



# **BUILDING SAFETY ASSESSMENT FOR RMG SECTOR (FIRE AND ELECTRICAL SAFETY)**



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Bangladesh University of Engineering & Technology  
(BUET)**





## BUILDING SAFETY ASSESSMENT FOR RMG SECTOR (FIRE AND ELECTRICAL SAFETY)



How fire is generated ?

Heat fluxes in the vicinity of ignition sources (Fuel)

Igniting objects e.g. matches, burning paper & cigarettes, gas burners, etc.

Or

electric spark, electric short circuit, heating element of machines or mechanical friction





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Fires in buildings behave differently from outdoor fires. Heat and toxic smoke rise to the ceiling and spread outwards and downwards.

Smoke passes through any space or opening





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## Consequence of Fire



CONFLAGRATION





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Fire Hazard (Smoke )





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Heat release rate ( rise of temperature) and generation rates of products of fire ( hazardous smoke ) are governed by :

- ☐ fire initiation within the ignition zone
- ☐ fire propagation rate beyond the ignition zone
- ☐ fire ventilation
- ☐ external heat sources
- ☐ presence or absence of the fire suppression agents
- ☐ Materials:
  - shapes, sizes, and arrangements fire propagation rate beyond the ignition zone
  - chemical natures
  - types of additives mixed in presence of other materials



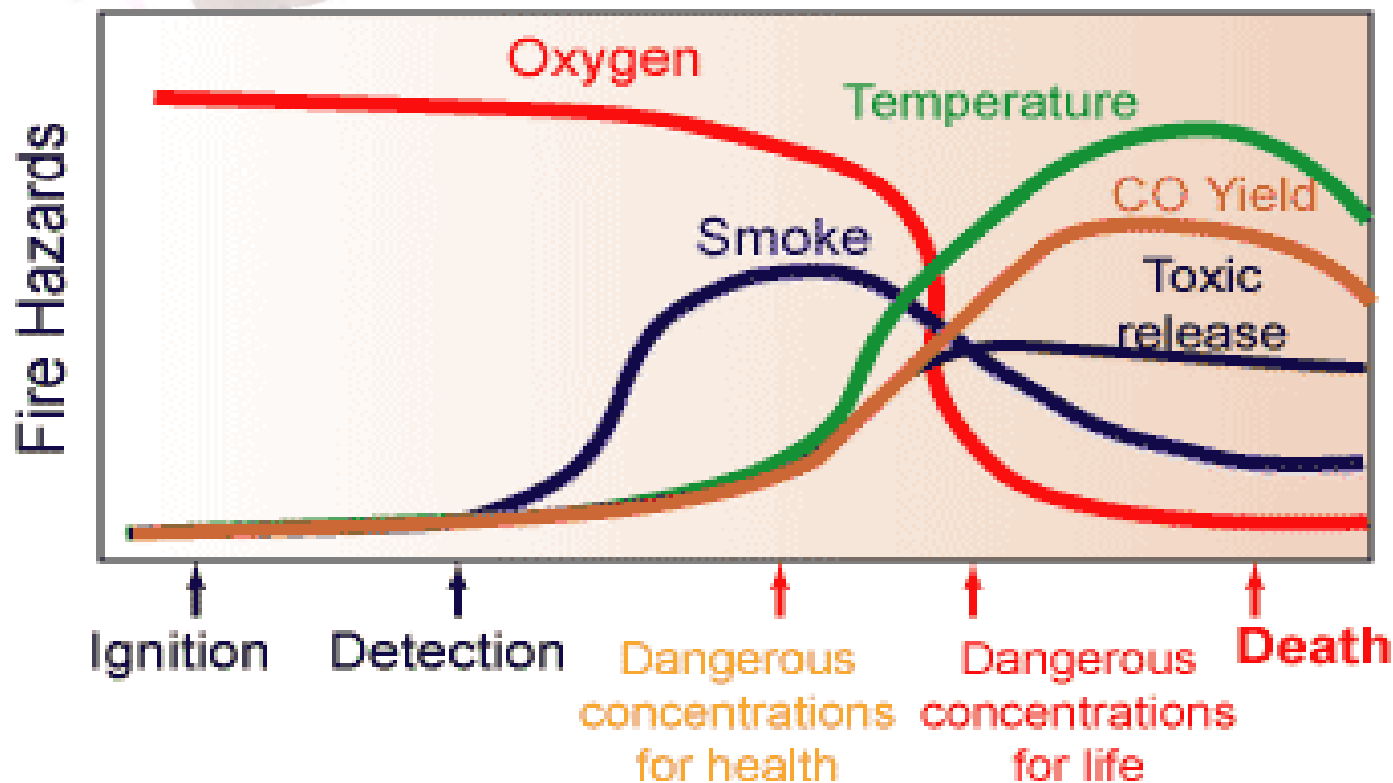


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During burning heat released is transferred as conductive, convective and radiative heat fluxes from the flame causing rise in temperature.

Incomplete combustion generates smoke, CO, hydrocarbons, and other intermediate products, resulting in an increase in non-thermal hazard (i.e. smoke)





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### Prevention of Fire To save **life** and **property**

#### Control fire:

- Heat source
- Source interaction and ignition

#### Manage fire:

- Fire movement through vent, by confinement
- Structural stability

#### Manage fire exposure:

- Limit exposed
- Defend exposed
- Provide safe destination

#### Suppress fire:

- Detect, communicate, respond
- Apply suppressant (automatically or manually)





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Fire safety objective must be to:

- Save life
- Reduce property damage

May be achieved by:

- Control of initiation of fire
- Control of propagation of fire and smoke
- Provide and control proper circulation and safe exit of occupants
- Fire extinguishment





## BUILDING SAFETY ASSESSMENT FOR RMG SECTOR (FIRE AND ELECTRICAL SAFETY)



### Control of Initiation of Fire

Controlling :

- Heat source
- Source interaction and ignition

Checking all electrical wirings and connections as per standards

Checking whether all electro-mechanical systems are installed and maintained according to the standards and as per manufacturers specification



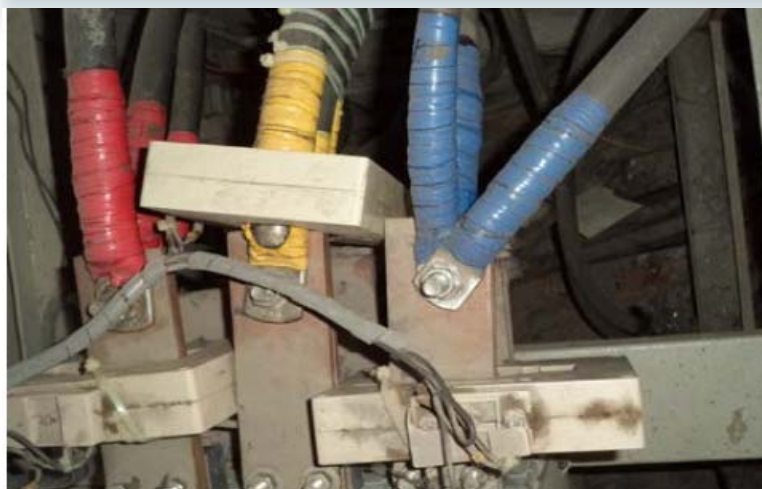


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## BUILDING SAFETY ASSESSMENT FOR RMG SECTOR (FIRE AND ELECTRICAL SAFETY)



### REMEMBER

As garments factories use combustible material which ignite easily and these factories use heat as a part of their production process, so fire initiation can not be stopped.





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### MANAGE FIRE

Through control of propagation of fire and smoke

Control by construction:

- Venting and confinement
- Structural stability

The main objectives of venting and confinement by design are:

- ☐ to facilitate escape of people from fire by restricting spreading of smoke and hot gases into escape routes;
- ☐ to facilitate fire fighting by providing easy access to fire fighters in the building;
- ☐ to reduce property damage from fires





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Design the Factory Building to Achieve:

- Occupant circulation during panic situation due to fire
- Appropriate relocation of the occupant to the safe areas
- Control fire and smoke propagation
- Proper house keeping provisions





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**What is the REAL SITUATION ???**





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## Floor Plan

3 ENCLOSED STAIRS



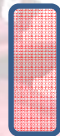
3 STAIRS



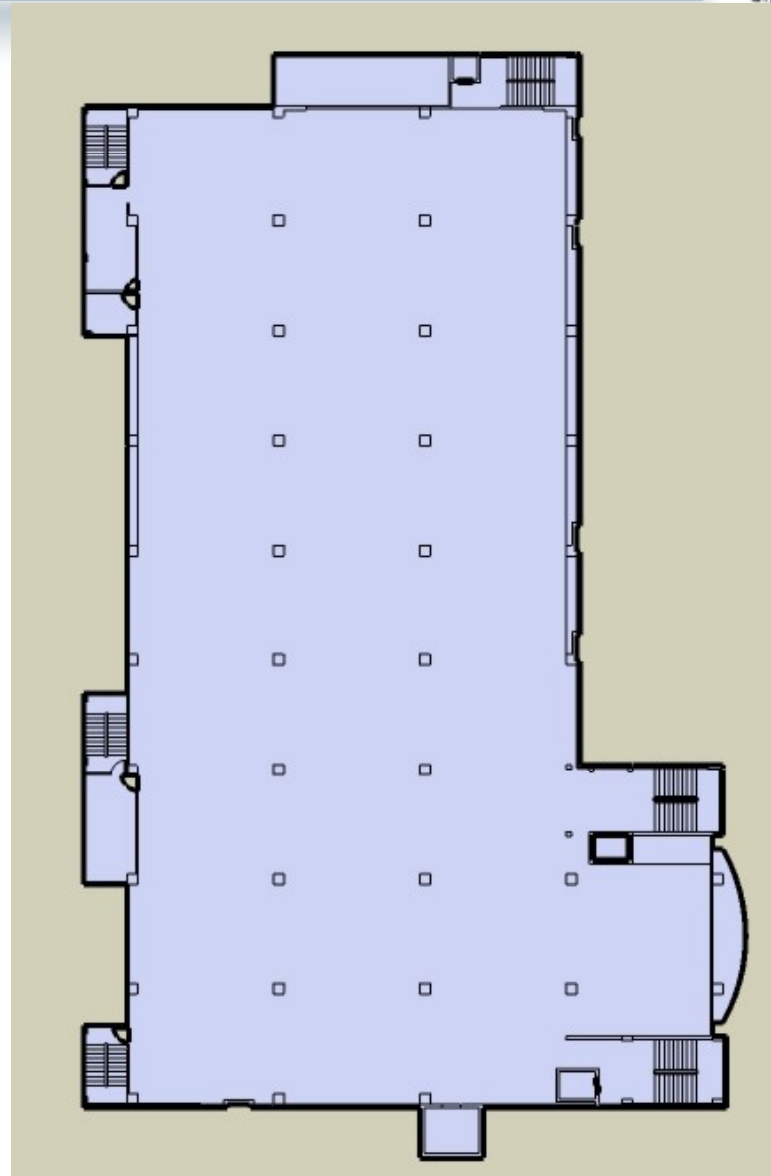
3 TOILET BLOCKS



PRODUCTION FLOOR  
WITH PACKING



4 ELEVATORS





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### Fire & Electrical Safety Assessment Methodology

- Analysis of approved building floor plans
- Raw data collection : measurements, sketches, photographs, checking as built conditions
- Analysis
- Report





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## GUIDELINE FOR FIRE AND ELECTRICAL SAFETY VISUAL INSPECTION

Factory Identification,  
Classification for  
Occupancy  
Construction type  
Hazard type  
Horizontal Exits  
Refuge Areas  
Atrium  
Vertical Openings  
Barrier Wall  
Ventilation system  
Basement

Fire Separation  
Building Height  
Structural Elements  
Enclosure Walls  
Floor Division  
Interior Finish  
Entry  
Stair Case  
Exit Signage  
Lift  
Fire Lift  
Lift lobby





## BUILDING SAFETY ASSESSMENT FOR RMG SECTOR (FIRE AND ELECTRICAL SAFETY)



### GUIDELINE FOR FIRE AND ELECTRICAL SAFETY VISUAL INSPECTION (Contd.)

Detection System

Alarm System

Fire Suppression System

Electro-Mechanical system:

Electrical Substation

Power Generator

Natural Gas/LNG/CNG/LPG

Cooking Facilities

Detail Electrical wiring

Fire Commend Station

Fire Drill





## BUILDING SAFETY ASSESSMENT FOR RMG SECTOR (FIRE AND ELECTRICAL SAFETY)



### ASSESSMENT STANDARDS FOR FIRE AND ELECTRICAL SAFETY

Assessing parameters related to building design, electrical and electro-mechanical systems, fire detection and alarm systems, active fire fighting system are to be decided based on Laws of the land

- Fire law
- Labour and Industrial law
- Bangladesh National Building Code (BNBC)
- Any other laws applicable for occupancy G2 (moderate hazard industries)





## BUILDING SAFETY ASSESSMENT FOR RMG SECTOR (FIRE AND ELECTRICAL SAFETY)



### WHAT NFPA CLAIMS ?

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## BUILDING SAFETY ASSESSMENT FOR RMG SECTOR (FIRE AND ELECTRICAL SAFETY)



### 2.12 REQUIREMENTS FOR OCCUPANCY H - STORAGE BUILDINGS (as per BNBC)

#### 2.12.7 Special Hazards

“The storage of hazardous materials shall **not exceed** the **exempt amount** as specified in **Table 3.2.7**. The storage of moderate and low hazardous materials shall be separated **at least by a two hour fire resistive construction**”.

#### 2.1.8 Occupancy H: Storage Buildings

“H2 MODERATE FIRE RISK STORAGE : **These shall include any building or portion thereof** which is used for storage of materials which do not constitute the danger of self-ignition but which in the event of fire will burn with moderate rapidity, for example, warehouses, godowns or depots containing high fire risk materials, such as paper, **textiles, cotton, jute** etc., library stack rooms. Items which shall be deemed to render a building hazardous are specified in Sec 2.13.13 part 3 of BNBC along with the exempted amount for each item.....”





## BUILDING SAFETY ASSESSMENT FOR RMG SECTOR (FIRE AND ELECTRICAL SAFETY)



**Table 3.2.7**  
**Exempt Amounts of Hazardous Materials**

| Material               | Class/State | Maximum Quantities               |
|------------------------|-------------|----------------------------------|
| 5. Liquefied flammable |             | 230 litres                       |
| 6. Combustible fibres  | Loose       | 2800 litres (2.8m <sup>3</sup> ) |
| 7. Combustible fibres  | Baled       | 28,000litres(28m <sup>3</sup> )  |
| 8. Flammable solids    |             | 230 kg.                          |





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### NFPA 13 “Chapter 12 Storage

**12.2.2.2.2.1** The minimum number of design sprinklers for ordinary hazard and miscellaneous storage in accordance with this standard..

**12.1.2.3** Large drop, control mode specific application and ESFR sprinklers shall be permitted to protect ordinary hazard, storage of Class I through Class IV commodities”.





## BUILDING SAFETY ASSESSMENT FOR RMG SECTOR (FIRE AND ELECTRICAL SAFETY)



### New York City Fire Code: Chapter 29 Combustible fibers

#### “Section 2902

##### Definitions

**Combustible fibers.** Readily ignitable and free-burning fibers, such as coca fiber, **cotton**, hemp, jute, kapok, oakum, sisal, Spanish moss, straw, tow, wastepaper, or **other natural or synthetic fibers** that possess similar qualities.

#### Section 2904 (Loose fiber storage)

##### 2904.4 Storage of more than 500 cubic feet to 1000 cubic feet.

Loose combustible fibers in quantities exceeding 500 cubic feet (14 m<sup>3</sup>) but not exceeding **1,000 cubic feet (28 m<sup>3</sup>)** shall be stored in rooms enclosed with **2-hour fire-resistance-rated fire barriers**, with openings protected by an approved opening protected assembly having a fire protection rating of 1½-hours, and constructed in accordance with the construction codes, including the building code”.





## BUILDING SAFETY ASSESSMENT FOR RMG SECTOR (FIRE AND ELECTRICAL SAFETY)



### New York City Fire Code: Chapter 29 Combustible fibers (Contd.)

**“2904.5 Storage of more than 1,000 cubic feet to 2,500 cubic feet.** Loose combustible fibers in quantities exceeding 1,000 cubic feet (28 m<sup>3</sup>) but **not exceeding 2,500 cubic feet (70 m<sup>3</sup>)** shall be stored in rooms enclosed with 2-hour fire-resistance-rated fire barriers, with openings protected by an approved opening protected assembly having a fire protection rating of 1½-hours, and constructed in accordance with the construction codes, including the building code. The storage room shall be protected throughout **by a sprinkler system”**.





## BUILDING SAFETY ASSESSMENT FOR RMG SECTOR (FIRE AND ELECTRICAL SAFETY)



### New York City Fire Code: Chapter 29 Combustible fibers (Contd.)

#### “Section 2905

#### Baled storage

**2905.1 Bale size and separation.** Baled combustible fibers shall be limited to **single blocks or piles not more than 25,000 cubic feet (700 m<sup>3</sup>) in volume**, not including aisles or clearances. Blocks or piles of baled fiber shall be separated from adjacent storage by aisles not less than 5 feet (1524 mm) wide, or by flash-fire barriers constructed of continuous sheets of noncombustible material extending from the floor to a minimum height of 1 foot (305 mm) above the highest point of the piles and projecting not less than 1 foot (305 mm) beyond the sides of the piles”.

**New York City Code requires NO SPRINKLER for up to 700m<sup>3</sup> for Baled storage even though NFPA suggested otherwise. **BNBC requirement is only 28m<sup>3</sup>.****





## BUILDING SAFETY ASSESSMENT FOR RMG SECTOR (FIRE AND ELECTRICAL SAFETY)



### (Loose fiber storage)(for combustible fibers)

- New York City Code requirement  
**NO SPRINKLER for up to 28m<sup>3</sup>**
- BNBC requirement  
**NO SPRINKLER for up to 2.8m<sup>3</sup>**
- NFPA suggested **SPRINKLER**





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### Baled storage (for combustible fibres)

- New York City Code requires  
**NO SPRINKLER** for up to 700m<sup>3</sup>
- BNBC requirement  
**NO SPRINKLER** for up to 28m<sup>3</sup>
- NFPA suggested **SPRINKLER**





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**THANK YOU**

