (Differential Pressure of 50 Pa is based on NBC 2016Part IV Fire & Safety)
=0.839 x 0.6885 x 7.07

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Q1 = 4.083 cu. m/sec

Air flow through one open door considering an egress velocity of 1m/sec

Q2 =1 x 1.89 x 1 = 1.89cu.m/sec

Total air quantity required=Q1+ Q2

1.89 + 4.083 = 5.97 cu.m/sec

Total air quantity required considering 10% air leakage through ducts =5.973 x 1.10cu.m/sec

=6.571 cu. m/sec

Total air quantity required for lift well pressurization= 6.571 x 2118.8= 13923.4732 CFM=

(1cu.m/sec = 2118.8cfm) Say =14000 CFM

- **Staircase Pressurization:** All enclosed staircases in the basement, shall be pressurized to create a positive pressure of 50 Pa from surroundings.

STAIRCASE PRESSURIZATION (3 BASEMENT)

Staircase door size (Single Leaf)

Width (W) =1.25 m

Height (H) =2.1m

Staircase Door Area = W x H = 2.1x1.25 = 2.625 Sqm

Leakage area (based on 5mm gap all around the door & between Single leaf of the door)

=(2 x 2.1 + 2 x 1.25)x 0.005 =0.0335 Sqm.

No. of Landings = 3

Effective leakage area through doors = 0.0335 x 1 = 0.0335 Sq. m

Total air leakage through doors Q1 =0.839 x A(Effective large area) x VP(Pressure Differential Index)

Pressure Differential Index = V50 = 7.07 (Differential Pressure of 50 Pa is based on NBC 2016Part IV Fire & Safety)

=0.839 x 0.0335 x 7.07

Q1= 0.198 cu. m/sec

Air flow through one open door considering an egress velocity of 1m/sec

Q2 =1 x 2.625= 2.625 cu. m /sec

Total air quantity required=Q1+ Q2

2.625 + 0.198 = 2.8237 cu. m/sec

Total air quantity required considering 10% air leakage through ducts = 2.8237 x 1.10cu.m/sec

= 3.1060 cu. m/sec

Total air quantity required for lift well pressurization = 3.1060 x 2118.8= 6581.1713 =

(1cu.m/sec = 2118.8cfm) Say = 6600 CFM

GENERAL

- This report outlines the design features, basis of design, estimated requirements etc. of the HVAC system.
- The Scope of Work in Air Conditioning as Briefed in the report is as follows:

SL. No.	ZONE	FLOOR	Area (Sqm.)	Height M	Volume	Ventilation Type	ACPH	Air Volume CFM	Fan Selection
		BASEMENT 1							
1	ZONE 1	Basement 1	522	3.60	66,298	AXIAL FAN	12	13,260	1X13500 CFM TUBE AXIAL FAN FOR SMOKE EXHAUST FAN.
2	ZONE 1	Basement 1	522	3.60	66,298	AXIAL FAN	12	13,260	FRESH AIR THROUGH RAMP.
3	ZONE 2	Basement 1	522	3.60	66,298	AXIAL FAN	12	13,260	1X13500 CFM TUBE AXIAL FAN FOR SMOKE EXHAUST FAN.

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4	ZONE 2	Basement 1	522	3.60	66,298	AXIAL FAN	12	13,260	FRESH AIR THROUGH RAMP.
5	D.G. Panel	Basement 1	40	3.60	5,080	AXIAL FAN	28	2,371	1X2500 CFM TUBE AXIAL FAN FOR SMOKE EXHAUST FAN.
6	D.G. Panel	Basement 1	40	3.60	5,080	AXIAL FAN	28	2,371	1X2500 CFM TUBE AXIAL FAN FOR FRESH AIR FAN.
7	Services	Basement 1	69	3.60	8,764	AXIAL FAN	12	1,753	1X2000 CFM TUBE AXIAL FAN FOR SMOKE EXHAUST FAN.
8	Services	Basement 1	69	3.60	8,764	AXIAL FAN	12	1,753	1X2000 CFM TUBE AXIAL FAN FOR FRESH AIR FAN.
9	PUMP ROOM	Basement 1	47	3.60	5,969	AXIAL FAN	20	1,990	1X2000 CFM TUBE AXIAL FAN FOR SMOKE EXHAUST FAN.
10	PUMP ROOM	Basement 1	47	3.60	5,969	AXIAL FAN	20	1,990	1X2000 CFM TUBE AXIAL FAN FOR FRESH AIR FAN.
		BASEMENT 2							
11	ZONE 1	Basement 2	592	4.20	87,720	AXIAL FAN	12	17,544	1X18000 CFM TUBE AXIAL FAN FOR SMOKE EXHAUST FAN.
12	ZONE 1	Basement 2	592	4.20	87,720	AXIAL FAN	12	17,544	1X18000 CFM TUBE AXIAL FAN FOR FRESH AIR FAN.
13	ZONE 2	Basement 2	592	4.20	87,720	AXIAL FAN	12	17,544	1X18000 CFM TUBE AXIAL FAN FOR SMOKE EXHAUST FAN.
14	ZONE 2	Basement 2	592	4.20	87,720	AXIAL FAN	12	17,544	1X18000 CFM TUBE AXIAL FAN FOR FRESH AIR FAN.
15	WTP	Basement 2	139	4.20	20,596	AXIAL FAN	12	4,119	1X4250 CFM TUBE AXIAL FAN FOR SMOKE EXHAUST FAN.
16	WTP	Basement 2	139	4.20	20,596	AXIAL FAN	12	4,119	1X4250 CFM TUBE AXIAL FAN FOR FRESH AIR FAN.
		BASEMENT 3							
17	ZONE 1	Basement 3	613	4.20	90,832	AXIAL FAN	12	18,166	1X18250 CFM TUBE AXIAL FAN FOR SMOKE EXHAUST FAN.
18	ZONE 1	Basement 3	613	4.20	90,832	AXIAL FAN	12	18,166	1X18250 CFM TUBE AXIAL FAN FOR FRESH AIR FAN.
19	ZONE 2	Basement 3	613	4.20	90,832	AXIAL FAN	12	18,166	1X18250 CFM TUBE AXIAL FAN FOR SMOKE EXHAUST FAN.
20	ZONE 2	Basement 3	613	4.20	90,832	AXIAL FAN	12	18,166	1X18250 CFM TUBE AXIAL FAN FOR FRESH AIR FAN.
21	STP	Basement 3	100	4.20	14,818	AXIAL FAN	12	2,964	1X3000 CFM TUBE AXIAL FAN FOR SMOKE EXHAUST FAN.
22	STP	Basement 3	100	4.20	14,818	AXIAL FAN	12	2,964	1X3000 CFM TUBE AXIAL FAN FOR FRESH AIR FAN.

FOR RESIDENTIAL APARTMENTS:

- VRV units for the Residential Units shall be proposed.

SECTION- III:

FIRE ALARM SYSTEM, PUBLIC ADDRESS SYSTEM AND LIGHTNING PROTECTION SYSTEM

AUTOMATIC ADDRESSABLE FIRE ALARM SYSTEM WITH DIGITAL EVACUATION

The proposed fire alarm system shall be intelligent analogue addressable type. This shall be networked with a BMS system via BACNET/MODBUS Interface (Optional). All Fire Alarm devices shall be connected to Main fire alarm panel installed in control Room which in shall be connected to repeater panels installed at Main Reception / Security Manager's Room /. Digital Voice Evacuation (Public Address) System shall be integrated with fire alarm system to automatically announce emergency / evacuation message in case of fire. The system could also be used to make any general public announcement manually / play music. The message can be announced zone wise. Furthermore -

- The fire alarm panel shall consist of multiple loops where each loop has a capacity of 125 devices.
- The capacity of fire alarm panel shall be chosen considering expansion in future. The system is completely scalable at an additional cost of supply / installation of devices and re commissioning of the system.
- In case of fire, FAS shall activate the PA system on the fire floor / a floor above the fire floor / a floor below the fire floor for announcement.

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- Fire alarm system shall be complete with suitably rated battery backup facilities. The batteries shall be capable of powering the complete system for a period of at least 24 hours, or should be capable to support the system operation during a full fire condition for a period of 30 Minutes.
- The system shall operate on 120/240 VAC, 50-60 Hz and shall be provided with necessary UPS power.
- The cable used for fire alarm system shall be armored FRLS in conformance to BIS standards.

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.

FIRE ALARM & DIGITAL VOICE EVACUATION SYSTEM COMPONENTS:

ANALOGUE ADDRESSABLE FIRE ALARM PANEL

The control panel(s) shall be a micro-processor based networked system designed specifically for fire, one-way audio communications, and smoke control with integration modules for any third-party control/ annunciation. The Fire Alarm Control panel shall be UL listed.

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 of dispensary block. 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 7.5 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 of dispensary block. Multi / 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.

DUCT DETECTOR (OPTIONAL)

Intelligent Duct Smoke Detector located within the duct, protruding into the duct or located outside the duct that detects visible or invisible particles of combustion flowing within the duct.

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.

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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 & TALK BACK SYSTEM

It is proposed to provide the totally enclosed PA system operator console for hooters cum speakers, with two ways communication (Talk back system) with microphone, all call facility, for required no. of zones with facility for recorded message & emergency microphone. PA system shall be coupled to the fire alarm system.

FRLS CABLE

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

2 Core x 1.5 mm2, Multi stranded AT Copper, FRLS 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 is considered for containment.

4.0 FIRE ALARM SYSTEM

4.1 GENERAL

The proposed fire alarm system will enable either manual fire alarm or automatic detection of fire and will feature detection and control panel. This will operate in conjunction with emergency alarming & intercommunication system, this will enable firefighting system by a combination of both manual and automatic signal.

4.2 FIRE COMMAND CENTRE

There will be Existing fire Alarm Panel located in Ground Floor near entrance of building Size = 5.53 M X 4.88 M = 26.98 Sqm.

- Main Fire Alarm Panel
- Public Address System in common area.
- The Fire fighter's intercom system.
- The purpose of fire detection control panel is that the fire alarm control panel will response to one or more positive signals from either the automatic detection or MCP as follows:
- Notification through hooters and repeater panels to alert general public as well as security staffs.
- By integrating the fire alarm system within appropriate zones and by instigating the broadcast of appropriate message via public address system.
- Main Fire Alarm Panel (MFAP) will be provided at the Fire Command Center.
- Fire alarm panel will be provided in fire command center at ground floor.
- The Fire Detection and control panel will have battery back-up in case of mains power failure.

4.3 AUTOMATIC FIRE ALARM DETECTION SYSTEM

The fire alarm and detection system will be designed as per the recommendations of the National Building Code of India-2016.

GROUP-A-4 : RESIDENTIAL BUILDING.

Considering that the purpose of the building, as well as the height of the structure, it will be necessary to provide a manually operated electric fire alarm system based on the requirements of the National Building Code 2016.

4.3.1 The main emphasis of manually operated electronic fire alarm system shall be on having the timely warning in case of any fire.

4.3.2 Main Fire Control panel shall be provided at appropriate places. Manual call point, Hooters will be installed at each staircase.

4.3.3 Cables for fire alarm and PA system shall be laid in metal conduits or FRLS (Flame / fire Retardant Low Smoke) armored to provide physical segregation from the power cables.

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4.3.5 MANUAL CALL POINT (MCP)

The Manual Call Point will be provided to enable people to signal the presence of fire.

Manual call points will be provided:

- Adjacent to Stair door at each floor.

The status of the system will be monitored and registered at the main control Panel.

5.0 PORTABLE FIRE EXTINGUISHRS :-

Portable Fire Extinguishers will be provided as per the relevant IS codes.

Dry Chemical Power and ABC type Extinguishers will be provided appropriate areas throughout the building. The maximum distance 200 sq m Each or 15m c/c.

Carbon Dioxide extinguishers will be provided in plant rooms and electrical rooms.

Areas susceptible to oil fire will be provided with Mechanical Foam Type Fire Extinguishers

5.1 CARBON DIOXIDE GAS FLOODING FIRE EXTINGUISHING SYSTEM:

All Electrical Hazard room areas like Electrical panels are provided with 'point of fire activated Carbon Dioxide Total Flooding System comprising of a Fire trace tube and independent Carbon Dioxide Bottles which will allow the Carbon Dioxide to be directly discharged at the exact point of Fire without endangering other occupants in the area.

6.0 CODES & STANDARDS:

The following standards, bye-law, manual have been followed in the designing the firefighting system.

[1] National Building Code of India 2016 Part 4 "Fire & Life safety".
[2] IS 884:1985 First-aid hose reel for firefighting (first revision)
[3] IS 3844:1989 Code of practice for Installation and maintenance of Fire hydrant and Hose reels on premises.
[4] IS 13039:1991 External Hydrant system –Provision and Maintenance code practice.
[5] IS 2190:1992 Code of practice for selection, installation and maintenance of internal portable first aid fire extinguisher.
[6] IS 2189: 2008 Selection, installation and maintenance of automatic fire detection and alarm system code of practice.
[7] IS 15105 : 2021 for sprinkler.

- **ELECTRICAL SYSTEM**

7.0 SOURCES OF POWER SUPPLY

Based on the prevailing Electricity rules, the power supply to meet this requirement, from the local electric supply board shall be made available at 33 kV. To transform this supply to the useable voltage, step-down system is recommended.

Considering the high-profile nature of the project, it is recommended to provide dedicated 33 kV HT power supply by nearby authority substation. Power supply will be received through one number 33 kV HT tariff meter installed by power authority as outgoing to feed 33 kV HT VCB. Space allocation & access doors for VCB Room & HT metering shall be as per local norms near the main gate entry. 1 HT panel board consisting of 4 Nos. 33 kV HT VCB is proposed which comprising of 1 No. 33 KV Vacuum circuit breaker to receive power supply from metering panel and 3 Nos. vacuum circuit breaker for feeding to transformer and shall be located in Basement 1

Transformer, LT Panel shall be installed in Basement 1 & D.G. Set in Basement 2. Automatic Power Factor Correction Panel will also be installed here. LT panel shall supply power to sub distribution boards (SDBs) and floor distribution boards (FDBs) located on the area basis.

Electrical meter room of respective floor shall be provided with 2hours fire rated wall.

8.0 INVERTER/UPS SYSTEM

Standalone inverter/UPS shall be planned for 10% common area emergency lighting capable of providing uninterrupted power during changeover period of normal power to DG power.

Battery backup up to 30 minutes shall be provided. Storage batteries shall be VRLA sealed maintenance free type.

9.0 CABLES, WIRES AND CONDUCT

All cables proposed shall be of copper/aluminum conductor, XLPE insulated PVC sheathed armored type.

All control and lighting circuit cables shall be of single core copper conductor, with minimum conductor size of 1.5 mm^2.

The power supply to the panel/distribution board of these fire and life safety systems shall be through fire proof enclosures or circuit integrity cables or through alternate route in the adjoining fire compartment to ensure that supply of power is reliable.

All wires shall be PVC insulated FRLS (Flame / Fire Retardant Low Smoke) with copper conductor. All recessed/concealed conduits for light/power will be heavy duty PVC & surface conduit will be MS. All conduits for Fire alarm/detection will MS and all conduits for light/power will be MS wherever they are susceptible to mechanical damage (for surface, basements etc.).

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☐ LIST OF APPLICABLE STANDARDS FOR FIRE ALARM SYSTEM:

S. No.	STANDARDS	TITLE
1	IS:2189 – 1962	Code of Practice for Automatic Fire Alarm System.
2	IS:2195 – 1962	Specifications for Heat sensitive Fire Detectors.
3	IS:732 - 1973	Code of practice for Electrical Wiring installation
4	UL 168	Under writer's laboratory specifications for smoke detectors

LIGHTNING PROTECTION SYSTEM

1. SCOPE

As lightning flashes are hazardous to people, to the structures themselves .The main and most effective measure for protection of structures against physical damage is considered to be the lightning protection system (LPS). It usually consists of both external and internal lightning protection systems.

2. AIR TERMINATION SYSTEM

Air-termination system is a part of an external LPS using metallic elements such as rods, mesh conductors or catenary wires intended to intercept lightning flashes. The probability of penetration by a lightning current on a structure is considerably decreased by the presence of a properly designed air-termination system.

ELECTRICAL PANEL PROTECTION SYSTEM

Electrical Panel Protection System: This includes Co2 or equivalent approved gas Suppression system.

1.0 Scope

a. Clean Agent Fire Suppression system designed to provide a uniform concentration within the electrical panels in accordance with NBC.
b. Materials for a complete agent suppression system including Co2 or equivalent approved gas storage cylinders with steel bracket, extinguishing agent, detection tube, cylinder valve and associated accessories including but not limit to; adaptors, pressure switch, tube fittings etc., required for complete operation of system.
c. All necessary safety requirements such as warning signs, discharge alarm shall be part of system.
d. The necessary nomenclature such as pressurization level, agent volume, gross/net weight of cylinder shall be clearly marked on cylinder.

2.0 System Description:

a) The detection tube shall be fixed with cylinder valve at top of cylinder. The tube shall be pressurized with dry nitrogen. In case of reach of pre-determined temperature (100-120°C), the tube shall rupture gas shall be released 7tube over the protected area.
b) The pressure switch shall be provided for necessary indication of discharge of gas.
c) The Extinguishing Agent shall be stored in cylinder as liquefied compressed gas, super pressurized with dry nitrogen at 195 psi.
d) The cylinder shall be equipped with brass valve, pressure gauge (to monitor agent pressure) and isolation valve for maintenance purposes. The cylinder bracket shall be of steel construction with quick release clamp.
e) The detection tube shall be installed throughout the compartments of panel. The location and spacing of tube shall be above the hazard, to be protected.
f) In case of fire, the tube shall rupture at a point. The rupture of tube shall result in formation of discharge point and release the agent in uniform pattern.

3.0 System Components:

a) Cylinder of steel construction with standard red epoxy paint finish. Cylinders shall be accompanied by original manufacturers test certificate confirming the contents of the cylinder.
b) The cylinders shall be from reputed Manufacturers only. Cylinders shall be super pressurized with dry nitrogen to an operating pressure and temperature as per manufacturer recommendations.
c) Each cylinder shall have pressure gauze and low-pressure switch to provide visual and electrical supervision of the cylinder pressure. The low-pressure switch shall be wired to the Audio-Visual Alarm to provide audible and visual trouble alarm in the event of drop of pressure. The pressure gauze shall be color coded to provide an easy, visual indication of cylinder pressure.
d) Furnish a welded steel bracket with each cylinder assembly for holding the cylinders in a saddle with a front bracket piece that secures the cylinders.
e) Cylinder shall be provided with a certificate provided by the company who charge with the Co2 or equivalent approved gas mixture. The certificate shall be secured around the cylinder with chain fastener.
f) The Detection Tube, UL approved and CE marked to be Red Color and pressurized at 195 Bar. The Detection Tube to rupture between (100-120°C).
g) The Pressure Switch should be CE Marked having NO/NC contact.

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h) The cylinder should be DOT-4B approved. (Department of Transport, USA)

4.0 Extinguishing Agent

Co2 or equivalent gas approved gas

(a) The agent shall not contain any Hydro fluorocarbon's (HFC).
(b) The ozone depletion potential should be zero.
(c) The Global warming potential should be equal to or less than 1.
(d) The Extinguishing Agent should be UL Listed/ FM approved.
(e) The extinguishing agent should be filled in an UL Listed or FM approved filling station.

ELECTRICAL SYSTEM

Table of Contents

1 Emergency Lighting System
2 Lightning Arrester Installation
3 Electrical load calculations

1. EMERGENCY LIGHTING INSTALLATION

Emergency Lighting will be provided as per NBC norms.

2. LIGHTNING ARRESTOR INSTALLATION

8.2 Lightning protection levels (LPL)

For the purposes of IEC 62305, four lightning protection levels (I to IV) are introduced. For each LPL, a set of maximum and minimum lightning current parameters is fixed.

NOTE 1 Protection against lightning whose maximum and minimum lightning current parameters exceed those relevant to LPL I needs more efficient measures which should be selected and erected on an individual basis.

NOTE 2 The probability of occurrence of lightning with minimum or maximum current parameters outside the range of values defined for LPL I is less than 2 %.

The maximum values of lightning current parameters relevant to LPL I shall not be exceeded, with a probability of 99 %. According to the polarity ratio assumed (see Clause A.2), values taken from positive flashes will have probabilities below 10 %, while those from negative flashes will remain below 1 % (see Clause A.3).

The maximum values of lightning current parameters relevant to LPL I are reduced to 75 % for LPL II and to 50 % for LPL III and IV (linear for /, Q and di/dt, but quadratic for W/R). The time parameters are unchanged.

NOTE 3 Lightning protection levels whose maximum lightning current parameters are lower than those relevant to LPL IV allow one to consider values of probability of damage higher than those presented in Annex B of IEC 62305-2:2010, but not quantified and are useful for better tailoring of protection measures in order to avoid unjustified costs.

The maximum values of lightning current parameters for the different lightning protection levels are given in Table 3 and are used to design lightning protection components (e.g. cross-section of conductors, thickness of metal sheets, current capability of SPDs, separation distance against dangerous sparking) and to define test parameters simulating the effects of lightning on such components (see Annex D).

The minimum values of lightning current amplitude for the different LPL are used to derive the rolling sphere radius (see Clause A.4) in order to define the lightning protection zone LPZ Og which cannot be reached by direct strike (see 8.3 and Figures 3 and 4). The

IS/IEC 62305-1 : 2010

minimum values of lightning current parameters together with the related rolling sphere radius are given in Table 4. They are used for positioning of the air-termination system and to define the lightning protection zone LPZ O, (see 8.3).

Table 3 - Maximum values of lightning parameters according to LPL

First positive impulse LPL

T/T, us / us 10 / 350 First negative impulse? LPL

Current parameters Symbol zs

Peak current

x 2S i = o

Average steepness di/dt 200 150 100 Time parameters T, / T, 0,25 / 100 at the use of this current shape concerns only calculations and not testing. Table 4 — Minimum values of lightning parameters and related rolling sphere radius corresponding to LPL Interception criteria LPL

Symbol Unit I II III IV Minimum peak current I kA 3 5 10 16 Rolling sphere radius r m 20 30 45 60

From the statistical distributions given in Figure A.5, a weighted probability can be determined that the lightning current parameters are smaller than the maximum values and respectively greater than the minimum values defined for each protection level (see Table 5).

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Table 3 - Maximum values of lightning parameters according to LPL
First positive impulse LPL
T/T, us / us 10 / 350 First negative impulse? LPL
Current parameters Symbol zs
Peak current
x 25 i = o
Average steepness di/dt 200 150 100 Time parameters T, / T, 0,25 / 100 at the use of this current shape concerns only calculations and not testing. Table 4 — Minimum values of lightning parameters and related rolling sphere radius corresponding to LPL Interception criteria LPL
Symbol Unit | II III IV Minimum peak current I kA 3 5 10 16 Rolling sphere radius r m 20 30 45 60
From the statistical distributions given in Figure A.5, a weighted probability can be determined that the lightning current parameters are smaller than the maximum values and respectively greater than the minimum values defined for each protection level (see Table 5).

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HYDRAULIC CALCULATIONS

For

Date-28 Aug 2025

Project Name- REVISED BUILDING FOR GROUP HOUSING (GH1) AREA MEASURING 0.75989 ACRES IN SEC – 23 A GURUGRAM. BEING DEVELOPED BY M/S META DESIGN SOLUTIONS PVT. LTD.

Drawing No. - 3119/2025

Type Of System – Water Curtain System

Design Basis – Is Code 15105:2021

Design Data

Remote Area Location	Top Lvl
Occupancy Classification	High Hazard
Density	35 LPM/M
Min. Pressure	1.4 Bar
K Factor	59.16
No. Of Nozzles Calculated	10
Calculated Pump Capacity	734.77 LPM
Proposed Pump Capacity	900 LPM
At Pressure	2.681 Bar
Proposed Pump Head	60 M

Consultant Information

Name Of Consultant	Ram Kunwar & Associates
Address	100,G.F, Indra Colony I , Sec 52 Gurugram
Phone No.	9899004192
Name Of Designer	Ram Kunwar
Authority Having Jurisdiction	Haryana Fire Service

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PIPENET SPRAY/SPRINKLER MODULE

VERSION 1.8

Results for :

Licence Owner from key:

Licence Type: UNKNOWN

Key number: Unavailable

MDS Date: Unavailable

17:03 on 28-Aug-2025

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LIST OF CONTENTS

	Page
Control Information	1
Fluid System	1
Design Information	2
Pipe Configuration	4
Nozzle Configuration	6
Designed Diameters & Flowrates	7
Flow in Pipes	8
Flow through Nozzles	9
Flow at Inlets	10
Materials Take Off	11
Important Notice	14
Comments	15

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CONTROL INFORMATION

```
Convergence Accuracy       = 1.00E-03
Maximum no. of iterations  =    50
Elevation Check Tolerance  =     0.50 metres
Warnings Control Option    =     0
****** Diagnostic level     =     2
```

FLUID SYSTEM

```
Fluid Class          = 1 (Liquid                )
Density              =   998.2      kg/cu.m
Viscosity            = 1.0000E-03 Pa.s
```

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DESIGN INFORMATION

Waterspray System

Pipe Materials are :

Pipe Type	Lining Type	Thickness(milli.m.)
3 -- ANSI B36.10 Sch.40	Not Lined	

Design to NFPA 2013 Rules
Using the Hazen-Williams Equation

Velocity Pressure Model: Ignore velocity pressure

Pressure loss at entrance: Ignore

Pressure loss at exit: Ignore

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AVAILABLE PIPE SIZES AND MAXIMUM VELOCITIES USED FOR PIPE SIZING

ANSI B36.10 Sch.40
Not lined

Nom.Bore (milli.m.)	Act.Diam (milli.m.)	Max.Vel. (m/sec)	Nom.Bore (milli.m.)	Act.Diam (milli.m.)	Max.Vel. (m/sec)	Nom.Bore (milli.m.)	Act.Diam (milli.m.)	Max.Vel. (m/sec)
15.0000	15.7600	6.0000						
20.0000	20.9600	6.0000						
25.0000	26.6400	6.0000						
32.0000	35.0800	6.0000						
40.0000	40.9400	6.0000						
50.0000	52.4800	6.0000						
65.0000	62.6800	6.0000						
80.0000	77.9200	6.0000						
90.0000	90.1200	6.0000						
100.0000	102.2600	6.0000						
125.0000	128.2000	6.0000						
150.0000	154.0800	6.0000						
200.0000	202.7400	6.0000						
250.0000	254.5600	6.0000						
300.0000	303.2800	6.0000						
350.0000	333.3400	6.0000						
[illegible]0.0000	381.0000	6.0000						
450.0000	428.4600	6.0000						
500.0000	477.8200	6.0000						
600.0000	575.0400	6.0000						

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PIPE CONFIGURATION

Pipe Label	Input Node	Output Node	Nom.Bore (millim.)	Length (metres)	Elevation (metres)	C Factor	Fitt.eq.lnth (metres)
1	1	2	100.00	2.000	2.000	120.0	0.000
2	2	3	100.00	10.000	0.000	120.0	0.000
4	3	5	100.00	4.000	4.000	120.0	3.048
5	5	6	65.00	1.0000	0.000	120.0	3.658
6	6	7	65.00	2.000	0.000	120.0	3.658
7	7	8	65.00	2.000	0.000	120.0	3.658
8	8	9	65.00	2.000	0.000	120.0	3.658
9	9	10	65.00	2.000	0.000	120.0	3.658
10	10	11	65.00	2.000	0.000	120.0	3.658
11	11	12	65.00	2.000	0.000	120.0	3.658
12	12	13	65.00	2.000	0.000	120.0	3.658
13	13	14	65.00	2.000	0.000	120.0	3.658
14	14	15	65.00	2.000	0.000	120.0	3.658

PIPE FITTINGS

Pipe Label	Number x Type	Equivalent Length (metres)
1	1 x 2	3.048
5	1 x 4	3.658
6	1 x 4	3.658
7	1 x 4	3.658
8	1 x 4	3.658
9	1 x 4	3.658
10	1 x 4	3.658
11	1 x 4	3.658
12	1 x 4	3.658
13	1 x 4	3.658
14	1 x 4	3.658

Fitting types are :
1 -- 45 Deg Elbow
2 -- 90 Deg Standard Elbow
3 -- 90 Deg Long Radius Elbow
4 -- Tee or Cross (Flow Turned Thro 90 Deg)
5 -- Gate Valve
6 -- Swing Check Valve
7 -- Non-Return Valve
8 -- Ball Valve
9 -- Butterfly Valve

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NOZZLE CONFIGURATION

Nozzle Label	Input Node	Nozzle Type	K-Factor	Req Flow (lit/min)	Min Press (bar G)	Max Press (bar G)
1	6	1	59.1600	70.0000	0.14000E+01	0.12000E+02
2	7	1	59.1600	70.0000	0.14000E+01	0.12000E+02
3	8	1	59.1600	70.0000	0.14000E+01	0.12000E+02
4	9	1	59.1600	70.0000	0.14000E+01	0.12000E+02
5	10	1	59.1600	70.0000	0.14000E+01	0.12000E+02
6	11	1	59.1600	70.0000	0.14000E+01	0.12000E+02
7	12	1	59.1600	70.0000	0.14000E+01	0.12000E+02
8	13	1	59.1600	70.0000	0.14000E+01	0.12000E+02
9	14	1	59.1600	70.0000	0.14000E+01	0.12000E+02
10	15	1	59.1600	70.0000	0.14000E+01	0.12000E+02

Nozzle types are :
1 -- WATER CURTAIN

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DESIGNED DIAMETERS & FLOWRATES

Pipe Label	Input Node	Output Node	Flowrate (lit/min)	Pipe Type	Act. Bore (milli.m.)	Nom. Size (milli.m.)	Pipe Group
1	1	2	734.7710	3	102.2600	100.0000	*
2	2	3	734.7710	3	102.2600	100.0000	*
4	3	5	734.7710	3	102.2600	100.0000	*
5	5	6	734.7711	3	62.6800	65.0000	*
6	6	7	653.2742	3	62.6800	65.0000	*
7	7	8	574.8244	3	62.6800	65.0000	*
8	8	9	498.8659	3	62.6800	65.0000	*
9	9	10	424.8810	3	62.6800	65.0000	*
10	10	11	352.3975	3	62.6800	65.0000	*
11	11	12	280.9952	3	62.6800	65.0000	*
12	12	13	210.3133	3	62.6800	65.0000	*
13	13	14	140.0362	3	62.6800	65.0000	*
14	14	15	70.0002	3	62.6800	65.0000	*

A * indicates that this is a SET diameter

Pipe Materials are :

Pipe Type	Lining Type	Thickness(milli.m.)
3 -- ANSI B36.10 Sch.40	Not Lined	

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FLOW IN PIPES

Pipe Label	Input Node	Output Node	Nom.Bore (milli.m.)	Inlet Pr. (bar G)	Outlet Pr. (bar G)	Drop in Pr. (bar)	Frict. Loss (bar)	Flowrate (lit/min)	Velocity (m/sec)
1	1	2	100.00	2.681	2.480	0.2014	5.6434E-03	736.8	1.491
2	2	3	100.00	2.480	2.452	2.8205E-02	2.8205E-02	736.8	1.491
4	3	5	100.00	2.452	2.040	0.4115	1.9882E-02	736.8	1.491
5	5	6	65.00	2.040	1.898	0.1425	0.1425	736.8	3.989
6	6	7	65.00	1.898	1.758	0.1393	0.1393	653.3	3.529
7	7	8	65.00	1.758	1.649	0.1099	0.1099	574.8	3.105
8	8	9	65.00	1.649	1.564	8.4560E-02	8.4560E-02	498.9	2.693
9	9	10	65.00	1.564	1.501	6.2830E-02	6.2830E-02	424.9	2.295
10	10	11	65.00	1.501	1.457	4.4450E-02	4.4450E-02	352.4	1.903
11	11	12	65.00	1.457	1.427	2.9240E-02	2.9240E-02	281.0	1.518
12	12	13	65.00	1.427	1.410	1.7110E-02	1.7110E-02	210.3	1.136
13	13	14	65.00	1.410	1.402	8.0600E-03	8.0600E-03	140.1	0.7565
14	14	15	65.00	1.402	1.400	2.2349E-03	2.2349E-03	70.00	0.3781

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FLOW THROUGH NOZZLES

Nozzle Label	Input Label	Inlet Press (bar G)	Req. Flow (lit/min)	Flowrate (lit/min)	% Deviation	Req. FlowDens (lit/min /metres **2)	FlowDens
1	6	0.18977E+01	70.0000	81.4967	16.42		
2	7	0.17586E+01	70.0000	78.4486	12.07		
3	8	0.16485E+01	70.0000	75.9584	8.51		
4	9	0.15640E+01	70.0000	73.9847	5.69		
5	10	0.15011E+01	70.0000	72.4833	3.55		
6	11	0.14567E+01	70.0000	71.4021	2.00		
7	12	0.14274E+01	70.0000	70.6918	0.97		
8	13	0.14103E+01	70.0000	70.2570	0.37		
9	14	0.14023E+01	70.0000	70.0539	0.08		
10	15	0.14000E+01	70.0000	70.0000 *	0.00		

Note: A * after a value indicates that this is a specification

Certified that hydraulic calculation of water curtain system has been designed as per IS:15105:2021 which is meeting all the relevant of codes.
Er. Ramkunwar

For MetaDesign Solutions Pvt. Ltd.

Authorised Signatory

FLOW AT INLETS

Inlet Node	Pressure (bar G)	Flowrate (lit/min)	Equivalent K-factor (lit/min , bar G)
1	2.681	734.6	448.73

Note: A * after a value indicates that this is a specification

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VAIBHAV TYAGI
ARCHITECT
CA/[illegible]/437
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Er. Ramkunwar

For MetaDesign Solutions Pvt. Ltd.

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Materials Take-off

Pipe lengths

ANSI B36.10 Sch.40

Nom. Size (milli.m.)	Tot. Length (metres)	Nom. Size (milli.m.)	Tot. Length (metres)	Nom. Size (milli.m.)	Tot. Length (metres)	Nom. Size (milli.m.)	Tot. Length (metres)	Nom. Size (milli.m.)	Tot. Length (metres)
65.000	18.00								
100.000	16.00								

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VAIBHAV TYAGI
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Materials Take-off

Nozzles

Type	K-Factor	Number
WATER CURTAIN	59.1600	10



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Er Ramkumar

For MediDesign Solutions Pvt. Ltd.

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Materials Take Off

Fittings

Fitting Nominal Size (milli.m.)	Fitting Type 1	2	3	4	5	6	7	8	9
65.000	0	0	0	10	0	0	0	0	0
100.000	0	1	0	0	0	0	0	0	0

Fitting Types are :

1 -- 45 Deg Elbow	4 -- Tee or Cross	7 -- Non-Return Valve
2 -- 90 Deg Standard Elbow	5 -- Gate Valve	8 -- Ball Valve
3 -- 90 Deg Long Radius Elbow	6 -- Swing Check Valve	9 -- Butterfly Valve

All fittings are as specified by user - no additional fittings have been generated automatically.

The supply demand graph is not available for the network without pump

DAULAT & PUNEET ARCHITECTS LLP

IMPORTANT NOTICE

Your attention is drawn to the need to maintain adequate standards. SUNRISE SYSTEMS Ltd has itself taken steps to ensure that this program produces valid results when properly used. Users are reminded of their responsibilities in the application of program results and, in particular, you should ensure that pertinent output documents are examined and approved by qualified staff prior to use.

DAULAT & PUNEET ARCHITECTS LLP

AV TYAGI
HITECT

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Dr. Ramkunwar

Authorised Signatory

For MetaDesign Solutions Pvt. Ltd.

Authorised Signatory

COMMENTS

Analysis Converged in 6 Iterations

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For MetaDesign Solutions Pvt. Ltd.

Authorised Signatory

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