



# **FSAI Suraksha Index [FSI]**

**VERSION 2019**

**TECHNICAL GUIDELINE FOR USERS**



**First Edition September 2019**




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## MESSAGE FROM INTERNATIONAL PRESIDENT, FSAI



**MR. PANKAJ DHARKAR**

*"FSAI Suraksha Index (FSI) will be the first such in the world which makes it unique".*

The construction industry in India has shown a vibrant growth during the last decade. Along with it the safety of the occupants and the property as a whole have become complex. According to the National Crime Records Bureau; in the last decade around 3.16 lakh fire accidents were reported in the country; with an average of 59 deaths per day. Even after such unfortunate incidents there are several multi-story buildings that are without NOCs. This necessitates the urgent need to incorporate strict laws, regulations and stringent measures both in upcoming construction and existing buildings by the Government. There is National Building Code Part- 4 in place which deals with the requirements of fire prevention, life safety to ensure fire protection in buildings. In India individual states also have their exclusive fire laws and regulations for the purpose of fire safety and provide clearance certificates. However, most often the guidelines lay down by the NBC 2016 Part 4 for fire safety of buildings and inmates are not adhered due to flexible legal system and fraudulent practices which is leading to the rising fire incidents in the country. In India, to prevent losing more lives due to such unfortunate incidents, this fire rating has been introduced wherein the building owners can strictly follow the fire rules and guidelines mentioned in the rating and in return claim a rating to assert the fire and life safety quotient of the building. This will positively impact the reputation of a building and give a feeling of safety and security to the inmates.

The buildings applying for the ratings will be judged based on two major criteria's which are Safety and Security of the building. Hence, the Rating not only targets to make the buildings fire proof, it attempts to implement a holistic comfort and safety environment whilst enhancing the functionality quotient by smarter technologies. FSAI has formulated this index after major considerations of the current market scenario, the requirements posed to enhance the fire safety in Indian Buildings and discussions with the stakeholders. There is a huge scope of evolution as and when we progress and earn experiences while working on projects. This will also give the organization a scope to understand the areas where an improvement can be made and accordingly revisions will be carried out.





## ACKNOWLEDGEMENT

The FSAI Suraksha Index (FSI) was formulated due to the efforts and active involvement of members of the Fire and Security Association of India. This index was reviewed, developed and implemented by the FSAI.

We are especially grateful to Mr. Pankaj Dharkar (International President, FSAI), Mr. Suresh Menon (National Secretary), Mr. Leela Prasad, Mr. Lalit Gabhane & Mr. Pradip Sheth (Vice Chairman, Auditing & Rating of Building), Mr. M.M. Bhuskute (Chairman, Training and Development (Fire)), and all the advisory council members, national working committee members and industrial experts for their valuable inputs based on their expertise in the MEP and fire sector which assisted us structuring the development of the rating.

With gratitude and excitement we would like to acknowledge the Fire safety design and sustainable buildings professionals; Mr. Ashu Gupta and Mr. Kushagra Juneja to have helped us in formulating a comprehensive rating on fire safety and security in the building with their treasured inputs and thoughts.

The content of this guideline was put together by the joint efforts of professionals who are from diverse fields of building architecture, civil, mechanical and electrical, so that all aspects of building engineering are covered appropriately. We express our deepest thanks to Mr. Manjunath V., Mr. Rajnish Aggarwal, Mr. M.M. Bhuskute, Mr. Abasaheb P. Kale, Mr. Sandeep Goel, Mr. Gulpawan Singh, Ar. Hrishikesh Kulkarni, Mr. Ashwani Jain, Mr. Mandeep Singh Wasu, Mr. Harshul Pandey, Ms. Rasikha Chougale, Ms. Riddhi Chatterjee, Mr. Swapnil Jain and Mr. Vivek Gupta who served as the team of engineers and building consultants for developing this rating system.

FSAI Suraksha Index (FSI) places on record sincere thanks to the other participating organizations for their insights in development of the first ever guideline on Safety and Security of the buildings.



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## POINT ALLOCATION

Part	Credit Name	Points
Safe: Section 1	Adhering to Local Laws and obtaining the Fire NOC	M
Safe: Section 2	Implement strategies and techniques to prevent the onset of fire through appropriate operation, inventory storage and maintenance strategies.	M +6
	Install Fire Detection devices and alarm system in the Building Spaces	M +6
Safe: Section 3	Design Fire Retardant Electrical Infrastructure and reliable Electrical Supply System to ensure successful operation of the Firefighting systems	M +8
	Designing of the Air- conditioning and Ventilation system in the building	M +6
	To design a well laid fire hydrant and firefighting system to fight fire and minimize fire related hazards	M +8
	Design Fire Evacuation Infrastructure alongside an evacuation plan to ensure safety of all occupants during a fire event	M +10
Safe: Section 4	Simulation and Evacuation modelling	6
Secure: Section 1	Risk monitoring strategy for preparedness during security threats and develop a response process for the allocated risks.	M +6
Secure: Section 2	Skilled and trained work force for manual checking and identifying the risk; to alert and handle/combat the situation.	M
	Incorporate security-training plans for both security and non-security security personnel.	6



Secure: Section 3	To monitor the activities at all locations in the building premise and also provide a space for the security personnel to carry out responsibilities.	M
	Detecting the presence of an intruder attempting to breach a perimeter.	12
	Access control determines who may and who may not enter specific areas or access particular assets.	4
Secure: Section 4	Response refers to the means taken to counter an intrusion, or attack so as to protect important assets.	M +4
	Efficiently and effectively monitor multiple information streams and to make accurate mission-critical decisions.	6
	Surveillance mechanism for security forces to monitor the situation and respond appropriately.	M +8
	To ensure the best management of the building fire safety and security systems by integrating systems with building management system.	4


***\*Note: M stands for Mandatory Requirement***



# **Part 1: Safe**







## Part I: Safe

### Section I: Building Regulations, Design and Materials

#### *Credit 1 – Adhering to Local Laws and obtaining the Fire NOC*

**Intent:** In India every state has their own Fire NOC which verifies and checks whether the building is fire resistant or if the building can adequately deal with any fire-related accidents.


#### **Maximum Points – Mandatory Requirement**

##### **Compliance Requirements:**

1. **Mandatory:** The Building must be able to achieve the clearance certificates from the government bodies for compliance. The types of compliance required to be achieved are:
  - a. Compliance to all the State Fire Department rules and regulations for the Building.
  - b. Compliance to the General Development Regulations and Building Bye Laws with respect to the Building Location


##### **Further Explanation:**

1. The guidelines and requirements to obtain this NOC are exclusive to each state and the types of Building requiring the Fire NOCs also usually varies. If the building seeking rating falls under any of the categories that require a State Fire clearance certificate, then they must obtain that. For such buildings production of the NOC certificate is mandatory to confirm that the building has crossed the finishing line of the guidelines. Also the building must adhere to the renewal requirements of the Fire Certificate time to time.
2. Produce all construction permissions and plan sanctions obtained from the respective Local Development Authorities. All mandatory Master Plan/ Development Control Regulations cover the following parameters of a building:

- 
- a. Building Use, coverage
  - b. FAR
  - c. Set-backs
  - d. Open spaces
  - e. Height
  - f. Number of stories
  - g. Number of dwelling units
  - h. Parking standards etc.

**Documentation Requirement:**

1. The approved NOC certificate issued by the Fire Department of the respective state in which the building is located.
2. The approved NOC certificates and permissions from the Local Development Authorities based on Building location.
3. **Fill Form – Project Fire Safety Information Form**



## Part I: Safe

### Section II: Fire Prevention through appropriate O&M, Fire Detection and Alarming system

*Credit 1: Implement strategies and techniques to prevent the onset of fire through appropriate operation, inventory storage and maintenance strategies.*

**Intent:** The safest way to deal with fire is its prevention by detecting the possible sources and taking appropriate measures of fire proofing them.

**Maximum Points – 6 Points**

#### **Compliance Requirements:**

##### **1. Mandatory:**

- a) Decide the Fire Zone according to NBC 2016 and adhere to the restrictions mentioned in the code.
- b) Prohibit smoking in all interior spaces of the building. Preferably prohibit smoking even in the exterior areas of the buildings. If smoking is not prohibited in the exterior spaces designate smoking areas (Must be away from combustible rubbish or flammable material storage). Provide “No Smoking” signage at appropriate locations to intimate all occupants about the policy of the building.
- c) Carry out a detailed Fire Safety Risk Assessment for the Building by considering all possible fire hazards within the building spaces by authorized personnel and submit the detailed report to reviewing team. Also, provide details of the fire prevention measures implemented for the High Risk Fire Sources.
- d) Fire Audits shall preferably be conducted by a third party auditor having requisite experience in fire and life safety inspections. Frequency of fire audits should be once in every two years.



e) Incorporate all the general safeguard techniques for Heat, Oxygen and Fuel as mentioned in the further explanation.

2. The project must also address each of the processes that are responsible for heat generation, for extra points: (3 Points)

a) **Plants and Equipment:** Plants and equipment must be maintained properly to prevent fire. Strategies as mentioned in the further explanations can be used to do so.

b) **Hot work** can be very dangerous and stringent controls must be in place. Strategies as mentioned in the further explanations can be used to do so.

3. **Testing and Maintenance Chart:** It is essential to ensure proper maintenance through good engineering practices to ensure better upkeep and proper functioning of all the systems and equipment. This can be done using the activities as mentioned in the Table 1 below at the suggested time intervals. (3 Points)

**Table 1: Periodical Testing and Maintenance Chart:**

Sr. No.	Subject	Activities	Duration
1	Reservoir	Level Checking, Cleaning	Weekly, once in two years
2	Pumps	Running test	Daily 5 minutes
		Test Flow	Annually
		Lubrication	Quarterly
		Gland Packing Checking, Replacement	Weekly, once in two years
3	Engines	Running test	Daily 5 minutes
		Lubrication	Quarterly
		Battery Status	Weekly
		Load Test	Annually
		Overhaul	1500 engine running hours
		Fuel Tank Level Check	Daily
4	Motors	Lubrication	Weekly
		Starter Contact Checking	Weekly
		Insulation Resistance	Half Yearly
5	Piping	Flushing	Once in two years
		Gauge pressure	Check Daily
6	Hydrant Valves	Operating wheels, spring catch, rubber rings	Weekly



**Further Explanation:**

**The Building must address the components of the Fire Prevention Triangle which are: Heat, Oxygen and Fuel to implement a full proof Fire Prevention Plan.**




1. **Heat:** Heat is usually generated from work processes and cooking. Usually such places are susceptible for causing fires. Hence this heat must be controlled and kept away from fuel unless carefully controlled. The project team must incorporate all the general Heat safeguard techniques provided in list mentioned below:

- Ensure employees are aware of their responsibility to report dangers
- Control sources of ignition
- Have chimneys (kitchen exhausts) inspected and cleaned regularly
- Treat independent building uses, such as an office over a shop as separate purpose groups and therefore compartmentalize from each other
- Ensure cooking food is always attended as unattended open fires may increase the causes of fire.

- 1.1 **Plants and Equipment:** Plants and equipment must be maintained properly to prevent fire. Ensure the following steps to achieve this:

- Working equipment must be protected against overheating. To do so, ensure proper housekeeping and prevent ventilation points of machinery getting clogged which can cause overheating. A planned maintenance programme must be put in place for all equipment.

- 
- Electrical equipment must be serviced regularly by a competent person to prevent sparks and fires
  - Heat producing equipment such as burners, heat exchangers, boilers, ovens, stoves, and fryers must be inspected and tested yearly. Storage of flammables must be away from this equipment.

**1.2 Hot Work:** Hot work often arises from construction and/ or maintenance activities. Hot work is work that might generate sufficient heat, sparks or flame to cause a fire. Hot work includes welding, flame cutting, soldering, and brazing, grinding and other equipment incorporating a flame, e.g. tar boilers, etc. The controls for hot work are as follows:

- Identify all hot work
- Only allow hot work if no satisfactory alternative
- Ensure relevant contractors are aware of hot work procedures and controls
- Use a **hot work permit system** including:

Fire-resistant protective clothing

Clear responsibility

Routine checking and supervision

Items to be worked on removed to safe area

Remove or protect combustible or flammable materials


Prevent, suppress and control sparks and heat

Particular precautions for special risks, e.g. Confined space

Leave workplace clean and safe

Final check of area at least 60 minutes after completed job and certainly prior to premises being vacated

2. **Oxygen:** Oxygen gas is used in processes such as Gas cutting, hospitals, food preservation and packaging processes, and decompression chambers. All these



processes use pure oxygen which instigates materials to catch fire and burn vigorously. The leakage of oxygen from equipment and incorrect and careless operation of oxygen equipment are the most common causes of fire because of oxygen.

Incorporate the following general steps to prevent fire because of Oxygen:

- Ensure employees are aware of their responsibility to report dangers
- See safeguards in the Code of Practice for Working in Confined Spaces
- Oxygen should never be used to “sweeten” the air in a confined space
- Prevent oxygen enrichment by ensuring that equipment is leak-tight and in good working order
- Check that ventilation is adequate
- Always use oxygen cylinders and equipment carefully and correctly
- Prevent oxygen enrichment by ensuring that equipment is leak-tight and in good working order
- Check that ventilation is adequate
- Always use oxygen cylinders and equipment carefully and correctly
- Always open oxygen cylinder valves slowly

3. **Fuel:** Building operation and maintenance which need the storage of large amounts of flammable materials present a greater hazard than those where the amount kept is small.

Fuel can be referred to as any material that catches fire (flammable). The types of fuels that need to be addressed are:

- Flammable Materials (e.g. charcoal, paper)
- Flammable liquids (e.g. petrol)
- Flammable gasses (e.g. propane and butane)



- 
- Cleanliness and Housekeeping materials

The general Fuel Safeguards are as mentioned below:

Ensure employees are aware of their responsibility to report dangers

Follow the Authority's advice on LPG

Follow the Authority's advice on explosive atmospheres

Use the Code of Practice For Avoiding Danger From Underground Services

Ensure furnishings and fittings in places of assembly comply with the NBC 2016

Take care if placing notice boards in escape corridors/ routes as any paper on the board could be fuel in the event of a fire

Where there is a possibility of the presence of flammable gas/ vapor, conduct a full risk assessment and consider the need for gas detection equipment

Where gas detection equipment is needed, ensure it is properly installed, maintained and serviced


Operators of locations storing larger amounts of substances with flammable or explosive properties have duties under the appropriate Regulations

#### 4. Proper Storage and Handling of the different types of Flammable materials:

Follow maximum of the steps mentioned below to prevent any fire incident occurring from Flammable materials:

- Identify all flammable materials so that proper controls can be put in place (away from escape routes). Also, reduce quantities of flammable materials just to run the business.
- Replace highly flammable materials with less flammable ones
- Store remaining stocks of highly flammable materials properly outside, in a separate building, or separated from the main workplace by fire-resisting construction



- 
- Provide clearly marked separate storage for flammable chemicals, gas cylinders, and waste materials and they must be kept covered at all times
  - Train employees on safe storage, handling and use of flammable materials
  - Keep stocks of office stationery and supplies and flammable cleaners' materials in separate cupboards or stores. They should be fire-resisting with a fire door if they open onto a corridor or stairway escape route
  - There should not be any potential ignition sources near the storage areas of flammable substance
  - Never store the Flammable or combustible substance such as rubbish (even temporarily) in the fire escape routes



### **Documentation required:**

1. Signage details of the “No Smoking” policy and ODL from Building owner that this policy will be maintained throughout building operation
2. Fire Safety Risk Assessment report listing and mitigation strategies of the High Risk Fire Sources
3. List of all flammable materials being used in the Building
4. Safety Data Sheets prepared for the Operation and Maintenance of the Building
5. Details of the Security systems in the prevent that can prevent Arson
6. Storage plan of building materials in the Building highlighting the Flammable materials, Housekeeping and Cleanliness chemicals and Combustible Waste
7. ODL (Owner Declaration Letters) for each credit that the compulsory criteria will be met and the additional safeguard techniques mentioned in the Rating System are being followed.
8. Experience certificate of the third party carrying out the Fire Audits and the Audit Report.

*\*The Reviewing team will have the right to carry out Fire audits to check if the strategies mentioned by the project team are being implemented appropriately on- site. In case the project team fails to fulfill the promises made through ODLs regarding the Fire Prevention strategies they have used, the Reviewing team can take necessary actions as deemed fit.*

## ***Credit 2: Install Fire Detection devices and alarm system in the Building Spaces***

**Intent:** If incase the Fire Prevention techniques and measures fail and there is an onset of fire the next best way to deal with the situation is instant Fire detection and alarming the occupants to initiate the evacuation and firefighting process.

**Maximum Points – 6 Points**

### **Requirements:**

#### **1. Mandatory:**

- a) Install manually operated Electric Fire Alarm System where applicable according to NBC 2016: Part 4 or Automatic Fire Detection and Alarm Systems where applicable as mentioned in NBC 2016 in accordance to any one accepted standards with one or more call boxes located at each floor.
  - b) Fire alarm panels shall be connected in peer to peer network or with redundant cables, run in different shafts.
  - c) Voice evacuation systems shall employ Hindi, English and vernacular language using pre-recorded messages and integrate with fire alarm panels for alerting the zone of fire and surrounding zones/floor.
2. Fire Control Room: Irrespective of whether the building needs a Fire Control Room or not according to NBC 2016: Part 4; provide a Fire Control Room on the entrance floor of the building. (2 Points)
  3. Install completely automatic Fire Alarm systems (Conventional or Addressable Type) in all floors irrespective of the Annexure I requirements. (Not applicable for Building types that already require an automatic Fire detection and Alarm Systems). (2 Points)
  4. Buildings that already require automatic Fire alarming systems can claim additional points by installing higher technology systems as mentioned below: (1 Point)
    - a) Both audio and visual alarming appliance



- b) Video- Based Fire detection system
  - c) Analogue Addressable Fire Alarm Systems or Wireless Fire Alarm Systems
5. In buildings where automatic fire alarm system is provided, the following shall be monitored from fire alarm panel: (1 Point)
- a) Water level in all tanks.
  - b) Hydrant and sprinkler pressures of respective zones as provided.
  - c) Pump ON/OFF status.
  - d) All isolation valves, wherever provided with supervisory switch (non-padlock valves).
  - e) Other requirements to meet electro-mechanical services interface.

**Further Explanation:**


1. **The Electric Fire Alarm System** can be manually operated or completely automatic the type of detection and alarm system to be used according to the type of building occupancy is mentioned in Table 7 of NBC 2016: Part 4. The location of the call boxes shall be decided after taking into consideration their floor without having to travel more than 22.5 m. The base of the call box shall be at a height of 1.5 m. from the floor level.

*\*The guidelines laid down in NBC 2016 Part 4 must also be adhered to while installing the fire detection and alarm systems.*

*\*Some accepted standards are OSHA, BIS, EN 54, IS 2189/1988, and, etc.*

2. **The call boxes** shall be of the break glass type without any moving parts, where the call is transmitted automatically to the control room without any other action on the part of the person operating the call boxes. All call boxes shall be wired in a closed circuit to a control panel in a control room. The circuit shall also include one or more batteries with a capacity of 48 hours normal working at full load. The battery shall be arranged to be a continuously trickle charged from the electric mains. The call boxes shall be so installed that they do not obstruct the exit ways and yet their location can easily be noticed from either direction.



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3. **The Fire Control Room** must be well-equipped with communication systems to and from every floor. The Fire Control Room must also have the firefighting plan, details of the firefighting equipment and indicator boards to detect fire on any floor.
  4. The different types of Alarming systems are as explained below:
    - a. Both audio and visual alarming appliance covering all occupied spaces in the building. The notification appliances should be suitable for different kinds of environment as per the risk involved in that area. For example, heat detection sensors are installed in parking areas instead of smoke sensors.
    - b. The Building can also install a Video- Based Fire detection system which allows Fast and secure identification of smoke and flames than the conventional detectors usually used.
    - c. Analogue Addressable Fire Alarm Systems or Wireless Fire Alarm Systems than conventional and Addressable Fire Alarm systems. The former two types of the fire alarm systems are more intelligent and efficient. The Analogue Addressable Fire Alarm Systems with a true intelligent detector effectively evaluates the environment around it, and communicates to the Control Panel whether there is a fire, fault or the detector head needs cleaning. Whereas, the Wireless systems provide an alternative to the traditional wired fire alarm systems.

**Documentation Required:**

1. Owner Declaration Letters confirming that all NBC 2016 norms laid down for the Fire Detection and Alarm systems will be/ are abided by in the designs and during implementation on site.
2. Product Specification sheets of the Fire Detection and Fire Alarm system installed in the Building.
3. The standards which the installed systems qualify.
4. The location of the Fire Control Room near the entrance of the building in the Site Plan of the Building



5. Fire Plans of the Building showing the installation and location details of the Fire detection and Alarming systems in each floor.
6. Photographs of the Fire Detection and Alarm systems after installation in the building.
7. Review of Two fire drills conducted during the operation of the building to testify that the systems installed are functioning as per the requirements and are capable to raise appropriate alarms as and when required.



## Part I: Safe

### Section III: Fire Fighting and Evacuation

#### *Credit 1- Design Fire Retardant Electrical Infrastructure and reliable Electrical Supply System to ensure successful operation of the Firefighting systems*

**Intent:** A lot of fire incidents in buildings occur from faults in the electrical systems (usually short-circuits). It is therefore essential to use fire retardant electrical installations in the buildings. Also, reliable functioning of the Fire and Life Safety Systems and equipment in case of emergency is necessary for the safety of the occupants.

#### **Maximum Points – 8 Points**

#### **Compliance Requirements:**

##### **1. Mandatory:**

- a. Separate conduits and shafts for low and medium voltage wiring and cabling.
- b. The inspection panel doors and any other opening in the shaft shall be provided with airtight fire doors having fire resistance of not less than 2 hours.
- c. The false ceiling including all fixtures used for its suspension shall be of noncombustible material.
- d. Provision of fire retardant cables so as to avoid chances of spread of fire in the sub-station building.
- e. Provision of fire compartmented shaft for carrying high voltage cables to upper floors in a building.
- f. Baffle walls of 4-hour fire rating for substation equipment having more than 2000 liter of oil whether located indoors as utility or outdoors.
- g. In case of two transformers (dry type or containing oil less than 2000 liters) the distance between them should be as follows:



Line Capacity	Minimum Distance
11 kV	1500 mm
22 kV	2000 mm
33 kV	2500 mm
Greater than 33 kV	Baffle wall of 4 hour fire rating

- h. Loss of power to the part of the access control system that locks the doors shall automatically unlock the doors in the direction of egress.
- i. Provision of the following equipment's or systems connected to the emergency power supply:

Fire pumps;

Pressurization and smoke venting; including its ancillary systems such as dampers and actuators;

Fireman's lifts (including all lifts).

Exit signage lighting;

Emergency lighting;

Fire alarm system;

Public address (PA) system (relating to emergency voice evacuation and announcements);

Magnetic door holds open devices; and


Lighting in fire command center and security room.

Provision of the staircase and corridor lighting on separate circuits and independently connected.

Emergency lights shall be provided in the staircase and corridor.

- 2. Apart from the above mentioned mandatory requirements comply with any 4 of the following to earn additional points: (2 Points for each measure)
  - a. Separate ducts for Water mains, telephone wires, inter-com lines, gas pipes.
  - b. Separate circuits for water pumps, lifts, staircases & corridor lighting and blowers for pressuring system shall be made directly from the main switch panel and these






circuits shall be laid in separate M.S. Conduits, so that fire in one circuit will not affect the others.

- c. High Voltage cable shafts with provision of fire detection and suppression measures throughout the length of the cable on each floor.
- d. The transformers (Oil filled) with capacity more than 5 MVA shall be protected with Nitrogen Injection System or Carbon Dioxide total flooding system.
- e. The electrical panel rooms shall be protected with Gas Flooding System.
- f. Manual control of auto high velocity spray system for individual transformers shall be located at fire control room.
- g. The power supply to the panel/distribution board of these fire and life safety systems shall be through fire proof enclosures or circuit integrity cables or through alternate route in the adjoining fire compartment to ensure that supply of power is reliable to these systems and equipment.
- h. Staircase and corridor lighting shall also be connected to alternate source of power supply.


**Further Explanations:**

1. The electric distribution cables/wiring shall be laid in a separate duct sealed at every floor with non-combustible material having the same fire resistance as that of the duct.
2. Master switches controlling essential service circuits shall be clearly labeled.
3. Suitable arrangement for pump house, water storage tanks with main electrical pump and a diesel-operated pump shall be installed in the building, if no such arrangement is provided in the building. In case the water pumping facilities are existing in the building for sprinkler system, the same should however be utilized for high velocity water spray system. Alternatively, automatic CO<sub>2</sub> total flooding system shall be provided with manual controls outside the electric sub-station.

- 
4. Separate circuits ensure that system could be operated by one switch installation on the ground floor easily accessible to firefighting staff at any time irrespective of the position of the individual control of the light points, if any.
  5. Suitable arrangement shall be made 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 stand by supply.
  6. O &M of the battery powered lights to be carried out at least once every six months.

**Documentation Requirements:**

1. Product brochure highlighting specifications of fire redundant cables.
2. Product brochure of noncombustible false ceiling suspension materials.
3. Building services layouts indicating separate ducts and conduits.
4. Layouts showing direct/easy access of termination of electrical supply.
5. Transformer specifications.
6. ODL and product specifications of the Nitrogen Injection System or Carbon Dioxide system to be used for fire prevention or extinguishing.
7. Narrative explaining the fire detection and suppression measures proposed in high voltage cable shafts.
8. Electrical SLD highlighting the systems connected to the emergency power supply.
9. Lightings plans highlighting the emergency lighting and lights connected to separate circuits.
10. Photographs of the emergency lights installed.



## Part I: Safe

### Section III: Fire Fighting and Evacuation

#### *Credit 2- Designing of the Air-conditioning and Ventilation system in the building*

**Intent:** Air-Conditioning and Ventilation is one of the most common and important services in a building and during a fire incident smoke and fire may travel and spread to other spaces in building through air conditioning ducts. To prevent so air-conditioning and ventilation systems should be designed such that it is well-suited during fire incidents and provide sufficient time to all inmates for safe evacuation

#### **Maximum Points – 6 Points**


#### **Compliance Requirements:**

##### **1. Mandatory:**

- a. The fire rated duct shall have the same period of fire resistance as the wall or floor it penetrates. In addition to providing fire rated enclosure to the duct within the lobby, fire damper is fitted where the duct penetrates the lobby enclosure in which case, the fire damper should still be contained within the duct.
- b. Supply air for the system shall be drawn directly from the external, with intake point not less than 5 m from any exhaust discharge openings.
- c. The exhaust duct where it runs outside the kitchen shall either be enclosed in a structure or be constructed to give at least the same fire rating as the kitchen or that of the room through which it traverses, whichever is higher. The rating shall apply to fire exposure from both internal and external of the duct or structure. No fire damper shall be fitted in kitchen exhaust ducts.

2. Apart from the above mentioned mandatory requirements comply with the any 3 of the following design requirements to earn additional points: (2 Points for each measure)



- 
- a. Duct smoke detectors should be used in air conditioning duct and these detectors should be tied with air conditioning units over 2000 CFM so the units can be shut down during a fire incident.
  - b. The mechanical ventilation system shall be automatically activated by the Building Fire Alarm System. In addition, a remote manual start-stop switch shall be made available to firemen at the fire command center, or at the fire indicating board where there is no fire command center. Visual indication of the operation status of the mechanical ventilation system shall be provided.
  - c. Mechanical ventilation system-Provision of fire damper to the supply and exhaust ducts are not permitted as the supply and exhaust system are required to function during emergency.
  - d. Smoke Venting facilities installed to provide safe use of exits in windowless building spaces and underground structures such as parking spaces of the buildings. The smoke venting installations must also satisfy the requirements as mentioned in the further explanations.


**Further Explanations:**

1. **Ventilation ducts** should not pass through smoke-stop or firefighting lobby. Where unavoidable, the part of the ventilation duct within the lobby shall be enclosed in construction with fire resistance rating at least equal to that of the elements of structure. Such construction shall be in masonry. If other form of fire resisting construction is used, fire damper shall be fitted where the duct penetrates the lobby enclosure.
2. **Kitchen Fire dampers** are not permitted within the duct system. The effectiveness of fire dampers is questionable as grease on the downstream side would likely ignite before the damper closed. The potential for false operation is also greater than normal and closure other than in a fire situation could have serious consequences. Further it is expected that the majority of kitchen hoods



will have their own suppression thereby reducing the risk of fire spreading into the duct. Continuation of the exhaust system during a fire involving the cooking equipment or in the compartment is not considered to aggravate the situation.

3. **Duct smoke detectors:** Duct smoke detectors are special detectors that are located with the duct and generally span the entire width of the duct. These are tied into the fire alarm system and will activate the alarm just like any other detector.
4. **Manual Start/Stop Switch** The main purposes of locating the manual start/stop switch with visual indication at the fire command center, or at the main fire indicating board (FIB) where there is no fire command center are:
  - a) To allow firefighting personnel to shut down the supply air system temporarily in the event that smoke is being drawn into the lobby through the outdoor air intake
  - b) To allow firefighting personnel to activate the supply air system should the fire alarm system fail to automatically activate the supply air system.
5. **Smoke Venting** is provided for safe use of exits in windowless building spaces and underground structures such as parking spaces of the buildings. Use automatic smoke venting facilities with manual controls for underground parking/ Basement areas and building spaces where natural venting provisions are not provided. These mechanical venting systems should be fire safe. If, smoke exhaust equipment is installed the minimum recommended Air Changes per Hour as per NBC 2016: Part 4 for all is 12. Smoke vents shall be adequately distributed along perimeter of basement and their outlets shall be easily accessible during firefighting and rescue operations. Installation shall comply with the following requirements:
  - i. The number and their sizes shall be such that the aggregate effective vent openings shall not be less than 2½ per cent of the basement floor area served.

- 
- ii. The vent outlets if covered under normal conditions shall be openable in case of fire.
  - iii. The position of all vent outlets and the areas they serve shall be suitably indicated adjacent to such outlets.
  - iv. Where ducts are required to connect the vent to outlets, the ducts shall either be enclosed in structure or be constructed to give at least 1 hour fire resistance.
  - v. Separate ducts and vent outlets shall be provided for each basement story.

*\*Also, where these facilities are provided, they should be able to prevent the accumulation of harmful smoke during the evacuation period.*

**Documentation Requirements:**

1. Mechanical Plans with damper locations
2. Duct insulation specifications
3. Specification sheet for the dampers
4. Specification sheet for the ventilation fans

## Part I: Safe

### Section III: Fire Fighting and Evacuation

**Credit 3-** *To design a well laid fire hydrant and firefighting system to fight fire and minimize fire related hazards*

**Intent:** In cases where the Fire prevention fails and there is an unfortunate onset of fire, the building must be well equipped to immediately address the issue and start the firefighting process to prevent loss of lives and properties. The Firefighting infrastructure, systems and equipment must undergo sound and continuous maintenance so that they are able to function as per the requirements.

#### Maximum Points – 8 Points

#### Compliance Requirements:

##### 1. Mandatory:

- a. The provision of firefighting equipment's should be installed based on building height as per the **Annexure 1**.
- b. Provision of Fire Tanks must be according to the Table 2: Fire Tank Specifications mentioned in the further explanations.
- c. Fire extinguishing equipment and their installation shall be in accordance with accepted standards (IS 15683: 2006, European standards or NFPA codes).
- d. Automatic sprinklers shall be installed wherever required in terms of Annexure 1, throughout the building in accordance with good practice. Automatic sprinklers shall also be installed in false ceiling voids exceeding **800 mm** in height.
- e. Design hydrant system with a minimum hydraulic pressure of **5.25 kg/cm<sup>2</sup>** at any remotest point of system.
- f. The lowest size of Riser Pipe in any hydrant system should not be below **100 mm** dia. and the same should be preferred for terminals.
- g. All the pumps must be installed in positive suction only.



- h. Electrical supply to the motorized fire pumps should entirely be independent of all other equipment in the premises.
- i. Hydrant mains should be at a minimum distance of **3 meters** from the main building structure if laid underground and a minimum distance of **5 meters** should be maintained when laid over ground.
- j. Distance between Yard Hydrants should not be more than **30 meters** for **High hazard** and **45 meters** for **Ordinary Hazard**.

**2. Firefighting equipment's: (2 Point)**

- a. Design fire hydrant system in rings so as to receive water at a place via two routes.
- b. First-aid firefighting appliances shall be provided and installed in accordance with good practice.
- c. Valves in fixed firefighting installations shall have supervisory switch with its signaling to fire alarm panel or to have chain(s), pad lock(s), label and tamper-proof security tag(s) with serial number to prevent tampering/unauthorized operation. These valves shall be kept in their intended "open" position.
- d. The first-aid hose reel shall be connected directly to the riser/down-comer main and diameter of the hose reel shall not be less than **19 mm**.
- e. Hydrants planned to be provided near fire exit staircase on the floor shall be within **5 m** from exit door in exit access.

**3. Automatic sprinklers: (2 Point)**

- a. The sprinkler flow switches provided shall be monitored by fire alarm panel.
  - b. Extended throw, quick response type sprinklers for all guest rooms and suites.
  - c. Provision of audio-based detectors, having a sound level of at least 75 dB to be installed for all Guest Rooms and Suits Rooms.
4. All Fire Fighting infrastructures and systems must be periodically tested and maintained as per Table 2 given in further explanations. **(2 Points)**



## 5. Firefighting Pumps (2 Points)

- Fire pumps should be capable of furnishing not less than 150% of rated capacity at a head of not less than 65% of the rated head. Also the shut off head should not exceed 120% of rated head in case of horizontal pumps and 140% in the case of vertical turbine type of pump.
- Fire water reservoir should be constructed in at least two compartments with a provision of common pump.
- Pump room and substation feeding fire pumps should be located at a minimum distance of 6 meters away from surrounding building
- Installed equipment should have approved marking of national body like Bureau of Indian Standards (BIS) or international bodies like UL, FM, and VDS. In absence of any marking tests certificate from recognized laboratory could be acceptable.


### Further Explanations:

- Fire Tank Specification:** Based on the type of occupancy, height of the building and area of the building the Fire tank specifications are decided. The type of tank and the water supply in liters is as given below:

Table 2: Fire Tank Specifications

Sr. No.	Type of Occupancy(Hotels)	Water Supply (Litre)	
		Underground static water storage tank	Terrace tank over respective tower
1	<b>Less than 15 m in height</b>		
a)	Greater than 300 m <sup>2</sup> floor area	Not Required	5000
b)	300 – 1000 m <sup>2</sup> floor area	10,000 for every 500 m <sup>2</sup> floor area subject to min. of 50,000	10,000
c)	Greater than 1000 m <sup>2</sup> area on any of the floor	10,000	10,000
2	<b>15 – 30 m height</b>	<b>150,000</b>	20,000
3	<b>Greater than 30 m height</b>	200,000	20,000
4	<b>Five stored and above hotels</b>	250,000	20,000

The static water storage tank shall be provided with a fire brigade collecting head with 4 number 63 mm diameter (2 number 63 mm diameter for pump with capacity



1400 liter/min) instantaneous male inlets arranged in a valve box at a suitable point at street level.

2. **Installation of Fire Fighting Equipment:** Extinguishers with a gross weight not exceeding 18.14 kg should be installed so that the top of the extinguisher is not more than 5 feet above the floor. Extinguishers with a gross weight greater than 18.14 kg, except wheeled types, should be installed so that the top of the extinguisher is not more than 3 feet above the floor.
3. **Automatic sprinklers:** Pressure in sprinkler system shall not exceed 12 bar or else high pressure sprinkler to be installed for above 12 bar operations. It is essential to make provisions for avoiding water from sprinkler/hydrant operation entering lifts and electrical rooms.

**Documentation Requirements:**

1. Plans and sections showing the location and capacity of fire tanks
2. NOC from local fire department.
3. Plans highlighting the locations of the firefighting equipment
4. Sectional plan of the building.
5. Cut sheets/invoice of the standardized fire extinguishers highlighting the standard.
6. In case of existing buildings, provided the photographs of the firefighting equipment's.
7. Provide a system schematic drawing (with valve numbers) of the sprinkler system showing all valves and auxiliary equipment.

## Part I: Safe

### Section III: Fire Fighting and Evacuation

***Credit 4- Design Fire Evacuation Infrastructure alongside an Evacuation Plan to ensure safety of all occupants during a fire event***

**Intent:** In cases where the Fire prevention fails and there is an unfortunate onset of fire, the building must be well equipped to immediately address the issue and start the safe evacuation of all inmate to prevent any loss of life and property.

**Maximum Points – 10 Points**

#### **Compliance Requirements:**

##### **1. Mandatory:**

- a. Fire drills shall be conducted, in accordance with the Fire Safety Plan, at least once every three months for buildings during the first two years. Thereafter, fire drills shall be conducted at least once every six months. The occupants shall be made thoroughly conversant with their action in the event of emergency, by displaying fire notices at vantage points and also through regular training.
- b. Put proper signage all around the building to guide the occupants in implementing the evacuation plan without panic or rush. The points mentioned in the further explanation can be incorporated to do so.

##### **2. Apart from the above mentioned mandatory requirements comply with the following design requirements to earn additional points:**

- a. Provide Fire Lifts where applicable (such as high rise buildings) (3 Points)
- b. Designing proper Exit Requirements (Means of egress) throughout the building. The design requirements and techniques are divided based on six parameters. Fulfilling design requirements of each of these parts will earn points. The design strategies for each parameter are explained in the further explanations. (4 Points)

The Exit Requirement parameters are as follows:

- Number of Stairs and Exit Discharge





- Arrangement of Exits and Travel
- Capacity of exit
- Fire Doors
- Exit Safety Scenario
- Exit Corridors and Passageways

3. Designing proper Refuge Area in buildings of height more than 24 m. (3 Points)

**Further Explanation:**

1. **Building Fire Signage:** The building signage must be in compliance with the following requirements:
  - a. Lift Landings should have a Signage reading “INCASE OF FIRE USE STAIRWELL UNLESS OTHERWISE”.
  - b. Floor Numbering: A sign shall be posted and maintained within each stair enclosure on every floor, indicating the number of the floor.
  - c. Stair and Lift identification signs: Each stairway and each lift bank shall be identified by an alphabetical letter. A sign indicating the letter of identification shall be posted and maintained at each lift landing and on the side of the stairway door from which egress is to be made.
  - d. Stair Re-entry signs: A sign shall be posted and maintained on each floor within each stairway and on the occupancy side of the stairway where required, indicating whether re-entry is provided into the building and the floor where such re-entry is provided.
2. **Fire Lifts** must be provided where applicable (such as high rise buildings) which have a minimum capacity of 8 passengers and fully automated with emergency switch on the ground floor of the building. Other safety measures related to the fire lifts must be fulfilled. These are:
  - a. Only Firemen in case of fire is allowed to operate the lifts.
  - b. Suitable inter-communication equipment must be provided within the lift to communicate with the Fire Control Room.






- c. The number of lifts and location must be in accordance to the building population, floor area and compartmentation.
  - d. The lift shall have a floor area of not less than 1.4 sq.mt. It shall have a loading capacity of not less than 545 kg (8 persons lift) with automatic closing doors.
  - e. The electric supply shall be on a separate service from electric supply mains in a building and the cables run in a route safe from fire that is within a lift shaft.
  - f. The words 'FIRE LIFT' shall be conspicuously displayed in fluorescent paint on the lift landing doors at each floor level.
  - g. The electric supply shall be on a separate service from electric supply mains in a building and the cables run in a route safe from fire that is within a lift shaft. Lights and fans in the elevator having wooden paneling or sheet steel construction shall be operated on 24-volt supply.
  - h. In case of failure of normal electric supply, it shall automatically switch over to the alternate supply. For apartment houses, this changeover of supply could be done through manually operated changeover switch. Alternatively, the lift should be so wired that in case of power failure, it comes down at the ground level and comes to stand still with door open.
  - i. The operation of a fire lift shall be by a single toggle of 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 and the lift will be on car control only 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.
3. **Exit Requirements (Means of egress):** Exits are doorways, corridors, passageway(s), internal staircases and external staircases in the building. A verandah and a terrace can also be considered as an exit considering it has access to street or to the roof of the building or a refuge area. Horizontal exits can also be provided in the buildings which

connect the building to an adjoining building at the same level. The design parameters of the exit requirements in the building spaces are as mentioned below:

- a. **Number of Stairs and Exit Discharge:** Buildings with 15 meters or more of height having an area of 500m<sup>2</sup> or more on each floor shall have a minimum of two staircases which are of enclosed type and at least one of them should be on the external walls of the buildings such that it directly opens to the exterior space or to a place that is fire safe. The number of stairs is also decided based on the fulfilment of the arrangement of stair conditions where the travel distance from any point on the floor to a nearest exit must not be greater than 30 meters.
- b. **Arrangement of Exits and Travel Distances** should be such that the travel distance for people on the floor should not exceed 30 m for Residential types of Buildings. Also wherever more than one exit is required for any building space exits shall be as remote from each other as possible and should also be arranged to provide direct access in separate directions from any given point. (1 Point)
- c. **Capacity of exit** refers to the exit door width or the measure of the number of people that can comfortably pass through the door at one time. The design of the capacity of the exit should take into consideration the occupant load of the building. The occupant Load refers to the number of persons within any floor area. Calculate the actual number of occupants that would occupy each floor at any given point to determine the occupant load. The occupant load is used to determine the number of exits in the building.
- d. The unit of exit width considered is 500 mm. Hence, the formula that can determine the exit width dimensions for stairways, ramps and doors in a Residential type building will be:

$$\frac{\text{Total Number of Occupants}}{\text{Occupants per Unit Exit Width}} \times \text{Unit of Exit Width(500 mm)} = \text{Exit Door Width Required}$$



As per NBC 2016: Part 4 the Occupant Door Width should be such that for Type I of construction the evacuation time is within 2.5 minutes. Refer Table 2 of NBC 2016: Part 4 for the Occupants per Unit Exit Width.

*Please Note: No exit doorway should be less than 1000 mm in width for residential buildings and the height shall not be less than 2000 mm.*

- e. **Fire Doors:** Use well designed Fire Doors at critical exit points and passageways that are capable to provide barrier to the spread of fire and smoke without causing too much hindrance to the general movement of people around the building. The Fire Doors must also be fitted with a cold smoke seal to prevent ingress of smoke through the door edges.

- f. **Exit Safety Scenario:** The following terms are to be considered in terms of Exit doorways-

The exit doorways should also always open outwards and not obstruct travel along the ways.

Another point to be considered for Exit door design with stairways and landings is that the door once opened should not reduce the width of the stairways or landings to less than 900 mm.

Every Exit doorway should have a landing equal to the width of the exit door and not immediately open to a flight of stairs. The level of landing shall be same as the floor it is connected to.


To avoid any confusion regarding the direction of exit, mirrors should not be placed in fire exit ways.

- g. **Exit Corridors and Passageways** shall comply with some design points to achieve the credit points:

Have a minimum width of the aggregate required width of exit doorways leading from them in the direction of travel to the exterior

Height of the corridors and passageways should not be less than 2.4 m if stairways are discharged into them.





Provide adequate ventilation in the exit corridors, passageways and also stairways.

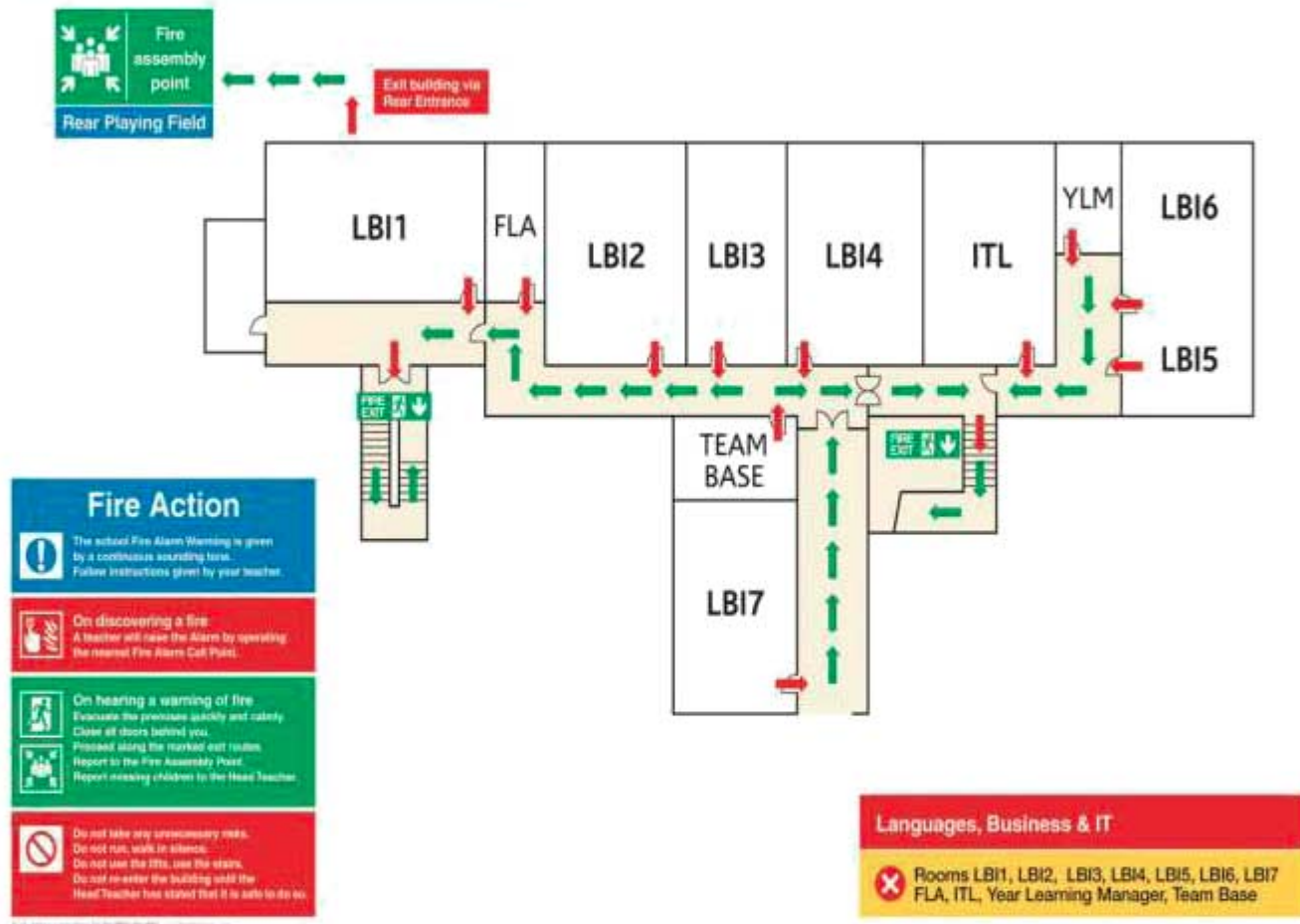
4. **Refuge areas** shall be provided in buildings of height more than 24 m. Refuge area provided shall be planned to accommodate the occupants of two consecutive floors (this shall consider occupants of the floor where refuge is provided and occupants of floor above) by considering area of 0.3 m<sup>2</sup> per person for the calculated number of occupants and shall include additionally to accommodate one wheelchair space of an area of 0.9 m<sup>2</sup> for every 200 occupants, portion thereof, based on the occupant load served by the area of refuge or a minimum of 15 m<sup>2</sup>, whichever is higher, shall be provided as under:
  - a. The refuge area shall be provided on the periphery of the floor and open to air at least on one side protected with suitable railings.
  - b. Refuge area(s) shall be provided at/or immediately above 24 m and thereafter at every 15 m or so.
  - c. Refuge areas must also be connected to firefighting shaft and entire refuge area shall be provided with sprinklers.



The Figure below shows a sample Fire Evacuation Plan that incorporates all the requirements of safe exit and evacuation as mentioned above:

**Documentation Required:**

## Fire Evacuation Plan



1. Record of the fire drill conducted in the last 3 years.
2. Plans showing the location of the signage.
3. Photographs of the signage provided.
4. Architectural Floor plans, Elevations and Sections
5. Occupant Load calculation
6. Door and Window Schedules
7. MEP Floor Plans



8. Specification sheets of the ventilation systems to be installed
9. Specification sheets of the smoke venting systems installed in the building
10. Specification sheets of the Fire Lift if installed in the building
11. The project team must provide proof and narrative that how the design has been made appropriate to withstand fire through compartmentation.
12. Fire Exits Floor Plan
13. Specification sheet and details of the Fire Exit Doors installed

## Section IV: Fire Modelling and Simulations

*Credit 1: Perform fire and smoke simulation and evacuation modelling of the building or demonstrate by analysis*

**Intent:** The use of simulation verifies, and utilizes measurements and predictive methods to quantify the behaviour of fire and means to reduce the impact of fire on people, property, and the environment.

**Maximum Points: 6 Points**

### **Compliance Requirement:**

1. Use simulation and modelling or demonstrate by analysis to monitor the following:
  - a. Smoke Extraction Analysis
  - b. Stairwell Pressurization
  - c. Fire Simulation
  - d. Visibility Analysis
  - e. Evacuation Modelling

### **Further Explanation:**

1. The simulation approach evaluates the smoke extraction and ventilation system. The movement of people while evacuation can be studied with the evacuation simulation. On the basis of Fire and smoke simulation various fire scenarios can be modelled for fire fighting and evacuation.
2. The objective is to evaluate and understand the air flow profile of the concerned space. The study also highlights possible design improvements by controlling air flow patterns, identification of dead air pockets, evaluation of age of air particle in the basements, throw of jet fans and air velocities in the spatial domain. To evaluate the performance of smoke ventilation system using CFD analysis, and to study the movement of smoke, temperature and visibility profile considering various scenarios of fire.
3. The results derived through fire related modelling depict the smoke concentration data, temperature-velocity profile of fire, evaluation of fire and smoke propagation





path, visibility study and evacuation study. The modelling software which can be used is FDS for fire simulation and FDS+Evac for evacuation modelling.

## **Part 2: Secure**



## Section I: Prevention & Deterrence

*Credit I: Risk monitoring strategy for preparedness during security threats and develop a response process for the allocated risks.*

**Intent – Considerations of potential risks or events beforehand and have a risk management plan in place would reduce the possible loss of the project in the future.**

**Maximum Points: 6 Points**

**Compliance Requirements:**

### **1. Mandatory:**

Building owners should adopt a risk management approach to put in place security measures that address identified threats. Risk management involves first working through possible threat scenarios and consequences should existing security measures fail. In order for protection measures to be focused and effective, the risk management process can calibrate protection needs based on assets, threats and existing protection level.

### **2. Regular update and Training of the security manpower (6 Points)**

The building owner should also incorporate security training plans for both security and non-security personnel, to familiarize them with the following:

#### **a. Identification and management of suspicious:**

Activities

Persons

Vehicles

Items

#### **b. Incident reporting procedures;**

#### **c. Response(s) to bomb/terrorist threats; and,**

#### **d. Familiarization with the crisis response plans and evacuation plan.**





### **Further Explanation:**

1. Depending on risk assumptions, constraints, priorities, and tolerance levels, the set of risk monitoring practices actually implemented at any one time may differ from what is documented in the risk monitoring strategy. The purpose of risk monitoring is to address how risk will be monitored.
2. Existing emergency response plans for fire, security manuals, crisis response plans, standard operating procedures and business continuity plans should be regularly reviewed, updated and communicated to the relevant staff.
3. Regular exercises should be conducted to test out these response plans, and to resolve any operational issues.

### **Document Submission:**

Risk Management report to study and understand security measures adopted at site and in the building. The report should include the following:

1. Identified Assets
2. Details of Manpower (e.g. Armed/unarmed security officers, level of training, security plans, deployment, shift schedule, security manager, patrolling schedule, quality assurance) and logs of the trained personnel's along with shifts.
3. Operational & Technological measures
4. Standard Operating Procedures & Policies for risk assessment and training for occupants
5. Photographs of the mock drills and trainings carried out in the project.



## Section II: Specialist Man Power

*Credit I – Skilled and trained work force for manual checking and identifying the risk; to alert and handle/combat the situation.*

**Intent:** Trained security manpower provides a visible deterrent to criminals and provide professional protection for assets. Monitoring of sites to prevent theft, vandalism, fire and other harmful situations thus reducing the future risk is the responsibility of this skilled manpower.

### Compliance Requirements:

#### 1. Mandatory:

Qualified and trained Security Guard. The agency from where the security manpower is hired should have PSARA license or equivalent.


### Further Explanation:

1. Security guards are required to obtain licensure. Eligibility varies by state, but most
2. licensure applicants must be 18 or older, have a clean criminal record and pass a drug test.
3. Security guards may be required to perform legal training in the premises.

Lock down mechanism: A Lock Down is a procedure used when there is an immediate threat to the building occupants. In the event of a Lock Down, students, faculty and staff would be instructed to secure themselves in the room they are in and not to leave until the situation has been curtailed. This allows emergency responders to secure the students and staff in place, address the immediate threat and remove any innocent bystanders from immediate danger to an area of safe refuge.

### Documentation Requirement:

1. Copy of the PSARA license of the agency from where the manpower is hired.



## ***Credit II: Security Training in Building***

**Intent:** Incorporate security-training plans for both security and non-security security personnel.

Maximum Points: 6

### **Compliance Requirements:**

1. Employees/tenants should also undergo a security induction programme to communicate the security policies of the premise and to share with them on their roles and responsibilities. (6 Points)
  - a. Training should be carried out by trained personnel with experience of more than 10 years.
  - b. The duration of training should be once a year.

### **Further Explanation:**

1. The training activities should involve the security and the non-security personnel/staff. The aim should be train for identification and management of suspicious:

Activities

Persons

Vehicles

Items

2. Familiarization with the crisis response plans and evacuation plan.

### **Documentation Requirement:**

1. Submit the training certificate of trainer and qualification details of the trainer. The trainer could be part of a security agency.
2. Photographs of the training carried out in the premises.



### Section III: Detection at Perimeter/ Perimeter Security System

*Credit I: To monitor the activities at all locations in the building premise and also provide a space for the security personnel to carry out responsibilities.*

**Intent:** The security post located at the entrance of the site, gives a line of vision to monitor and also acts as a check post. The design and the location of the security cabin plays a crucial role building safety and security.

#### **Compliance Requirements:**

##### **Mandatory:**

1. The security post positioned on the perimeter which are securing the entrances should be designed to give the guards a good field of vision and tactical control of the area under their responsibility.
2. Blind spots should be prevented and backed up by CCTV monitoring or mirrors if they cannot be avoided.
3. The entrance to the security post should be from the inner area and not from the outside.
4. The entrance security post should be equipped with a duress button to allow guards to alert the security team /local security monitoring center in the event of an attack.

#### **Further Explanation:**

1. If the security post is on the building line, it should be carefully considered if access is needed both between the security post and the screening area and between the security post and the inner building area. This should be avoided, but if it is unavoidable, forced-entry protection should be considered to deny or delay entry to the perpetrators.
2. The entrance security post should have enough allocated space to house all screening equipment for both currently planned and future options.

**Documentation Requirement:** Submit a plan locating the security post details showing the perimeter of view/field of vision.



### ***Credit II: Detection at Perimeter***

**Intent: Detecting the presence of an intruder attempting to breach a perimeter.**

Maximum Points: 12

#### **Compliance Requirements:**

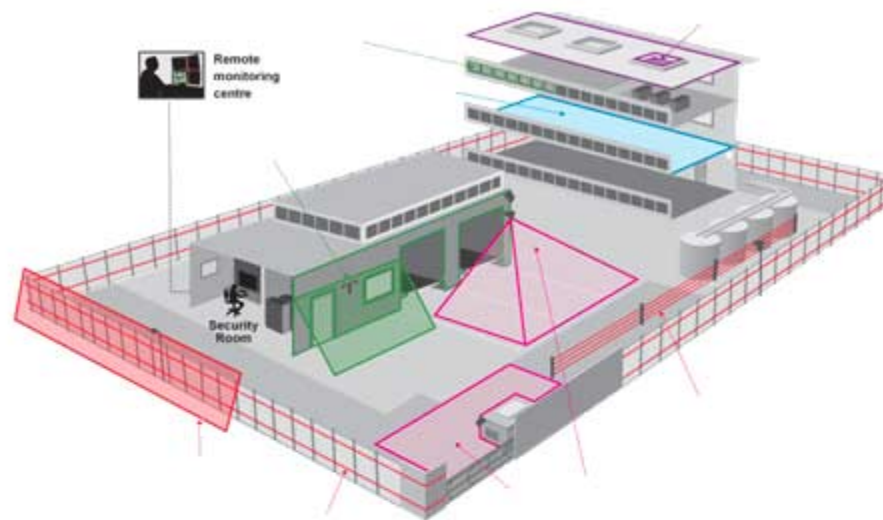
1. Deter: A physical barrier is the basis of a deterrent system. The design and material choices will determine the effectiveness. (2 Points)
  - a) Installation of Motion activated lighting for reaction and perceived detection. These sensors can act as early warning sensor and delay medium. (1 points)
  - b) Landscaping and plant selections for deterrence. (1 Points)
2. Detect: By designing the system to be able to identify and classify the method, force and agility of the attack; we can better understand the nature of the threat and subsequently prepare a better defense. Two points for each component installed. (8 Points)
  - a) Electric fence
  - b) In ground sensors
  - c) CCTV - traditional and thermal combined with analytics
  - d) Ground and thermal radar
  - e) Seismic acoustics
  - f) Microwave and infrared sensors
  - g) Laser sensors
3. Scalable Perimeter Detection: Stand-off distance can be achieved by having an effective perimeter line which creates space between where an explosion could take place and the building itself. (2 points)



### **Further Explanation:**

1. Perimeter security system should be used in combination with some other security systems and alarms (such as video surveillance and intruder alarms). Perimeter Intrusion Detection System combines many different security technologies into a single robust solution.
2. The main designation of perimeter security system is to early detect any intrusion to the guarded facility and to further alert the guards in order to take the appropriate subsequent steps. These components may include:
  - a) Surveillance (including infrared and thermal)
  - b) Radar video surveillance (ground or water-based)
  - c) Sensors (fence line, optical, thermal, microwave and underground)
  - d) Digital video (CCTV)
  - e) Video analytics
  - f) Automatic identification systems
  - g) Access control (including the latest in biometrics)
3. The deterrence layer forms the first layer farthest from the asset. It is an effect of visible physical security measures and clear warnings that the building is protected.
4. Achieving sufficient stand-off distance (or setback) from an explosion is one of the most effective measures to minimize its effects. It can substantially reduce the need to protect the building's structural elements.





**Documentation Requirement:**

1. Submit the images of installed security equipment on site with PO/invoice.
2. Plans showing the deterrence and detect measures adopted and the areas covered under perimeter security eg. Roof, site entries, etc.

### ***Credit III: Access Control Systems***

**Intent:** Access control determines who may and who may not enter specific areas or access particular assets. Access management, is an important aspect of any effective security system.

**Maximum Points:** 4

#### **Compliance Requirements:**

1. Main entrance doors should be equipped with an automatic locking mechanism that allow external guards to lock the doors if an emergency situation occurs outside. (1 point)
2. All external doors that are used on a regular basis by authorized persons only, require access control. (1 point)
3. Linkage of access control system to one or more of the following: (1 point)
  - a. Burglar Alarm
  - b. Video Surveillance
  - c. Time Recording systems
4. Entrance Access Control: The building occupants should have one of the following for entrance access; (1 point)
  - a. Biometric System/ID cards
  - b. Scanning systems installed for visitors.





### **Further Explanations:**

1. The number of entrances to the building/installation should be minimized.
2. Identifying and deciding areas to which access should be limited.
3. The employed measures should not interfere with fire protection and safety systems.
4. The measures must still facilitate access to the building by the disabled.
5. Proper identification and record keeping is necessary for all the visitors who are visiting the site, vehicle and equipment which enters into the site. The record should be kept either manually or computerized data so that the data can be used when it is required. All equipment can be marked with unique identifying tags, such as engraved PINs and owner applied numbers (OANs), in multiple locations on the equipment. This, when coupled with an up-to-date record of all equipment (including manufacturer, model number, purchase date, etc.), makes it much more likely that stolen equipment will be found, identified, and returned, if it is stolen.

### **Documents Required:**

1. Submit photographs and manufacturer's cut-sheet of baggage scanning system, metal detectors etc.
2. Submit the copy of visitor record maintained during the building operation
3. Submit the documentation and photographs to show the compliance with building access control systems. Submit manufacturer's cut-sheets also if electronic access control is present



## Section IV: Response

*Credit-1: Response refers to the means taken to counter an intrusion, or attack so as to protect important assets.*

**Intent:** To rescue victims in the shortest possible time and to provide legal assistance and support, Quick Response Team (QRT) needs to be available at a call.


Maximum Points: 4

### Compliance Requirements:

1. **Mandatory: Response measures should include: (1 point each, maximum 2 points)**
  - a) Turning on lights,
  - b) Sounding sirens,
  - c) Focusing surveillance cameras at the point of intrusion
2. A Quick Response Team Comprising of a Field Officer / Inspector and with 2-3 security Guard is perpetually on mobility for quick response to any emergent situation. (2 points)
3. QRT team having with proper uniform, Helmet, torch, rope, axe, fire extinguisher, bucket, raincoat, gun and ammunition, shield cover, communication sets loud speaker and mobile. (2 point)

### Further Explanations:

1. A well-established communication setup exists with Walkie - Talkie sets, Mobile Phones, etc., at respective operational levels.
2. Response measures must be integrated with detection and delay measures for the response to be effective and timely.
3. Around the clock operations room monitors the strength of all units and reacts to any demands most promptly through the closest patrolling van to reach the spot and attend to the emergency.

- 
4. During any emergency irrespective of security, safety, road accident, riot, fire, theft etc., QRT team ready to rush to the scene of the incident within 2 minutes and able to take necessary action.

**Documentation Requirement:**

1. Submit the detailed equipment list of QRT team and photographs.
2. Submit the training certificates of QRT team members.
3. List and narrative of Response mechanism



## ***Credit-2: Command and Control Room***

**Intent:** To efficiently and effectively monitor multiple information streams and to make accurate mission-critical decisions.

Maximum Points: 6

### **Compliance Requirements:**

1. The Control room should consist of the following:
  - a. Seamless Integration of AV and IT
  - b. Visual Excellence: Integrated information and visual details in resolutions up to 4K allow for more accurate monitoring, contact collaboration, and proper responses for situations that have an ever-increasing number of sources, authentication mechanisms and applications to control
  - c. Location of the control room and access along with Flexible Deployment and Management
  - d. Security and Reliability: provide secure, reliable access to any system across multiple security domains for 24/7 operation; adjustable authority levels, encrypted communication and loggings; virtual media data encryption; also provides vital rapid failover/backup support for systems and operation, from local and offsite.

### **Further Explanations:**

1. The Command and Control Suite quickly transforms actionable data into near real-time, actionable information, giving users operational insight into your business.
2. The Command Station is a single window, single monitor interface, designed for a desktop PC, laptop, and Windows tablet, and is often ideal for facility technicians, security guards, and management as well as for casual use by occupants.

### **Documentation Requirement:**

1. Submit images of established control room with equipment details.



### ***Credit-3: CCTV Surveillance Mechanism***

**Intent:** Surveillance mechanism for security forces to monitor the situation and respond appropriately.

Maximum Points: 8


#### **Compliance Requirements:**

1. **Mandatory: Licensed engineers and electricians in the design and installation of a CCTV power distribution system. (Annexure 2 – Appendix 1, 2)**
2. For achieving 4 points, comply with any of the four measures mentioned below:
  - a. Day/night cameras offering flexibility
  - b. Utilize closed-circuit television (CCTV) systems at entrances
  - c. Video analytics for providing real-time alarms
  - d. Exterior camera lenses with automatic apertures
  - e. Low-light cameras for indoors
  - f. Analytics software for surveillance. The functions served should include at least 4 of the following:
    - Perimeter detection
    - After-hours surveillance
    - Asset protection
    - Remote locations
    - Parking lots and garages
    - Restricted zones
    - Construction projects
    - Common areas (dorms, multifamily)

#### **Further Explanation:**


1. Light (or illumination) levels, both natural and artificial, affect system requirements at different times of the day for exterior systems. Exterior cameras often require lenses





with automatic apertures to compensate for changes in light levels. Artificial lighting can affect the appearance of the image as well as the operation of the CCTV system.

2. The stability of the input power to CCTV equipment can be determined by taking several readings of the voltage and current levels over a short time period, or by using a voltage recorder for long-term monitoring.
3. In addition, uninterruptible power supplies (UPSs) are beneficial in protecting equipment and conditioning the power.
4. Utilize closed-circuit television (CCTV) systems at entrances to residence halls to identify visitors requesting entry, in parking lots to monitor potential criminal activity, and on campus grounds for surveillance purposes and as a deterrent to crime. Connect the CCTV system to a digital or video recorder to provide a record of events. Review recorded images to determine access control and traffic patterns.
5. Low-light cameras are designed to perform in some level of ambient lighting, such as indoor restaurant lighting, street lamps, or a full moon; they are not intended for use in complete darkness.
6. Day/night cameras offer flexibility by automatically adjusting to current lighting conditions. These cameras capture color images in daylight and switch to black-and-white to improve image quality at night. The camera relies on an analysis of the current image or a photoelectric sensor to determine when to automatically remove the infrared-cut filter and switch to monochrome settings.
7. Each camera deployed in a CCTV system requires power and the means to transmit video data to monitoring and storage systems. These requirements can necessitate modifications to a facility's infrastructure, such as installing new poles for mounting cameras.
8. Video analytics provides real-time alarms based on user-defined rules to proactively detect irregular behavior without the need for human supervision, "Video analytics is a way to manage the mass of undifferentiated video data received from cameras and turn it into useful information.
9. The function of the observation or surveillance should include:



Crowd control

Theft

Unauthorized entry

**Documentation Requirement:**

1. An inspection of the system shall be carried out and documented on completion of the installation of the CCTV system to confirm that the CCTV system has been installed in accordance with the System Design Proposal.
2. Fill details as per **Annexure 2 - Appendix 1,2**
3. Plan and photographs showing the location of the CCTV and the area covered by the CCTV.
4. Specifications of the CCTV installed.
5. Details of the license of the designer and electrician installing the system.



#### ***Credit 4: Install Building Automation System in the Building***

**Intent:** To ensure the best management of the building fire safety and security systems by integrating these systems with building management system.

**Maximum Points: 4 Points**

**Compliance Requirement:**

1. The building management system or a command center should at least control below fire safety and security:
  - a. Access Control
  - b. Fire Alarm System
  - c. Video surveillance or Closed-circuit television (CCTV)
  - d. PA system
  - e. Alarm Monitor


**Further Explanation:**

1. Building management system (BMS) is a computer based control system. To start with, it mainly monitors and controls the electrical & mechanical equipment in an enterprise. Most importantly, such equipment or services might include power, heating, ventilation, air-conditioning, physical access control, pumping stations, elevators and lights etc. It can also expand to include fire systems, access control and security systems.
2. Few of the security systems are elaborated below which should be integrated with the Building Management System:
  - a. **Access Control and Intruder Alarms:**

Access control system shall be integrated with building automation, lighting controls and other security systems using the Building Management System as the integration platform.

Access control shall be implemented with proximity readers, control nodes, electronic keys and electronic locks. Users can be classified so that they have access only to the spaces they are allowed to enter according to programmed





time zones. The access control system is connected to BOS for full control and reporting, and integrated into the central user interface.

Intruder alarm system shall include cover protection and indoor surveillance. Monitored doors and windows shall be equipped with magnetic contacts. Movement detectors used in indoor surveillance shall be sensitive enough for presence detection of a single person, so that they can also be used for lighting controls and air-conditioning controls.

**b. Video surveillance or Closed-circuit television (CCTV):**

The video monitoring system shall be integrated to BOS server so that the system shall start recording video stream upon triggering from intruder alarm system, access control, CCTV or any other system integrated to BMS.

**c. Fire Alarms:**

Fire alarm system shall be integrated with BMS for monitoring. Fire alarm system can be integrated either by

Using potential free contacts of Fire Alarm Panels connected to control modules

Using system driver which gives alarm information on individual sensor level to BOS.

In both cases alarms are relayed to BMS and shown in the integrated graphical user interfaces. Ventilation is shut down in the area concerned.

**Documentation Requirement:**

1. Submit the narrative/documentation/electric circuit diagram showing the integration on fire safety & security system with BMS
2. Submit the photographs of the BMS
3. Submit the SOP of BMS to which control the building fire safety and security system



## ANNEXURE 1

Sr. No.	Type of Building Occupancy	Type of installation							
		Fire Extinguisher	First Aid Hose Reel	Wet Riser	Down Corner	Yard Hydrant	Automatic Sprinkler System	Manually Operated Electronic Fire Alarm System	Automatic detection and alarm system
Hotels									
1	Less than 15 m height								
a)	Greater than 300 m2 floor area	Required	Required	Not Required	Not Required	Not Required	Required (1)	Required	Not Required
b)	Area between 300 – 1000 m2	Required	Required	Required (3)	Not Required	Not Required	Required (1)	Required	Required
c)	Greater than 1000 m2 area on any of the floor	Required	Required	Required (4)	Not Required	Required	Required	Required (5)	Required
2	15 – 30 m height	Required	Required	Required	Not Required	Required	Required	Required	Required
3	Greater than 30 m height	Required	Required	Required	Not Required	Required	Required	Required	Required
4	Five stored and above hotels	Required	Required	Required	Not Required	Required	Required	Required	Required

### Notes:

- (1) Required to be installed in basement, if the area of basement exceed 200 m<sup>2</sup>.
- (2) Sprinklers shall be fed water from both underground static water storage tank and terrace tank.
- (3) Required to be provided for buildings with more than two story (Ground + One).
- (4) Required to be provided for buildings with more than one story.
- (5) System shall also include talk back system and public address system. These shall also be provided in car parking spaces more than 300 m<sup>2</sup> and multi-level car parking irrespective of areas.

## ANNEXURE 2

### APPENDIX: 1

#### RECORD OF MAINTENANCE

CLIENTS NAME AND ADDRESS: \_\_\_\_\_

\_\_\_\_\_

MAINTENANCE CARRIED OUT: \_\_\_\_\_

DATE MAINTENANCE CARRIED OUT: \_\_\_\_\_

MAINTENANCE CARRIED OUT BY: \_\_\_\_\_

I CEERTIFY THAT I HAVE CARRIED OUT THE FOLLOWING MAINTENANCE ON THE CCTV SYSTEM LOCATED AT \_\_\_\_\_  
\_\_\_\_\_ ON THE DATE ABOVE:

- ☐ System History since last maintenance visit checked
- ☐ Signs of deterioration or damage checked for, through visual inspection.
- ☐ Cameras, lenses and housing checked and cleaned.
- ☐ Remote signaling equipment (where fitted) checked and tested.
- ☐ Recording and playback quality checked
- ☐ Lenses and pictures checked for correct field of view and adjusted (if necessary)
- ☐ All CCTV control equipment (e.g. monitors, multiplexers, DVR, etc.) checked.
- ☐ Transmission of images to remote center checked (where applicable)
- ☐ All test results logged and available for inspection
- ☐ CCTV system returned to operational status (date and time conveyed to client)

Additional Comments (if required)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Signature of Maintenance Operative: \_\_\_\_\_

Date: \_\_\_\_\_

Signature of client: \_\_\_\_\_

## Appendix: 2

### CCTV SYSTEMS SAMPLE LAYOUT FOR SYSTEM DESIGN PROPOSAL

Client Name: _____
Address: _____
Supervised Area (if different from above):
Name: _____
Address: _____
Telephone No. _____
Fax No. _____
e-Mail: _____

Details of CCTV System Contractor:
Name: _____
Address: _____
Telephone No. _____
Fax No. _____
e-Mail: _____
Job Reference No.: _____

Schedule of Equipment: (A schedule of the type and location of operational equipment. This may be supplemented by a diagrammatic layout of the operational equipment. A continuation sheet may be used as and if required.)				
Product Description	Equipment Manufacturer:	Manufacturer Product Ref.:	Location:	Operational Requirement: (Monitor, Detect, Recognize, Identify, Record)

Notification: Details of proposed notification equipment shall be included along with the name and contact details of the remote monitoring station, in the event that the CCTV system is subject to remote monitoring.
Legislation: (Details of any claims of compliance of the system components to any local or national legislation shall be included.)
Standards: (Details of any claims of compliance of the system Components to National or European Standards shall be included.)
Other Regulations: (Details of any claims of compliance of the system components to any other regulations shall be included.)

Certification (Details of any claims for certification of the system components shall be included.)
Intervention: (Planned response to faults during the operation of the system shall be detailed.)
Maintenance: (A maintenance Contract/Agreement will be offered on completion of the CCTV System installation.)
Repair: (Details of the proposed repair service to be provided including contact names and telephone numbers.)

Signed on behalf of CCTV System Contractor: \_\_\_\_\_

Signed on behalf of the Client: \_\_\_\_\_

(Note: Two signed copies required; one for installer and one to be retained by the client).

Project Fire Safety Information Form	
Project Description	Details
1. Name of the Building	
2. Classification of Building as per NBC 2016	
3. Address of the Building	
4. Name and address of builder / promoter	
5. Name and address of owners / occupiers of individual flats	
6. Plot Area	
7. Covered area (at ground /grade level)	
8. Height of the Building	
a) Overall height from ground level (Top of Architectural feature)	
b) height up to the highest occupied floor (Terrace Level)	
9. Number of floors (including ground floor)	
a) Number of basements (Please indicate level below grade in each case)	
10. Area of Basement	
11. Covered Area of Each Floors	
12. If basement extends beyond the building line, please indicate the load bearing strength of the roof of basement	
13. Occupancy	
a) Sanctioned	
b) Actual	
14. Parking areas (Please give details)	
15. Details of surrounding property features:	
NORTH	
SOUTH	
EAST	
WEST	
16. Approach to proposed building, width of the road and connecting roads, if any	



17. Please give details of water supply available exclusively for fire fighting
18. Has wet riser(s) been provided? If so, please indicate the number of risers and internal dia. of each
19. Has any dry riser been provided? If so, please give details.
20. Has any down comer been provided? If so please give details
21. Please indicate the present arrangement for replenishment of water for firefighting.
22. Is a public or other water storage facility available nearby? If so, please give the capacity and distance from your building; also please indicate if it is readily accessible.
23. Please give any other information that you can regarding availability of water supply for firefighting.
24. Have internal hydrants been provided. If so, please indicate:- a) Have these hydrant single or twin outlets. b) No. of hydrants on each floor including basement(s) and terrace. c) Have these hydrants single or twin outlets.
25. Have first aid hose reels been provided? If so, please indicate:- a) No. of hose reel on each floor including basement & terrace b) Bore and length of hose-reel tubing on each reel. c) Size (bore) and type of nozzle fitted to each hose reel. d) Is the hose reel connected directly to the riser or to the hydrant outlet?
26. Has fire hose been provided near each hydrant? If so, please indicate:- a) The type of hoses. b) The size (bore) of hoses. c) The length of each hose. d) Total number of hoses provided near each hydrant.
27. Have branch pipes been provided? If so, please indicate :- a) The type of branch pipes b) Size of nozzle fitted to each branch
28. If Automatic Sprinkler system provided in Upper Floors? Please provided details. If the basement is used for car parking or storage, has it been sprinkled? Has compart mentation been done in basements and Upper Floor. If so give details



29. Is the building equipped with automatic fire detection and alarm system? If so, please indicate :- a) The type of detectors used. b) The standard to which the detectors confirm. c) The code to which the installation confirms.
30. Have manual call boxes been installed in the building for raising an alarm in the event of an outbreak of fire? If so, please give details.
31. Has public address system been installed in the building with loudspeakers on each floor?
32. Has an intercom system been provided between the various floors and the fire control room in entrance lobby?
33. Has a fire control room been provided in the entrance lobby of the building?
34. How many staircases have been provided in the building? Please indicate in each case :- a) Number of Staircases b) Width of the stairway c) Width of treads. d) Height of risers e) If the treads are of the non-slip type
35. What is the average occupant load per floor? Please indicate details.
36. How many lifts have been installed in the building? Please indicate in each case: How many lifts have been installed in the building? a) The floors between which the lift runs b) The type of doors fitted to the lift car and at each landing. c) Fire resistance rating of lift car and landing doors, if known. d) Floor area of the lift car. e) Loading capacity of the lift car. f) Has communication system been installed in the lift for car? g) Has a Fireman's switch been installed in the lift for grounding it in the event of fire?
37. Have any stationary fire pump(s) been installed for pressurizing the wet riser? If so, please indicate : a) The number of pumps in Pump room b) The size of suction and delivery connection of each pump. c) The output of each pump. d) The maximum head against which the pump can operate at the output mentioned at (c) e) Is the pump automatic in action
38. If Terrace Tank provided? Please provided details.
39. Domestic tank is connected with the overflow of Fire Tank
40. Has a standby source of power supply been provided? If it is through a generator, please indicate:- a) The capacity (output) b) The functions that can be maintained simultaneously by the use of generator, such as operating lift(s) fire pumps emergency lighting etc. c) Is the generator automatic in action or has to be started manually ?



41. Has any yard hydrant been provided from the building's fire pump?
42. Where more than one lifts are installed in a common enclosure, have individual lifts been separated by fire resisting walls of 2 hours fire rating?
43. Has the lift shaft(s) lift lobby or stairwell been pressurized? If so, give details.
44. Have the lift lobbies and staircases been effectively enclosed to prevent fire / smoke entering them from outside at any floor?
45. Have all exists and direction of travel to each exit been sign-posted with illuminated signs.
46. Has false ceiling been provided in any portion of the building? If so, please indicate location and also mention if the material used for the false ceiling is combustible or non-combustible. Fire system arrangement above false ceiling.
<p>47. Is the building centrally air-conditioned? If so, please indicate :-</p> <ul style="list-style-type: none"> <li>a) The material used for construction of ducts and its fittings.</li> <li>b) The type of tinning used for ducts if any.</li> <li>c) The type of lagging used, if any for insulating any portion of the duct; please also indicates how the lagging is secured.</li> <li>d) If false ceiling is provided, please give information as at (42) above.</li> <li>e) If plenum is used a return air passage has it been protected with fire detectors? Please give details.</li> <li>f) Has a separate A.H.U been provided for each floor?</li> <li>g) Whether automatic shutdown of A.H.U. is coupled with detection system?</li> <li>h) Is the ducting for each floor effectively isolated or is it continuous on more than one floors?</li> <li>i) Is the fire dampers being provided?</li> </ul>
<p>48. Where are the switchgear and transformers located? If inside the building, please indicate :-</p> <ul style="list-style-type: none"> <li>a) If the switchgear and transformer(s) have been housed in separate compartments, effectively separated from each other and from other portions of the buildings by a four hours' fire resistive wall?</li> <li>b) What precautions have been taken to prevent a possible fire in the transformer(s) from spreading?</li> <li>c) If Main Electrical panel provided with gas separation system? Please give details</li> </ul>
49. Where electric cables, telephone cables, dry/wet risers/down commers pass through a floor or wall have the spaces (apertures) round the cables/pipes been effectively sealed/plugged with non-combustible, fire resistant material?
50. Please indicate the number and type of fire extinguishers provided at various locations and the arrangement for the maintenance of the extinguishers.

51. Ventilation-

- a) Whether Natural ventilation is relied upon? If so, give detail of the vents for the stairwell lift lobby and lift shaft.
- b) Whether Mechanical ventilation has been proposed? If so give detail of the proposed system indicating the no. of air changes for the basement and upper floors.
- c) Whether mechanical ventilation is coupled with automatic detection system? Please give details of the system.

52. Please indicate if all fire extinguishers bear the ISI Certification mark.

53. Are the occupants of the building systematically trained in fire prevention, use of fire extinguishers and emergency procedures? If so, please give details.

54. Does an emergency organization exist in the building? If so, please give details and append a copy of the emergency (Fire) orders.

55. Has a qualified Fire Officer been appointed for the building either individually or jointly with other building(s).

56. Has the building been protected against lightning? If so, does the lightning protect confirm to any code? Please indicate details.

57. Does the Fire tender movement road proposed around building.

58. Does Refuge area provided in the complex.





Signature of the Fire Consultant
With date & Stamps
Name (In Block Letters)
Organization
Place: -
Dated: -

Signature of the Fire Consultant
With date & Stamps
Name (In Block Letters)
Organization
Place: -
Dated: -

[illegible]





15 horizontal lines for writing.





