PRESENTATION OF FIRE SAFETY IN TALL RISE BUILDINGS
FIRE ACCIDENT – THE COST

- LOSS OF LIFE
- DAMAGE TO PROPERTY
- LOSS OF BUSINESS
- LOSS OF GOODWILL
- ENVIRONMENT POLLUTION
F I R E

- About 15,000 calls per year
- On an average 300 deaths per year
- Huge property losses
- About 69% fires are caused by electricity

ALL THIS CAN BE REDUCED
## Fire in Highrise Building in Delhi

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of cases</th>
<th>Year</th>
<th>Number of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1984-85</td>
<td>124</td>
<td>1993-94</td>
<td>173</td>
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<td>1985-86</td>
<td>130</td>
<td>1994-95</td>
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</tr>
<tr>
<td>1986-87</td>
<td>109</td>
<td>1995-96</td>
<td>72</td>
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<tr>
<td>1987-88</td>
<td>153</td>
<td>1996-97</td>
<td>75</td>
</tr>
<tr>
<td>1988-89</td>
<td>161</td>
<td>1997-98</td>
<td>87</td>
</tr>
<tr>
<td>1989-90</td>
<td>158</td>
<td>1998-99</td>
<td>87</td>
</tr>
<tr>
<td>1990-91</td>
<td>138</td>
<td>1999-2000</td>
<td>66</td>
</tr>
</tbody>
</table>
FIRE FIGHTING AND FIRE SAFETY

THE OBJECTIVE

✓ LIFE SAFETY
✓ PROPERTY PROTECTION
LIFE SAFETY

- Designing structures to withstand fire conditions.
- Raising Alarm
- Smoke Management
- Adequate means of escape
- Protection of escape routes.
A High-rise Building is one in which Emergency Evacuation is not practical and in which fires must be fought internally because of height.
PROBLEMS IN HIGHRISE BUILDINGS

- 3-D spreading of fire
- Violation of fire safety norms
- Delayed access to seat of fire
- Total Evacuation
- Limitation of the fire fighting equipment
- Limitations posed by the fire fighters
- People’s behavior
SPREAD OF FIRE

- Compartment to compartment
- Floor to floor
- Unsealed service shafts
- Ceiling voids
- A.C. Ducts
- Failure of door/windows
Unfortunately in Today’s context Fire Risk Management is an after thought and hence the success is partial.

To have nearly complete success the process of Fire Risk Management must begin right from the conceptual stage.
SMOKE MANAGEMENT

- SELECTION OF MATERIALS
- SMOKE VENTING
- SMOKE BARRIERS
- SMOKE EXTRACTION SYSTEM
- POSITIVE PRESSURE VENTING
ACCIDENT PREVENTION

- Safety Audits
- Routine Safety Inspection
- Safe Working Practices
- Performance Assessment
- Interaction
- Education and Training
- Following Safety Standards.
An Overview of National Building Code of India

- What is this Code all about?
- Construction - In all Sectors of Development.
- Planning Commission - A need felt for in-depth Study, Reason & its Justification.
- Linkage - Latest Technology V/S Outdated Byelaws
- Resulted in the Evolution of NBC.
- Formation of Guiding Committee in 1967 & its Outcome
Applicability of the Code

To Service as model for adoption by

- Public works department, other government construction departments and other construction agencies.
- To be adopted by State Government / local bodies
NBC

- Birth of NBC 1970
- First Revision of NBC 1983 (after 13 years)
- Second Revision of NBC-IV 1997 (after 14 years)
- 3rd Revision of NBC 2005 (after 22 years)
## Sub panels constituted for revision of NBC of India

<table>
<thead>
<tr>
<th>Topic</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administration, Development Control Rules and General Building Requirements</td>
<td>CED46:P1</td>
</tr>
<tr>
<td>Fire Protection</td>
<td>CED 46:P2</td>
</tr>
<tr>
<td>Building Materials</td>
<td>CED 46:P3</td>
</tr>
<tr>
<td>Loads, Forces and Effects</td>
<td>CED 46:P4</td>
</tr>
<tr>
<td>Soils and Foundations</td>
<td>CED 46:P5</td>
</tr>
<tr>
<td>Timber</td>
<td>CED 46:P6</td>
</tr>
<tr>
<td>Masonry</td>
<td>CED 46:P7</td>
</tr>
<tr>
<td>Plain, Reinforced and Prestressed concrete</td>
<td>CED 46:P8</td>
</tr>
<tr>
<td>Steel</td>
<td>CED 46:P9</td>
</tr>
<tr>
<td>Prefabrication and Systems Buildings</td>
<td>CED 46:P10</td>
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<tr>
<td>Constructional Practices and Safety</td>
<td>CED 46:P11</td>
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</tbody>
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Sub panel constituted for revision of NBC of India….2

<table>
<thead>
<tr>
<th>Service</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lighting &amp; Ventilation</td>
<td>CED 46:P12</td>
</tr>
<tr>
<td>Electrical Installations</td>
<td>CED 46:P13</td>
</tr>
<tr>
<td>Air Conditioning and Heating</td>
<td>CED 46:P14</td>
</tr>
<tr>
<td>Acoustics, Sound Insulation and Noise Control</td>
<td>CED 46:P15</td>
</tr>
<tr>
<td>Installation of Lifts and Escalators</td>
<td>CED 46:P16</td>
</tr>
<tr>
<td>Plumbing Services</td>
<td>CED 46:P17</td>
</tr>
<tr>
<td>Landscaping, Signs and Outdoor Display Structures</td>
<td>CED 46:P18</td>
</tr>
</tbody>
</table>
Revision in Code

- **Purpose**
- To make the Same as Living Document
- **Salient Features of the Amendment**
- 20 Year’s of Experience resulted in-
  - State-of-the-art, modern and contemporary features of development.
Classification of Buildings

- Group A: Residential
- Group B: Educational
- Group C: Institutional
- Group D: Assembly
- Group E: Business
- Group F: Mercantile
- Group G: Industrial
- Group H: Storage
- Group J: Hazardous
PART 4 FIRE AND LIFE SAFETY

- Deals with Safety from Fire.
- Exits in Building V/S Importance of Life Safety.
- Involvement of Qualified & Trained Fire Protection Engineers from the very beginning.
- Standards Laid Down to provide safety from fire.
- Potential Panic Hazard - measures to minimize Panic hence control on accidents.
- Flexibility V/S Rigidity.
- Limitation of Height and areas of Building for Occupants Safety.
- Phasing out of Ozone Depleting Substance- Under Country Program.
- New standards have been already developed and put in place for Halon alternative clean agents.
Some Major Changes in 2005 Edition

- Coverage of Starred Hotels – Under New Sub Division (Group A)
- Heritage Structures, Archeological monument - (Group D)
- Underground/Elevated railways - (Group D)
- TV Stations covered under- (Group E)
- Minimum Capacity of Smoke Extraction System Equipment revised
- Increase in Width for exits from 1.5 mts to 2 mts.
- Cognizance to the HALON Phase Out Program.
- Requirements for Fire Fighting Installation made Comprehensive
ABSOLUTE SAFETY FROM FIRE IS NOT ATTAINABLE IN PRACTICE

- The objective of this part is to specify measures that will provide that degree of safety from fire which can be reasonably achieved.
- The Code endeavours to avoid requirements that might involve unreasonable hardships or unnecessary inconvenience or interference with normal use and occupancy of buildings, insist upon compliance with minimum standards for fire safety necessary in public interest.
- It is desirable to use such equipments/installation duly certified under the BIS Certifications Marks Scheme.
FIRE PREVENTION

- Classification of Buildings (9)
- Fire Zones (3)
- Types of Construction (4)
- Requirements common to all Occupancies
  - Heating/Smoke venting
  - Surface and Interior Finish
  - Glazing/Casement/Skylights/Louvers
  - Passive systems
## Life Safety

<table>
<thead>
<tr>
<th>General Exit requirements</th>
<th>Internal Staircases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupants Load</td>
<td>External Staircases</td>
</tr>
<tr>
<td>Capacities of Exit</td>
<td>Pressurization of escape routs</td>
</tr>
<tr>
<td>Arrangement of Exits</td>
<td>Ramps</td>
</tr>
<tr>
<td>Number of Exits</td>
<td>Refuge Area</td>
</tr>
<tr>
<td>Doorways</td>
<td>Fire lifts/Fire tower</td>
</tr>
<tr>
<td>Corridors/Passage ways</td>
<td>Emergency Escape lighting/Illumination</td>
</tr>
<tr>
<td>Horizontal Exits</td>
<td>Fire detection &amp; Warning</td>
</tr>
</tbody>
</table>
## FIRE PROTECTION (Components)

<table>
<thead>
<tr>
<th>Extinguishers</th>
<th>Manual Fire Alarm System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small Bore Hose Reels</td>
<td>Automatic Fire Alarm System</td>
</tr>
<tr>
<td>Dry Riser</td>
<td>Underground Storage Tank</td>
</tr>
<tr>
<td>Wet Riser</td>
<td>Terrace Tank</td>
</tr>
<tr>
<td>Down Comer</td>
<td>Ground Level Pumps</td>
</tr>
<tr>
<td>Yard Hydrant System</td>
<td>Terrace Level Pumps</td>
</tr>
<tr>
<td>Automatic Sprinkler Installation</td>
<td></td>
</tr>
</tbody>
</table>

25
PASSIVE SYSTEMS

- Openings in Separating walls and Floors (for all types of construction)
- Fire Stops/Enclosure of Openings
- Air-conditioning/Ventilation (dampers)
- Surface of Flame Spread definitions
- Glazing/Skylights (Wired Glass)
Internal Staircases (Min. Width)

- Residential buildings (dwellings) 1.0 m
- Residential hotel buildings 1.5 m
- Assembly buildings like auditorium, theatres and cinemas 2.0 m
- Educational buildings up to 30 m in height 1.5 m
- Institutional buildings like hospitals 2.0 m
- All other buildings 1.5 m
### Table 22 TRAVEL DISTANCE FOR OCCUPANCY AND TYPE OF CONSTRUCTION (Clause 4.4.1, 4.5.1 and 4.5.2)

<table>
<thead>
<tr>
<th>S.No</th>
<th>Group of Occupancy</th>
<th>Construction Type 1&amp;2</th>
<th>Construction Type 3&amp;4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Residential (A)</td>
<td>30.0</td>
<td>22.5</td>
</tr>
<tr>
<td>2</td>
<td>Educational (B)</td>
<td>30.0</td>
<td>22.5</td>
</tr>
<tr>
<td>3</td>
<td>Institutional (C)</td>
<td>30.0</td>
<td>22.5</td>
</tr>
<tr>
<td>4</td>
<td>Assembly (D)</td>
<td>30.0</td>
<td>30.0</td>
</tr>
<tr>
<td>5</td>
<td>Business (E)</td>
<td>30.0</td>
<td>30.0</td>
</tr>
<tr>
<td>6</td>
<td>Mercantile (F)</td>
<td>30.0</td>
<td>30.0</td>
</tr>
<tr>
<td>7</td>
<td>Industrial (G)</td>
<td>45.0</td>
<td>22.5</td>
</tr>
<tr>
<td>8</td>
<td>Storage (H)</td>
<td>30.0</td>
<td>22.5</td>
</tr>
<tr>
<td>9</td>
<td>Hazardous (J)</td>
<td>22.5</td>
<td>22.5</td>
</tr>
</tbody>
</table>
Table 22 – Travel distance Contd....

Note:
1. For fully sprinklered building the travel distance may be increased by 50 percent of the values specified.
2. Ramps shall be protected with automatic sprinkler system and shall be counted as one of the means of escape.
3. Construction of type 3 or 4 is not permitted.
TO CONCLUDE  -- Why NBC shall be a dynamic Document?

Every fire is investigated by different fraternities like
- Fire Authorities
- Police Authorities
- Loss Prevention Authorities
- Insurance Authorities etc..

- And each one of them look at the fire from different angles.
- Every fire leaves a signature behind, leaves a trail, leaves a tell tale evidence of what happened.
- The authorities shall strive to update the respective documents from the experience obtained from the fire behavior in each occurrence.

Let me explain certain instances in the next slide ..........
Past Experience put into the Code

**Upahar Cinema Fire** :- Resulted in Exclusion of Oil filled electrical equipment in the Basement

**Dabwalli Fire** :- Provided inputs with respect to Exit difficulties and Passive provisions (Meerut fire which took place subsequent to the NBC 2005 is also an eye opener in this regard)

**Underground shopping complex fires in Mumbai and Bangalore** :- Derived useful inputs with regard to fire separations (For every 750M² area, Blank wall to be provided OR for Every 40M linear length if the it is a long building)

**IGI Airport fire** :- How dangerous buildings are when huge concealed spaces are left unattended or not protected by detectors. Some useful provisions have been made in NBC for this purpose. (and so on .....)
IN CASE NBC IS NOT FOLLOWED CONSEQUENCES CAN BE :-
All sectional committees of NBC kept alive every five years, revision has been proposed.

Part-IV – Concerned committee has already met once for revision of some of the sections.

The Chairman of the NBC will meet all sectional heads on 20\textsuperscript{th} November, 2009 for taking up some amendment which are required in the NBC.
Presented by:

S.K. DHERI
Ex. Chief Fire Officer
Delhi Fire Services
AND
Convener of NBC Part- IV

THANK YOU