



APPENDIX 4

FIRE SAFETY REQUIREMENTS FOR GENERAL WAREHOUSES

1 SCOPE

- 1.1 The scope of these guidelines covers the fire safety requirements for general warehouses which include single-storey single-user warehouses, single-storey multi-user warehouses, underground warehouses, multi-storey warehouses with or without basements and warehouse within other non-industrial buildings.

2 DEFINITION

2.1 *General Warehouse*

General warehouse is defined as space used for storing various types of goods or materials. It also includes warehouses for storing chemicals, fresh/perishable food products (cold room), etc. Those departmental stores, supermarkets and the likes having displayed storage height more than 4m (with sprinkler protection) or 2.5m (without sprinkler protection) shall comply with this Guidelines and the fire safety requirements stipulated in Fire Code for Purpose Group V (as retail shop).

- 2.2 Store having floor area more than 100m² shall be classified as warehouse (Purpose Group VIII) usage and subject to comply with this Guidelines.

- 2.3 Store having floor area equal or less than 100m² is still be required to comply with the storage height limit the BS EN 12845 (refer to Table 1A and 1B for details). For store room without sprinkler protection system the storage height should be limited to 4m.

- 2.4 Qualified person shall be responsible to inform the user to observe the storage height limit and type of storage strictly (please refer to clause 5 for details).

3 COMPARTMENT

- 3.1 The size of compartment shall not exceed the maximum allowable dimensions shown in the Table 1 of these Guidelines, depending on the type of fire protection and location of the warehouse.

- 3.2 Compartmentation, in respect of size limitation, may be achieved by using fire-rated roller shutter. Localized smoke detector shall be installed to activate the roller shutter. The roller shutter shall also be linked to the building automatic fire alarm system which shall act as a backup for the activation of the shutter.

Note: Such localized smoke detection system shall be provided with zone indication on the main fire alarm panel with buzzer sound, however it's activation is not necessary to sound the general fire alarm.



3.3 Compartmentation between the warehouse and loading/unloading (or staging) area shall be provided (to comply with Cl.3.2), except where:

- (i) the warehouse is a single-storey single-user or multi-storey single-user per storey type, with the loading/unloading area abutting external space; or
- (ii) the roof over the loading/unloading (or staging) area abutting external space is not more than 3m

Note: Down-stand fire wall of minimum depth 1m hanging from the ceiling shall be provided [except for cl 3.3(ii)] between the loading/unloading area and the warehouse storage area.

3.4 The compartment size limit stipulated in Table 1 shall include the loading/unloading (or staging) area if it is not fire compartmented from the warehouse area, unless the entire warehouse including the loading/unloading and driveway area is sprinkler protected and is provided with smoke control system.

Note: This sub-clause is not applicable to warehouse with roof over the loading/unloading (or staging) area abutting external space not more than 3m.

4 SPRINKLER PROTECTION

4.1 Automatic sprinkler system shall be provided if the compartment size of the warehouse exceeds the maximum allowable size shown in the Table 1 of this Guidelines.

4.2 Sprinkler coverage shall be extended to the areas shielded by access platforms in the high-rack storage warehouse. The supporting structures of the platforms shall have the same fire resistant rating as the element of structure of the warehouse.

5 STORAGE HEIGHT CONTROL

5.1 Signage shall be provided on the walls of the warehouse (including the loading/unloading or staging area) to control the maximum allowable storage height and to maintain the minimum clearance below the sprinkler heads in accordance with BS EN 12845.

5.2 A 50mm wide red line shall be drawn around the wall with signage indicated as “**No Storage Above This Line**”. This sign shall be provided at not more than 30m interval along the red line.

5.3 The lettering of the sign shall not be less than 100mm.

5.4 The storage height limitations shall be clearly indicated on plans. To facilitate such provision, the Qualified Person shall make known to the owner and the warehouse operator the clearance and height limitations appropriate to the particular storage or warehouse usage.



5.5 Those transient storages at loading/unloading (or staging) area shall comply with the Table 1A in terms of the storage height limit. For those non-sprinkler protected warehouse, the storage height shall be limited to 2.5m.

6 SMOKE CONTROL

6.1 The provision of smoke control shall be in accordance with Table 2 of this Guidelines, either in a form of smoke vent, smoke purging or engineered smoke control system depending on the fire compartment size and type of fire protection system.

6.2 *Smoke Vents*

6.2.1 Smoke vents (refer to Table 2) shall be of permanent open type and the effective opening shall be either comply with Table 2 or 2A. The use of glass blocks or panels as smoke vents shall not be considered unless they are designed to be activated automatically.

6.2.1 The minimum dimensions of vertical smoke vent shall be 400mm (length) X 600mm (height) and horizontal smoke vent (roof or ceiling) shall be 0.25 m² in area.

6.2.3 No area in the warehouse shall be more than the stipulated distance (refer to either Table 2 or 2A) measured horizontally away from any vertical or horizontal smoke vent.

6.2.4 All smoke vents shall be located at the highest unobstructed level along the perimeter walls of the warehouse.

6.3 *Smoke Purging System*

6.3.1 Replacement of smoke vents by smoke purging system is allowed provided that the warehouse is sprinkler protected. The smoke purging system shall comply with clause 7.1.9 of the Fire Code.

6.4 *Engineered Smoke Control*

6.4.1 Engineered smoke control system shall be provided if the floor area of the compartment is more than 5,000 m² or 2,000 m² for aboveground or belowground warehouses respectively.

6.4.2 The system shall be designed and installed in accordance with the requirements stipulated in Fire Code or equivalent standards approved by the MFRS.

6.4.3 The fire size determined shall be concurred by MFRS before it is used for the design of the engineered smoke control system.



7 FIRE EXTINGUISHER

7.1 Fire extinguisher shall be provided in accordance with BS EN 3.

7.2 Classification of storage hazards basing on storage heights shall follow Tables 1A and 1B for the different categories of storage and overall stack heights. Ordinary hazard classification in BS EN 12845 shall be taken as equivalent to medium hazard classification in BS EN 3.

8 OTHER FIRE SAFTY REQUIREMENTS

8.1 Other fire safety requirements, namely means of escape, structural fire precautions, external firefighting provisions, rising mains, hose reel system, electrical fire alarm, exit lighting, exit signs, emergency voice communication system, fire command centre, fireman lift and emergency power supplies, etc. shall be provided as stipulated in the Fire Code.



Table 1: Compartment Size & Storage Height for General Warehouse

Location of Warehouse	Item	With Sprinkler Protection	Without Sprinkler Protection *	
		Storage Hazard	Storage Hazard	
		All	Normal	High
Single storey warehouse	Max. Floor Area per Compartment	12000m ²	3000m ²	2000m ²
	Max. Cubical Extent per compartment	NC	12000m ³	7500m ³
	Max. Storage Height	18m	+Ref Table 1 (A) & 1 (B)	12m
Warehouse located on 1 st storey of multi-storey warehouse	Max. Floor Area per Compartment	12000m ²	3000m ²	2000m ²
	Max. Cubical Extent per compartment	NC	12000m ³	7500m ³
	Max. Storage Height	15m	+Ref Table 1 (A) & 1 (B)	12m
Multi-storey warehouse with vehicular ramp (min. loading 24 tons with dry rising mains)	Max. Floor Area per Compartment	9000m ²	3000m ²	2000m ²
	Max. Cubical Extent per compartment	NC	12000m ³	7500m ³
	Max. Storage Height	15m	+Ref Table 1 (A) & 1 (B)	12m
Multi-storey warehouse without vehicular ramp	Max. Floor Area per Compartment	6000m ²	3000m ²	2000m ²
	Max. Cubical Extent per compartment	NC	12000m ³	7500m ³
	Max. Storage Height	15m	+Ref Table 1 (A) & 1 (B)	12m
Warehouse located in basement	Max. Floor Area per Compartment	3000m ²	NP	NP
	Max. Cubical Extent per compartment	12000m ³	NP	NP
	Max. Storage Height	12m	NP	NP

Note: NC = No Control

NP = Not Permit

* subject to full compliance of clause 3.2.7(a) and clause 1.2.39(d) of the Fire Code.

+ storage height not exceeding the limits for goods in the various categories suitable for ordinary hazard protection (you may refer to Table 1A or 1B below).

**Table 2: Smoke Control Requirements for General Warehouse**

Location of Warehouse	Compartment Size	Provision of Sprinkler System	Smoke Control Requirement
Above ground level	$\leq 100\text{m}^2$	no	NR
	$> 100\text{m}^2$ and $\leq 400\text{m}^2$	no	^a Smoke vent (min % openings follow Table 2A)
	$> 400\text{m}^2$ to size limit of Table 1	no	^b Smoke vent (20% / 12m)
	$\leq 700\text{m}^2$	yes	NR
	$> 700\text{m}^2$ and $\leq 5000\text{m}^2$	yes	^c Smoke vent or ⁺ purging system
	$> 5000\text{m}^2$	yes	engineered smoke control system
Below ground level (*Basement)	$\leq 2000\text{m}^2$	yes	^c Smoke vent or ⁺ purging system
	$> 2000\text{m}^2$	yes	engineered smoke control system

Note: NR = Not Required

- a smoke vent openings base on the Table 2A;
- b smoke vent shall be at least 20% of the floor area it served and shall not be more than 12m measured horizontally away from any part of the warehouse;
- c smoke vent shall comply with Cl.7.4.2 of the Fire Code (adequately & evenly distributed along the perimeter of the fire compartment or basement);
- + smoke purging system shall comply with Cl.7.1.9 of the Fire Code (adequately & evenly distributed within the fire compartment or basement);
- * smoke control system shall be provided for the entire basement except the protected exit shafts, lift shafts and M&E riser shafts;



Table 1A

Category of storage	Overall stack height (m)	
	Non-encapsulated storage	Encapsulated storage
1	4.0	3.00
2	3.0	2.25
3	2.1	1.60
4	1.2	0.90

The term “store” or “storage” includes the warehousing or the temporary depositing of goods or materials while undergoing process

Table 1B:

Category of storage	Overall stack height (m)	
	Non-encapsulated storage	Encapsulated storage
1	3.5	2.7
2	2.6	2.0
3	1.7	1.3
4	1.2	0.9

The term “store” or “storage” includes the warehousing or the temporary depositing of goods or materials while undergoing process

Table 2A (Smoke vent requirements for non-sprinkler protected building)

Min opening of smoke vent based on the floor area	No area in the warehouse shall be more than the following distance measured horizontally away from any vertical or horizontal smoke vent
2.5%	12m
5.0%	15m
10.0%	18m
15.0%	21m
20.0%	24m