FIRE SAFETY PART 2

With reference to :

UBBL PART VII – FIRE REQUIREMENTS

UBBL PART VIII - FIRE DETECTION, FIRE ALARM AND FIRE EXTINGUISHMENT

UBBL 1984

vs

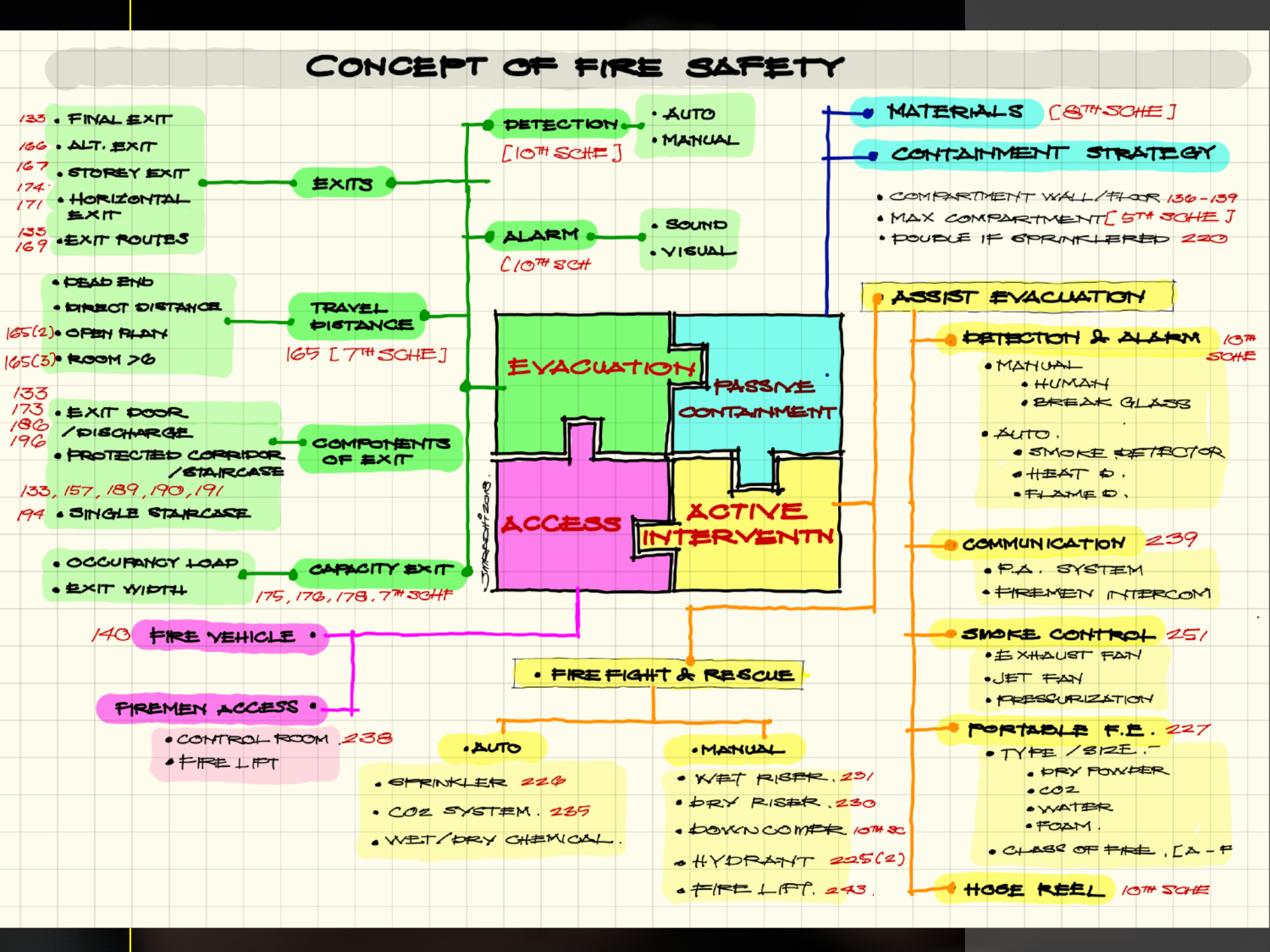
Selangor UBBL 1986 (amendment 2012)

1. Reference to Malaysia Standards
2. Setting new standards (MS 1525 : EE)
3. Change of Prescription
4. Numbering ?
5. Deletion of previous by-laws

PART VII and VIII of UBBL

1. Purpose Group
2. Open Structures and corridors
3. Fire Appliance Access : BL 140
4. Travel Distances
5. Single Staircase

CONCEPT OF FIRE SAFETY



CONCEPTS OF FIRE SAFETY

1 EVACUATION

2 PASSIVE CONTAINMENT

3 ACTIVE INTERVENTION

4 ACCESS FOR FIRE FIGHTING AND RESCUE

Contributing factors to designing for evacuation

OCCUPANTS

- Numbers and distribution
- State of mind
- Familiarity of place
- Physical mobility

Contributing factors to designing for evacuation

Buildings

- Detection and alarm
- Complexity of plan
- Passive and active systems

These factors lead to the designation of purpose groups in the Fifth Schedule, UBBL

MS 1183 : 2015

Table 2. Occupancy characteristics

Occupancy characteristic	Description	Examples
Small residential	Occupants who are awake and familiar with the building	Terrace type, semi-detached, detached, town-house
Institutional	Occupants who are awake and familiar with the building	Hospitals, specialist centres, nursing homes, schools, colleges, universities, training centres, kindergartens, canteens/kitchens, libraries, vocational schools, multi-purpose hall
	Occupants receiving medical care	Hospitals, nursing homes, retirement homes, training centres
	Occupants who are likely to be asleep:	
	• Long-term individual occupancy	Nursing homes, dormitory
	• Long-term managed occupancy	Halls of residence, sleeping areas or boarding schools, hostels
	• Short-term occupancy	Hostels, halls of residence

PART 1 : EVACUATION

Awake vs Asleep

Familiar vs Unfamiliar

Table 2. Occupancy characteristics *(continued)*

Occupancy characteristic	Description	Examples
Other residential	Occupants who are awake and familiar with the building	Apartments and flats, condominiums
	Occupants who are awake and unfamiliar with the building	Hotels, motels, service apartments
	Occupants who are likely to be asleep:	
	• Long-term individual occupancy	Terrace type, semi-detached, detached, town-house
	• Long-term managed occupancy	Apartments and flats, condominiums,
	• Short-term occupancy	Hotels, motels, service apartment
Office	Occupants who are awake and familiar with the building	Office, office building
Shopping complexes, shops and markets	Occupants who are awake and unfamiliar with the building	Hawker centres, food courts, wet and dry markets
Factory	Occupants who are awake and familiar with the building	Flatted factories block, special hazards
Place of assembly	Occupants who are awake and unfamiliar with the building	Convention center, community centers, private clubs, exhibition centers, museums and art galleries, theatres, cinemas, concert halls, auditoriums, places of worship, amusement centers
	Occupants in transit	Bus terminals, ferry terminals, LRT, ERL, monorail, train stations, airports
Storage and general	Occupants who are awake and unfamiliar with the building	Car parks, underground car parks, automated multi-level car parks, warehouse and storage of non-combustible such as clay and bleaching earth, warehouse and storage of combustible products, ammunition depots, tank farm (combustible/flammable liquid)

Designation of purpose group :

UBBL 134

UBBL 135, 136, 137, 138, 139

- Every building is to have one overall designation
- Individual components of building with different usage from overall must be designed to accommodate the more stringent requirement, and where these requirements 'spill' into the other parts of the building, the more stringent requirement applies.
- Only 'horizontal' separation is allowed between buildings of different purpose groups

EVACUATION

- Detection
- Alarm
- Exits
- Travel distance
- Components
- Capacity of exits

Accepted assumption in designing for safe evacuation:

"Only one fire at one location at a time"

" The recommendations and guidance given in this standard are based on the assumption that under normal circumstances (i.e. except in the case of arson) a fire is unlikely to start in two different places in a building." MS 1183:2015

1. EVACUATION

- 1.1 Detection
- 1.2 Alarm
- 1.3 Exits
  - 1.3.1 Final Exit [133 : Definition]
  - 1.3.2 Alternative Exits [166]
  - 1.3.3 Storey Exits [167, 174]
  - 1.3.4 Horizontal Exit [171]
  - 1.3.5 Exit Route [133, 169]

1.4 Travel Distance [165, 7th Sche]

- 1.4.1 Dead end
- 1.4.2 Direct Distance
- 1.4.3 Open Plan [165(2)]
- 1.4.4 Room <7 pax [165(3)]

1.5 Components

- 1.5.1 Exit door / exit discharge [133, 173 , 186, 193]
- 1.5.2 Protected corridor / staircase [133, 157, 189, 190, 191]
- 1.5.3 Single staircase [194]

1.6 Capacity of Exits [175, 176, 178, 7th Schedule]

- 1.6.1 Occupant Load
- 1.6.2 Exit width
  - Parking / ground floor

CONCEPTS OF FIRE SAFETY

1 EVACUATION

2 PASSIVE CONTAINMENT

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4 ACCESS FOR FIRE FIGHTING AND RESCUE

2. PASSIVE CONTAINMENT / COMPARTMENTATION

PRIMARY OBJECTIVE :

"To contain the one fire within the one location at all times"

- To allow sufficient time for safe evacuation, active extinguishment of fire and rescue.
- To limit the potential size of the fire
- To separate areas of different levels of hazard
- To separate areas for safe exit, evacuation or refuge
- To limit threat to the structural integrity of the building

2. PASSIVE CONTAINMENT / COMPARTMENTATION

- MATERIALS – contribute spread of fire. Containment is about controlling spread of fire
- CONTAINMENT STRATEGY – Tools to control spread of fire

2. PASSIVE CONTAINMENT / COMPARTMENTATION

Higher Fire Load = Higher Risk of Spread of Fire during growth & development stage

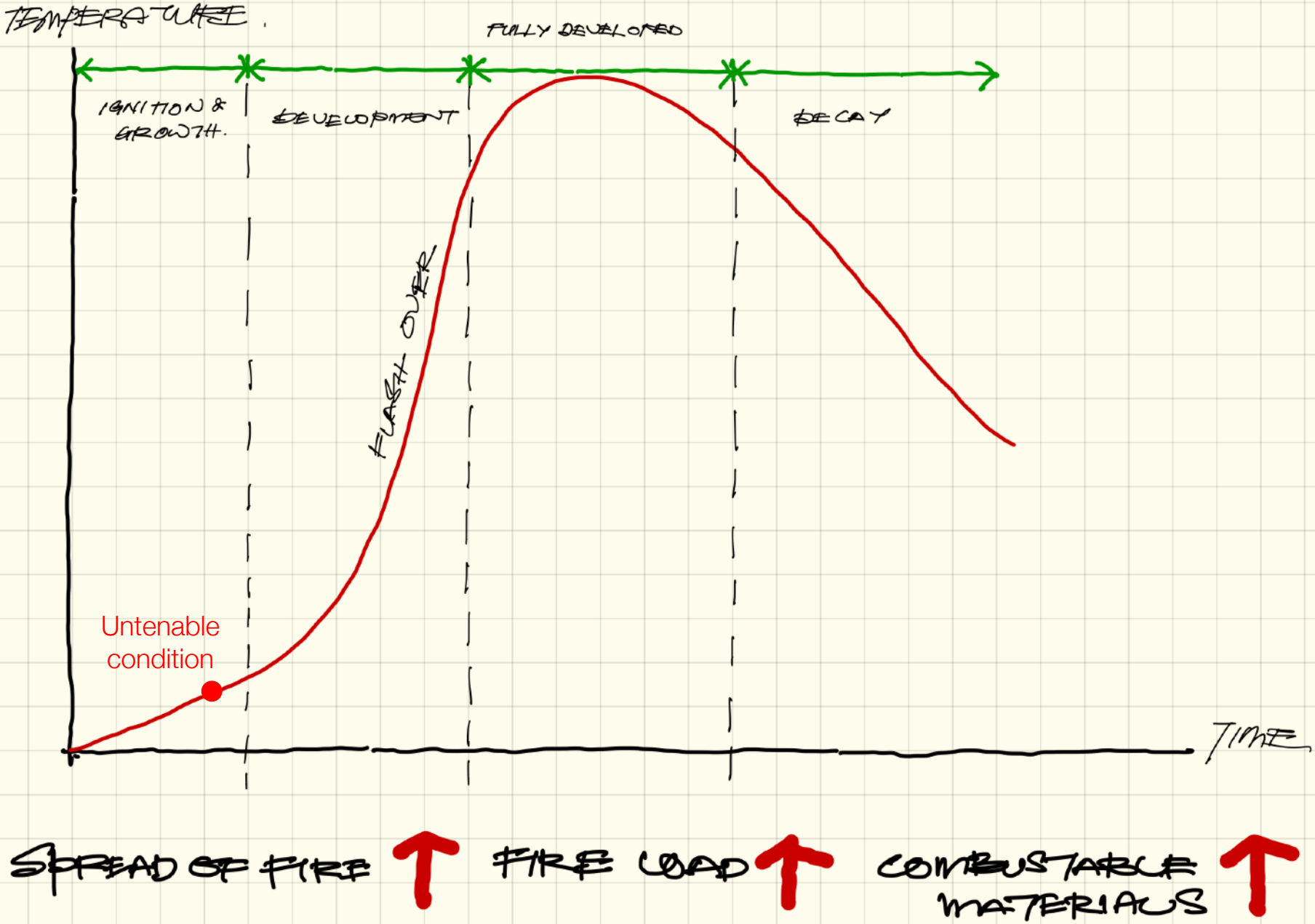
Fire Load : the amount of combustible material in a building or confined space and the amount of heat this can generate.

Fire Load Density : the amount of combustible material per square foot of floor space [Joules / msq]

Fire Load = (A) x (B)

(A) Surface area / volume of combustible content

(B) Combustion heat per area / volume


TEMPERATURE
FULLY DEVELOPED
IGNITION & GROWTH.
DEVELOPMENT
DECAY
FLASH OVER
Untenable condition
TIME
SPREAD OF FIRE
FIRE LOAD
COMBUSTABLE MATERIALS

Contributing factors to potential fire load :

Contents of the building

- Fittings and furnishings.....
- .....including the building itself
- Furniture and equipment
- Consumables
- Storage items
- Presence of hazardous materials
- Presence (or absence) of human occupants

Relevant By-Laws :

- 136 : compartment walls and floors

  5th Schedule : Dimension of Buildings & Compartments

DIMENSIONS OF BUILDINGS AND COMPARTMENTS

(By-law 136)

Purpose Group	*Height Of Building*	*Limits Of Dimensions*	
(1)	*(2)*	*Floor area of storey in building or compartment (in m^2) (3)*	*Cubic capacity of building or compartment (in m^3) (4)*
Part I - Buildings other than single storey buildings			
II (Institutional)	Any height	2,000	No limit
III (Other residential)	Not exceeding 28m	3,000	8,500
IV (Other residential)	Exceeding 28m	2,000	5,500
V (Shop)	Any height	2,000	7,000
VI (Factory)	Not exceeding 28m	No limit	28,000
VI (Factory)	Exceeding 28m	2,000	5,500
VIII (Storage and general)	Not exceeding 28m	No limit	21,000
VIII (Storage and general)	Exceeding 28m	1,000	No limit
Part II - Single storey buildings			
II (Institutional)	Any height	3,000	No limit
III (Other residential)	Any height	3,000	No limit

NOTE - Purpose Groups I, IV and VII are excluded as there are no limits applicable under by-law 138

- 220 : limit doubled if automatic sprinklers installed

- 137 : floor to floor compartmentation
- 138 : floor and wall compartmentation for flats, basement and areas of different usage
- 139 : compartmentation of hazardous areas

Others :

- 158 : Place of assembly – proscenium wall separating stage from the auditorium
- 252A* : Atriums in buildings – (b) , (h) **(UBBL Selangor amend 2012)*

UBBL 6th Schedule

Objective : to establish a safe distance between buildings so that radiant heat in the event of a fire does not represent a source of ignition to neighboring buildings.

- 142 to 146 : Construction and protection of separating and external walls
    - distance
    - openings

UBBL 8th Schedule

- 204 to 207 : Flame spread over surfaces of walls and ceilings

UBBL 9th Schedule

- 213 : Minimum periods of Fire Resistance for Elements of Structure.

CONCEPTS OF FIRE SAFETY

1 EVACUATION

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3. ACTIVE INTERVENTION

Relevant By-Laws

UBBL 225 : Detecting, warning and extinguishing fire

3.1 to assist evacuation

1. Detection & Alarm - minimise RSET
2. Communication - minimise RSET
3. Smoke Control - extend ASET
4. Portable Fire Extinguisher - extend ASET
5. Hose Reels - extend ASET

3.1(1) Fire Detection and Alarm

System objective are:

- To detect outbreak of fire and warn occupants
- To activate fire safety systems
- To inform Fire Brigade
- To monitor fire safety equipment

RELEVANT BY-LAWS

- UBBL 237, fire alarm systems are required for buildings defined under the 10th Schedule
- UBBL 238, a fire command center is required for all buildings above 30.5 meters or exceeding 9,290 sq. meters in gross area.

- Manual break glass for occupants to activate manually.
- Heat detectors to detect heat intensive fires automatically for spaces up to 9 meters high.
- Smoke detectors to detect smoke intensive fires automatically for spaces up to 10 meters high.
- Beam (smoke) detectors for high spaces such as atriums up to 25 meters high.
- Flame (IR or UV) detectors

Heat or Smoke?

- Smoke detectors for electrical rooms and store rooms.
- Heat detectors for general areas.
- Smoke detectors for areas where rapid heat development is normal for the function of the space, or where combustibles may burn with high release of smoke
- Heat detectors for areas where smoke may be a common presence in the space, or where combustibles may burn rapidly and efficiently

MAIN FIRE ALARM PANEL

Main fire alarm panel comprises:

- Alarm, fault and isolation indication for each zone.
- Indicator lights to monitor status of power supply and fire safety systems such as fire pumps, smoke control equipment, carbon dioxide systems, fire tank water levels, etc.
- Mimic panel to identify location of each zone.
- Battery with charger to provide power supply for the whole system.

3.1 (2) Communication

VOICE COMMUNICATION SYSTEMS

- To raise alarm of the fire incident
- To guide the occupants in an orderly manner during evacuation upon detection of fire.
- For the firemen to communicate with one another during fire fighting operations.

RELEVANT BY-LAW

UBBL 239 : two voice communication system is required for all large buildings and high rise buildings and they are:

- Public address system, and
- Fire brigade intercommunication system

3.1 (3) Smoke Control

SMOKE CONTROL TYPES

- Pressurization system to prevent entry of smoke by pressurizing the compartment with air.
- Space depressurization system to prevent the spread of smoke by extraction.
- Smoke dilution system to remove the smoke by extraction and make-up of air.

3.1 (3) Smoke Control

Depressurization System

Typical application are multi-storey office buildings.

- Floor on fire is maintained under negative pressure by extracting the smoke laden air.
- Immediate floors above and below are maintained at positive pressure by supplying air to these floors.

Dilution System

Typical application are basement car parks and shopping complexes.

- Smoke is extracted from zone on fire.
- Make-up air is provided to zones adjacent to area on fire.

3.1 (4) Portable Fire Extinguisher

- Intended for use by the occupants during the early stages of the fire (ignition and growth)

Relevant By-Laws

- UBBL 227 : portable fire extinguishers are required for first aid use.

CLASSES OF FIRES

Class A: Combustible solids like paper, wood

Class B: Inflammable Liquids like kerosene, diesel

Class C: Flammable gases

Class D: Reactive metals like sodium, potassium

Class E: Ignition of an electrical nature

Class F: Cooking oil fires

3.1 (4) Portable Fire Extinguisher

TYPES OF EXTINGUISHERS

Water type for Class A fires

Dry powder type for Class A, B, C, D and F fires

Carbon Dioxide type for Class E fires

Foam type for Class B fires

- Dry powder type of 6 kg for general use
- Carbon Dioxide type for electrical rooms

LOCATION AND SPACING

- Beside exit and staircase doors
- Generally located within 20 meters of any potential hazard

3.1 (5) Hose Reels

- Intended for use by the occupants during the early stages of the fire (ignition and growth)

LOCATION AND SPACING

- Near exit and staircase doors
- All spaces to be within 30 meters of a hose reel.
- No restriction on location of hose reel pumps and tanks.

3. ACTIVE INTERVENTION

Relevant By-Laws

UBBL 225 : Detecting, warning and extinguishing fire

3.2 Fire Fighting System : 10th Schedule

Automatic Systems

1. Sprinkler System – 226
2. Carbon Dioxide Extinguishing System – 235

Fire Fighting & Rescue

3. Wet Riser
4. Down Comer
5. Hydrants
6. Fire Lift

Automatic Systems

3.2 (1) Sprinkler System

- Intended to detect and extinguish a fire and warn the occupants to evacuate.
- UBBL 226 : automatic sprinkler systems are required for storage and other types o occupancies where automatic extinguishing system is necessary.
- UBBL 136 : limits of dimensions for compartmentation can be doubled with the provision of automatic sprinkler system.
- UBBL 252A Atrium : (d) - fully protected by automatic sprinklers
  (e) - may be omitted if ceiling of the atrium more than 17m

3.2 (2) Carbon Dioxide Extinguishing System

- System using carbon dioxide to extinguish a fire by excluding oxygen from the fire and commonly used for electrical rooms where water may not be suitable.
- The by-law relevant to this system is UBBL 235.

3.2 (3) Wet Risers Systems

- Intended to supply water up to the floors on fire for the firemen to use.
- Under UBBL 231, wet risers required for all buildings with topmost floor above 30.5m from the fire appliance access level.

Location and Spacing

- Landing valves located within fire access lobbies.
- Provided on every upper floor such that all spaces are within 45 m from a landing valve.
- Distance between landing valves on the same floor not to exceed 60 m.
- Breeching inlet to be no more than 18 m. from fire appliance access road and not more than 30 meters from nearest outdoor hydrant.

3.2 (4) Down Comer Systems

- Intended to provide water from roof fire tank to the floors on fire using static head available.
- Only permitted for private residential buildings where the topmost floor is no higher than 60 m. above fire appliance access level.

Location and Spacing

- Landing valves located within fire access lobbies
- Provided on every upper floor such that all spaces are within 45 m from a landing valve.
- Breeching inlet to be no more than 18 m. from fire appliance access road and not more than 30 meters from nearest outdoor hydrant.
- Tanks located on roof of building for maximum pressure.

- System of Pipe work connected to public water mains to provide water for the pumps in the fire engine.
- For industrial plants, fire pumps have to be provided where flow is unreliable or pressure is inadequate

RELEVANT BY-LAWS

- UBBL 225, every building shall be provided with at least one fire hydrant.

Location and Spacing :

- away from obstructions such as street furniture (benches), phone booths, etc.
- not less than 2,000mm from adjacent buildings and overhangs.
- between 610mm to 2,400mm from Fire Appliance Access.
- away from risks of vehicular damage.
- not more than 90m apart from each other (in new buildings adjacent to existing developments, a new hydrant within 45m radius of the new building).

3.2 (6) Fire Lifts

- Intended to assist the firemen to reach the floors on fire rapidly.

RELEVANT BY-LAWS

- UBBL 243, any building exceeding 18.5 meters high shall be provided with firemen's lift.

Location and Spacing :

- Not more than 61 meters from the furthermost point of the floor.
- Not more than 61 meters from the main entrance of the building or the fire control room whichever is nearer.

DESIGN REQUIREMENTS

- Lift capacity to be able to carry 550kg. min
- Lift car platform size to be not less than 1.45 sq. meters.
- Lift car door to be min. 800 mm clear in width. u Lift to serve all occupied floors.

FIRE MODE OF OPERATION

- Lift to be provided with emergency power for operation during power failure.
- Lift to return to main landing upon detection of power failure and remain inoperable until firemen arrive.
- Fire switch to be provided at main landing for firemen to activate the lift for their use.

CONCEPTS OF FIRE SAFETY

1 EVACUATION

2 PASSIVE CONTAINMENT

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4 ACCESS FOR FIRE FIGHTING AND RESCUE

4. FIRE APPLIANCES ACCESS [UBBL 140]

- update amendment 2012 ?
- any contra, supersedes "Guide to Fire" red book : 30 tones, 1:15

UBBL 140 : "Access Way" (street, road or open space) is to be provided as a proportion of the perimeter of the building, with reference to the volume of the building.

4.1 EXTERNAL ACCESS

Access for emergency and rescue vehicles, equipment and personnel

- Access Road [1:8.3], Access Way [1:15]
- Roads / hard surface / turfed area : width, loading

Availability of water :

- Hydrants
- Storage tank
- Lakes, rivers, ponds

And access to fire fighting systems in the premises

4.2 AT THE PREMISES

Clarity of :

- Type of building and function
- Configuration of building
- Location of fire control panel
- Location of breaching inlets and pump rooms

Access into the building

- Protected passage
- Protected stairs
- Firemen's lift
- Fire fighting lobby

Special Cases :

- Place of assembly(PG VII) – 158, 178 to 188
- Single Staircase Building – 194
- Atriums in Buildings. – 252A, MS 1183 (Annex B & C)
- Exempted Buildings – 256
- Theatre, Cinemas and similar – MS 1183 (Annex D)
- Hospitals
- Super High-rise

4 Stages of Architect's Role in Fire Safety

Session 12

1. Planning Stage (Planning Approval / DO)
   - site planning, massing / volume (BL 140)
   - hydrants (BL 225)
   - external wall / relation to other building (6th Schedule)

2. Design Stage – Passive design : identify PG
   - 2.1 Evacuation ; Fire Exits
   - 2.2 Containment ; Compartmentization

3. Design Stage ; Active Fire Fighting & Rescue
   - 3.1 Fire Fighting installation
   - 3.2 Space requirement

4 Stages of Architect's Role in Fire Safety

Session 12

4. CCC Stage

4.1 ensure updated passive and active plan submitted and approved

4.2 ensure consistency between arch, m&e and c&s dwgs

4.3 ensure as-built on site as per approved plan

4.4 internal inspection and testing prior to Bomba

4.5 call JBPM for inspection with completed forms and fees

4.6 C forms completed and signed

4.7 upon successful inspection, obtain CCC support letters

4.8 Borang G8 and G9 completed and signed

5. Fire Certification Stage *

5.1 building owner to ensure that the passive fire safety and active systems are maintained and operational.

5.2 yearly renewal

ANALYSIS OF FIRE QUESTIONS 1996 - 2018

	YEAR	18M	17S	17M	16S		16M	15	14		13		12	11	10	09	08	07	06	05	04	9/03	7/03	02	01	00	99	98	97	96
	PAPER	P2	P2	P2	P1*	P2*	P1	P2	P1	P2*	P1	P2*	P1	P1	P1*	P2		P1	P1	P1	P1	P2	P2	P2	P2			P2		
1	Design of safety evacuation																						10		5				5	
2	Fire Requirement : Terrace Houses / Shoplots													10		X		5	3	4	X		5					X		3
3	Fire Requirement : below 18m (+ basement)											6							5	6	X	8	5+5		15				20	4
4	Fire Requirement : above 18m / above 30m			15+ 10	10					5+5 +15	13	8+5	11	10	X				12	10	X	7		9				X		18
5	Occupancy Load Calculation	5	15	X			8+5	21		X				5	18+2															
6	6th Schedule					25																								
7	4 concepts of fire safety	20			15						12		14																	
8	Converting adjoining terrace units to multi-function facilities															25					`	10		7						
9	Single-storey factory office, production area and recreation rooms																							9						
10	Single staircase building																	5+5										X		
11	Checking plans / dwgs for mistakes			X										X				X												
12	Active M&E Installation		10				4											5												
13	Fire-fighting provision during construction											3																		
14	Carpark Podium Design																	5												
15	4 stages of fire submission								18																					
16	Perimeter Access / Site Planning											3			5															
17	Elaborate UBBL Part Fire								7																					
18	Access Lobby							4																						
19	Travel Distance						8																							
	Total	25	25	25	50		25	25	50		50		25	25	25	25	0	25	20	20	20	25	25	25	20	0	0	15	25	25

Analysis of Fire Questions 1996 – 2018

Z&SR Part 3 Study Group 2020

Analysis of Fire Questions 1996 – 2018

ANALYSIS OF FIRE QUESTIONS 1996 - 2018

	YEAR	07	06	05	04	9/03	7/03	02	01	00	99	98	97	96
	PAPER	P1	P1	P1	P1	P2	P2	P2	P2			P2		
1	Design of safety evacuation						10		5				5	
2	Fire Requirement : Terrace Houses / Shoplots	5	3	4	X		5					X		3
3	Fire Requirement : below 18m (+ basement)		5	6	X	8	5+5		15				20	4
4	Fire Requirement : above 18m / above 30m		12	10	X	7		9				X		18
5	Occupancy Load Calculation													
6	6th Schedule													
7	4 concepts of fire safety													
8	Converting adjoining terrace units to multi-function facilities					10		7						
9	Single-storey factory office, production area and recreation rooms							9						
10	Single staircase building	5+5										X		
11	Checking plans / dwgs for mistakes	X												
12	Active M&E Installation	5												
13	Fire-fighting provision during construction													
14	Carpark Podium Design	5												
15	4 stages of fire submission													
16	Perimeter Access / Site Planning													
17	Elaborate UBBL Part Fire													
18	Access Lobby													
19	Travel Distance													
	Total	25	20	20	20	25	25	25	20	0	0	15	25	25

Analysis of Fire Questions 1996 – 2018

ANALYSIS OF FIRE QUESTIONS 1996 - 2018

	YEAR	18M	17S	17M	16S		16M	15	14		13		12	11	10	09	08
	PAPER	P2	P2	P2	P1*	P2*	P1	P2	P1	P2*	P1	P2*	P1	P1	P1*	P2	
1	Design of safety evacuation																
2	Fire Requirement : Terrace Houses / Shoplots													10		X	
3	Fire Requirement : below 18m (+ basement)											6					
4	Fire Requirement : above 18m / above 30m			15+ 10	10					5+5 +15	13	8+5	11	10	X		
5	Occupancy Load Calculation	5	15	X			8+5	21		X				5	18+2		
6	6th Schedule					25											
7	4 concepts of fire safety	20			15						12		14				
8	Converting adjoining terrace units to multi-function facilities															25	
9	Single-storey factory office, production area and recreation rooms																
10	Single staircase building																
11	Checking plans / dwgs for mistakes			X										X			
12	Active M&E Installation		10				4										
13	Fire-fighting provision during construction											3					
14	Carpark Podium Design																
15	4 stages of fire submission								18								
16	Perimeter Access / Site Planning											3			5		
17	Elaborate UBBL Part Fire								7								
18	Access Lobby							4									
19	Travel Distance						8										
	Total	25	25	25	50		25	25	50		50		25	25	25	25	0

FIRE REQUIREMENTS

	Check for	*Clauses*	*Schedules*
1	Established **Purpose Group**.	134	5th Schedule
2	Check **limit of compartment**. Check if Clause 137, 138 & 139 applies	136 137, 138, 139	5th Schedule
3	Established **size & volume** to determine proportion of building abutting street	140	
4	Check compliance of **unprotected opening** allowed & sufficiency of setback. - common land occupation : 146 applies	142, 145, 146	6th Schedule
5	Check max. **travel distance** - location of exit, dead end, 45° alternative route	165, 166, 167, 170	7th Schedule
6	Calculate **Occupancy Load** to determine size and no. of exits	175 to 181	7th Schedule
7	**Ventilation design** for staircase. - smoke lobbies, ventilation, pressurize	198, 200, 202	
8	All **finishes** to comply with Schedule 8 (spread of flame)	204, 205, 206	8th Schedule
9	All **structural elements** to comply with Schedule 9 (fire resistance period)	213	9th Schedule
10	Established **Fire Fighting appliances** required - extinguishing system - detection & alarm system - emergency lights - hydrant	225 (1) 225(2)	10th Schedule
	Special requirement for high-rise building: **a) Above 18 m**		

8	All **finishes** to comply with Schedule 8 (spread of flame)	204, 205, 206	8th Schedule
9	All **structural elements** to comply with Schedule 9 (fire resistance period)	213	9th Schedule
10	Established **Fire Fighting appliances** required - extinguishing system - detection & alarm system - emergency lights - hydrant	225 (1) 225(2)	10th Schedule
11	Special requirement for high-rise building: **a) Above 18 m** - Protected lobby - Fire fighting access lobby - Fire lift - Dry riser **b) Above 30 m** - Command & Control Room - Compartmented floor - Staircase to roof - Wet Riser **c) Above 45 m** - staircase to be pressurized	 197(1) 229, 242 243 230 238 137 195 231 197(2)	
12	**Single staircase building**	194	
13	**Underground basement.** - Smoke vent. Facilities - Smoke lobbies - Compartment floors	 249 196 138(d)	
14	Building exempted from Part 7 and 8 of UBBL except 141 and 225(2) **- bungalow, semi-d, terrace houses**	256	

Group Discussion

1. Terrace houses / shoplots
2. Below 18 m
3. Above 18 m below 30 m
4. Above 30 m
5. Combine terrace
6. 4 stages of arch roles


End