GOVERNMENT OF MAHARASHTRA

No.MFS/51/2014/ 80
Tel No. 2667 0439
Fax No.2666 0287

Directorate of Maharashtra Fire Services
Maharashtra Fire Service Academy
Vidyanagri, Hans Bhugra Marg,
Santacruz (East), Mumbai – 400 098
Date: 25/03/2014

M/s. Lodha Dwellers Pvt Ltd,
Survey No 31/1, Village Khoni &
Survey No. 23/1/1, village-Khoni,
Tal-Kalyan, Dist-Thane

Sub: Grant of "Provisional NO Objection Certificate" for your proposed Residential Building on Survey No. 31/1, Village Khoni & Survey No. 23/1/1, Village-Khoni, Tal-Kalyan, Dist-Thane

Ref: Online Application no MFSKON005206022014 Dated on 10.02.14

Dear Sir,

This has reference to the above, you are submitted an application along with the drawings for grant of **"Provisional No-Objection Certificate"** for your proposed **high rise Residential buildings in** village-Khoni, Tal- Kalyan,Dist-Thane. This office has **"No Objection (Provisional)"** for your proposed Residential buildings as per details given below.

The Details of the Project is as under

TOTAL PHASES

- **Total Plot Area Including All Sectors = 11,09,225.00 sq.m.**
- **Total BUA Including All Sectors = 24,37,755.90 sq.m.**
- **Total Nos Of Sector. = 4 Nos.**
- **Buildings Upto 36 mtrs = 36 Nos.**
- **Buildings Above 36 mtrs & Upto 50 mtrs. = 212 Nos.**
- **Buildings Above 50 mtrs & Upto 90 mtrs. =29 Nos.**
- **Nos Of Flats. = 24806 Nos.**
- **Population @ 5 persons = 124030 Nos**
- **30% Floating Population. = 37209 Nos.**
- **Total Population = 161239 Nos.**

DIRECTORATE, MAHARASHTRA FIRE SERVICES * GOVERNMENT OF MAHARASHTRA * सत्यमेव जयते

43.02.14

DETAILS OF SECTOR A.
PLOT AREA = 2,57,249.59 SQ.M.

S.No.	Description	SECTOR A			
		Types	Nos	BUA IN SQM	MAX / MIN HT IN MTRS.
1	RESIDENTIAL BLDGS.	6	75	523003.04	84.55 /46.85
2	SHOPS ATTACHED TO RESIDENTIAL BLDGS.	8	8	5263.83	4.95
3	PARKING BUILDING.	1	1	92466.00	28.90
4	SCHOOL BUILDING.	1	1	4233.79	18.50
5	TOTAL		85	624966.66	84.55 / 18.50

DETAILS OF SECTOR B.
PLOT AREA = 3,05,200.00 SQ.M.

S.No.	Description	SECTOR B			
		Types	Nos	BUA IN SQM	MAX / MIN HT IN MTRS.
1	RESIDENTIAL BLDGS.	6	59	410694.49	84.55 /46.85
2	SHOPS ATTACHED TO RESIDENTIAL BLDGS.	4	4	6578.95	4.95
3	PARKING BUILDING.	1	1	92466.00	28.90
4	PARKING BUILDING.	1	1	65703.00	28.90
5	SCHOOL BUILDING	1	1	9960.39	26.93
6	CIVIC ADMINISTRATIVE BUILDING	1	1	2902.60	15.60
7	POLICE STATION	1	1	1836.52	15.60
8	LIBRARY	1	1	5794.10	20.60
9	ARTS CENTRE	1	1	3582.84	7.80

10	EXHIBITION HALL	1	1	4114.89	7.80
11	CLUB HOUSE.	2	2	16373.18	23.10/19.35
12	FIRE STATION	1	1	494.00	6.15
13	TOTAL		74	620500.96	84.55 / 6.15

DETAILS OF SECTOR C.
PLOT AREA = 3,46,158.22 SQ.M.

S.No.	Description	SECTOR C			
		Types	Nos	BUA IN SQM	MAX / MIN HT IN MTRS.
1	RESIDENTIAL BLDGS.	8	65	545789.53	84.55 /46.85
2	SHOPS ATTACHED TO RESIDENTIAL BLDGS.	4	4	4483.81	4.95
3	PARKING BUILDING.	1	1	92466.00	28.90
4	PARKING BUILDING.	1	1	65703.00	28.90
5	COMMERCIAL BUILDINGS.	2	8	189111.15	36.60
6	SCHOOL BUILDING	1	1	9960.39	26.93
7	CLUB HOUSE.	1	1	3845.98	19.35
8	TOTAL		80	911359.86	84.55 / 19.35

DETAILS OF SECTOR D.
PLOT AREA = 2,00,617.19 SQ.M.

S.No.	Description	SECTOR D			
		Types	Nos	BUA IN SQM	MAX / MIN HT IN MTRS.
1	RESIDENTIAL BLDGS.	3	33	259784.80	84.55 /46.85
2	SHOPS ATTACHED TO RESIDENTIAL BLDGS.	2	2	1113.30	4.95
3	COMMERCIAL BUILDINGS.	1	1	17254.80	36.60

4	MEDICAL BUILDING	1	1	2775.52	26.85
5	TOTAL		39	259784.80	84.55/26.85

ABSTRACT

SR. NO.	BUILDINGS	TOTAL BUILT UP AREA IN SQ. MTRS
1 A	RESIDENTIAL BLDGS	17,39,271.86
1 B	SHOPPING BLDGS	17,439.89
2	COMMERCIAL BLDGS	2,06,365.96
3	PARKING BUILDING	4,08,804
4	SCHOOL BLDG	24154.57
5	HOSPITAL BLDG	2,775.52
6	ADMINISTARTIVE BLDG	2,902.60
7	POLICE STATION	1,836.52
8	LIBRARY	5,794.10
9	ARTS CENTRE	3,582.84
10	EXHIBITION HALL	4,114.89
11	CLUB HOUSE	20219.16
12	FIRE STATION	494.00
	TOTAL	24,37,755.91

The details of the Area Statement is given in Annexure A, the details of the Drawing Sheet Statement are given in Annexure B. Observation, if any are given in Annexure C. The Recommendation of Fire Fighting System and Prevention is given Schedule I

This office has scrutinized the proposed Master Layout plan submitted by you and recommendations with respect to the Fire & Life Safety Measures for the proposed township layout are enclosed herewith as a detailed separate report for favour of information and further needful please.The proposal is scrutinized on the basis Part 3 and Part 4 of National Building Code 2005. After the scrutiny of the said proposal Following recommendation are made as Under:-

Considering high rise buildings, you have to develop a well equipped fire station with required plant and machinery to cater the need of height rise buildings as per the recommendations of this office. Minimum 4000 Sq Mtrs of land should be reserved for fire station with open space for parade ground which is shown in plan. The facility should be provided with Turn Table Ladder (TTL) of 55 Mtrs in addition to conventional fire engine.

This N.O.C. is valid subject to fulfillment of the following conditions: - Provisions of Maharashtra Fire Prevention and Life Safety Measures Act, 2006

1. Under **Section 3** of **"Maharashtra Fire Prevention and Life Safety Measures Act, 2006"** (hereinafter referred to as "said Act"). The applicant (developer, owner, occupier by whatever name called) shall comply with all the Fire and Life Safety measures adhering to National Building Code of India, 2005 and as amended from time to time failing which it shall be treated as a violation of the said Act.
2. As per the provision as **under :- 10** of the said Act. No person other than the License Agency shall carry out the work of providing Fire Prevention and Life Safety Measures or performing such other related activities required to be carried out in any place or building or part thereof provided that,
   A) If the Director, MFS is satisfied that, for any reason, to be recorded in writing, the owner or occupier is not able to carry out the fire prevention and fire safety measures in any such place or building or part thereof through a Licensed Agency, he may authorize any person or persons he thinks fit to carry out such work, and any work carried out by such authorized person or persons shall be deemed to be carried out by a Licensed Agency.
   B) No Licensed Agency or any other person claiming to be such Licensed Agency shall give a certificate under **sub-section (3) of section 3** regarding the compliance of the fire prevention and life safety measures or maintenance thereof in good repair and efficient condition, without there being actual such compliance or maintenance.
   C) The names of the License Agencies approved by Directorate of Maharashtra is available in our website www.mahafireservice.gov.in
3. Under **Section 11** of the said Act, the fire service fees shall be assessed and the same shall be payable after serving the notice to that effect or prior to issue of the building completion certificate or occupancy certificate whichever is earlier.
4. Though certain conditions are stipulated from the said Act and the National Building Code of India, it is obligatory on part of the applicant that is developer, builder, occupier, owner, tenant, by what so ever named called to abide with the provisions of the said Act failing which it shall be actionable under the provisions of said act.
5. The plans of the building should be approved by The Concern Competent Authority.
6. The Occupancy Completion certificate should be obtained from The Competent Authority. **The O.C. shall be issued subject to "Final No-Objection Certificate" from this Department.**

7. Proper roads in the premises should be provided for easy mobility of the Fire Brigade Appliance & the roads should be capable to hold weight of fire appliances i.e. **45 tons. The width of the internal road shall not be less than 6.0 Mtrs with turning circle radius not less than 9.0 Mtrs. For building up to 50 Mtr building height & building above 50 Mtrs clear 9.00 Mtr Should be provided**
8. All portable fire fighting equipments installed at various locations as per local hazard such as Co2-DCP, Foam, Fire buckets & it must be strictly confirming to relevant IS specification.
9. All the fire fighting equipments shall be well maintained and should be easily accessible in case of emergency.
10. Emergency Telephone numbers like **"Police", "Fire Brigade", "Hospital", "Doctors",** and **"Responsible persons of the complex"** should be displayed in security cabin & at other strategic locations.
11. It shall be ensured that security staff & every employee of the complex are trained in handling fire fighting equipment & fire fighting.
12. Cautionary boards such as **"DANGER", "NO SMOKING", "EXIT", "FIRE ESCAPE", "EXTINGUISHER",** etc. should be displayed on the strategic location to guide the occupants in case of emergency. The signs should be of florescent type and should glow in darkness.
13. **In future if the said firm intends to go for any expansion, alteration, modification of any building an approval of this department must be obtained before commencing proposed construction.**
14. **The height & other clearances / approvals must be obtained from local "Civil Aviation Department ".**
15. **The Director, Maharashtra Fire Service reserves all right to modify the fire safety recommendations and it shall be responsibility of company authorities to maintained close liaison with fire department.**
16. **Well equipped fire control room shall be provided on the ground floor of the building & a qualified Fire Officer who have completed Sub-Officer & Fire Prevention Course from "Maharashtra Fire Service Academy shall be employed to maintain the all fire prevention & protection arrangements provided to various buildings in the campus.**

In addition to the above, all provision under the National Building Code of India-2005 shall be strictly adhered, also if any change in activity or Proposed expansion or Subletting of Plot, NOC from this department is essential.

This is a **"Provisional No-Objection Certificate"** which shall be treated valid for the period of one year from the date of issue. After compliance with above mentioned recommendations / conditions, inspection of the fire prevention & protection systems provided by you will be carried out by this department & after satisfactory performance of the system **"Final No-Objection Certificate"** will be issued.

As per Maharashtra Fire Prevention and Life Safety Measures Act, 2006, Section 25-Annexure-Part III, M/s. Lodha Dwellers Pvt Ltd has paid Fire Protection Fund Fees amounting to Rs. 3,10,84,950/- (Rs. Three Crore Ten lacks Eighty Four Thousand Nine hundred Fifty Only).Vide Receipt no 0941902 dated on 25.03.14,(In Reference to UTR noKKBKH14084817436)

The undersigned reserves right to amend any additional recommendations deemed fit during the final inspection due to the statutory provisions amended from time to time and in the interest of the protection of the company.

Thanking you.

Yours faithfully

(M.V. Deshmukh)
Director
Maharashtra Fire Services.

D.A. As Above.

Copy Submitted to
1) The Principal Secretary, UDD – I for favour of information please.
2) The Principal Secretary, UDD – II for favour of information please.

Copy f.w.c.'s to Collector, Thane for information please.

Annexure A

The Area Details of the Residential Building

DETAILS OF SECTOR A.

PLOT AREA = 2,57,249.59 SQ.M.

S.No.	Description	SECTOR A			
		Types	Nos	BUA IN SQM	MAX / MIN HT IN MTRS.
1	RESIDENTIAL BLDGS.	6	75	523003.04	84.55 /46.85
2	SHOPS ATTACHED TO RESIDENTIAL BLDGS.	8	8	5263.83	4.95
3	PARKING BUILDING.	1	1	92466.00	28.90
4	SCHOOL BUILDING.	1	1	4233.79	18.50
5	TOTAL		85	624966.66	84.55 / 18.50

DETAILS OF SECTOR B.

PLOT AREA = 3,05,200.00 SQ.M.

S.No.	Description	SECTOR B			
		Types	Nos	BUA IN SQM	MAX / MIN HT IN MTRS.
1	RESIDENTIAL BLDGS.	6	59	410694.49	84.55 /46.85
2	SHOPS ATTACHED TO RESIDENTIAL BLDGS.	4	4	6578.95	4.95
3	PARKING BUILDING.	1	1	92466.00	28.90
4	PARKING BUILDING.	1	1	65703.00	28.90
5	SCHOOL BUILDING	1	1	9960.39	26.93
6	CIVIC ADMINISTRATIVE BUILDING	1	1	2902.60	15.60

DIRECTORATE, MAHARASHTRA ★ GOVERNMENT OF MAHARASHTRA ★ सत्यमेव जयते

7	POLICE STATION	1	1	1836.52	15.60
8	LIBRARY	1	1	5794.10	20.60
9	ARTS CENTRE	1	1	3582.84	7.80
10	EXHIBITION HALL	1	1	4114.89	7.80
11	CLUB HOUSE.	2	2	16373.18	23.10/19.35
12	FIRE STATION	1	1	494.00	6.15
13	TOTAL		74	620500.96	84.55 / 6.15

DETAILS OF SECTOR C.
PLOT AREA = 3,46,158.22 SQ.M.

S.No.	Description	SECTOR C			
		Types	Nos	BUA IN SQM	MAX / MIN HT IN MTRS.
1	RESIDENTIAL BLDGS.	8	65	545789.53	84.55 /46.85
2	SHOPS ATTACHED TO RESIDENTIAL BLDGS.	4	4	4483.81	4.95
3	PARKING BUILDING.	1	1	92466.00	28.90
4	PARKING BUILDING.	1	1	65703.00	28.90
5	COMMERCIAL BUILDINGS.	2	8	189111.15	36.60
6	SCHOOL BUILDING	1	1	9960.39	26.93
7	CLUB HOUSE.	1	1	3845.98	19.35
8	TOTAL		80	911359.86	84.55 / 19.35

DETAILS OF SECTOR D.
PLOT AREA = 2,00,617.19 SQ.M.

S.No.	Description	SECTOR D			
		Types	Nos	BUA IN SQM	MAX / MIN HT IN MTRS.
1	RESIDENTIAL BLDGS.	3	33	259784.80	84.55 /46.85

DIRECTORATE ... GOVERNMENT OF ...

2	SHOPS ATTACHED TO RESIDENTIAL BLDGS.	2	2	1113.30	4.95
3	COMMERCIAL BUILDINGS.	1	1	17254.80	36.60
4	MEDICAL BUILDING	1	1	2775.52	26.85
5	TOTAL		39	259784.80	84.55/26.85

The Built up area Details of buildings are as follows

RESIDENTIAL BUILDINGS

BUILDING TYPE A1				
S.NO.	FLOORS	Built-up AREA SQ.M.	OCCUPANT LOAD PERSON PER FLOOR	HEIGHT IN MT.
1	GR	343.83		46.85
2	1	377.13		
3	2	376.16		
4	3	377.13		
5	4	376.16		
6	5	377.13		
7	6	376.16		
8	7	377.13		
9	8	376.84		
10	9	377.13		
11	10	376.16		
12	11	377.13		
13	12	376.16		
14	13	377.74		
15	14	376.16		
16	15	377.13		
17	TOTAL	5995.22		
18	TOTAL NOS OF BUILDINGS = 57 X 5995.22			
			= 3,41,730.50 SQ.M. ------(A)	

BUILDING TYPE A2				
S.NO.	FLOOR	TOTAL AREA SQ.M.	OCCUPANT LOAD PERSON PER FLOOR	HEIGHT IN MT.
1	GR	300.02		46.85

DIRECTORATE, MAHARASHTRA * GOVERNMENT OF MAHARASHTRA

2	1	318.20		
3	2	318.78		
4	3	318.20		
5	4	318.78		
6	5	318.20		
7	6	318.78		
8	7	318.20		
9	8	323.07		
10	9	318.20		
11	10	318.78		
12	11	318.20		
13	12	318.78		
14	13	322.81		
15	14	318.78		
16	15	318.20	25	
17	TOTAL	5085.98	407	
18	TOTAL NOS OF BUILDINGS = 40 X 5081.21			
			= 2,03,248.40 SQ.M.-------- (B)	

BUILDING TYPE B1				
S.NO.	FLOOR	TOTAL AREA SQ.M.	OCCUPANT LOAD PERSON PER FLOOR	HEIGHT IN MT.
1	GR	461.93	37	46.85
2	1	493.04	39	
3	2	489.18	39	
4	3	493.04	39	
5	4	489.18	39	
6	5	493.04	39	
7	6	489.18	39	
8	7	493.04	39	
9	8	490.89	39	
10	9	493.04	39	
11	10	489.18	39	
12	11	493.04	39	
13	12	489.18	39	
14	13	494.49	40	
15	14	489.18	39	
16	15	493.04	39	
17	TOTAL	7833.67	623	
18	TOTAL NOS OF BUILDINGS = 21 X 7833.67			
			= 1,64,507.07 SQ.M.--------(C)	

BUILDING TYPE B2				
S.NO.	FLOOR	TOTAL AREA SQ.M.	OCCUPANT LOAD PERSON PER FLOOR	HEIGHT IN MT.
1	GR	374.98	30	46.85
2	1	407.54	33	
3	2	421.72	34	
4	3	407.54	33	
5	4	421.72	34	
6	5	407.54	33	
7	6	421.72	34	
8	7	407.54	33	
9	8	424.27	34	
10	9	407.54	33	
11	10	421.72	34	
12	11	407.54	33	
13	12	421.72	34	
14	13	410.75	33	
15	14	421.72	34	
16	15	407.54	33	
17	TOTAL	6593.10	532	
18	TOTAL NOS OF BUILDINGS = 19 X 6593.10			
			= 1,25,268.90 SQ.M. ------- (D)	

BUILDING TYPE B3				
S.NO.	FLOOR	TOTAL AREA SQ.M.	OCCUPANT LOAD PERSON PER FLOOR	HEIGHT IN MT.
1	GR	454.91	36	46.85
2	1	484.85	39	
3	2	481.52	39	
4	3	484.85	39	
5	4	481.52	39	
6	5	484.85	39	
7	6	481.52	39	
8	7	484.85	39	
9	8	482.62	39	
10	9	484.85	39	
11	10	481.52	39	
12	11	484.85	39	
13	12	481.52	39	
14	13	486.33	39	
15	14	481.52	39	
16	15	484.85	39	
17	TOTAL	7706.93	621	

DIRECTORATE, MAHARASHTRA
GOVERNMENT OF MAHARASHTRA

18	TOTAL NOS OF BUILDINGS = 35 X 7706.93		
			= 2,69,742.55 SQ.M.---------(E)

BUILDING TYPE C				
S.NO.	FLOOR	TOTAL AREA SQ.M.	OCCUPANT LOAD PERSON PER FLOOR	HEIGHT IN MT.
1	GR	470.88	38	46.85
2	1	470.88	38	
3	2	470.88	38	
4	3	470.88	38	
5	4	470.88	38	
6	5	470.88	38	
7	6	470.88	38	
8	7	470.88	38	
9	8	403.78	32	
10	9	470.88	38	
11	10	470.88	38	
12	11	470.88	38	
13	12	470.88	38	
14	13	430.78	34	
15	14	470.88	38	
16	15	470.88	38	
17	TOTAL	7426.88	598	
18	TOTAL NOS OF BUILDINGS = 31 X 7534.37			
			= 2,33,565.47 SQ.M.---------(F)	

BUILDING TYPE D1				
S.NO.	FLOOR	TOTAL AREA SQ.M.	OCCUPANT LOAD PERSON PER FLOOR	HEIGHT IN MT.
1	GR	461.93	37	84.55
2	1	493.04	39	
3	2	489.18	39	
4	3	493.04	39	
5	4	489.18	39	
6	5	493.04	39	
7	6	489.18	39	
8	7	493.04	39	
9	8	490.92	39	
10	9	493.04	39	
11	10	489.18	39	
12	11	493.04	39	
13	12	489.18	39	

14	13	494.46	40	
15	14	489.18	39	
16	15	493.04	39	
17	16	489.18	39	
18	17	493.04	39	
19	18	490.92	39	
20	19	493.04	39	
21	20	489.18	39	
22	21	493.04	39	
23	22	489.18	39	
24	23	494.46	40	
25	24	489.18	39	
26	25	493.04	39	
27	26	489.18	39	
28	27	493.04	39	
29	28	489.18	39	
30	TOTAL	14219.33	626	
31	TOTAL NOS OF BUILDINGS = 12 X 14219.33			
			= 1,70,678.28 SQ.M.------(G)	

BUILDING TYPE D2				
S.NO.	FLOOR	TOTAL AREA SQ.M.	OCCUPANT LOAD PERSON PER FLOOR	HEIGHT IN MT.
1	GR	374.98	30	84.55
2	1	407.54	33	
3	2	421.72	34	
4	3	407.54	33	
5	4	421.72	34	
6	5	407.54	33	
7	6	421.72	34	
8	7	407.54	33	
9	8	424.27	34	
10	9	407.54	33	
11	10	421.72	34	
12	11	407.54	33	
13	12	421.72	34	
14	13	410.75	33	
15	14	421.72	34	
16	15	407.54	33	
17	16	421.72	34	
18	17	407.54	33	
19	18	424.27	34	
20	19	407.54	33	

DIRECTORATE, MAHARASHTRA ★ GOVERNMENT OF MAHARASHTRA ★ सत्यमेव जयते

21	20	421.72	34	
22	21	407.54	33	
23	22	421.72	34	
24	23	410.75	33	
25	24	421.72	34	
26	25	407.54	33	
27	26	421.72	34	
28	27	407.54	33	
29	28	421.72	34	
30	TOTAL	11996.14	536	
31	TOTAL NOS OF BUILDINGS = 4 X 11996.14			
			= 47,984.56 SQ.M.---------(H)	

BUILDING TYPE D3				
S.NO.	FLOOR	TOTAL AREA SQ.M.	OCCUPANT LOAD PERSON PER FLOOR	HEIGHT IN MT.
1	GR	454.91	36	84.55
2	1	486.08	39	
3	2	482.75	39	
4	3	486.08	39	
5	4	482.75	39	
6	5	486.08	39	
7	6	482.75	39	
8	7	486.08	39	
9	8	488.43	39	
10	9	486.08	39	
11	10	482.75	39	
12	11	486.08	39	
13	12	482.75	39	
14	13	492.14	39	
15	14	482.75	39	
16	15	486.08	39	
17	16	482.75	39	
18	17	486.08	39	
19	18	488.43	39	
20	19	486.08	39	
21	20	482.75	39	
22	21	486.08	39	
23	22	482.75	39	
24	23	492.14	39	
25	24	482.75	39	
26	25	486.08	39	
27	26	482.75	39	
28	27	486.08	39	
29	28	482.75	39	

43.02.14

30	TOTAL	14042.01	624	
31	TOTAL NOS OF BUILDINGS = 13 X 14042.01			
			= 1,82,546.13 SQ.M.--------(I)	

SHOPS ATTACHED TO RESIDENTIAL BUILDINGS

SHOPS CFO AREA CALCULATIONS			DESCRIPTION
S.NO.	FLOOR	BUA SQ.M.	
1	SHOP 1	556.65	ATTACHED TO CLUSTER 1.05 WING D(B3 TYPE) & WING E (B1 TYPE)
2	SHOP 2	630.83	ATTACHED TO CLUSTER 1.07 WING E(A1 TYPE) & WING F (A1 TYPE)
3	SHOP 3	630.83	ATTACHED TO CLUSTER 1.09 WING E(A1 TYPE) & WING F (A1 TYPE)
4	SHOP 4	840.22	ATTACHED TO CLUSTER 1.12 WING D(B3 TYPE) & WING E (B1 TYPE)
5	SHOP 5	786.96	ATTACHED TO CLUSTER 1.13 WING D(B1 TYPE) & WING E (B3 TYPE)
6	SHOP 6	786.96	ATTACHED TO CLUSTER 1.13 WING D(B3 TYPE) & WING E (B1 TYPE)
7	SHOP 7	630.83	ATTACHED TO CLUSTER 1.08 WING A(A1 TYPE) & WING E (A1 TYPE)
8	SHOP 8	400.55	ATTACHED TO CLUSTER 1.11 WING A(B3 TYPE)
9	SHOP 9	1786.22	ATTACHED TO CLUSTER 2.08 WING A(A1 TYPE) & WING N (A1 TYPE)
10	SHOP 10	1949.25	ATTACHED TO CLUSTER 2.10 WING A(A1 TYPE) & WING O (A1 TYPE)
11	SHOP 11	933.56	ATTACHED TO CLUSTER 2.12 WING A(A1 TYPE) & WING P (A1 TYPE)
12	SHOP 12	1909.92	ATTACHED TO CLUSTER 2.11 WING C(B3 TYPE) & WING D (B2 TYPE)
13	SHOP 13	1880.65	ATTACHED TO CLUSTER 3.02 WING C(A1 TYPE) & WING D (A1 TYPE)

DIRECTORATE, MAHARASHTRA
GOVERNMENT OF MAHARASHTRA

14	SHOP 14	753.96	ATTACHED TO CLUSTER 3.05 WING D(A2 TYPE) & WING E (A2 TYPE)
15	SHOP 15	1067.57	ATTACHED TO CLUSTER 3.03 WING A(A1 TYPE) & WING P (A1 TYPE)
16	SHOP 16	781.63	ATTACHED TO CLUSTER 3.04 WING A(A1 TYPE)
17	SHOP 17	556.65	IN SECTOR D
18	SHOP 18	556.65	IN SECTOR D
19	TOTAL	17439.89	

COMMERCIAL BLDG C1				
S.NO.	FLOOR	TOTAL AREA SQ.M.	OCCUPANT LOAD PERSON PER FLOOR	HEIGHT IN MT.
1	GR	4754.58	380	36.60
2	1	4754.58	380	
3	2	4754.58	380	
4	3	4754.58	380	
5	4	4754.58	380	
6	5	4754.58	380	
7	6	4754.58	380	
8	7	4754.58	380	
9	8	4754.58	380	
10	TOTAL	42791.18	3420	
11	TOTAL NOS OF BUILDINGS = 2 X 42791.18			
		= 85,582.36 SQ.M. ----------(J)		

COMMERCIAL BLDG C2				
S.NO.	FLOOR	TOTAL AREA SQ.M.	OCCUPANT LOAD PERSON PER FLOOR	HEIGHT IN MT.
1	GR	1917.20	153	36.60
2	1	1917.20	153	
3	2	1917.20	153	
4	3	1917.20	153	
5	4	1917.20	153	
6	5	1917.20	153	
7	6	1917.20	153	
8	7	1917.20	153	
9	8	1917.20	153	
10	TOTAL	17254.80	1377	
11	TOTAL NOS OF BUILDINGS = 7 X 17254.80			
		=1,20,783.60 SQ.M.----------(K)		

43.02.14

PARKING BUILDING P1		
CFO AREA CALCULATIONS		
S.NO.	FLOOR	BUA SQ.M.
1	GR	8406.00
2	1ST	8406.00
3	2ND	8406.00
4	3RD	8406.00
5	4th	8406.00
6	5th	8406.00
7	6th	8406.00
8	7th	8406.00
9	8th	8406.00
10	9th	8406.00
11	10th	8406.00
12	TOTAL	92466.00
Total Nos Of Bldg = 3 Nos. Total Area = 3 x 92466 = 2,77,398.00 ----------(L)		

PARKING BUILDING P2		
CFO AREA CALCULATIONS		
S.NO.	FLOOR	BUA SQ.M.
1	GR	5973.00
2	1ST	5973.00
3	2ND	5973.00
4	3RD	5973.00
5	4th	5973.00
6	5th	5973.00
7	6th	5973.00
8	7th	5973.00
9	8th	5973.00
10	9th	5973.00
11	10th	5973.00
12	TOTAL	65703.00
Total Nos Of Bldg = 2 Nos. Total Area = 2 x 65703 = 1,31,406.00 ----------(M)		

DIRECTORATE, MAHARASHTRA ★ GOVERNMENT OF MAHARASHTRA ★

SCHOOL BLDG - 1		
CFO AREA CALCULATIONS		
S.NO.	FLOOR	BUA
		SQ.M.
1	GR	683.04
2	1	713.17
3	2	945.86
4	3	945.86
5	4	945.86
6	TOTAL	4233.79 ----- (N)

SCHOOL BLDG - 2 & 3		
CFO AREA CALCULATIONS		
S.NO.	FLOOR	BUA
		SQ.M.
1	GR	1347.88
2	1	1260.63
3	2	1470.38
4	3	1470.38
5	4	1470.38
6	5	1470.38
7	6	1470.38
6	TOTAL	9960.40
Nos Of Bldgs = 2 nos. Total Area = 9960.40 x 2 = 19,920.80 ----(O)		

MEDICAL		
CFO AREA CALCULATIONS		
S.NO.	FLOOR	BUA
		SQ.M.
1	GR	413.32
2	1	393.70
3	2	393.70
4	3	393.70
5	4	393.70
6	5	393.70
7	6	393.70
6	TOTAL	2775.52 ----------(P)

43.02.14

CIVIC ADMINISTRATIVE BLDG		
CFO AREA CALCULATIONS		
S.NO.	FLOOR	BUA
		SQ.M.
1	GR	725.65
2	1	725.65
3	2	725.65
4	3	725.65
5	TOTAL	2902.60 ----------(Q)

POLICE STATION		
CFO AREA CALCULATIONS		
S.NO.	FLOOR	BUA
		SQ.M.
1	GR	459.13
2	1	459.13
3	2	459.13
4	3	459.13
5	TOTAL	1836.52 ----------(R)

LIBRARY		
CFO AREA CALCULATIONS		
S.NO.	FLOOR	BUA
		SQ.M.
1	GR	1158.82
2	1	1158.82
3	2	1158.82
4	3	1158.82
5	4	1158.82
6	TOTAL	5794.10 ----------(S)

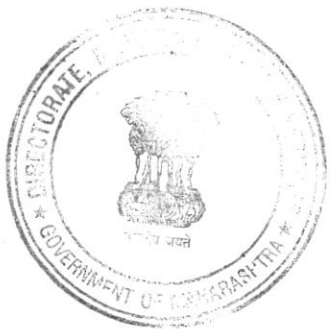
ARTS CENTRE		
CFO AREA CALCULATIONS		
S.NO.	FLOOR	BUA
		SQ.M.
1	GR	2384.27
2	1	1198.57
3	TOTAL	3582.84 ----------(T)

DIRECTORATE OF MAHARASHTRA STATE ... GOVERNMENT OF MAHARASHTRA

EXHIBITION HALL		
CFO AREA CALCULATIONS		
S.NO.	FLOOR	BUA
		SQ.M.
1	GR	2566.46
2	1	1548.43
3	TOTAL	4114.89 ----------(U)

CLUB HOUSE 1		
CFO AREA CALCULATIONS		
S.NO.	FLOOR	BUA
		SQ.M.
1	GR	2101.20
2	1	2085.20
3	2	2085.20
4	3	2085.20
5	4	2085.20
6	5	2085.20
7	TOTAL	12527.20 ----------(V)

CLUB HOUSE 2 & 3		
CFO AREA CALCULATIONS		
S.NO.	FLOOR	BUA
		SQ.M.
1	GR	767.58
2	1	769.60
3	2	769.60
4	3	769.60
5	4	769.60
6	TOTAL	3845.98
Nos Of Club House = 2 Nos. Total Area = 2 x 3845.98 = 7691.96 --------(W)		



FIRE STATION (Plot Area = 4525 Sq. Mtrs)		
CFO AREA CALCULATIONS		
S.NO.	FLOOR	BUA SQ.M.
1	GR	247.00
2	1	247.00
3	TOTAL	494.00 ------- (X)

ABSTRACT

SR. NO.	BUILDINGS	TOTAL BUILT UP AREA IN SQ. MTRS
1 A	RESIDENTIAL BLDGS	17,39,271.86
1 B	SHOPPING BLDGS	17,439.89
2	COMMERCIAL BLDGS	2,06,365.96
3	PARKING BUILDING	4,08,804
4	SCHOOL BLDG	24154.57
5	HOSPITAL BLDG	2,775.52
6	ADMINISTARTIVE BLDG	2,902.60
7	POLICE STATION	1,836.52
8	LIBRARY	5,794.10
9	ARTS CENTRE	3,582.84
10	EXHIBITION HALL	4,114.89
11	CLUB HOUSE	20219.16
12	FIRE STATION	494.00
	TOTAL	24,37,755.91

DIRECTORATE MAHARASHTRA FIRE SERVICE GOVERNMENT OF MAHARASHTRA सत्यमेव जयते

Annexure B

The Details of Drawings of Residential Building

Details of Drawings

LIST OF DRAWINGS			
Sr.No	Bldg Type	Discription	Sheet No
1	Layout	Layout plan of Palava city	1
2	Layout	Layout plan of Palava city-Sector A	2
3	Layout	Layout plan of Palava city-Sector B	3
4	Layout	Layout plan of Palava city-Sector C	4
5	Layout	Layout plan of Palava city-Sector D	5
6	A1	Ground, Typical & Terrace floor plan, BUA Summary & Calculation	6
7	A1	8th & 13th Refuge floor plan,Parking & Carpet area Statement, BUA calculation , Door Window Schedule	7
8	A1	8th & 13th Refuge floor plan,Parking & Carpet area Statement, BUA calculation.	8
9	A2	Ground floor plan, Typical Odd & Even floor plan,Terrace floor plan, Carpet area Calculation	9
10	A2	Section AA & BB , Terrace area calculation,Parking Statement	10
11	A2	8th & 13th Refuge floor plan,Parking & Carpet area Statement, BUA calculation.	11
12	A2	8th & 13th Refuge floor plan,Parking & Carpet area Statement, BUA calculation.	12
13	B1	Ground floor plan, Terrace floor plan, BUA Summary & Calculation Carpet area statement, Terrace area calculation	13
14	B1	Ground Floor plan,& Area line Diagram ,Section AA & BB	14
15	B1	Odd & Even floor plan, BUA Calculation, Parking Statement & Carpet area Statement	15
16	B1	8th & 13th Refuge floor plan, Carpet area Statement, BUA calculation.	16
17	B1	8th & 13th Refuge floor plan, Carpet area Statement, BUA calculation.	17
18	B2	Ground floor plan, Typical Odd & Even floor plan , BUA Calculation, Terrace floor plan,	18
19	B2	8th & 13th Refuge floor plan,Parking & Carpet area Statement, BUA calculation.	19
20	B2	8th & 13th Refuge floor plan,Parking & Carpet area Statement, BUA calculation.	20

DIRECTORATE, MAHARASHTRA FIRE SERVICES * GOVERNMENT OF MAHARASHTRA * सत्यमेव जयते

43.02.14

21	B2	Section AA	21
22	B3	Ground floor plan, Typical Odd & Even floor plan , BUA Calculation, Terrace floor plan, Carpet & parking statement	22
23	B3	Odd & Even floor plan, BUA Calculation, Section AA, Carpet area Statement	23
24	B3	8th & 13th Refuge floor plan, Carpet area Statement, BUA calculation.	24
25	B3	8th & 13th Refuge floor plan, Carpet area Statement, BUA calculation.	25
26	C	Ground, Typical & Terrace floor plan, BUA Summary & Calculation, Carpet Statement	26
27	C	8th & 13th Refuge floor plan,Section AA, Carpet area Statement, BUA calculation.	27
28	D1	Ground floor plan, BUA Calculation,Carpet Statement,BUA Summary	28
29	D1	Odd & Even floor plan, BUA Calculation, Carpet area Statement	29
30	D1	8th & 13th Refuge floor plan, Carpet area Statement, BUA calculation.	30
31	D1	Section AA & BB	31
32	D2	Ground floor plan, Typical Odd & Even floor plan , BUA Calculation, Terrace floor plan.	32
33	D2	8th & 13th Refuge floor plan, Carpet area Statement, BUA calculation,Carpet area Statement.	33
34	D2	8th & 13th Refuge floor plan, Carpet area Statement, BUA calculation,Parking Statement.	34
35	D2	Section AA	35
36	D3	Odd & Even floor plan, BUA Calculation, Carpet area Statement, Section AA	36
37	D3	Ground floor plan, Terrace floor plan , BUA Calculation, Carpet Statement,Parking Statement.	37
38	D3	8th & 13th Refuge floor plan, Carpet area Statement, BUA calculation,	38
39	D3	Section AA	39
40	C1	Ground floor plan,1 to 5 & 7 & 8 floor plan , 6th Floor plan Refuge,BUA & CFO Calculation, Terrace floor plan,Section BB, Door Window Schedule	40
41	C2	Ground floor plan,1 to 5 & 7 & 8 floor plan , 6th Floor plan Refuge,BUA & CFO Calculation, Terrace floor plan,Section AA, Door Window Schedule	41
AMENITY BUILINGS			
42	School Sector A	Ground floor plan,1 st floor plan ,BUA Diagram Calculation,Parking Statement.Door Window Schedule,Parking Statement,Block plan,Location Plan,Sanitation Requirement	1

43.02.14

43	School Sector A	3rd floor plan Terrace Plan,BUA Diagram Calculation,Section AA , BB,CC,DD	2
44	School Sector B &C	Ground floor plan,1 st to 5th floor plan ,BUA Calculation,Section BB,Door Window Schedule,Block plan,Location Plan,Sanitation Requirement,Parking Statement.	3
45	School Sector B &C	Section AA ,South side Elevation.	4
46	Shop 1 to 8	Ground floor plan ,BUA Diagram & Calculation,Section AA ,Block plan,Location Plan.	5
47	Shop 9 to 12	Ground floor plan ,BUA Diagram & Calculation,Section AA ,Block plan,Location Plan.	6
48	Shop 13 to 18	Ground floor plan ,BUA Diagram & Calculation,Section AA ,Block plan,Location Plan.	7
49	Club House Sector B	Ground floor plan,1 st to 4th floor plan ,BUA Diagram Calculation,Parking Statement.Section AA & BB ,Door Window Schedule,Parking Statement,Block plan,Location Plan.	8
50	Club House Sector B & C	Ground floor plan,1 st to 5th floor plan ,BUA Diagram Calculation,Parking Statement.Section AA & BB ,Door Window Schedule,Parking Statement,Block plan,Location Plan.	9
51	Police Station	Ground floor plan,1 st to 3rd floor plan ,Terrace floor plan,BUA Calculation,Section AA,Door Window Schedule,Block plan, Location Plan	10
52	Civic Admin Building	Ground floor plan,1 st to3rd floor plan ,BUA Diagram Calculation,Parking Statement.Section AA,Door Window Schedule,Parking Statement,Block plan,Location Plan.	11
53	Library	Ground floor plan,1 st to 5th floor plan ,BUA Diagram Calculation,Parking Statement.Section AA ,Door Window Schedule,Parking Statement,Block plan,Location Plan.Sanitation Requirement	12
54	Medical	Ground floor plan,1 st to 6th floor plan ,BUA Diagram Calculation,Parking Statement.Section AA BB ,Door Window Schedule,Parking Statement,Block plan,Location Plan.Sanitation Requirement	13
55	PERFORMING ARTS CENTRE	Ground floor plan,1 st to 4th floor plan ,BUA Diagram Calculation, Block plan, Location Plan, Section AA, Sanitation Requirement, BUA summary	14
56	EXHIBITION CENTRE	Ground floor plan,1 st to 4th floor plan ,BUA Diagram Calculation, Sanitation Requirement, Parking Statement.	15
57	Fire	Ground floor plan,1 st floor plan ,Terrace floor plan, BUA Calculation, Section AA,Door Window Schedule, Block plan, Location Plan	16
58	P1- Parking	Ground floor plan,1 st to 10 floor plan ,11 floor plan ,Section AA,Door Window Schedule, Construction Area Statement, Parking Details	17
59	P2-Parking	Ground floor plan,1 st to 10 floor plan ,11 floor plan ,Section AA, Door Window Schedule, Construction Area Statement, Parking Details	18

DIRECTORATE OF GOVERNMENT OF MAHARASHTRA

Schedule I
PART - 1

GENERAL REQUIREMENTS FOR FIRE SAFETY & LIFE SAFETY

As per the National Building Code 2005 and other IS and various Acts and Rules. The following recommendations are given for better life and fire safety of occupants and general safety of the buildings. :

1) Increased Structural Integrity:

The standards for estimating the load effects of potential hazards (e.g., progressive collapse, wind) and the design of structural systems to mitigate the effects of those hazards should be improved to enhance structural integrity. This aspect should be taken in to consider while finalizing the design and construction details of all high rise building in the complex.

The recommendations are:

- Relevant standards should be adopted to prevent progressive collapse;
- More reliable means of predicting the potential for complex failures in structures subjected to multiple hazards; and
- Adoption of accepted standards for wind tunnel testing of prototype structures and estimating wind loads for tall buildings.

2) Enhanced Fire Resistance of Structures:

The material used in the construction stage and for carrying out internal finished should have the fire resistance of structures should be enhanced by improving the technical basis for construction classifications and fire resistance ratings; improving the technical basis for standard fire resistance testing methods; using the "structural frame" approach to fire resistance ratings; and developing in-service performance requirements and conformance criteria for spray-applied fire resistive materials (commonly referred to as "fireproofing").

The recommendations are:

- Evaluating, and where needed, improving, the technical basis for determining appropriate construction classifications and fire rating requirements—especially for tall buildings—and making related changes by considering a variety of factors (including timely access by emergency responders, full evacuation of occupants and redundancy in fire protection systems critical to structural safety);
- Adoption of standard for fire resistance testing of building components, assemblies and systems—including establishing a capability for doing the improved testing under realistic fire and load conditions; and

DIRECTORATE, MAHARASHTRA ... GOVERNMENT OF MAHARASHTRA ... सत्यमेव जयते

- Implementing criteria, test methods and standards for measuring the in-service performance and as-installed condition of "fireproofing."

3) New Methods for Fire Resistance Design of Structures:

The procedures and practices used in the design of structures for fire resistance should be enhanced by requiring an objective that uncontrolled fires result in burnout without partial or global (total) collapse. Performance-based methods are an alternative to prescriptive design methods. This should include:

(1) Use of new fire resistive coating materials and technologies for limiting the spread of fire within the building, and

(2) Use of fire resistant steels and concretes should be done while construction of high rise buildings.

4) Active Fire Protection:

Active fire protection systems (i.e., sprinklers, standpipes/hoses, fire alarms and smoke management systems) should be enhanced through improvements to design, performance, reliability and redundancy of such systems.

Among the recommendations in this group are:

- Installation of fire protection systems to provide redundancy and accommodate the higher risks associated with tall buildings;
- Installation of advanced fire alarms and communications systems that provide continuous, reliable and accurate information on life safety conditions; and
- The real-time secure transmission of data from fire alarm and other monitored building systems for use by emergency responders at any location, and storage of that data off-site or in a black box.

5) Improved Building Evacuation:

The process of evacuating a building should be improved to include system designs that facilitate safe and rapid egress; methods for ensuring clear and timely emergency communications to occupants; better occupant preparedness for evacuation during emergencies; and incorporation of appropriate egress technologies should be implemented in high rise buildings.

Among the recommendations are:

- Improving occupant preparedness for building evacuations through joint and wide public education and training campaigns;



43.02.14

- Designing tall buildings to accommodate timely full building evacuation of occupants if needed—including stairwell capacity and stair discharge door width that accommodates counter flow due to access by emergency responders;
- Maximizing the remoteness of egress components (i.e. stairs, elevators) without making them hard to reach;
- Using pagers and cell phones for broadcast warning systems and Community Emergency Alert Networks; and
- Incorporation of future use such current and next-generation evacuation technologies as protected/hardened elevators, exterior escape systems and stairwell descent devices etc. should be incorporated in high rise building.

6) Improved Emergency Response:

Latest Technologies and procedures for emergency response should be incorporated which will improve better access to buildings, response operations, emergency communications, and command and control in large-scale emergencies for high rise building.

Among the recommendations are:

- Installing fire-protected and structurally hardened elevators to improve emergency response activities, the evacuation of mobility impaired occupants—and preferably, all occupants—in tall buildings;
- Installing, inspecting and testing emergency communications systems, radio communications and associated operating protocols to ensure that the systems and their protocols will function in challenging radio frequency propagation environments and large-scale operations, and can be used to track emergency responders within a building; and
- Developing and implementing codes and protocols for ensuring effective and uninterrupted operation of the command and control system in large-scale building emergencies.

7) Improved Procedures and Practices:

The procedures and practices used in the design, construction, maintenance and operation of buildings should be improved to include encouraging code compliance by non-governmental and quasi-governmental entities; adoption and application of egress and sprinkler requirements in codes for existing buildings; and retention and availability of building documents over the life of a building.

8) Education and Training:

The professional skills of building and fire safety professionals should be upgraded through an education and training effort for fire protection engineers, structural engineers and architects. The skills of building regulatory and fire service personnel also should be upgraded to provide sufficient understanding of what is needed to conduct the review, inspection and approval tasks for which they are responsible.

DIRECTORATE OF MAHARASHTRA
GOVERNMENT OF MAHARASHTRA
सत्यमेव जयते

Along with strongly urging that immediate and serious consideration be given to these recommendations for the building safety and fire safety point of view.

Provisions of Maharashtra Fire Prevention and Life Safety Measures Act, 2006

1. Under **Section 3** of **"Maharashtra Fire Prevention and Life Safety Measures Act, 2006"** (hereinafter referred to as "said Act"). The applicant (developer, owner, occupier by whatever name called) shall comply with all the Fire and Life Safety measures adhering to National Building Code of India, 2005 and as amended from time to time failing which it shall be treated as a violation of the said Act.
2. As per the provision as **under :- 10** of the said Act. No person other than the License Agency shall carry out the work of providing Fire Prevention and Life Safety Measures or performing such other related activities required to be carried out in any place or building or part thereof provided that,

   A) No Licensed Agency or any other person claiming to be such Licensed Agency shall give a certificate under **sub-section (3) of section 3** regarding the compliance of the fire prevention and life safety measures or maintenance thereof in good repair and efficient condition, without there being actual such compliance or maintenance.

   B) The names of the License Agencies approved by Directorate of Maharashtra is available on our website www.mahafireservice.gov.in

3. Under **Section 11** of the said Act, the fire service fees shall be assessed and the same shall be payable after serving the notice to that effect or prior to issue of the building completion certificate or occupancy certificate whichever is earlier.

4. Under **Section 45** of the said Act, the owner/occupier or developer shall appoint Fire Officer/Officers and staff for taking adequate Fire and Life Safety Measures, qualifications and experience of such persons be got approved from the Director, Maharashtra Fire Services.

5. Though certain conditions are stipulated from the said Act and the National Building Code of India, it is obligatory on part of the applicant that is developer, builder, occupier, owner, tenant, by what so ever named called to abide with the provisions of the said Act failing which it shall be actionable under the provisions of said act.

DIRECTORATE, MAHARASHTRA FIRE SERVICES * GOVERNMENT OF MAHARASHTRA *
43.02.14

General Requirements and Conditions for the fire and life safety of the buildings :

1. The plans of the building should be approved by the Concerned Competent Authority
2. **Permission from Civil Aviation should be obtained for the maximum height of the building with reference to Mumbai / Navi Mumbai Airport, if required.**
3. Proper roads in the premises should be provided for easy mobility of the Fire Brigade Appliance & the roads should be capable to hold weight of fire appliances i.e. **45 tons. The width of the internal road shall not be less than 6.0 Mtrs with turning circle radius not less than 9.0 Mtrs. For building up to 50 Mtr building height & building above 50 Mtrs clear 9.00 Mtr Should be provided**
4. Dedicate water storage for the fire fighting purpose should be provided and on water mains fire hydrant should be provided after every 50 meter length of pipeline. This will help fire service to draw water from any point in case of emergency.
5. The staircase provided in high rise residential tower should be pressurized and provided with self closing fire doors of 2 hours fire resistance.
6. All portable fire fighting equipments installed at various locations as per local hazard such as Co2-DCP, Foam as per **IS: 2190**, & it must be strictly confirming to relevant IS specification. It is recommended for every 100 Sq. Meter one fire extinguisher should be provided for electrical installation Co2 extinguisher of 4.5 Kg should be provided.
7. All the firefighting equipment shall be well maintained and should be easily accessible in case of emergency.
8. Emergency Telephone numbers like **"Police", "Fire Brigade", "Hospital", "Doctors",** and **"Responsible persons of the office"** should be displayed in Fire Control Room, Security Office and in Reception area.
9. It shall be ensured that security staff & every employee of the office, security are trained in handling **firefighting equipment & in fire fighting.**
10. Cautionary boards such as **"DANGER", "NO SMOKING", "EXIT", "FIRE ESCAPE", "EXTINGUISHER", "FIRE HYDRANT"** etc. should be displayed on the strategic location to guide the occupants in case of emergency. The signs should be of florescent type and should glow in dark.
11. The Fire Exit Drill or Evacuation Drill should be plan and instruction should be given to the staff minimum **four times in a year** and drill should be carried out **twice in a year.**
12. **"On-Site" & "Off-Site"** emergency plan shall be prepared & mock drills shall be conducted twice a year & instructions to every employee shall be given once in three months.



13. For construction of high rise buildings noncombustible materials shall be used and the internal walls of staircase enclosures should be with minimum of 2 hrs. Fire Resistance rating.
14. The construction should be done considering the seismic zoning and proper care should be taken while designing the building of such a high rise.
15. A high rise building during construction shall be provided with the following fire protection measures, which shall be maintained in good working condition at all times:
    a) Dry riser of minimum 100 m.m. dia. Pipe with hydrant outlets on the floors constructed with a fire service inlet.
    b) Drums filled with water of 2000 Ltrs. Capacity with two fire buckets on each floor.
    c) A water storage tank of minimum 20,000 ltrs. Capacity, which may be used for other construction purposes also.
16. The use of combustible surface finishes on walls (including facade of the building) and ceiling affects the safety of the occupants of the building. Such finishes tend to spread the fire and even though the structural elements may be adequately fire resistant, serious danger to life may result. It is therefore, essential to have adequate precautions to minimize spread of flame on wall, façade of building and ceiling surfaces.
17. The finishing materials used for various purposes and décor shall be such that it shall not generate toxic fumes / smoke.
18. Automatic smoke venting facilities shall be provided for safe use of exits in windowless buildings.
19. Natural draft smoke venting shall utilize roof vents in walls at or near the ceiling level, such vents shall be normally open, or, if closed, shall be designed for automatic opening in case of fire, by release of smoke sensitive devices.
20. Where smoke venting facilities are installed for purposes of exit safety, these shall be adequate to prevent dangerous accumulation of smoke during the period of time necessary to evacuate the area served, using available exit facilities with a margin of safety to allow for unforeseen contingencies.
21. The fluorescent glow signs like "Staircase", "Extinguisher", "Fire Escape" "Hydrant Point", Manual Call Point" "Exit", "Lift" shall be installed on strategic locations in all common areas of the building like passages, Corridors etc.
22. Fire evacuation orders & exit map shall be provided in every floor & in lobbies of the buildings.
23. Well equipped fire control room shall be provided on the ground floor of the building & A qualified Fire Officer from **"Maharashtra Fire Service Academy** shall be employed to maintain the all fire prevention & protection arrangements provided to various buildings in the campus.

43.02.14

25. The **Annex C** for Fire Protection Requirements for High Rise Buildings- 15 m in Height or Above of NBC 2005, part 4 should be strictly followed.

26. The **Annex E,** The Guidelines for Fire Drill and Evacuation Procedures For High Rise Buildings (Above 15 m in Height) of NBC 2005, part 4 should be strictly followed and implemented.

27. Strom water management in case of 150 years contingency planning should be done in consultation with Town Planning Department of Govt. of Maharashtra.

28. All internal furniture and fixtures used for the building should be fire resistance type and it should not give toxic fumes and smoke in case involved in fire. It should have minimum Two hours Fire Resistance.

29. LPG banks should not be stored on upper floor for cooking etc. The kitchen for commercial purpose on uppers floors is not permitted.

30. The Glassing and facade other Glasses should have at least one hour fire resistance and should be UL approved and in accordance with NFPA requirements.

31. The glass faced should be protected with coating film so that in case of breaking of glass the glass can remain in it's place for some hours before replacement. This will reduce the risk of injuries to occupants and fire & rescue personal. In the event of blast the shock wave created which creates the damage to glass faced the use of film will help to reduce the damages due to glass breaking.

32. This being a very special type of building if any additional recommendations to be added or deleted depending upon the need of the fire safety requirement of buildings.

33. The Director, Maharashtra Fire Service reserves all right to modify the fire safety recommendations and it shall be responsibility of company authorities to maintained close liaison with fire department.

Standard Specifications and Regulations to be followed: -

a) Part-3 & 4 National Building Code: 2005,

b) **IS: 3844** – for installation and maintenance of internal fire hydrants and hose reels on premises.

c) **IS: 2189** – for selection, installation and maintenance of automatic fire detection and alarm system.

d) **IS: 2190** – for selection, installation and maintenance of portable first aid fire extinguishers.

e)IS : 9583 : 1981 Emergency lighting units.

f)IS 12456 : 1988 Code of practice for fire protection of electronic data processing installation.

g)IS 4963 : 1987 Recommendations for buildings and facilities for physically handicapped.

h)IS 3614 (Part I) :1966 Specification for fire check doors .

DIRECTORATE, MAHARASHTRA ★ GOVERNMENT OF MAHARASHTRA ★

43.02.14

e) **Code of practice for Fire Safety Buildings IS-1642 – for Details of Construction.**

f) **Code of Practice of Fire Safety of Buildings IS-1643– Exposure Hazard.**

g) **Code of Practice of Fire Safety of Buildings IS-1644 – Exit requirement and Personal Hazard.**

h) **IS : 15105 – Design and installation of fixed automatic sprinkler fire extinguishing system.**

i) **IS 9668 : 1990 Code of practice for provision and maintenance of water supplies and fire fighting.**

j) **IS 2175 : 1988 Specification for heat sensitive fire detectors for use in automatic fire alarm system.**

k) **IS 11360 : 1985 Specification for smoke detectors for use in automatic electrical fire alarm system.**

l) **IS 9457 : 1980 Safety colours and safety signs.**

m) **IS 12349 : 1988 Fire protection – Safety sign**

n) **IS 12407 : Graphic symbols for fire protection plan.**

FIRE PREVENTION

Passive Fire protection required.

Requirement and Provision: - The following passive fire protection systems will have to be followed and installed for the Life Safety of the building as per Part 3 & 4 of National Building Code 2005:-

Sr. No.	Clause Number	Description.
1.	Clause NO: 3.3.1 & 3.3.2	**Fire Test General Requirement:** Element / Component shall have the requisite fire resistance performance when tested in accordance with the accepted standards.
2.	Clause NO: C-9	**Compartmentation:** The building shall be suitably compartmentalaised so that the fire & smoke remain confined to the area where the fire incident has occurred & does not spread to other part of the building.
3.	Clause NO: 4.10.5	**Smoke Extraction System:** The exhaust system may be continued, provided the construction of the ductwork & fans is such that it will not be rendered inoperable by hot gases & smoke & there is no danger of spread of smoke to other floors via the path of extraction system.
4.	Clause NO: 3.4.12.3	**Smoke management:** Where smoke venting facilities are installed for the purpose of exit safety these shall be adequate to prevent dangerous accumulation of smoke during the period of time necessary to evacuate the area served using available exit facilities, with margin of safety to allow for unforeseen contingencies.

43.02.14

5.	Clause NO: C-1.17	**Fire rated ducts:** Where the ducts passes through fire walls, the opening around the duct shall be sealed with fire resisting materials having the fire resistant rating of the compartment. Where the duct crosses the compartment which is fire rated for same fire rating. Depending on the services passing around the duct work, which may be affected in case of fire temperatures rising, the ducts shall be insulated
6.	Clause NO: C-1.12 a	**Cable ducts:** The electric distribution cables/wiring shall be laid in separate duct. The duct shall be sealed at every floor with non-combustible material having the same fire resistance as the fire rating of the duct.
7.	Clause NO: C-1.12 e	**Fire rated ceilings:** The exhaust system may be continued, provided the construction of the ductwork & fans is such that it will not be rendered inoperable by hot gases & smoke & there is no danger of spread of smoke to other floors via the path of extraction system.
8.	Clause NO: 3.3.3	**Steel protection:** Load bearing steel beams & columns of building having total covered area of 500Sq.Mtrs. and above shall be protected against failure collapse of structure in case of fire. This could be achieved by using appropriate methodology using suitable fire rated materials as per the accepted standards.
9.	Clause NO: 4.13	**Fire escape enclosure:** Fire towers shall be constructed of walls with a 2 hours fire rating without openings other than the exit doorway, with platforms, landings & balconies with the same fire rating of 2 Hours.
10.	Clause NO: C-1.4	**Glazing:** If glazing or glass bricks are used in a stair case shall have fire rating of minimum 2 hours.
11.	Clause NO: 3.4.19	**Glazing:** If glass is used as a façade for building it shall have minimum 1 hour fire rating.
12.	Clause NO: 3.4.8.3	**Fire stopping:** 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 spread of fire, smoke or fumes through vertical openings from floor to floor, which will allow the occupants to complete their safe use of means of egress.

DIRECTORATE MAHARASHTRA GOVERNMENT OF MAHARASHTRA

13.	Clause NO: 3.4.8.4	**Fire Stopping:** Openings in the walls or floors which are provided for the passage of all building services like cables, electrical wiring & telephone cables etc. Shall be protected by the enclosure in the form of Ducts/shafts with a fire resistance of not less than 2 Hours.
14.	Clause NO: C-1.9	**Fire stopping service ducts & shafts**: Service ducts & shafts shall be enclosed by walls of 2 hours & doors of 1 hour fire rating. All such ducts/shafts shall be properly sealed & fire stopped at all floors.
15.	Clause NO: C-1.12	**Fire stopping cable ducts penetration:** The electrical distribution cables/wiring shall be laid in separate duct. The duct shall be sealed at every floor with non-combustible materials having the same fire resistance as the fire rating of the cable duct.

STAIRCASES

The height of proposed building is **46.85 to 84.55 Mtrs** As these buildings is 15 Mtrs and above, hence as per NBC Part IV-4.6.2 the building shall have minimum two enclosed type staircases out of which one shall be on external walls of buildings and shall open directly to the exterior open place of safety.

GUIDELINES FOR INTERNAL STAIRWAYS as per NBC 2005

a) Stairways shall be constructed of non-combustible materials throughout. Hollow combustible construction shall not be permitted. **Width of Staircase should be 1.5 Mtrs for Residential, 1.5 Mtrs for Commercial, Parking & for Shops. Shall not be less than 2.0 Mtrs for School, Medical & Public Buildings like Library.**

b) No Gas piping shall be laid down in the stairway.

c) Internal staircase shall be constructed as a self-contained unit with at least one side adjacent to an external walls and shall be completely enclosed.

d) Internal staircase shall not be arranged around lift shaft unless the later is entirely enclosed by material of fire resistance rating as that for type of construction itself.

e) The access to main staircase shall be gained through at least half-an-hour fire resisting automatic closing doors, placed in the enclosing walls of the staircase. They shall be swing type doors opening in the direction of the escape.

f) No living space, store or other space, involving fire risk, shall open directly in to staircase.

g) The external exit door of a staircase enclosure at ground level shall open directly to the open space or should be accessible without passing through any door other than a door provided to form a draught lobby.

43.02.14

h) The exit signs with arrows indicating the escape routes shall be provided at a height of 1.5 m. from the floor level on the wall and shall painted with fluorescent paint. All exit signs should be flush with the wall and so designed that no mechanical damage to them can result from the removing furniture, material or any other equipment.

i) Exits shall be so located that it will not be necessary to travel more than 30 m. from any point to reach the nearest exit.

STAIRCASE AND CORRIDOR LIGHTINGS:

a) The staircase and corridor lighting shall be on separate service and shall be independently connected so as it could be operated by one switch installation on the ground floor easily accessible to fire fighting staff at any time irrespective of the position of the individual control of the light points, if any.

b) Staircase and corridor lighting shall also be connected to alternate source of supply.

c) Suitable arrangements shall be made by installing double throw switches to ensure that the lighting installed in the staircase and the corridor do not get connected to the sources of supply simultaneously. Double throw switch shall be installed in the service room for terminating the stand by supply.

d) Emergency lights shall be provided in the staircase/corridor.

e) Passageway should be provided as per the guidelines given in National Building Code- 2005.

EXIT REQUIREMENT:

1. An exit may be doorway, corridor, Passageway(s) to an internal staircase, or external staircase, or to a verandah or terrace(s), which have access to the street, or to the roof of a building or a refuge area. An exit may also include a horizontal exit landing to an adjoining building at the same level.
2. Every exit, exit access or exit discharge shall be continuously maintained free of all obstructions or impediments to full use in the case of fire or other emergency
3. Exits shall be clearly visible and the route to reach the exits shall be clearly marked and signs posted to guide the occupants of the floor concerned. Signs shall be illuminated and wired to an independent electric circuit on an alternative source of supply.
4. To prevent spread of fire and smoke, fire doors with 2 hours fire resistance shall be provided at appropriate places along the escape routes and particularly at the entrance to lift lobby and stair well where a 'funnel or flue effect' may be created inducing an upward spread of fire.
5. All exits shall provide continuous means of egress to the exterior of a building or to an exterior open spaces leading to the street.

6. Exits shall be so arranged that they may be reached without passing through another occupied unit.

STAIRCASE DESIGN REQUIREMENT:

1. The minimum headroom in a passage under the landing of a staircase and under the staircases shall be **2.2 Mtrs.**
2. Access to main staircase shall be through a fire / smoke check door of a minimum 2 hours fire resistance rating.
3. No living space, store or other fire risk shall open directly in to the staircases.
4. The main and external staircases shall be continuous from ground floor to the terrace level.
5. No electrical shafts, A/c ducts or gas pipe etc. shall pass through or open in the staircases. Lifts shall not open in staircases.

EXTERNAL STAIRCASE OR FIRE ESCAPE STAIRCASE:-

Shall comply the following.

1. **Fire Escape shall not be taken into consideration while calculating the number of staircases for the building.**
2. **Fire escape constructed of M.S. angels, wood or glass is not permitted.**
3. Staircase shall always be kept in sound operable condition.
4. Fire Escape Staircase shall be directly connected to the ground.
5. Entrance to the Fire Staircase shall be separate and remote from the internal staircase.
6. Care shall be taken to ensure that no wall opening or window opens on to or close to Fire Escape Stairs.
7. The route to the external staircase shall be free of obstructions at all times.
8. The Fire Escape stairs shall be constructed of noncombustible materials, and any doorway leading to it shall have the required fire resistance.
9. No Staircase, used as a fire escape, shall be inclined at an angel greater than 45^{0} from the horizontal.
10. **Fire Staircase shall have straight flight not less than 125 c.m. wide (only for Residential) with 25 c.m. treads and risers not more than 19 c.m. The number of risers shall be limited to 15 per flight.**
11. Handrails shall be of a height not less than 100 c.m. and not exceeding 120 c.m.
12. **All the staircase doors on every floor shall be provided with two hours fire resistive doors having panic bars at both the sides.**

STAIRCASE ENCLOSURES :-

1. The external enclosing walls of the staircase shall be of the brick or the RCC construction having the fire resistance of not less than two hours. All enclosed staircases shall have access through self closing door of one hour fire resistance. These shall be single swing doors opening in the direction of escape. The door shall be fitted with the check action door closers.
2. The staircase enclosures on the external wall of the building shall be ventilated to the atmosphere at each landing.
3. Permanent vent at the top equal to the 5% of the cross section area of the enclosure and openable sashes at each floor level with area equal to 1 to 15 % of the cross sectional area of the enclosure on external shall be provided. The roof of the shaft shall be at least 1 meter above the surrounding roof. There shall be no glazing or the glass bricks in any internal closing wall of staircase. If the staircase is in the core of the building and cannot be ventilated at each landing a positive pressure of 5 mm w.g. by an electrically operated blower/ blowers shall be maintained.
4. The mechanism for pressurizing the staircase shaft shall be so installed that the same shall operate automatically on fire alarm system/ sprinkler system and be provided with manual operation facilities.

EMERGENCY AND ESCAPE LIGHTING :-

1. Emergency lighting shall be powered from a source independent of that supplying the normal lighting.
2. Escape lighting shall be capable of
   - A) Indicating clearly and unambiguously the escape routes.
   - B) Providing adequate illumination along such routes to allow safe movement of persons towards and through the exits.
   - C) Ensuring that fire alarm call points and fire fighting equipments provided along the escape routes can be readily located.
3. The horizontal luminance at floor level on the centerline of an escape rout shall be not less than 10 lux. In addition, for escape routes up to 2 m wide, 50 percent of the route width shall be lit to a minimum of 5 lux.
4. The emergency lighting shall be provided to be put on within 1 s of the failure of the normal lighting supply.
5. Escape lighting luminaries should be sited to cover the following locations
   - a) Near each intersection of corridors
   - b) At each exit door
   - c) Near each change of direction in the escape rout

DIRECTORATE OF MAHARASHTRA ★ GOVERNMENT OF MAHARASHTRA ★

d) Near each staircase so that each flight of staircase receives direct light.
e) Near any other change of floor level.
f) Outside each final exit and close to it.
g) Near each fire alarm call point.
h) Near fire fighting equipment, and
i) To illuminate exit and safety signs as required by the fire department.

6. Emergency lighting systems shall be designed to ensure that a fault or failure in any one luminaire does not further reduce the effectiveness of the system.
7. The luminairies shall be mounted as low as possible but at least 2 m above the floor level.
8. Signs are required at all exits, emergency exits and escape routs, which should comply with the graphic requirements of the relevant Indian Standard.
9. Emergency lighting luminaries and their fittings shall be of non flammable type.
10. It is essential that the wiring and installation of the emergency lighting system are of high quality so as to ensure their perfect serviceability at all times.
11. The emergency lighting system shall be capable of continuous operation for a minimum duration of 1 hour and 30 minutes even for the smallest premises.
12. The emergency lighting system shall be well maintained by periodical inspections and tests so as to ensure their perfect serviceability at all times.

ILLUMINATION OF MEANS OF EXIT :-

Staircase and corridor lights shall confirm to the following :-

a) The staircase and corridor lighting shall be on separate circuit and shall be independently connected so that it could be operated by one switch installation on the ground floor easily accessible to fire fighting staff at any time irrespective of the position of the individual control of the light points, if any. It should be of miniature circuit breaker type of switch so as to avoid replacement of fuse in case of crises.
b) Staircase and corridor lighting shall also be connected to alternative supply. The alternative source of supply may be provided by battery continuously trickle charged from the electric mains; and
c) Suitable arrangements shall be made by installing double throw switches to ensure that the lighting installed in the staircase and the corridor does not get connected to two sources of supply simultaneously. Double throw switch shall be installed in the service room for terminating the sand by supply.

GUIDELINES FOR REFUGE AREA :-

Refuge Area: For buildings more than **24 Mtrs.** in height, refuge area of **15 Sq. Mtrs.** or an area equivalent to **0.3 Sq. Mtrs.** per person to accommodate the occupants of two consecutive floors, whichever is higher shall be provided. The refuge area shall be provided on the periphery of the floor or preferably on a cantilever projection & open to air at least on one side protected with suitable railings.

A) **For floors above 24 Mtrs. & up to 39 Mtrs. One refuge area on the floor immediately above 24 Mtrs.**
B) **For floors above 39 Mtrs. one refuge area on the floor immediately above 39 Mtrs. and so on after every 15 mtrs. Shall be provided.**

Pressurization of Staircases (Protected Escape Routes) :

1. Though in normal building design compartmentation plays a vital part in limiting the spread of fire, smoke will readily spread to adjacent spaces through the vertical leakages openings in the compartment enclosure, such as cracks, opening around pipes ducts, airflow grills and doors, as perfect sealing of all these openings is not possible. It is smoke and toxic gases, rather than flame, that will initially obstruct the free movement of occupants of the building through the means of escape (Escape Routes) Hence the exclusion of smoke and toxic gases from the protected routs is of great importance.
2. Pressurization is method adopted for protected escape routs against ingress of smoke, especially in high rise buildings. In pressurization, air is injected into the staircases, lobbies or corridors, to raise their pressures slightly above the pressure in adjacent parts of the building. As a result, ingress of smoke or toxic gases into the escape routes will be prevented. The pressurization of staircases shall be adopted for high rise buildings and building having mixed occupancy.

3. The pressure difference for staircases shall be as under

Building Height	**Pressure Difference**	
	Reduced Operation (Stage 1 of a 2 Stage System)	Emergency Operations (Stage 2 of a 2 Stage System or Single Stage System)
15 m or Above	15 Pa	50 Pa

DIRECTORATE MAHARASHTRA FIRE SERVICES
GOVERNMENT OF MAHARASHTRA

If possible , the same levels shall be used for lobbies and corridors, but levels slightly lower may be used for these if desired. The difference in pressurization levels between staircase and lobbies (or corridors) shall not be greater then 5 Pa.

4. Pressurization system may be of two types :-

   A) Single Stage , designed for operation only in event of an emergency, and

   B) Two stage; where normally a level of pressurization is maintained in the protected escape routes and an increases level of pressurization can be brought into operation in an emergency.

LIFT ENCLOSURES: -

1. The walls enclosing lift shafts shall have a fire resistance of not less than **two** hours.
2. Shafts shall have permanent vents at the top not less than 18 c.m. (0.2sq.m.) in clear area.
3. Lift motor room shall be preferably be sited at the top of the shaft and shall be separate from lift shafts by the enclosing wall of the shaft or by the floor of the motor room.
4. Landing doors in lift enclosures shall open in the ventilated corridor/lobby & shall have fire resistance of not less than one hour.
5. The number of lifts in one lift bank **shall not exceed four**. Lift car doors shall have fire resistance of not less than one hour. A wall of two hours fire rating shall separate individual shafts in a bank. Minimum one lift in every lift bank must be a **"Fire Lift"**
6. For the buildings 15 meters and above in height, collapsible gates shall not be permitted for lifts and shall have solid doors with fire resistance of at least one hour.
7. If the lift shaft and lobby is in the core of the building a positive pressure between 25 and 30 pa shall be maintained in the lobby and a possible pressure of 50 pa shall be maintained in the lift shaft. The mechanism for the pressurization shall act automatically with the fire alarm/ sprinkler system and it shall be possible to operate this mechanically also.
8. Exit from the lift lobby, if located in the core of the building, shall be through a self closing fire smoke check door of one hour fire resistance.
9. Lift shall not normally communicate with the basement. If however, lifts are in communication, the lift lobby of the basement shall be pressurized as mention above with self closing doors.
10. The lift machine room shall be separate and no other machinery shall be installed therein.

DIRECTORATE, MAHARASHTRA FIRE SERVICES * GOVERNMENT OF MAHARASHTRA *

11. Grounding switch/switches at ground floor level to enable the fire service personnel to ground the lift car/cars in emergency shall be provided.
12. Telephone or other communication facilities shall be provided in the lift cars which shall be connected to fire control room of the building.
13. Suitable arrangements such as providing slope in the floor of the lift lobby shall be made to prevent water used during fire fighting etc. at at landing from entering the lift shaft.
14. A sign shall be posted & maintained on every floor at or near the lift indicating that in case of fire occupants shall use the stairs unless instructed by otherwise. The sign shall also contain a plan for each floor showing the locations of the stairway.
15. Alternate source of supply shall be provided for all the lifts through a manually operated change over switch.

FIRE LIFTS: (For High Rise Buildings)

1. To enable the fire service personnel to reach the upper floors with minimum delay, one fire lift per 1200 Sq. Mtrs. of floor area shall be provided and shall be available exclusive use of the fireman in an emergency.
2. The lift shall have floor area not less than 1.4 Sq.Mtrs. It shall loading capacity of not less than 545 Kg. (8 person Lift) with automatic closing doors of minimum 0.8 m width.
3. The electrical supply shall be on separate service from electric mains in a building and the cables run in a safe route from fire, that is, within the lift shaft. Lights & fans in the elevators having wooden paneling or sheet steel construction shall be operated on 24 Volts supply.
4. Fire fighting lift shall be provided with a ceiling hatch for the use in case of emergency, so that when lift car gets stuck up, it shall be easily openable.
5. In case of failure of normal electric supply, it shall automatically trip over to alternate supply. This change over of supply could be done through manually operated changeover switch. Alternatively the lift shall be so wired that in case of power failure, it comes down at ground level and comes to stand still with door open.
6. The operation of lift shall be by a simple toggle or two button switch situated in a glass fronted box adjacent to the lift at the entrance level. When the switch is ON, landing call points will become inoperative & the lift will be on car control or on a priority control device. When the switch is OFF, the lift will return to normal working. This lift can be used by the occupants in normal times.
7. The words **"Fire Lift"** shall be conspicuously displayed in fluorescent paint on the lift landing doors at each floor levels.
8. The speed of the fire lift shall be such that it can reach topmost floor from ground level in **1 Minute.**

DIRECTORATE, MAHARASHTRA ... GOVERNMENT OF MAHARASHTRA

SERVICE DUCTS / REFUGE CHUTE :

1. Service duct shall be enclosed by walls and door, if any, of two hours fire rating. If ducts are larger than 10 Sq. Meters the floor should seal them, but provided suitable opening for the pipes to pass through, with the gaps sealed.
2. A vent opening at the top of the service shaft shall be provided between one fourth and one half of the area of the shaft. Refuge chutes shall have an outlet at least of wall of non combustible material with fire resistance of not less than two hours. They shall not be located within the staircase enclosure or service shafts or air conditioning shafts. Inspection panel and door shall be tight fitting with one hour fire resistance; the chutes should be as far away as possible from exits.
3. Refuge Chutes shall not be provided in staircase walls and A/C shaft etc.

ELECTRICAL SERVICES:

1. The electric distribution cables/wiring shall be laid in separate duct. The duct shall be sealed at every alternate floor with non-combustible materials having same fire resistance as that of the duct. Low & medium voltage wiring running in shaft & false ceiling shall run in separate conduits.
2. Water mains, telephone lines, intercom lines, gas pipes or any other service lines shall not be laid in the duct of electric cables, use of bus ducts / solid rising mains instead of cables shall be preferred.
3. Separate circuits for water pumps, lifts, staircase & corridor lighting shall be provided directly from the main switch gear panel and these circuits shall be laid in separate conduit pipes so that fire in one circuit will not affect the others. Such circuits shall be protected at the origin by an automatic circuit breaker with its no-volt coil removed. Master switches controlling essential service shall be clearly labeled.
4. The inspection panel doors and any other opening in the shaft shall be provided with airtight fire doors having the fire resistance of not less than **one hours.**
5. Medium & low voltage wiring running in shaft and within fall ceiling shall run in metal conduit. Any 230 Volt wiring for lighting or other services, above false ceiling, Shall have 660 Volt grade insulation. The false ceiling including all fixtures for its suspension, shall be of non-combustible material and shall provide adequate fire resistance to the ceiling in order to prevent spread of fire across ceiling.
6. An independent & well-ventilated service room shall be provided on the ground floor with direct access from outside or from the corridor for the purpose of termination of electric supply from services & alternative supply cables. The doors provided for the service room shall have fire resistance of not less than **two hours.** If service room is located at the first basement, it should have automatic fire extinguishing system.
7. Suitable circuit breakers shall be provided at the appropriate points.



Transformers:

1. Transformers shall not be installed on upper floors or in the basement.
2. The switchgears shall be housed in a separate room separated from the transformer bays by a fire-resisting wall with fire resistance of not less than four hours.
3. The transformers shall be protected by providing proper fire protection.
4. A tank of RCC construction of capacity capable of accommodating entire oil from the transformers shall be provided at lower level, to collect the oil from the catch pit to the tank shall be of non-combustible construction and shall be provided with a flame-arrestor.
5. No grass or shrubs shall be allowed to grow in transformer switchyard.
6. A barbed wired fencing of minimum 1.5 m. height shall be provided around transformer switchyard & the gate shall be provided for entrance. The gate should be always locked & the keys should be kept with authorized/responsible person of the company.
7. Danger/ No smoking board shall be displayed at the entrance gate of transformer switchyard.

FIRE PROTECTION
Active Fire protection required for
Cluster of Residential Towers
As per Table 23 of Part IV, NBC 2005
For Each Plot / Building / Wing
(For other type of building refer part III)

Sr. No.	Protection	Requirements	Provision	Remarks
01	Fire Extinguishers for A,B,C class of firers.	Required	**As per Is 2190**	**At strategic location**
02.	Hose Reel Hose with jet & spray multipurpose nozzle.	Required	**Confirming to IS:884 : 1985**	**In every stair case well / shaft.**
03.	Wet Riser cum down comer.	Required		**In every stair case well / shaft.**
04.	Court Yard Hydrant or Ring Hydrant System around Buildings	Required	**Confirming to IS:3844:1989 & IS: 13039 : 1991**	
06.	Manually Operated Fire Alarm System	Required		On each floor Near staircase
08.	Underground Static Storage Tank	Required 3,00,000 ltrs.		For each Cluster Plot of 6 to 8 Building

Sr. No.	Protection	Requirements	Provision	Remarks
09.	Terrace Tank	Required 20,000 ltrs. for each down comer		Above every stair cases on terrace floor for independent water supply to every wet riser cum down comer.
10.	Fire Pumps Main Pumps on Underground Water Tank Booster Pumps On terrace level of both towers	**2 Nos. 4550 lpm electrical driven (main + sprinkler)** **1 No. 4550 lpm Diesel driven** **1 No. 180 lpm electric driven** **2 Nos. 900 lpm electrical driven**		Independent pumping arrangements for the proposed Residential Towers shall be provided.
11.	**Automatic Detection System**	Required on each floor	Automatic Detection system should be provided. Standards and guidelines given in IS-11360-1985 specification for Smoke Detectors for use in Automatic Electrical Fire Alarm system. Detection system for Cable Trench should be provided. Heat Detectors should be provided for Canteen Area as per the standards and guidelines given IS-2175-1988 specification for Heat sensitive Fire Detectors for use in Automatic Fire Alarm System.	
12.	**Sprinkler system**	Required on Each floor and for each flat	**Sprinkler system should be provided on each floor.** **Separate Pumping arrangement should be provided for the Basement.** **Guidelines are given in IS 15105 Design and installation of Fixed Automatic sprinkler fire Extinguishing system**	
13.	Fire Brigade Connection- - For Static Water Tank and For Hydrant System	Required		**Near the entry point of the building.**
14.	Fire Dampers in A.C. Ducts	Not Required	**IS:655:1963 specifications for metal air ducts (Revised)**	

43.02.14

Sr. No.	Protection	Requirements	Provision	Remarks
15.	Fire Lift	Required	**50% of total lifts provided to the building.**	
16.	Refuge Area	**Required**		For High rise Bldgs.
17.	Fire Doors	**Required at every stair case landing on every floor.**	**Confirming to IS: 3614 (Part-I) 1966**	**2 Hrs. Fire resistive types with panic bar from both the sides.**
18.	Safety signs & Exit Signs	**Florescent type**	**IS: 12349:1988 & IS: 12407:1988**	**On all strategic locations.**
19.	Compartmentation of floors	**Required**		**750 Sq. meter area per floor**
20.	Pressurization of fire escape staircases	**Required**		**For High-rise buildings above 24 meter height.**
21.	Fire Resistance Insulation or sealing of floor or compartment ducts	**Required for limiting the spread of heat & smoke**		
22.	Emergency Lights	**Required**		
23.	PA System with Talk Back Facility	**Required**		
24.	Auto D.G. Backup	**Required for all fire safety systems**		
25.	Fire Resistance rating for Glass used for façade.	**Required**		
26.	Road side fire hydrant on water mains	**Required**		After every 60 meter length of water mains.

ANTICIPED POTENTIAL FIRE HAZARDS IN TOWNSHIP PROJECT

Residential Area

The residential area has been divided into various parts based on type of structure permitted to construct, the population density namely low density and mixed use. The building height presently shown is about 45 Mtrs whereas it is expected to touch the height of 90 Mtrs in near future.

The sources of fire hazards in residential areas are as follows

- **Electrical**
  - Short circuit

DIRECTORATE, MAHARASHTRA * GOVERNMENT OF MAHARASHTRA *

- Malfunction/faulty operation of electrical and electronic equipment
- Not replacing faulty plugs or cords
- Using electrical appliance bought from garage sales or market without checking professionally
- Over loading electrical sockets
- By any other faults

• LPG fire

- Due to Leakage from gas cylinders or gas pipe line
- Leaving electric cords, tea towels, oven clothes etc., near stove
- Leaving children unattended

• Fire during festive occasion

- Crackers
- Incorrect use of Christmas tree lights
- Decorative lit candles being left unattended

In case of residential areas, fire outbreak is mainly due to LPG and Electricity and some other minor causes. These fires can be prevented if they follow fire safety measures properly, proper usage of LPG cylinders and electrical equipments. These fires can be extinguished through fire extinguishers, fire hydrants or fire engines.

Commercial Area

The aim of the proposed commercial nodes is to provide shopping and marketing convenience for residents living in and around the general vicinity of township. In line with this objective, pockets of commercial use are proposed throughout the whole township. The proposed town within the non-processing occupies for proposed township i.e. business center & business hotel. Within this town there will be shops, restaurants, entertainment outlets, a supermarket and some banks.

A cluster of retail shops. These are the retail shops that provide the day-to-day needs and such as personal services of the residents or specialized shops. Amenity centers will house recreational facilities and commercial and eating facilities for day to day tasks such as ATMs, postal agencies, restaurants etc. The possible causes for fire in commercial areas are

• Electrical

- Short circuit
- Malfunction/faulty operation of electrical and electronic equipment
- Not replacing faulty plugs or cords



- Using electrical appliance bought from garage sales or market without checking professionally
- Over loading electrical sockets
- By any other faults

• LPG fire

- Due to Leakage from gas cylinders or gas pipe line
- Leaving electric cords, tea towels, oven clothes etc., near stove

As mentioned above the fire may occur in commercial area like restaurants or cinema halls due to electricity or some other causes like smoking at restricted area etc. In order to avoid loss due to fire at these places, Smoke detectors and Alarm systems can be provided to alert people in case of fire. Fire extinguishers can be provided and type of extinguisher can be chosen based on type of fire that could occur. Fire hydrants and fire fighters can be involved to extinguish fire in case of fire accident.

Institutional Area

The primary objective of providing sufficient and high quality social institutions within township is to be able to give a better quality and modern life style to the residents here. Institutions in township would be schools (primary and secondary), community centers, polyclinics, library, religious institutions, swimming complex, sports complex and an indoor stadium, golf academy. The possible sources of fire hazard in institutional areas are

• Electrical

- Short circuit
- Malfunction/faulty operation of electrical and electronic equipment
- Not replacing faulty plugs or cords
- Using electrical appliance bought from garage sales or market without checking professionally
- Over loading electrical sockets
- By any other faults

Institutions mentioned above can be provided with smoke detectors, fire alarm to avoid loss during fire accidents. Fire extinguishers at these areas can help people to fight small fires.

Above all one **major threat of forest fires** and **grass fires** anticipated which may lead to exposure hazards to all occupancies inside the town ship. To over come this hazard proper segregation of plot boundaries by way of natural water bodies, by way of roads or by way of rock patches, compound

walls or by way of counter fires periodic precaution methods should be taken by management to control such hazards.

INFRASTRUCTURAL AND OTHER FACILITIES PROPOSED FOR FIRE PREVENTION AND CONTROL

The poor fire prevention and control measures will result in huge loss in terms of precious human lives, damage to National property etc. Hence it is essential to prepare a strategic plan which includes extensive utilization of built in fire protection, early warning systems and automatic fighting systems in addition to fire fighting measures and fire prevention or education programmes. Some of the fire prevention and control provisions are given below. The following standards and codes are followed while giving conceptual design of various infrastructure and other facilities proposed for fire prevention and control.

1. Standards lay down by National Fire Prevention Authority (NFPA)
2. Standing Fire Advisory Committee (SFAC) Recommendations. (Recommending Body to the Govt. of India)
3. National Building Code- 2005, Part -3 & 4, Govt. of India
4. Applicable BIS standards.

PROPOSED FIRE SYSTEM FOR TOWNSHIP

General Norms & specifications-

Adequate size of cross-sectional area of ducts shall be provided for various services like electrical conducts instead of concealing in walls, water mains, garbage chutes and wet risers also should have separate ducts.

Provision of entrance gates of adequate width 4.5 m. minimum is prescribed in Regulations. However, these entrance gates shall not obstruct a maneuvering space for fire engines.

In case of high-rise buildings with podiums with provision of ramp for fire engines a gradient of 1:10 is recommended.

At the dead end plots, the location of gate (4.5m. wide) is important and shall be positioned, as away from the dead end.

Like sprinkler systems, a fire sensitive Air curtains of fire retardant gases, can be provided above FIRE Resistant Doors at various places which may retard spread of fire.

Electric connections for floodlights shall be provided at various points in the compound walls all round, with separate wiring/conduit etc.

DIRECTORATE ... GOVERNMENT OF MAHARASHTRA
43.02.14

The thickness of internal and external walls can retard by the fire and reduce the requirements of safety majors. This fact shall be studied, while designing interiors of the commercial buildings.

A study shall be made to provide telescopic common corridors leading to Fire Fighting Stair case or fire lift in case of commercial buildings as it will accommodate more gathering of people which will ease escape in case of fire rescue operations or reaching Refuse floors, in a minimum time.

Fixed fire fighting Installations-

Buildings shall be protected by wet riser, wet riser-cum-down comer, automatic sprinkler installation.

Wet riser-cum-down comer is an arrangement for fire fighting within the building.
The performance of pumps shall be at 2000 R.P.M.

A minimum of four hydrants shall be provided within a courtyard.

Wet Riser Installations shall conform to I.S:3644-1966 Code of practice for installations of internal fire hydrants in multi-storied buildings. Static Water storage tank & Automatic sprinklers are installed as Wet Riser Installations.

Automatic high pressure water spray system shall be provided for protection of indoor transformers of a substation in a basement area.

All other buildings exceeding 15m. height shall be equipped with fire alarm system.

The lightning protection systems for buildings shall be in accordance with the provision of Part-8, Building Services, Section 2 Electrical Installations of National Building code of India 2005.

Except residential buildings, all other buildings shall have a control room on the entrance floor of the building with communication system.

The water storage shall be maintained for firefighting and domestic use as per the requirements given in part 4 of NBC 2005. The proposed pump house shall be constructed near water treatment plant. The space required for the pump house is about 100 Sq. mtr.

The main line from the pump room is laid in a ring main system and also connected with fire brigade inlet connection post. Sprinklers are provided only in the basement floors and for all commercial occupancies and also in common areas of residential building having height more than 45 meters.

DIRECTORATE, MAHARASHTRA ... GOVERNMENT OF MAHARASHTRA

PROPOSED WATER DISTRIBUTION SYSTEM:

The treated water then shall be pumped to zonal GSRs' from where it will be distributed by gravity. The major part of this campus shall be served by gravity. The following methodology shall be proposed.
The Towers shall be served by Hydro-Pneumatic system for water distribution
The commercial establishments shall be served by localized OHT.
Storage: Total water requirement is divided into two viz, raw water and treated water, raw water storage is done in water treatment plant.

Classification of Hazards based on Occupancy

Sr. no.	Proposed potential hazards	Type of Hazards
1	Logistics	High Hazards
2	Apparel	High Hazards
3	IT & ITES	High Hazards
4	General Industries	High Hazards
5	Service Industry	High Hazards
6	High Density Residential	High Hazards
7.	Medium Density Residential	Medium Hazards
8	Low Density Residential	Ordinary Hazards
9	Commercial	High Hazards
10	Institutional	Medium Hazards
11	Utility	High Hazards
12	Parking Area	Medium Hazards

Water supply from fire hydrant

1. As per the Standing Fire Advisory committee's (SFAC) recommendations water supply for the industrial establishment is calculated on the following formula.

$$\frac{A + B + C + D}{1000}$$

where,



43.02.14

A = Total area in sq .feet of all floors including galleries of the factory building.

B = Total area of all floors and galleries inclusive of open spaces in which combustible material are handled or stored.

C = The total area of all floors over 15m (50 feet) above ground level.

D = The total area of all floors of combustible construction.

2. In addition, the water supply requirement should be based to give 100 minute supply at the rate and capacity worked out according to the above formula.
3. 50 % of water supply or 4 lakh liters whichever is less should be in the form of Static supply.
4. For Industrial and Commercial areas, water mains which will be laid down shall not be less than 15 cm (6") in diameter and should be capable of supplying minimum 4000 lit/min at a pressure not less than 1 kg/cm2 keeping storage capacity without any reduction.
5. For Residential areas main pipeline should not be less than 10 cm (4") diameter branched out of main line and should be capable of yielding a minimum of 2000 lit/min at a pressure of not less than 1 kg/cm2
6. Wells, ponds, creeks, rivers should be made approachable for fire engines by suitable constructions.

As per the N.F.P.A. the total Hazards are classified into 3 groups as follows:

Fire Hydrant Points as per NFPA Guidelines

Sr. No.	Type of hazard	Distance Between two hydrants	Remark
1	Ordinary	30 M	Hydrants installed on the underground water mains should preferably stand post type as per latest Indian Standard Specification No. 908.
2	Moderate	30 M	
3	High	15 M	

Water quantity calculation as per NFPA

For Ordinary and Light hazards

The quantity of water required = 946 liters/min

Total quantity of water required = 1.5 X (Quantity required for 120 Minutes + Reserve for 120 minutes)

Quantity of water required

for 120 mins	= 946 X120 X 1.5	= 170280 liters
Reserve for 120 mins	= 946 X120 X 1.5	= 170280 liters

Total quantity of water required = 340560 liters

For High hazards

The quantity of water required = Double the quantity required for Ordinary and Light Hazard
= 946 X 2 liters / min

Total quantity of water required = 1.5 X (Quantity required for 120 Minutes + Reserve for 120 minutes)

Total Quantity required	= 946 X 2 X 120 X 1.5	= 340560 liters
Reserve	= 946 X 2 X120 X 1.5	= 340560 liters

Total quantity of water required = 681120 liters

Note:

1. The water mains to carry water to the village for provision of hydrant points shall be at least 15 cm (6") diameter.
2. The locations of hydrants will be marked on the detail plan.
3. Fire services in township may face water problem through hydrants and as such fabricating water tenders of small capacity to the extent of 4,500 liters.



CRITERIA FOR DESIGNING A FIRE STATION

Detailed synopsis

A. BAY

A Three bay fire station for accommodating one mini water tenders (fire tender of type fabricated as per IS 950, Aerial ladder platform to render the services to high rise buildings, One Bay for one ambulance & one jeep which would be usually a convenience for the fire officer in case of emergency.

A(a) The dimension of the main bay would be as under: -
Length 30 – 36 feet (Practically 36 ft)
Width 10 - 14.5 feet (Practically 14.5 ft)
Height 18 feet.

A(b) The dimension of the fire engine
Length 14.5 ft
Width 10.9 ft
Height 14 ft
It is preferable if all the bays should also have the same dimension as that of the main bay so that accommodation in the subsequent years could be utilized for the stationing of an additional appliance.

B. BUILT UP ACCOMMODATION

(1) Watch room cum control room

A spacious room covering an area of at least 15 sq m may be provided as the watch room cum control room. It would be equipped with all modern communication facilities including wireless system. It may also be provided with hot line communication system with the nearest fire station of Pune fire service, Pimpri Chinchawad Fire Service & MIDC Hinjewadi Fire Station.

(2) Store

Enough storage accommodation comprising of at least 2 rooms each measuring about 18 sq mtr (length about 5 – 6 mtrs, breath 3 – 4 mtrs with an height matching with the height of the bay). It should be constructed adjoining to the bay and the distribution will be as follows:

2(a) Fire Fighting equipment like suction, hoses, branches, delivery hoses, extinguishers, etc.

2(b) Foam and foam making equipment, dry powders, stretchers, Breathing Apparatus sets, rescue suits, blankets, etc.

2(c) It will be divided into two parts:

(i) First part will be fully used for serviceable equipment, which are required in any type of emergency and which should be readily available. The key of this store would be with the shift in charge and not with the store man

(ii) In the second part, condemned and unserviceable equipments would be kept separately so that by mistake it should not be carried on the appliances in the emergency situations.

DIRECTORATE MAHARASHTRA FIRE SERVICES GOVERNMENT OF MAHARASHTRA

(3) Officer accommodation

3(a) Station Officer / in-charge of the fire station

The room covering an area of 120 – 130 sq feet roughly 12 to 13 sq mtr may be provided for officer in-charge with adequate furniture the receiving the visitors / officers. The room should be equipped with necessary communication facilities duly connected with control room, watch room through intercom.

3(b) Shift In-charge & other staff

As the station officer and his leading staff would be on duty during the day shift so that the evening and night shift would be supervised and controlled by and officer equivalent to the rank of sub-officer in the capacity of shift in-charge. Therefore, accommodation having a covered area of 40 sq mt may also be provided in the fire station for essential staff of 12 nos..

(4) Office accommodation

Generally a clerk and an officer assistant are made available for the performance of the official duty and to attend day-to-day work relating to the placement of indents and to submit and forward periodical reports, to take up repair and procurement of fire tenders and fire fighting equipments. To look after the pay, allowances, leave, etc. of the operational fire staff on duty.

(5) Work room for minor repairs

A room covering a suitable area of about 18 –2 sq mt would also be provided to carryout minor repair of fire fighting equipment like repair of delivery hoses, binding of coupling of hoses, repair of branches, hydraulic testing of extinguisher, fixing and fitment of branches in the hose reel and other allied equipments.

(6) Rest room / Recreation room

One crew rest cum recreation room for use by the fire staff who are on duty on the 2nd appliance and 3rd appliance. The room will also be utilized for placing the almirahs and cabinets allotted to the fire staff for the storage and upkeep of personal authorized equipments. The room will be also be used for making meals. The size of the room depends on the no. of person in each shift. For 6 persons - 660 x 550 cm area is required subsequently for 12 persons – 1320 x 550 cms should be given.

Note: Atleast one door from this room will open as direct entrance to the fire engine bay.

(7) Washroom / sanitary facilities

(a) For fire staff – One sanitary annexe with bath, WC and urinal facility will be provided next to the crew and rest room It should be quite spacious to meet the requirement of about 12 persons on duty.

(b) For officers – One sanitary annexe with bath, WC and urinal facility should be provided at suitable location for the officers. It should be well furnished, as it is likely to used by the visiting officers and inspecting staff.

DIRECTORATE, MAHARASHTRA ... GOVERNMENT OF MAHARASHTRA

(8) Fuel storage

It should be provided in accordance with the guidelines incorporated in the Indian Petroleum Act of 1934 and rules made there under of 1976. A suitable POL(Petrol Oil and Lubricants) room should be provided to meet the day-to-day requirement of vehicles / appliances / pumps at the fire station.

(9) Class room / Training room

A specious classroom with adequate furniture should be provided for imparting theoretical training to atleast 15 –20 persons. It should have desk / table with separate chairs so that the trainees could note down as written / displayed by the lecturer / instructor on the black board / white board or through displaying of transparencies.

Chair having a slightly boarder arm on the right hand side for placing the note book as a substitute it not acceptable as it does not facilitate a speedy recording of note. A spare is also required in the training class room for audio video means, for keeping cut-sections of equipments, models, models of the building and tender / fire engine, charts, OHPs, besides this leaflet / technical literature could be displayed on the walls. It would be advantageous if a small room of 15 sq mtrs were also annexed with the classroom, which could be used as library with furniture for providing reading and writing facilities for those who wish to enhance technical knowledge.

(10) Drill Ground

A drill ground measuring 200 x 100 ft with outdoor training facility should be provided near the fire station. 2 /3 hydrants duly connected with the feeder (Originated from the static water tank with potable pump). Overhead water reservoir or with city mains should be provided to carryout wet exercises /drills and live demonstration. To maintain the physical fitness of the fire crew the game items like horizontal / parallel bars, etc. should be provided in the drill ground.

(11) Residential Accommodation

It should be provided for some operating staff near the fire station so that a person could be called for manning the 2nd and 3rd appliances in times of emergency. The accommodation invariably may be provided for the STO and sub-officer in a separate officer block and for the resident family accommodation for other members of the fire staff in a separate block, which will be multi-story building.

C. SOURCES OF WATER SUPPLY

A fire station for accommodating mini water tender (fire tender of type B fabricated as per IS 950 which would be usually a convince for the fire officer however would be used as jeep fire engine in case of emergency.

C1. A static tank of capacity 1 lack liters should be provided near fire station in a manner with pucca parking space enabling the fire tenders to fill the tanks from the open source of water supply.

DIRECTORATE, MAHARASHTRA FIRE SERVICES * GOVERNMENT OF MAHARASHTRA

C2. A portable pump of adequate capacity should also be provided to maintain the overhead supply.

C3 An overhead filling point may also be provided coupled with a portable pump.

C4 The portable pump would also meet the requirement of hydrant installation erected in the fire drill ground.

D. COMMUNICATION FACILITY

The communication facility should be very efficient and the communication center will be provided with all modern communication system. It should have telephones, radio sets, one hot line from each building / block. One line should be connected with city fire brigade beside this a repeater fire alarm panel from each high-rise building should also be installed.

E. FIRE PERSONNEL

E(a) *Station Officer*

One no. of station officer would be required to look after the complete station and he will be overall in-charge of fire station. He would remain on duty during the day shift.

E(b) *Fire fighting staff for the One appliances*

Leading hand fire / leading firemen (02), fire engine driver (01), Firemen (04). Thus total fire fighting staff in one shift could be 08, hence for three shifts 36 nos. For leave reserve / holiday / Sunday / Gazette Holiday, etc. 33% of the total staff required is 12, thus total fire fighting staff would be 38.

E(c) Driver for Jeep & Ambulance (1 in each shift)

E(d) Staff for telephone duty

At least one person in each shift would be required to man the communication center / watch room. Thus the total would be 4 nos. The rank of the telephone staff could be that of fireman.

F. NUMBER OF APPLICANCES

As per the given information about the population and area, One no. of appliances will be required and these appliance will be of type B, IS 950.

G. LOCATION OF THE FIRE STATION

The fire station should be so located that they would meet the standard response time.

H. NUMBER OF FIRE STATION REQUIRED (01 No.)

As per the given information of land area and population, one fire station would be enough for township

DIRECTORATE MAHARASHTRA GOVERNMENT OF MAHARASHTRA

I. LAND AREA REQUIRED FOR THE FIRE STATION

The land area required for this type of fire station would be 8000 – 10000 sq mtrs. With sufficient open space attached to fire station for carrying out fire drills and parade.

J. CONSTRUCTION OF THE STATION – CONCRETE

K. MISCELLANEOUS EQUIPMENT

Besides above equipments / system minor rescue equipment should also be provided that is hydraulic spreader and hydraulic cutting machine, salvage equipments, first aid equipments, different types of hydrants, etc. As there will be no city fire station at a distance of 5 Kms from the township.

It may please be appreciated that the necessary requisite information have been given in the above paragraph for meeting the urgent requirement envisaging the location of the fire station with necessary facility together with the fire appliances, inter area, manpower for the establishment of an independent fire brigade for the township. However, detailed informed together with drawing of the fire station and other facilities erected for achieving operational efficiency beside specification of the static tank, fire appliances, Jeep fire engine and the ancillary equipment and appurtenances would be made available after spot survey of the area or on the receipt of essential information as stated in above para.

We have tried our level best to give the latest information on the above subject, based on the standards formulated for the celebrated authorities because we firmly believe in fire protection as it is well-known that if fire snatches the upper hand, then it causes unimaginable magnitude of losses and in that context there is no remedy. Subsequently, save a weave off repentance.



PART 2

TECHNICAL SPECIFICATIONS – FIRE FIGHTING SYSTEM
For
Various Types of Buildings in Township.

I N D E X

SR .NO.	DESCRIPTION
1.	FIRE HYDRANT SYSTEM INSTALLATION
2.	SPRINKLER SYSTEM INSTALLATION
3.	PUMPS and ACCESSORIES
4.	HAND HELD FIRE EXTINGUISHERS and HAND APPLIANCES
5.	MISCELLENEOUS
6.	STATUTORY AUTHORITIES' TESTS & INSPECTIONS



1. FIRE HYDRANT SYSTEM

1.1 SCOPE OF WORK & SPECIAL CONDITIONS

The scope of work includes complete design, supply, installation, erection, testing, commissioning the fire hydrant system, Hose Reel system, Sprinkler system and first aid fire extinguishers with all necessary accessories as per FIRE BRIGADE AUTHORITY/Design drawings & specs. Further it shall include for getting the necessary approval from the FIRE BRIGADE AUTHORITIES if required.

1.2 APPLICATION CODES AND STANDARDS

The work shall be carried out in accordance with the regulations of local bodies, if any and the following specifications and codes which may govern the requirements of the system.

a. IS 901 - 1975 - Specification for couplings, double male and double female, instantaneous pattern for fire fighting.
b. IS 902 - 1974 - Specification for suction hose coupling for fire fighting purposes.
c. IS 13039 - - Butterfly valve for water works purposes.
d. IS 1239 - Mild steel tube and other wrought steel fittings.
e. IS 8423 - 1977 - Controlled percolating hose for fire fighting.
f. IS 5290 - 1983 - Landing valves
g. IS 2871 - 1983 - Branch pipe, universal for fire fighting purposes.
h. IS 884- - First aid hose reel for fire fighting
i. TAC Manual/NBC

1.3 DRAWINGS AND DESIGN CALCULATIONS

The drawings enclosed herewith are for the general guidance to the tenderer. The contractor shall upon the award of the work furnish detailed working drawings necessary to carryout the work at site with detail/design calculation. These shall be submitted to the consultant/statutory bodies for the approval and the work shall be commenced only after the approval of drawing by the consultants/statutory bodies.

1.4 INSPECTION AND APPROVAL

The contractor shall arrange all necessary inspection by FBA. He shall also arrange for the tests and obtain and deliver to the owners any approval required as per local by laws/statutory requirements.

1.5 PAINTING

All piping equipment, cabinets etc., shall be properly painted with two coats of synthetic enamel paint over a coat of primer of approved color and make.

1.6 MATERIAL & WORKMANSHIP

The contractor shall guarantee both the material and workmanship of first class quality corresponding to standard engineering practice. Any defective materials/workmanship shall be rejected and the contractor shall rectify/replace at his own cost. Guarantee certificate of the materials supplied shall be handed over to the company.

1.7 INSTRUCTION MANUAL/COMPLETION DRAWING/TRAINING

The contractor shall furnish detailed instruction and operation manual in triplicate including detailed completion drawing on a tracing cloth to approved scale. Further it is the responsibility of the contractor to train the employer's personnel in the operation and maintenance of the system.

1.8 FIRE HYDRANT SYSTEM

Without restricting to the generality of the foregoing, the fire hydrant system shall include the following:

1. Galvanized Iron Class "C" fire riser main /M.S. Pipe within the building and M.S. Pipelines outside the building as per drawings / Bill of quantities
2. Landing valves, hose reels, hose cabinets, etc.,
3. All materials shall be of the best quality conforming to these specifications and subject to the approval of the Engineer-in- charge.
4. Pipes shall be fixed in a manner as to provide easy accessibility for repair and maintenance and shall not cause obstruction in shafts, passages etc.,
5. Pipes and fittings shall be fixed to walls and ceilings by suitable clamps at intervals specified. Only approved type of anchor fasteners shall be used for RCC ceiling and walls.
6. Pipes and fittings shall be fixed truly vertical, horizontal or in slopes as required in neat workman like manner.
7. Valves and other appurtenances shall be so located that they are easily accessible for operations repairs and maintenance.
8. Pipes for wet risers within the Building shall be GI tubes conforming to IS 1239 (heavy duty 'C' class) / M.S. Pipes with flanged/welded joints.
9. Fittings for black steel pipes shall be Butt weld or approved type cast iron fittings with screwed/welded joints.
10. Joints for black steel pipes and fittings shall be metal - metal thread joints. A small amount of red lead may be used for lubrication and rust prevention. Joints shall be welded when approved by the engineer-in charge.
11. Standpipe (80mm Dia) shall be of GI class 'C' as per IS 1239 PI-90 and FBA/TAC approved make.

Pipe accessories such as gauges, meters, control devices, etc. shall have the same working pressure rating as the associated pipe work. All pipe work shall be free from burrs, rust and scale and shall be cleaned before installation. All personnel engaged on welding operations must possess a certificate of competence issued by an acceptable / recognized authority.

1.9 PIPING

Providing and supplying spirally welded/ERW/SAW/fabricated M.S. pipes(Commercial Quality)including procurements of plates, gas cutting to required size rolling, tack welding assembling in suitable lengths to form pipes, welding on automatic welding machine and forming `V' edge on both ends of pipes including all taxes(Central and Local),Railway freight, insurance unloading from railway wagon, loading into truck, transport to stores/site, unloading, stacking etc, complete as per IS-3589 and IS 5504 as applicable as per specifications(No negative tolerance in thickness is permissible) For Fire Fighting System All pipes inside the building and where specified, outside the building shall be MS Pipes/ seamless pipes/ Fittings for MS pipes installed above ground shall be malleable iron or approved type cast iron fittings with screwed threads welded or flanged to IS 1554 or as per IS: 1239, Part II (heavy grade) pipes above 150mmdia shall be fabricated as per IS: 3589. The

DIRECTORATE, MAHARASHTRA GOVERNMENT OF MAHARASHTRA

pipes shall be carefully laid to the alignment, levels and gradients shown on the plan and sections. Great care shall be taken during installation of pipes to prevent any sand, earth or other matter from entering the pipe. The pipe shall be kept thoroughly clean during the course of installation. The end of pipes shall be blocked by wooden plugs wedged home, at the end of each day's work to prevent dirt and animals from entering the pipe. For MS pipes up to 50mmdia tapered screwed jointing shall be adopted, while for pipes above 50mmdia welded or flanged connections shall be used. A small amount of red lead may be used for lubrication and rust prevention. Joints shall be welded when "approved by Engineer-in-Charge. Flanged joints shall be made with 3mm thick insertion rubber washer. Bolt holes in flanges shall be drilled. The drilling of each flange shall be in accordance with the relevant Indian Standard. Flanged joints shall be used for connections to vessels, equipment, flanged valves and also on suitable straight lengths of pipeline of strategic points to facilitate erection and subsequent maintenance work. Pipes shall be hung by means of expandable anchor fastener of approved make and design. The hangers and clamps shall be fastened by means of galvanized nuts and bolts. The size/diameter of the anchor fastener and the clamps shall be suitable to carry the weight of water filled pipe and dead load normally encountered. Hangers and supports shall be thoroughly galvanized after fabrication. The selection and design of the hanger & support shall be capable of carrying the sum of all concurrently acting loads. They shall be designed to provide the required supporting effects and allow pipeline movements as necessary. All guides, anchor braces, dampener, expansion joint and structural steel to be attached to the building/structure trenches etc. shall be provided. Hangers and components for all piping shall be approved by the Consultants. Flanged joints shall be used for connections for vessels, equipment, flanged valves and also on two straight lengths of pipelines of strategic points to facilitate erection and subsequent maintenance work.

Cut-outs in the floor slab for installing the various pipes area are indicated in the drawings. Contractor shall carefully examine the cut-outs provided and clearly point out wherever the cut-outs shown in the drawings, do not meet with the requirements. Pipe sleeves, larger diameter than pipes, shall be provided wherever pipes pass through walls and slab and annular space filled with fiber glass and finished with retainer rings. The contractor shall make sure that the clamps, brackets, saddles and hangers provided for pipe supports are adequate or as specified / approved by Consultants. Piping layout shall take due care for expansion and contraction in pipes and include expansion joints where required. All pipes shall be accurately cut to the required sizes in accordance with relevant BIS codes and burrs removed before laying. Open ends of the piping shall be closed as the pipe is installed to avoid entrance of foreign matter. Where reducers are to be made in horizontal runs, eccentric reduces shall be used for the piping to drain freely. In other locations, concentric reduces may be used. Automatic air valves shall be provided at all high points in the piping system for venting. All valves shall be of 15mm pipe size and shall be associated with an equal size gate valves. Automatic air valves shall be provided on hot water risers. Discharge from the air valves shall be piped through a pipe to the nearest drain or sump. All pipes shall be pitched towards drain points. Pressure gauges shall be provided as shown on the approved drawings. Care shall be taken to protect pressure gauges during pressure testing.

1.9.1 JOINTING

Welded Joints:

Joints between MS pipes and fittings shall be made with the pipes and fittings having "V" groove and welded with electrical resistance welding in an approved manner. But welding without "V" groove shall not be permitted. All joints in the pipe line with screwed fittings shall be seal welded after testing and the weld plus the adjoining portion shall be given two coats of zinc rich primer. Flanged joints (65 mm Dia and above). Flanged joints with flanges conforming to IS: 6392 shall be provided on:

a. Straight runs at intervals not exceeding 25-30m on pipe lines of 50 mm Dia and above and as directed by the Project Manager.

b. For jointing all types of valves, appurtenances, pumps, connections with other type of pipes, to water tanks and other places necessary and as required for good engineering practice and as shown/noted on the drawings.

Flanges shall be with GI bolts and nuts and 3mm insertion gasket of natural rubber conforming to IS: 11149.

Unions (up to 50 mm Dia); approved type of dismountable unions shall be provided on pipe lines of 40 mm Dia and smaller Dia, in locations similar to those specified for flanges.

1.9.2 AIR VESSEL

The air vessel shall be provided to compensate for slight loss of pressure in the system and to provide an air cushion for counter-acting pressure, surges, whenever the pumping sets come into operation. Air vessel shall conform to IS: 3844. It shall be normally half full of water, when the system is in normal operation. Air vessel shall be fabricated with 8 mm thick M.S. plate with dished ends and suitable supporting legs. It shall be provided with one 100 mm dia flanged connection from pump, one 25 mm drain with valve, one water level gauge and 25 mm sockets for pressure switches. The air vessel shall be tested to pressure for 12 hours at 2 times the operating pressure or 1.5 times the shut-off.

1.9.3 AIR CUSHION TANK

Every wet riser shall be provided with an air cushion tank at its top most point. The air cushion shall be provided with an automatic air release cock, 20 mm dia drain pipe, drain valve and shut off valve.

1.10 EXCAVATION/THRUST BLOCKS

1. Excavation for pipelines shall be in open trenches to lines and grades shown on the drawings or as required at site. Pipelines shall be buried to a minimum depth of 1M suitable thrust blocks pf PCC 1:2:4 shall be provided at change of direction of pipelines both horizontally and vertically or and shall have 230 mm x 230 mm masonry or concrete supports at least 300 mm high at 3m intervals. Masonry work to have plain cement concrete foundation (1 cement: 4 coarse sand : 8 stone aggregate) of size 380x380x75 thick resting on firm soil.

DIRECTORATE MAHARASHTRA GOVERNMENT OF MAHARASHTRA

2. Wherever required contractor shall support all trenches or adjoining structures with adequate timber supports.
3. On completion of testing and painting of the pipe lines trenches shall be refilled with excavated earth in 20cms. layers and consolidated.
4. Contractor shall dispose off all surplus earth within a lead of 50m or as directed by Engineer-in-charge.

Mains below ground level shall be supported at regular intervals not exceeding 3.0 meters and shall be laid at least 2.0 meter away from the building. Pipe hangers shall be provided at the following maximum spacing:

Pipe Dia (mm)	Hanger Rod Dia (mm)	Spacing between Supports (m)
Up to 25	6	2
32 to 50	10	2.7
80 to 100	12	2.7
125 to 150	16	3.6
200 to 300	19	5.3

1.11 MASONRY BLOCKS

Contractor shall provide suitable Burnt Brick Masonry blocks in loose soil conditions of suitable dimensions at regular intervals of 3.0m to support the pipes. Masonry shall be of TM Class I Bricks in CM 1:6 and plastered in Cm 1:3, finished with a neat smooth coat of cement.

1.12 VALVES

Butterfly valves shall be provided for pipes 50mm dia and above. The valves shall confirm to IS: 13039 and shall be CI construction. The valve shall be tested to a pressure of 20Kg/sq.cm.

1.12.1 SLUICE VALVES

Sluice valves shall be double flanged valves with cast iron body. The spindle, wall seat and wedge nuts shall be of bronze. They shall generally have non-rising spindle and shall be of the particular duty and design called for. The valves shall be supplied with suitable flanges, non- corrosive bolts and asbestos fiber gaskets. Sluice valves shall conform to Indian Standard IS: 780-1969 and IS: 2906.

1.12.2 BUTTERFLY VALVE

The butterfly valve shall be suitable for waterworks and rated for 300 P.S.I, the body shall be of cast iron to IS: 210 in circular shape and of high strength to take the water pressure. The disc shall be heavy duty cast iron with anti corrosive epoxy or nickel coating. The valve seat shall be of high grade elastomer or nitrite rubber. The valve is closed position shall have complete contact between the seat and the disc throughout the perimeter. The elastomer rubber shall have a long life and shall not give away on continuous applied water pressure. The shaft shall be EN 8 grade carbon steel. The valve shall be fitted between two flanges on either side of pipe flanges. The valve edge rubber shall be projected outside such that they are wedged within the pipe flanges to prevent leakages.

DIRECTORATE MAHARASHTRA GOVERNMENT OF MAHARASHTRA

1.12.3 BALL VALVE

The ball valve shall be made forged brass and suitable for test pressure of pipe line. The valve shall be internally threaded to receive pipe connections. The ball shall be made from brass and machined to perfect round shape and subsequently chrome plated. The seat of the valve body-bonnet gasket and gland packing shall be of Teflon. The handle shall be provided with PVC jacket. The handle shall also indicate the direction of 'open' and 'closed' situations. The gap between the ball and the Teflon packing shall be sealed to prevent water seeping. The handle shall also be provided with a lug to keep the movement of the ball valve within 90°. The lever shall be operated smoothly and without application of any unnecessary force.

1.12.4 GUN METAL VALVES

Gun metal Valves shall be used for smaller Dia pipes, and for threaded connections. The Valves shall bear certification as per IS: 778. The body and bonnet shall be of gun metal to IS: 318. The stem gland and gland nut shall be of forged brass to IS: 6912. The hand wheel shall be of cast iron to IS: 210. The Hand wheel shall be of high quality finish to avoid hand abrasions. Movement shall also be easy. The spindle shall be non rising type.

1.12.4 NON-RETURN VALVE

Non-Return valves shall be cast iron double flanged with cast iron body and gunmetal internal parts conforming to IS: 5312.

1.12.5 PRESSURE RELIEF VALVE

Each System shall be provided with a Pressure Relief Valves. The Valve shall be spring actuated and set to operate as per field requirement. The Valve shall be constructed of bronze and provided with an open discharge orifice for releasing the water. The Valve shall be open lift type.

1.12.6 PRESSURE GAUGE

Pressure gauge shall be provided near all individual connections of the hydrant system with isolation valves and near each flow switch assembly of the sprinkler system. Pressure gauge shall be 50 mm Dia gunmetal bourdon type with gun mental isolation ball valve, tapping and connecting pipe and nipple. The gauge shall be installed at appropriate height for easy readability.

1.13 EXTERNAL HYDRANTS

Yard hydrant valves shall be as per IS: 5290. The valve should be complete with hand wheel, quick coupling connection, spring and blank cap. The hydrant shall be laid on 100mmdia main tee off to 100mm/80mmdia and stand post of 80mmdia for single headed hydrant at 1.0M from ground level. The external hydrant valve shall be single headed type as specified in B.O.Q. Each external hydrant hose cabinet shall be provided with a drain in the bottom plate. Each external hydrant hose cabinet containing items as above shall also be provided with a nozzle spanner and a Fireman's Axe. This shall be measured and paid for separately. Each hose cabinet shall be conspicuously painted with the letters "FIRE HOSE".

DIRECTORATE MAHARASHTRA FIRE SERVICES * GOVERNMENT OF MAHARASHTRA *

1.14 RUBBER HOSE REEL

Contractor shall provide standard fire hose reels 30.0 m long with 19mmdia high pressure reinforced rubber hose of specified length with gunmetal nozzles and control valve, shut off valve, all mounted on a circular hose reel drum of mild steel construction and cast iron bracket.

1.15 HYDRANT VALVE AND CP HOSE PIPE

The landing valve (internal) shall be gunmetal single headed type confirming to IS: 5290, complete with hand wheel, quick coupling, spring and blank cap heavy duty CP hose pipe 63mmdia (2nos. 15.0m. length in FHC and 2 nos. of 15m. length in external hose cabinet) with 63mmdia. Instantaneous pattern single headed hydrant valve, branch pipe and nozzle to be provided in the fire hose cabinet. The branch pipe shall be gunmetal and confirm to IS: 903. The fire hose cabinet shall be as per B.O.Q.

1.15.1 Internal Hydrants

a. Contractor shall provide on each landing and other locations as shown on the drawings double headed gunmetal landing valve with 100 mm Dia inlet as per IS:5290, with shut off valves having cast iron heels as shown on the drawings. Landing valve shall have flanged inlet and instantaneous type outlets as shown on the drawings.

b. Instantaneous outlets for fire hydrants shall be standard pattern and suitable for fire hoses.

c. Contractor shall provide for each internal fire hydrant station two numbers of 63 mm dia. 15 m long rubberized fabric lined hose pipes with gunmetal male and female instantaneous type coupling machine would with GI wire (hose to IS:636 type 2 and couplings to IS:903 with IS certification), fire hose reel, gunmetal branch pipe with nozzle to IS:903. This shall be measured and paid for separately.

d. Contractor shall provide standard fire hose reels of 20mm Dia high pressure Dunlop rubber hose 36.5 m long with gunmetal nozzle, all mounted on a circular hose reel of heavy duty mild steel construction having cast iron brackets. Hose reel shall be connected directly to the wet riser with an isolating valve. Hose reel shall conform to IS: 884 and shall be mounted vertically. This shall be measured and paid for separately.

e. Each internal hydrant hose cabinet shall be provided with a drain in the bottom plate. The drain point shall be lead away to the nearest general drain.

f. Each internal hydrant hose cabinet containing items as above shall also be provided with a nozzle spanner and a Fireman's Axe. The cabinet shall be recessed in the wall as directed. This shall be measured and paid for separately.

g. Each hose cabinet shall be conspicuously painted with the letters "FIRE HOSE".

1.15.2 Hose Reel

Hose reel shall conform to IS: 884, heavy duty, 20 mm Dia length shall be 36 meter long fitted with gun metal chromium plated nozzle, mild steel pressed reel drum which can swing up to 170 degree with wall brackets of cast iron finished with red and black enamel complete.

1.15.3 Fire Hose
All hose pipes shall be of 63 mm diameter RRL/ CP as required, conforming to IS: 636 or IS: 8423. The hose shall be provided with copper alloy delivery coupling. The hose shall be capable of withstanding a bursting pressure of 35.7 Kg/Sq.cm without undue leakage or sweating. Hose shall be provided with instantaneous spring-lock, type couplings.

1.15.4 Branch Pipe, Nozzle
Branch pipes shall be of gun metal with loaded tin bronze ring at the discharge and to receive the nozzle and provided at the other with a leaded tin bronze ring to fit into the instantaneous coupling. Nozzle shall be of spray type of diameter of not less than 16 mm and not more than 25 mm. Nozzle shall be of loaded tin bronze branch pipe and nozzle shall be of instantaneous pattern conforming to Indian Standard - 903.

1.15.5 Hose Cabinet
Hose cabinet shall be provided for all internal and external fire hydrants. Hose cabinets shall be fabricated from 16 gauge MS powder coated sheet of fully welded construction with hinged double front door partially glazed (3 mm glass panel) with locking arrangement, stove enameled fire red paint (shade No. 536 of IS:5) with "FIRE HOSE" written on it prominently (size as given in the schedule of quantities). Cabinet surfaces in contact with the walls shall not be powder coated but instead given two coats of anti-corrosive bit mastic paint.

1.15.6 Internal Hose Cabinet
Hose cabinet shall be of glass fronted with hinged door & lock. The cabinet shall be made of 16 gauge thick MS sheet and spray painted to shade No. 536 of IS:5. The hose cabinet shall be of size to accommodate the following:
i. Landing Valves (Single/double headed)
ii. Hose pipe
iii. Hose reel (36.5 mtr.)
iv. Branch pipes, nozzles (2 sets)
v. Fire man's axe and hand appliances
External Hose Cabinet
The hose cabinet shall be of size to accommodate the following:
i. Single/Double headed yard hydrant valve
ii. Hose pipe (2 lengths of 15 m)
iii. Branch pipes, nozzles (2 sets)
iv. Fire man's axe

1.16 AIR VALVES
Provide 25mm screwed inlet GM single acting air valve on all high points in the system or as shown on drawings.

1.17 DRAIN VALVES
Provide 50mmdia GI pipe conforming to IS 1239 heavy class with 50mm butterfly valve for draining any water in the system in low pockets.

1.18 HYDRANT/VALVE CHAMBERS
Contractor shall provide suitable brick masonry chambers in cement mortar 1:4 (1 cement: 4 coarse sand) on cement concrete foundations 6" thick 1:5:10

mix (1 cement : 5 fine sand : 10 graded stone aggregate 1 ½" nominal size) ½" thick cement plaster inside and outside finished with a floating coat of neat cement inside including excavation, back filling, providing heavy duty FRC frame & cover etc., complete. Valve chambers shall be of following sizes: For depths up to 1200mm= 600mmx600mm.

1.19 PIPE PROTECTION

All pipes above ground and in exposed locations shall be painted with one coat of red oxide primer and two or more coats of synthetic enamel paint of approved shade. The below ground pipes shall be coated with bitumen paint and wrapping with plastic coated Hessian cloth.

1.20 PIPE SUPPORTS

All pipes shall be adequately supported from roof or walls from existing inserts by structural clamps fabricated from MS structures, expansion bolts, channels, angles and flats or hi-tech supports capable of carrying the loads. All clamps shall be painted with a coat of red lead and two coats of black enamel paint.

1.21 PAINTING

All Hydrant and Sprinkler pipes shall be painted with post office red color paint. All M S pipes shall first be cleaned thoroughly before application of primer coat. After application of primer coat two coats of enamel paint shall be applied. Each coat shall be given minimum 24 hours drying time. No thinners shall be used. Wherever required all pipe headers shall be worded indicating the direction of the pipe and its purpose such as "TO RISER NO.1" etc. Painting shall be expertly applied; the paint shall not over run on surfaces not requiring painting such as walls, surfaces etc. Nuts and bolts shall be painted black, while valves shall be painted blue. Under ground pipes to be provided with coal tar epoxy base paints of approved make.

1.22 TESTING

All piping in the system shall be tested to hydrostatic pressure of 2 1.5 times the working pressure or 1.5 time shut-off pressure including testing for water hammer effects. With out drop in pressure for at least 30 minutes. Rectify all leakage, make adjustment and retest as required and directed to the satisfaction of the FBA authorities and the consultants/client's representative.

2.0 SPRINKLER SYSTEM

2.1 SCOPE OF WORK:

The sprinkler system shall be provided in Basement. The system shall include the following:

1. Sprinkler main, branch and internal piping complete with valves and supporting arrangements.
2. Sprinkler heads with spare sprinklers.
3. Connections to risers etc.

DIRECTORATE MAHARASHTRA FIRE SERVICES

2.2 MATERIALS:

All materials shall be of the best quality conforming to specifications and subject to the approval of Engineer-in- charge. Pipes and fittings shall be fixed truly vertical, horizontal or in slopes required in neat workman like manner.

2.2.1 Pipes shall be fixed in a manner as to provide easy accessibility for repair, maintenance and shall not cause obstruction in shafts, passages etc.,

2.2.2 Pipes shall be securely fixed to walls and ceilings by suitable clamps at intervals specified. Only approved type of anchor fasteners shall be used for RCC ceiling and walls.

2.2.3 Valves and other equipment shall be so located that they are easily accessible for operation, repairs and maintenance.

2.3 SPRINKLER HEADS:

The sprinkler heads are of fixed temperature type with a quartzite bulb containing liquid having high vapor pressure held in position by forged GM yoke and a deflector. The rated temperature of quartzite bulb shall be 68deg. C. Sprinkler heads shall be provided at approximate spacing so ac to cover about 80 Sq. Ft. area/ sprinkler and as shown on drawing. The spacing shall however conform as per the detailed drawing, in co-ordination with electrical and other allied services at the ceiling level. Contractor shall supply 12 spare sprinkler heads and 2 nos. spanners neatly installed in a steel box with glass shutter at an appropriate position approved by the engineer-in-charge.

2.4 PIPES AND FITTINGS:

Pipe for sprinkler system shall be GI pipes conforming to IS 1239 (heavy class) Fittings for GI pipes shall be approved type, with flanged/threaded fittings.

2.5 JOINT

For jointing of pipes, butterfly valve, check valves etc., refer specifications given for fire hydrant system.

3.0 PUMPS AND ACCESSORIES

3.1 The pumps shall be exclusively used for fire fighting purposes and shall be approved by the Fire Authority. One set of Diesel engine driven direct coupled centrifugal pump and 1no. Electrical driven pump of adequate HP shall be provided. The pumping capacity of main hydrant pump shall be 2820Lpm. at 70.0m head, and that of Jockey pump on shall be 180Lpm. @ 70.0m head, terrace level pumps one each on Hotel Bldg., Business Bldg. and Center Hall. 900Lpm @ 35.0m head. Should include Suction strainers and accessories. Vibration eliminator pads and foundation bolts. Leak-off drain shall be led to the nearest floor drain.

DIRECTORATE MAHARASHTRA GOVERNMENT OF MAHARASHTRA

3.2 GENERAL REQUIREMENT

3.2.1 The head vs. capacity, input power vs. capacity characteristics, etc., shall match to ensure load sharing and trouble free operation throughout the range. In case of accidental reverse flow through the pump the driver shall be capable of bringing the pump to its rated speed in the normal direction from the point of maximum possible reverse speed. The contractor under this specification shall assume full responsibility in the operation of the pump and the drive as one unit.

3.2.2 The rated capacity of the pump shall be 150 percent of rated capacity at a total head of not less than 65 percent of the total rated head. The total shut off head shall not exceed 120 percent of total rated head on the pump.

3.2.3 An automatic air release valve shall be provided to vent air from the pump discharge and also to admit to the pump to dissipate the vacuum there, upon stopping of the pump. This valve shall be located at the highest point in the discharge line between the pump and the discharge check valve.

3.2.4 Pump coupled with motor or engine on a common platform shall perform smoothly without any excessive noise or vibration.

3.2.5 The main hydrant pump is working on positive suction

.

3.3 Pump Shaft-Motor Shaft Coupling

All shafts shall be connected with adequately sized flexible couplings with spacer of suitable approved design. Necessary guards shall be provided for couplings.

3.4 BASE PLATE

A common base plate mounting both for the pump and drive shall be provided. The base plate shall be of rigid construction, suitably ribbed and reinforced. Base plate and pump supports shall be so constructed and the pumping unit so mounted as to minimize misalignment caused by mechanical forces such as normal piping strain, hydraulic piping thrust etc.

3.5 VIBRATION AND BALANCING

The rotating elements shall be so designed to ensure least vibration during start and throughout the operation of the equipment. All rotating components shall be statically and dynamically balanced at workshop. All the components of pumps of identical parameters supplied under these specifications shall be interchangeable.

3.6 INSTRUCTION MANUAL AND TOOLS/SPARES

A comprehensive instruction manual shall be provided by the contractor indicating detailed requirements for operation, dismantling and periodic operation and maintenance procedures. Recommended tools/spares shall be provided and their rate breakup shall be provided by the contractor.



3.7 ELECTRIC MOTORS

The motor shall be rated not to draw starting current more than 6 times normal running current. Motor shall be capable of driving the pumps at 150% of its rated discharge and shall be designed for continuous full load duty. The motor shall be capable of handling the required starting torque of the pumps Speed of motor shall be compatible with the speed of the pump. The cooling fans shall be directly driven from motor shaft. Motor situated outdoors or exposed to the weather shall be weather protected. Motors shall be enclosed type and shall have dust tight construction with suitable means of breathing and of drainage to prevent accumulation of water from condensation. Drain holes shall exclude bodies greater than 6mm diameter. All components shall be of adequate mechanical strength and robustness and shall be constructed of metal unless otherwise approved. All motors shall be dynamically balanced. The enclosure shall be designed to provide an affective sealing between the primary and secondary air circuits. Winding insulation shall be class B 415V AC motor and winding shall be vacuum impregnated with heat and moisture resistant varnish glass fiber insulated. Two independent earthing points shall be provided in accordance with IS: 3043 on opposite sides of the motor for bolted connection. The cable boxes and termination shall be designed to enable easy disconnection and replacement of cables.

3.8 DIESEL ENGINE

3.8.1 General

The diesel engine shall be of multi-cylinder type four stroke cycles with mechanical (airless) injection cold starting type. The engine shall be designed with regard to ease of maintenance, repair, cleaning and inspection. This will also provide interchangeability of parts. All parts susceptible to temperature changes shall have tolerance for expansion and contraction without resulting in leakage, misalignment of parts or injury to parts.

3.8.2 Starting

The engine shall be capable of both automatic and manual start. Generally the engine shall start automatically but in case of the auto-start system failure the engine shall be capable of manual start. Engine shall be able to start without any preliminary heating of combustion chamber; cranking mechanism shall also be provided. All controls/mechanism which have to be operated in the starting process, shall be within easy reach of the operator. A high DC motor charged by battery shall initiate automatic start of diesel engine. The battery shall hold adequate retaining charge to provide the starting of the diesel engine. Starting power will be supplied from two sets of storage batteries.

One set of battery is for automatic starting of the engine and the other provided for manual starting. A selector switch will be provided at automatic starting control panel to select any of the two sets of battery for manual/auto starting of the engine. The battery capacity shall be adequate for ten consecutive starts without recharging with a cold engine under full compression. The battery banks shall be used for no other purpose other than starting of the engine and shall be fully charged at all times with provision for trickle and boast charges. After start of the engine the charger shall be disconnected, the battery being fed from the engine dynamo. The two battery charger of air cooled type shall be able to charge on battery bank at a time.

DIRECTORATE MAHARASHTRA GOVERNMENT OF MAHARASHTRA सत्यमेव जयते

The D/E starting panel along with the battery changers should be approved by FBA.

3.8.3 Governing System

The engine shall have a speed control device which will control the speed under all conditions of load. The governor shall be suitable for operation without external power supply. The Governor shall offer following features: An adjustable governor to regulate engine speed within a range of 10% between shut-off and maximum load conditions of the pumps. The governor shall be set to maintain rated pump speed at maximum pump load. The diesel engine is to run on high speed diesel, the tank provided being enough to hold the volume required for 6 hours (minimum) continuous operation.

3.8.4 Cooling Water System

Direct cooling system shall be employed for the diesel engine. Water shall be tapped from the fire pump discharge. This water shall be led through duplex strainer, pressure breakdown orifice and after passing through the engine, the outlet water shall be taken directly to the sump through an elevated funnel. Re-circulating Thermo siphon system of cooling using a fan cooled radiator or indirect cooling system using head exchange shall not be accepted.

3.8.5 Accessories

The engine shall be mounted on a base plate of fabricated steel construction. Adequate access shall be provided for the big end and main bearings, camshaft and governor drives, water jackets etc. The engine shall have a base plate made from MS sections. There shall be reasonable space at the big end, camshaft, water jackets, governor drives and main bearings.

The engine shall be provided with intake and discharge duct work, inlet filter and silencer, outlet muffler, expansion joints, dampers etc., as necessary for efficient operation. Intake air should be taken from inside the building in which the engine is located, but the exhaust should be discharged outside the building and exhaust duct shall be adequately sized for minimum pressure drop as per relevant code/standard, and shall be housed clearing man height. The flywheel shall have graduated marking around the periphery to facilitate checking of valve and fuel pump timings. Full set of diesel engine spares as per Standard requirement to be provided along with tool kit.

3.8.6 Instrumentation

The diesel engine shall be provided with adequate instrumentation. The gauges etc., as required are provided for in the Engine Panel.

3.8.6.1 Engine instrumentation shall include the following:-

i) Lub. oil pressure gauge.
ii) Lub. oil temperature gauge.
iii) Water pressure gauge.
iv) Water temperature gauge.
v) Tachometer.
vi) Hour meter.

The instrumentation panel shall be suitably resident mounted on the engine.

3.8.6.2 Engine Protection Devices- Following engine protection and automatic shut down facilities shall be provided:-
i) Low lub.oil pressure.
ii) High cooling water temp.
iii) High lub.oil temperature.
iv) Over speed shut down.

3.8.6.3 Pipe Work - All pipe lines with fittings and accessories required shall be provided for fuel oil, lub.oil and exhaust systems, copper piping of adequate sizes, shall be used for Lub.oil and fuel oil. M.S. piping will be permitted for exhaust.

3.8.6.4 Anti Vibration Mounting- Suitable vibration mounting duly approved by Project Manager shall be employed for mounting the unit so as to minimize transmission of vibration to the structure. The isolation efficiency achievable shall be clearly indicated.

3.8.6.5 Battery Charger-Necessary float and boost charger shall be incorporated in the control section of the power and control panel, to keep the battery in trim condition. Voltmeter to indicate the state of charge of the batteries shall be provided.

3.9 OPERATING CONDITION FOR PUMPS (START-STOP).
Operating Pressure 8.5kg/sqcm
Jockey Pump 6.0kg/sqcm 5.50kg/sqcm
Elec. Pump 5.50kg/sqcm Manual
Diesel Engine pump 4.0kg/sqcm Manual
Terrace Pump 1.5kg/sqcm Manual

3.9.1 Flexible connectors
On all suction and delivery lines double flanged reinforced neoprene flexible pipe connectors shall be provided. Connectors should be suitable for maximum working pressure of each pipe line on which it is mounted and tested to a test pressure of 1:5 times the operating pressure. Length of the connector shall be as per manufacturer's standard.

3.9.2 Interlocking
The following inter-locking between the two main fire pumps (i.e. wet riser pump & sprinkler pump), the jockey pump and the diesel engine driven pump. Only one category of pumps will work at a time i.e. either jockey pump or main fire pumps (wet riser and sprinkler, both the wet riser and sprinkler can come up at a time) or diesel driven pump.

3.9.3 Jockey wet riser diesel driven

	PUMP	PUMP	PUMP
i.	ON	OFF	OFF
ii.	OFF	ON	OFF
iii.	OFF	OFF	ON
iv.	OFF	ON	ON



3.9.4 Annunciation panel

One solid state electronic annunciation panel fully wired with visual display and audible alarm unit shall be provided to indicate:

a. Flow condition in any flow switch indicating the area of distress and fire alarm.
b. Starting and stopping of each hydrant pump.
c. Starting and stopping of each jockey pump.
d. Starting and stopping of each sprinkler pump.
e. Failure of Hydrant / Sprinkler pumps to start.
f. High level in fire water storage tank compartment.
g. Low level in fire water storage tank compartment.
h. Low level in HSD day tank of the fire pump.

The panel shall be factory fabricated, wired and tested. All details shall be submitted with the tender. The annunciation panel shall be located in the security office / reception on the ground floor or as instructed by the Project Manager.

3.9.5 Vibration isolation

The pump set shall be mounted on rolled steel channels and 150 mm thick inertia block spring and ribbed neoprene vibration isolation mounting shall support the inertia block onto a 100 mm thick concrete plinths. The spring mountings shall have a maximum deflection of15 mm. Reference shall be made to the section on "Nose and Vibration" for further technical requirements.

3.10 CODES AND STANDARDS FOR PUMPS, MOTORS, AND DIESEL ENGINE

3.10.1 Pumps

The pumps shall perform to the standards and codes as given below:
IS: 1520 Horizontal centrifugal pumps for clear, cold and fresh water.
BS: 599 methods of testing pumps.
PTC: 8 ASME Power Test Codes - Centrifugal Pumps.

3.10.2 Motor

The following codes shall be applicable for the motor IS: 325 Induction motors, three-phase.
IS : 900 Induction motors, installation and maintenance, code of practice for
IS : 4029 Guide for testing three phase induction motors.
IS : 3043 code of practice for earthing.
Further to those stated above, the design, manufacture, installation and performance of motors shall be conform to the latest Indian Electricity Act and Indian Electricity Rules. The motor shall also be acceptable to the Tariff Advisory Committee.

3.10.3 Diesel Engine

The following codes are to be followed in the design, manufacture, erection and testing of the diesel engineer:
IS: 1600 Codes for type testing of constant speed internal combustion engines for general purposes.
IS: 1601 Performance of constant speed internal combustion engines for general purposes. Code of diesel Engine Manufacturer's Assn. USA.

DIRECTORATE OF MAHARASHTRA GOVERNMENT OF MAHARASHTRA

4. HAND HELD FIRE EXTINGUISHERS and HAND APPLIANCES

4.1 SCOPE

Work under this section shall consist of furnishing all labor, materials, appliances and equipment necessary and required to install fire extinguishing hand appliances as per relevant specification of various authorities. Without restricting to the generality of the foregoing, the work shall consist of the following: Installation of fully charged and tested fire extinguishing hand appliances of A B C powder type as required and specified in the drawings and schedule of rates.

4.2 GENERAL REQUIREMENTS

Hand appliances shall be installed in easily accessible locations with the brackets fixed to the wall by suitable anchor fasteners. Each appliance shall be provided with an inspection card indicating the date of inspection, testing, change of charge and other relevant data. All appliances shall be fixed in a true workmanlike manner truly vertical and at correct locations. Distribution / installation of fire extinguisher to be in accordance to IS:2190.

4.2.1 MEASUREMENT

Fire extinguishers shall be counted in numbers and include installation of all necessary items required as given in the specifications.

4.2.2 ABC TYPE DRY POWDER EXTINGUISHER

The Extinguisher shall be filled with ABC grade 40, Mono Ammonium Phosphate 40% from any approved manufacturer. The capacity of the extinguisher when filled with Dry Chemical Powder (First filling) as per IS 4308, Part II, shall be 5 Kg +/-2% or 10 Kg +/- 3%. The distribution of fire extinguishers to be as per IS 2190 – 1992. It shall be operated upright, with a squeeze grip valve to control discharge. The plunger neck shall have a safety clip, fitted with a pin, to prevent accidental discharge. It shall be pressurized with Dry Nitrogen, as expellant. The Nitrogen to be charged at a pressure of 15 Kg/cm^2. Body shall be of mild steel conforming to relevant IS Standards. The neck ring shall be also mild steel and welded to the body. The discharge valve body shall be forged brass or leaded bronze, while the spindle, spring and siphon tube shall be of brass. The nozzle shall be of brass, while the hose shall be braided nylon. The body shall be cylindrical in shape, with the dish and dome welded to it. Sufficient space for Nitrogen gas shall be provided inside the body, above the powder filling.

4.2.3 WATER TYPE EXTINGUISHER (Gas Pressure Type)

The Extinguishing medium shall be primarily water stored under normal pressure, the discharge being affected by release of Carbon Dioxide Gas from a 120 gms cylinder. The capacity of Extinguisher, when filled up to the indicated level, shall be 9 liter +/- 5% The skin thickness of the Cylinder shall be minimum 4.0 mm, fabricated from Mild Steel sheet, welded as required,

DIRECTORATE MAHARASHTRA GOVERNMENT OF MAHARASHTRA सत्यमेव जयते

with dish and dome, being of same thickness, and of size not exceeding the diameter of body. The diameter of body to be not less than 150 mm and not exceeding 200 mm. The neck shall be externally threaded up to a minimum depth of 16 mm, and leaded tin bronze. The cap shall be of leaded tin bronze, and screwed on the body up to a minimum of 1.6 cm depth, with parallel screw thread to match the neck ring. The siphon tube to be of brass or G.I. and the strainer of Brass. The cartridge holder, knob, discharge fittings and plunger to be of Brass/Leaded tin bronze, and plunger of stainless steel, spring of stainless steel. The cap to have a handle fixed to it. The discharge hose shall be braided nylon, of 10 mm Dia and 600 mm long, with a nozzle of brass fitted at end. The extinguisher shall be treated for anti-corrosion internally and externally, and externally painted with Fire Red paint. The paint shall be stove enameled/powder coated. The cartridge shall be as per IS, and have 60 gm net carbon dioxide gas for expelling. The extinguisher, body and cap shall be treated to an internal hydraulic pressure of 25 Kg/cm2. It shall have external marking with letter A, of 2.5 cm height, in block letters within a triangle of 5 cm each side. The extinguisher shall be upright in operation, with the body placed on ground and discharge tube with nozzle held in one hand to give a throw of not less than 6 mtr, and continue so for at least 60 secs. The extinguisher body shall be clearly marked with ISI stamp (IS: 940).

4.2.4 CARBON DIOXIDE EXTINGUISHER

The Carbon Dioxide Extinguisher shall be as per IS: 2878. The body shall be constructed of seamless tube conforming to IS: 7285 and having a convex dome and flat base. Its Dia shall be maximum 140 mm, and the overall height shall not exceed 720 mm. The discharge mechanism shall be through a control valve conforming to IS: 3224. The internal siphon tube shall be of copper aluminium conforming to relevant specifications. Hose Pipe shall be high pressure braided Rubber hose with a minimum burst pressure of 140 Kg/cm^2 and shall be approximately 1.0 meter in length having internal Dia of 10 mm. The discharge horn shall be of high quality unbreakable plastic with gradually expanding shape, to convert liquid carbon dioxide into gas form. The hand grip of Discharge horn shall be insulated with Rubber of appropriate thickness.

The gas shall be conforming to IS: 307 and shall be stored at about 85 Kg/cm2. The expansion ratio between stored liquid carbon dioxide to expanded gas shall be 1:9 times and the total discharge time (effective) shall be minimum 10 secs and maximum 25 secs. The extinguisher shall fulfill the following test pressures:

Cylinder: 236 Kg/cm2

Control Valve: 125 Kg/cm2

Burst Pressure of Hose: 140 Kg/cm2 minimum

It shall be an Upright type. The cylinder, including the control valve and high pressure Discharge Hose must comply with relevant Statutory Regulations, and be approved by Chief Controller of Explosives, Nagpur and also bear IS marking. The Extinguisher including components shall be IS marked.

5.0 MISCELLENEOUS

5.1 METERS

i. All voltmeters and indicating lamps shall be through MCB's.

ii. Meters and indicating instruments shall be plug type.

iii. All CT's connection for meters shall be through Test Terminal Block (TTB).

43.02.14

iv. CT ratio and burdens shall be as specified on the Single line diagram.

5.2 CURRENT TRANSFORMERS

Current transformers shall be provided for Control panels carrying current in excess of 60 amps. All phase shall be provided with current transformers of suitable VA burden with 5 amps secondary for operation of associated metering. The CTs shall confirm to relevant Indian Standards. The design and construction shall be dry type, epoxy resin cast robust to withstand thermal and dynamic stresses during short circuits. Secondary terminals of CTs shall be brought out suitable to a terminal block which shall be easily accessible for testing and terminal connections. The protection CTs shall be of accuracy class 5P10 and measurement CTs shall be of accuracy class I.

5.3 SELECTOR SWITCH

Where called for, selector switches of rated capacity shall be provided in control panels, to give the choice of operating equipment in selective mode.

5.4 STARTERS

Each motor shall be provided with a starter of suitable rating. Starters shall be in accordance with relevant IS Codes. All Star Delta and ATS Starters shall be fully automatic.

5.5 CABLES

M.V. Cables shall be PVC insulated aluminum conductor and armored cables conforming to IS Codes. Cables shall be armored and suitable for laying in trenches, ducts, and on cable trays as required. M.V. Cables shall be termite resistant. Cable glands shall be double compression glands. Control cables and indicating panel cables shall be multi core PVC insulated copper conductor and armored cables.

5.6 CABLE LAYING

Cable shall be laid in accordance with IS code of Practice. Cables shall be laid on 14 gage factory fabricated perforated galvanized sheet steel cable trays, and cable drops / risers shall be fixed to ladder type cable trays factory fabricated out of galvanized steel angle. Access to all cables shall be provided to allow cable withdrawal / replacement in the future. Where more than one cable is running on a cable tray, one Dia spacing shall be provided between cables to minimize the loss in current carrying capacity.

Cables shall be suitably supported with Galvanized saddles when run on walls / trays. When buried, they shall be laid in 350 mm wide and 750 mm deep trench and shall be covered with 250mm thick layer of soft sifted sand & protected with bricks/tiles. Special care shall be taken to ensure that the cables are not damaged at bends. The radius of bend of the cables when installed shall not be less than 12 times the diameter of cable.

5.7 DRAWINGS

Shop drawings for control panels and for wiring of equipment showing the route of conduit & cable shall be submitted by the contractor for approval of Project manager/Consultant before starting the fabrication of panel and

DIRECTORATE MAHARASHTRA * GOVERNMENT OF MAHARASHTRA

starting the work. On completion, four sets of complete "As-installed" drawings incorporating all details like, conduits routes, number of wires in conduit, location of panels, switches, junction/pull boxes and cables route etc. shall be furnished by the Contractor.

6. STATUTORY AUTHORITIES' TESTS AND INSPECTIONS

As and when notified in writing or instructed by the Project manager, the Contractor shall submit shop drawing and attend all tests and inspections carried out by Local Fire Authorities, Water Authority and other Statutory Authorities, and shall forthwith execute free of charge any rectification work ordered by the Project manager as a result of such tests and inspections where these indicate non-compliance with Statutory Regulations. Some of these tests may take place after the issue of Practical Completion of the Main Contract and the Contractor shall make all allowances in this respect. The Contractor shall be responsible for the submission of all necessary forms and shop drawings to the Statutory Authorities which shall conform in layout to the latest project architectural plans submitted to and kept by these Authorities. The submission shall comply with the requirements set forth in the current Codes of Practice and circular letters of the Statutory Authorities. The shop drawings to be submitted shall be forwarded to the Project manager for checking before submission. The Contractor shall allow for at least two submissions of complete sets of shop drawings to the Authorities, one to be made within six months after the award of the Contract but not less than six weeks before the inspection. The Project manager may at his discretion instruct the Contractor for additional submissions to the Local Authorities whenever necessary. The Contractor shall notify the Project manager at least seven days in advance of his application for local Authority tests and inspections. On receipt of a confirmed date for test and inspection the Contractor shall inform the Project manager without delay.

6.1 FINAL ACCEPTANCE TESTS

Following commissioning and inspection of the entire installation, and prior to issue of the Completion Certificate, the Contractor shall carry out final acceptance tests in accordance with a programme to be agreed with the Project manager. Should the results of the acceptance tests show that plant, systems and/or equipment fail to perform to the efficiencies or other performance figures as given in this Specification, the Contractor shall adjust, modify and if necessary replace the equipment without further payment in order that the required performance is obtained. Where acceptance tests are required by the relevant Authorities having jurisdiction, these tests shall be carried out by the Contractor prior to the issue of Completion Certificate to the acceptance of the Authorities.

6.2 REJECTION OF INSTALLATION / PLANT

Any item of plant or system or component which fails to comply with the requirements of this Specification in any respect whatsoever at any stage of manufacture, test, erection or on completion at site may be rejected by the Project manager either in whole or in part as he considers necessary/appropriate. Adjustment and/or modification work as required by the Project manager so as to comply with the Authority's requirements and the

DIRECTORATE, MAHARASHTRA * GOVERNMENT OF MAHARASHTRA *

intent of the Specification shall be carried out by the Contractor at his own expense and to the satisfaction of the Authority/Project manager. After works have been accepted, the Contractor may be required to carry out assist in carrying out additional performance tests as reasonably required by the Project manager/Employer.

6.3 WARRANTY AND HANDOVER

The Contractor shall warrant that all plant, materials and equipment supplied and all workmanship performed by him to be free from defects of whatsoever nature before handover to the Owner.

6.4 HANDING OVER OF DOCUMENTS

All testing and commissioning shall be done by the Contractor to the entire satisfaction of the Owner's site representative and all testing and commissioning documents shall be handed over to the Owner's site representative. The Contractor shall also hand over all maintenance and operation manuals, all certificates and all other documentation as per the terms of the contract to the Owner's site representative.

PART III
FIRE PROTECTION
Active Fire protection required for
Other Buildings such as Commercial / Hospital / MLCP/ Building
As per Table 23 of Part IV, NBC 2005

Sr. No.	Protection	Requirements	Provision	Remarks
01	Fire Extinguishers for A,B,C class of firers.	Required	**As per Is 2190**	**At strategic location**
02.	Hose Reel Hose with jet & spray multipurpose nozzle.	Required	**Confirming to IS:884 : 1985**	**In every stair case well / shaft.**
03.	Wet Riser cum down comer.	Required		**In every stair case well / shaft.**
04.	Court Yard Hydrant or Ring Hydrant System around Buildings	Required	**Confirming to IS:3844:1989 & IS: 13039 : 1991**	
06.	Manually Operated Fire Alarm System	Required		On each floor Near staircase
08.	Underground Static Storage Tank	Required 1,00,000 ltrs.		For each Building
09.	Terrace Tank	Required 20,000 ltrs. for each down comer		Above every stair cases on terrace floor for independent water supply to every wet riser cum down comer.

DIRECTORATE OF MAHARASHTRA * GOVERNMENT OF MAHARASHTRA *

Sr. No.	Protection	Requirements	Provision	Remarks
10.	Fire Pumps Main Pumps on Underground Water Tank Booster Pumps On terrace level of both towers	**2 Nos. 2850 lpm electrical driven (main + sprinkler)** **1 No. 2850 lpm Diesel driven** **1 No. 180 lpm electric driven** **1Nos. 900 lpm electrical driven**		Independent pumping arrangements for the proposed building
11.	**Automatic Detection System**	Required on each floor	Automatic Detection system should be provided. Standards and guidelines given in IS-11360-1985 specification for Smoke Detectors for use in Automatic Electrical Fire Alarm system. Detection system for Cable Trench should be provided. Heat Detectors should be provided for Canteen Area as per the standards and guidelines given IS-2175-1988 specification for Heat sensitive Fire Detectors for use in Automatic Fire Alarm System.	
12.	**Sprinkler system**	Required for each building on Each floor.	**Sprinkler system should be provided on each floor.** **Guidelines are given in IS 15105 Design and installation of Fixed Automatic sprinkler fire Extinguishing system**	
13.	Fire Brigade Connection- - For Static Water Tank and For Hydrant System	Required		**Near the entry point of the building.**
14.	Fire Dampers in A.C. Ducts	Not Required	**IS:655:1963 specifications for metal air ducts (Revised)**	
15.	Fire Lift	Required	**50% of total lifts provided to the building.**	
16.	Refuge Area	**Required**		For bldg above 24 Mtrs
17.	Fire Doors	**Required at every stair case landing on every floor.**	**Confirming to IS: 3614 (Part-I) 1966**	**2 Hrs. Fire resistive types with panic bar from both the sides.**

DIRECTORATE OF FIRE SERVICES GOVERNMENT OF MAHARASHTRA
43.02.14

Sr. No.	Protection	Requirements	Provision	Remarks
18.	Safety signs & Exit Signs	**Florescent type**	**IS: 12349:1988 & IS: 12407:1988**	**On all strategic locations.**
19.	Compartmentation of floors	**Required**		**750 Sq. meter area per floor**
20.	Pressurization of fire escape staircases	**Required**		**For High-rise buildings above 24 meter height.**
21.	Fire Resistance Insulation or sealing of floor or compartment ducts	**Required for limiting the spread of heat & smoke**		
22.	Emergency Lights	**Required**		
23.	PA System with Talk Back Facility	**Required**		
24.	Auto D.G. Backup	**Required for all fire safety systems**		
25.	Fire Resistance rating for Glass used for façade.	**Required**		

Active Fire protection required for Other Buildings such as School /Amenity & Utility Building As per Table 23 of Part IV, NBC 2005

Sr. No.	Protection	Requirements	Provision	Remarks
01	Fire Extinguishers for A,B,C class of firers.	Required	**As per Is 2190**	**At strategic location**
02.	Hose Reel Hose with jet & spray multipurpose nozzle.	Required	**Confirming to IS:884 : 1985**	**In every stair case well / shaft.**
03.	Wet Riser cum down comer.	Required		**In every stair case well / shaft.**
04.	Court Yard Hydrant or Ring Hydrant System around Buildings	Required	**Confirming to IS:3844:1989 & IS: 13039 : 1991**	
06.	Manually Operated Fire Alarm System	Required		On each floor Near staircase
08.	Underground Static Storage Tank	Required 1,00,000 ltrs.		For each Building

DIRECTORATE MAHARASHTRA GOVERNMENT OF MAHARASHTRA

Sr. No.	Protection	Requirements	Provision	Remarks
09.	Terrace Tank	Required 20,000 ltrs. for each down comer		Above every stair cases on terrace floor for independent water supply to every wet riser cum down comer.
10.	Fire Pumps Main Pumps on Underground Water Tank Booster Pumps On terrace level of both towers	**2 Nos. 2250 lpm electrical driven (main + sprinkler)** **1 No. 2250 lpm Diesel driven** **1 No. 180 lpm electric driven** **1Nos. 900 lpm electrical driven**		Independent pumping arrangements for the proposed building
11.	**Automatic Detection System**	**Required for Library, Civic Amenity & Other amenity bldg**	Automatic Detection system should be provided. Standards and guidelines given in IS-11360-1985 specification for Smoke Detectors for use in Automatic Electrical Fire Alarm system. Detection system for Cable Trench should be provided. Heat Detectors should be provided for Canteen Area as per the standards and guidelines given IS-2175-1988 specification for Heat sensitive Fire Detectors for use in Automatic Fire Alarm System.	
12.	**Sprinkler system**	**Required for Library, Civic Amenity & Other amenity bldg**	**Sprinkler system should be provided on each floor.** **Guidelines are given in IS 15105 Design and installation of Fixed Automatic sprinkler fire Extinguishing system**	
13.	Fire Brigade Connection- - For Static Water Tank and For Hydrant System	Required		**Near the entry point of the building.**
15.	Fire Lift	Required	**50% of total lifts provided to the building.**	
16.	Refuge Area	**Required**		For bldg above 24 Mtrs

DIRECTORATE, MAHARASHTRA FIRE SERVICES * GOVERNMENT OF MAHARASHTRA *

Sr. No.	Protection	Requirements	Provision	Remarks
17.	Fire Doors	**Required at every stair case landing on every floor.**	**Confirming to IS: 3614 (Part-I) 1966**	**2 Hrs. Fire resistive types with panic bar from both the sides.**
18.	Safety signs & Exit Signs	**Florescent type**	**IS: 12349:1988 & IS: 12407:1988**	**On all strategic locations.**
19.	Compartmentation of floors	**Required**		**750 Sq. meter area per floor**
20.	Pressurization of fire escape staircases	**Required**		**For High-rise buildings above 24 meter height.**
21.	Fire Resistance Insulation or sealing of floor or compartment ducts	**Required for limiting the spread of heat & smoke**		
22.	Emergency Lights	**Required**		
23.	PA System with Talk Back Facility	**Required**		
24.	Auto D.G. Backup	**Required for all fire safety systems**		
25.	Fire Resistance rating for Glass used for façade.	**Required**		

PART IV

Applicable BIS standards on Fire Prevention and Fire Protection

Standard	Topics
Fire Extinguishers	
IS: 933:1989	Portable chemical fire extinguishers, foam type (third revision)
IS: 934: 1989	Portable chemical fire extinguishers, soda acid type (fourth revision)
IS: 940: 1989	Portable chemical fire extinguishers, water type (gas cartridge) (third revision)
IS: 2171: 1985	Portable chemical fire extinguishers, Dry Powder (Cartridge type) (third revision)
IS: 2190: 1992	Code of practice for selection, installation and maintenance of portable first - aid fire extinguisher (third revision)
IS: 2878: 1986	Portable fire extinguishers, carbon dioxide type (second revision)
IS: 4562: 1968	Portable chemical fire extinguishers, foam type, for marine use

DIRECTORATE, MAHARASHTRA FIRE SERVICES * GOVERNMENT OF MAHARASHTRA सत्यमेव जयते

IS: 4862: 1986	Portable chemical fire extinguishers, for aircraft.
IS: 4947: 1985	Gas cartridge for use in fire extinguishers (second revision)
IS: 5490	Refills for portable fire extinguishers and chemical fire engines.
Part I: 1977	For soda - acid portable fire extinguishers (first revision)
Part II: 1977	For foam type portable fire extinguishers (first revision)
Part III: 1979	For soda - acid chemical fire engines, 50 liter capacity (first revision)
Part IV: 1979	For foam chemical fire engines, 50 liter capacity (first revision)
IS: 6234: 1986	Portable fire extinguishers water type (stored pressure) (first revision)
IS: 8149: 1976	Functional requirement for twin CO2 fire extinguisher (trolley mounted)
IS: 10204: 1982	Portable fire extinguishers mechanical foam type
IS: 10472: 1983	150 liter capacity chemical fire engine, foam type
IS: 10658: 1983	Higher capacity dry powder fire extinguisher (trolley mounted)
IS: 11108: 1984	Portable fire extinguishers - Halon 1211 type.

Appliances

IS: 942: 1982	Functional requirements for 275 liter/min. portable pump set for fire fighting (second revision)
IS: 943: 1979	Functional requirements for 680 liter/min. trailer pump
IS: 944: 1979	Functional requirements for 1800 liter/min. trailer pump for fire brigade use (second revision)
IS: 946: 1977	Functional requirements for motor fire engine (first revision)
IS: 947: 1985	Functional requirements for towing tender for trailer fire pump for fire brigade use (first revision)
IS: 948: 1983	Functional requirements for water tender, type "A" for fire brigade use (second revision)
IS: 949: 1985	Functional requirements for emergency (rescue) tender for fire brigade use (second revision)
IS: 950: 1980	Functional requirements for water tender, type "B" for fire brigade use (second revision)
IS: 951: 1987	Functional requirements for crash fire tender for fire brigade use (first revision)
IS: 954: 1987	Functional requirements for CO2 tender for fire brigade use (first revision)
IS: 955: 1980	Functional requirements for dry powder tender for fire brigade use (first revision)
IS: 956: 1975	Functional requirements for rescue tender for fire fields (first revision)

DIRECTORATE, MAHARASHTRA FIRE SERVICES * GOVERNMENT OF MAHARASHTRA *
43.02.14

IS: 957: 1987	Control van for the fire brigade use
IS: 2696: 1974	Functional requirements for 1125-l/min. light fire engine (first revision)
IS: 2930: 1980	Functional requirements for hose laying tender for fire brigade use (first revision)
IS: 3947: 1966	Code of practice for testing, installation and maintenance of marine portable fire appliances.
IS: 5506: 1979	50-ltr capacity chemical fire engine, soda-acid type (first revision)
IS: 5507: 1979	20-ltr capacity chemical fire engine, foam type (first revision)
IS: 5896	Code of practice for selection, operation and maintenance of fire fighting appliances.
Part-I:	1970 Combined, foam, and crash tender
Part-II :	1975 Turntable ladder.
IS: 6067: 1983	Functional requirements for water tender type-X for fire brigade use (first revision)
IS: 6070: 1983	Code of practice for selection, operation and maintenance of trailer fire pumps portable pumps, water tender and motor fire engines (first revision)
IS: 7577: 1986	Gas testing flame safety lamps (first revision)
IS: 8150: 1976	45-ltr capacity chemical foam for marine engine use.
IS: 10460: 1983	Functional requirements for small foam tender for fire brigade use.
IS: 10999: 1984	Functional requirements for 2000 kg. Dry powder tender for fire brigade use.

Alarm systems and other systems and media

IS: 21775: 1988	Heat sensitive fire detectors for use in automatic electric fire alarm system (second revision)
IS: 2189: 1988	Code of practice for selection, installation and maintenance of automatic fire detection and alarm system (second revision)
IS: 3844: 1989	Code of practice for installation of internal fire hydrants in multistory buildings.
IS: 4308: 1982	Dry powder for fire fighting (first revision)
IS: 4861: 1984	Dry powder for fighting fires in burning metals (first revision)
IS: 4989	Foam concentrate (compound) for producing mechanical foam for fire fighting.
Part-I: 1985	Protein foam (second revision)
Part-II: 1984	Aqueous film forming foam (AFFF)
Part -III: 1987	Flouro-protein foam
IS: 6382: 1984	Code of practice for design and installation of fixed carbon dioxide fire extinguishing system (first revision)

DIRECTORATE MAHARASHTRA STATE
सत्यमेव जयते
GOVERNMENT OF MAHARASHTRA

IS: 7676: 1985	Glossary of terms for fire fighting equipment
IS: 9668: 1990	Code of practice for provision and maintenance of water suppliers for fire fighting.

Accessories, Hoses, Hydrants

IS: 636: 1988	Non-percolating flexible fire fighting delivery hose (third revision)
IS: 884: 1985	First-aid hose reel for fire fighting (first revision)
IS: 901: 1988	Couplings, double male and double female, instantaneous pattern for fire fighting (third revision)
IS: 902: 1992	Suction hose couplings branch pipe, nozzles and nozzle spanner (third revision)
IS: 903: 1984	Fire hose delivery couplings branch pipe, nozzles and nozzle spanner (third revision)
IS: 904: 1983	2-way and 3-way suction collecting heads for fire fighting purposes (second revision)
IS: 905: 1980	Delivery breeching, dividing and collecting, instantaneous pattern, for fire fighting purposes (second revision)
IS: 906: 1988	Branch with revolving head for fire fighting purposes (second revision)
IS: 907: 1984	Suction strainers, cylindrical type for fire fighting purpose second revision.
IS: 908: 1975	Fire hydrant, stand post type (second revision)
IS: 909: 1992	Underground fire hydrant sluice-value type (third revision)
IS: 910: 1980	Combined key for hydrant, cover and lower valve (second revision)
IS: 926: 1985	Firemen's axe (second revision)
IS: 927: 1981	Fire hook (second revision)
IS: 928: 1984	Fire bells (second revision)
IS: 930: 1977	Wooden extension ladder for fire brigade use (first revision)
IS: 931: 1973	Wheeled fire escape (first revision)
IS: 937: 1981	Washers for water fittings for fire fighting purposes (second revision)
IS: 939: 1977	Snatch block for use with fibre rope for fire brigade use (first revision)
IS: 941: 1985	Blower and exhauster for fire fighting (second revision)
IS: 928: 1984	Fire bells (second revision)
IS: 952: 1986	Fog nozzle for fire brigade use (first revision)
IS: 1941: 1976	Functional requirements for electric motor
Part-I: 1976	Sirens: Part-I AC, 3-phase, 50 Hz, 415 volts type (second revision)
IS: 2097: 1983	Foam-making branch pipe (first revision)
IS: 2298: 1978	Single barrel stirrup pump for fire fighting purposes (second revision)
IS: 2546: 1974	Galvanized mild steel fire bucket (first revision)
IS: 2871: 1983	Branch, pipe, universal fire the fighting purposes (first revision)

DIRECTORATE, MAHARASHTRA ★ GOVERNMENT OF MAHARASHTRA ★

IS: 3582: 1984	Basket strainers for fire fighting purpose (cylindrical type) (first revision)
IS: 3614: 1966	Part-I Fire-check doors: Part-I, Plate metal covered and rolling type.
IS: 3744: 1985	Hose binding machine (first revision)
IS: 4571: 1977	Aluminum extension ladders for fire brigade use (first revision)
IS: 4643: 1984	Suction wrenches for fire brigade use (first revision)
IS: 4927: 1992	Unlined flax canvas hose for fire fighting (first revision)
IS: 4928: 1986	Delivery valve for centrifugal fire pump outlet (first revision)
IS: 5131: 1986	Dividing breeching with control, for fire brigade use (first revision)
IS: 5290: 1983	Landing valves (second revision)
IS: 5486: 1985	Quick-release knife (first revision)
IS: 5505: 1985	Multi-edged rescue axe (non-wedging) (first revision)
IS: 5612:	Hose-clamps and hose-bandages for fire brigade use.
Part-I: 1977	Hose clamps (first revision)
Part-II: 1977	Hose bandages (first revision)
IS: 5714: 1981	Hydrant, stand pipe for fire fighting (first revision)
IS: 6026: 1985	Hand operated sirens (first revision)
IS: 8090: 1976	Coupling, branch pipe, nozzle used in hose reel tubing for fire fighting. IS: 8096: 1992 Fire beaters.
IS: 8423: 1977	Controlled percolating hose for fire fighting
IS: 8442: 1977	Functional requirements for stand post type water for fire fighting
IS: 5714: 1981	Hydrant, stand pipe for fire fighting (first revision)

Fire Safety in Buildings

IS: 1641: 1988	Code of practice for fire safety of buildings (general): General principles and fire grading and classification (first revision)
IS: 1642: 1989	Code of practice for fire safety of buildings (general): General Materials & details of construction (first revision)
IS: 1643: 1988	Code of practice for fire safety of buildings (general) : General Exposure hazard (first revision)
IS: 1644: 1982	Code of practice for fire safety of buildings (general): General hazard. (first revision)
IS: 1646: 1982	Code of practice for fire safety of buildings (general): General Electrical installations (first revision)
IS: 1891:	Rubber conveyor and elevator textile belting.
Part 4: 1978	Hygienic belting (first revision)
IS: 2726: 1988	Code of practice for fire safety of industrial buildings: Cotton ginning and pressing (including cotton seed) factories (first revision)
IS: 3016: 1982	Code of practice for fire precautions in welding and cutting operations (first revision)
IS: 3034: 1981	Code of practice for fire safety of industrial buildings: Electrical generating and distributing stations (first revision.

DIRECTORATE OF MAHARASHTRA ... GOVERNMENT OF MAHARASHTRA

IS: 3058: 1990	Code of practice for fire safety of buildings: Viscose rayon yarn/staple fibre plants (first revision)
IS: 3079: 1990	Code of practice for fire safety of industrial buildings Cotton textile mills (first revision)
IS: 3181: 1992	Conveyor belts, fire resistant belting for underground mines and such other hazardous applications (second revision)
IS: 3594: 1991	Code of practice for fire safety of industrial buildings: General storage and warehousing including cold storages (first revision)
IS: 3595: 1984	Code of practice for fire safety of industrial buildings: Coal pulverizes and associated equipments (first revision)
IS: 3808: 1979	Method of test for non-combustibility of building materials (first revision)
IS: 6809: 1979	Fire resistance test of structure (first revision)
IS: 3836: 1979	Code of practice for fire safety of industrial buildings: Jute mills (first revision)
IS: 4226: 1988	Code of practice for fire safety of industrial buildings: Aluminum/magnesium powder factories (first revision)
IS: 4355: 1977	Fire resistance brattice cloth (first revision)
IS: 4886: 1991	Code of practice for fire safety of industrial buildings: Tea factories (first revision)
IS: 5509: 1980	Fire retardant plywood (first revision)
IS: 6329: 1971	Code of practice for fire safety of industrial buildings: Saw Mills and woodworks.
IS: 7820: 1975	Method of test for ignition temperatures
IS: 8757: 1978	Glossary of terms associated with fire safety
IS: 9109: 1979	Code of practice for fire safety of industrial buildings, paint and varnish factories.
IS: 11457:	Code of practice for safety of chemical industries: Part-I
Part-I : 1985	Rubber and plastic.
IS: 11460: 1985	Code of practice for fire safety of libraries and archives.
IS: 11871: 1986	Methods for determinations of flammability and flame resistance of textile fabrics.
IS: 11884: 1986	Fire-resistant brattice sheeting made from unsupported plastics.
IS: 12307: 1988	Graphic symbols for fire protection.
IS: 12349: 1988	Fire protection safety signs.
IS: 12456: 1988	Fire protection of electronic data processing installations.
IS: 12459: 1988	Fire protection of cable runs.
IS: 12467: 1988	Methods for determination of the ignitability of upholstered composites for seating for furfures by smoker's materials.
IS: 12722: 1989	Textile floor covering - Determination of flame resistance by table test. IS: 13045: 1991 Fire safety of flour mills.
IS: 12459: 1988	Fire protection of cable runs.

DIRECTORATE MAHARASHTRA STATE GOVERNMENT OF MAHARASHTRA
43.02.14