Your Ref **:** **Our Ref:** CD/FSSD/12/02/03/01

Date : 13 Feb 2017

Registrar, Board of Architects
Registrar, Professional Engineers Board
President, Singapore Institute of Architects
President, Institution of Engineers, Singapore
President, Association of Consulting Engineers, Singapore

Dear Sir/Mdm

SEEKING PUBLIC CONSULTATION ON CHANGES TO THE STANDARD FOR FIRE SAFETY IN RAPID TRANSIT SYSTEMS 2012 EDITION

The design of fire safety measures in rapid transit systems (e.g. MRT stations and tunnels) is currently governed by the Standard for Fire Safety in Rapid Transit Systems (SFSRTS) 2012 Edition.

2. The standard is regularly reviewed by the SFSRTS Review Committee, which is chaired by the Singapore Civil Defence Force (SCDF) with representatives from the Land Transport Authority, Singapore Institute of Architects, Institution of Engineers, Singapore, and Association of Consulting Engineers, Singapore, to improve its clarity and keep pace with the latest developments.

3. A revised edition of the standard is scheduled for publication this year. The proposed key changes to the SFSRTS 2012 Edition are highlighted in Annex A. SCDF would like to invite feedback on these changes.

4. In order to ensure that the feedback is productive and focused, respondents are requested to adhere to the following guidelines when providing their feedback:

(i) Identify yourself and the organisation you represent (if any) so that SCDF may follow up with you to clarify any issues, if necessary;

(ii) Be clear and concise in your comments. Focus your comments on the proposed key changes and how they can be improved; and

(iii) Substantiate your points with illustrations, examples, data or alternative suggestions.

5. Please convey the contents of this circular to members of your Board/ Institution/ Association. This circular is also available in CORENET's e-Info: http://www.corenet.gov.sg/einfo. Responders can direct your feedback to Muhd_Izwan_IBRAHIM@scdf.gov.sg. Please use the template provided in Annex A of this circular for your feedback. This consultation exercise will end on 26 Mar 2017.

Yours faithfully

(transmitted via email)

MAJ Tan Chung Yee
Fire Safety & Shelter Department
for Commissioner
Singapore Civil Defence Force

Distribution list

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Fire Code Review Committee
SFSRTS Review Committee

Annex A

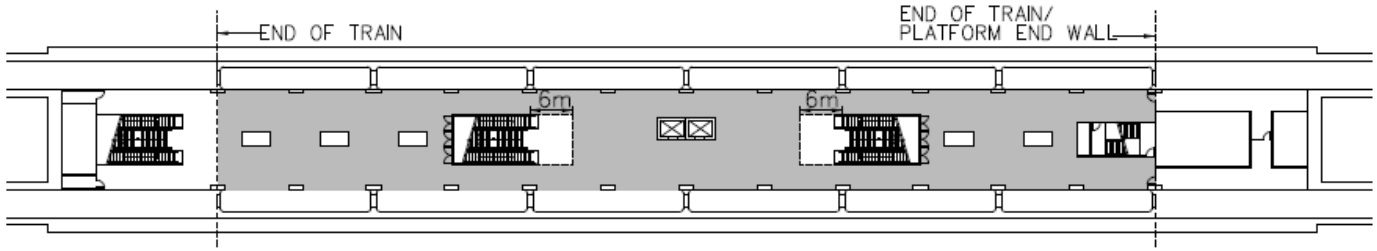
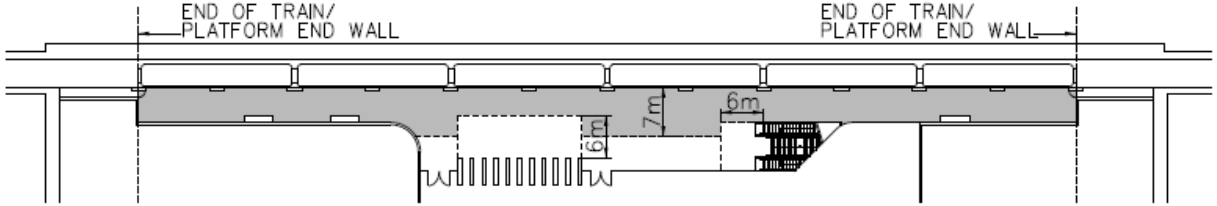
S/N	Existing Clause	Revised/New Clause	Rationale	Public Comment
1	Cl.2.1.2.8 Basement Storey (a) A storey of a station which is below the first storey and the floor of which is situated at such a level that more than half the height of such storey is below the level of the ground adjoining its perimeter walls for more than half the length of such perimeter walls, and (b) Where the station has no storey above ground, a storey the floor of which is situated at such a level that either the whole storey is below ground or more than half the height of such storey is below the level of the ground adjoining its perimeter walls for more than half the length of such perimeter walls.	Cl.2.1.2.8 Basement storey A basement storey is a storey of a station such that at least half the storey height is below the ground level, and also adjoins its perimeter walls for at least half the length of such walls. Exemption 1: Cable chamber and under-platform services ducts (UPSD) conforming with Cl.2.2.4.5 shall not be considered a basement in a transit station. Exemption 2: (i) Extended landings that connect transfer exit staircases, ventilation exhaust shafts, lift and staircase landings shall not be considered a basement storey in a transit station. (ii) The extended staircase landings shall not be	*Based on current description of basement storey, it is not clear whether the following areas i.e. ventilation exhaust shaft, lift and extended landing of a staircase qualify as a basement storey. This revised clause serves to clarify the above areas do not constitute a "basement storey".*	

		wider than the width of the exit staircase (to prevent other usage, i.e. storage). (iii) The ventilation exhaust shafts shall not contain mechanical, electrical and plumbing equipment.		
2	Cl.2.1.2.9 Boundary The boundary of the land belonging to the station under consideration, and including the imaginary extension of the boundary up to the centre of an abutting public street, canal or river.	Cl.2.1.2.9 Boundary Boundary of a station is the border demarcating the area surrounding the station, and where applicable (in determining the relevant boundary), it includes the imaginary extension of the border up to the centre of an abutting public street, canal or river.	*This clause is rephrased for clarity.*	
3	Cl.2.1.2.11 Cavity barrier Construction provided: (a) To seal a cavity (concealed space) against the penetration of smoke and flame, or	Cl.2.1.2.11 Cavity barrier A cavity barrier is a fire-rated construction complying to Cl.2.3.4 that seals or sub-divides a concealed space. This is for the purpose of limiting the spread of smoke and fire into or within that concealed space.	*To simplify further for ease of understanding.*	

	(b) Within a cavity (concealed space) to stop the movement of smoke and flame within the cavity.			
4	Cl.2.1.2.38 Fire-fighting lobby A smoke-stop lobby which is adjacent to a fire lift or firemen's staircase and designated for use by the fire fighting team during an emergency.	Cl.2.1.2.38 Firefighting lobby Firefighting lobby (also "fire lift lobby") refers to smoke-stop lobby serving a fire lift, which is used by the firefighting team during an emergency.	*This clause is rephrased for clarity.*	
5	Cl.2.1.2.39 Firemen's staircase Firemen's staircase means a staircase that has its enclosure constructed of non-combustible material and shall have a fire resistance of not less than that for the element of structure and designated for use by firemen.	Cl.2.1.2.39 Firefighting/exit staircase Firefighting/exit staircase refers to an exit staircase that has its enclosure constructed of non-combustible material and shall have a fire resistance of not less than that for the element of structure and designated for use by firefighters.	*The term "firemen's staircase" will be replaced with firefighting/exit staircase".*	
6	Cl.2.1.2.41 Habitable floor A floor or part thereof, including roof level, regardless whether it is opened to sky or not, designated to be used for any purpose/activity other than housing lift motors, fire	Cl.2.1.2.41 Habitable floor All floors in a building including roof level shall be considered as habitable floors. The roof level can be taken as non-habitable if it is not used for any purpose/activity other	*This relaxation serves to clarify roof level that houses M&E services will be considered as a non-habitable floor. In this revision exercise, the "green roof" at a transit station is*	

	pumps, water supply pumps, cooling towers and water tanks. Such purpose/activity shall include terrace, garden and playground and other M & E plants.	than housing M&E and/or telecommunication plants/equipment e.g. lift motors, fire pumps, generators, fire hose reel pumps, water supply pumps, cooling towers, solar photovoltaic panels, supply/exhaust fans with associated ductwork, air-con condensing units, telecommunication antenna, satellite dishes and public warning sirens, green roofs inaccessible to public, and the like.	*intended for authorised usage and not accessible to public at large.*	
7	Cl.2.1.2.71 Station platform Station platform means the area of a station used primarily for boarding and alighting transit vehicle passengers.	Cl.2.1.2.71 Station platform Station platform refers to the area of a station used primarily by passengers boarding and alighting trains. For the purpose of calculating the maximum occupant load, the station platform area shall be the standing area bounded by: (a) The platform screens/fixed panels along the platform edges (see illustration below);	*This revised clause is to specify clearly how the maximum occupant load of the station is to be computed.*	

		(b) 7m boundary parallel to the platform screen/fixed screens for side platforms (platforms serving only one track) (see illustration below); and (c) the ends of the train or to the platform end wall, whichever is shorter (see illustration below). (d) The station platform area shall exclude the following: (i) Any obstructions including lift shafts, voids, escalators, staircases, signage, artwork and railings. (ii) Run-off zones directly in front of escalators and staircases measured 6m from the comb plate for any escalator or last riser for any staircases (where there is no adjoining escalator) (see illustration below).		

	 			
8	Cl.2.1.2.73 Train crush load Train crush load means the maximum number of passenger capable of occupying a train.	Cl.2.1.2.73 Train-peak load Train-peak load is defined as the full seating capacity plus 4 passengers/m^2 at the available standing area and shall be taken as follows: (a) 88 passengers - 1 car length LRT train (b) 176 passengers - 2 car length LRT train	*This revised clause is to provide clarity on the train-peak load capacity.*	

		(c) 670 passengers - 3 car length MRT train (d) 890 passengers - 4 car length MRT train (e) 1340 passengers - 6 car length MRT train		
9	Nil	New Clause Cl.2.1.3.3 Light-emitting diode (LED) digital screen LED digital screens installed at the transit station shall not impede passenger flow/ evacuation and shall not block visibility of exit signs. Clusters of LED digital screens are allowed in the transit station. Each cluster of LED digital screens shall not have more than two LED digital screens and clusters of LED digital screens shall be placed at least 2m apart.	*The provision of LED digital screen is to support the operation needs of the transit station. It serves as a means in providing general information on train services and is not primarily used for commercial or advertisement purpose. The separation distance between the clusters of LED digital screens will prevent further spread of fire as the panel of such is still combustible though the risk is low.*	
10	Cl.2.1.3.4 One large shop (not exceeding 100m^2) and one small shop (not exceeding 15m2) within station are allowed in the public area except platform. For above ground storeys, there is no	Cl.2.1.3.4 Shops with a maximum aggregated area of 115m^2 (where no individual shop unit shall exceed 100m^2) are allowed in the public area except at platform level. The shops can be subdivided into	*To allow flexibility in the sizing and location of shops at concourse level but still maintaining a maximum aggregated area of 115m^2. Instead of mandating 1 big*	

	restriction on the number of shops if they are not located along the means of egress. Clusters of automatic vending machines are allowed in the public area except platform. Each cluster of vending machines shall consist of not more than two vending machines and clusters of vending machines shall be placed at least 1m apart.	several smaller units by fire compartments. Where the concourse is located on the same level as the platform, no shops shall be permitted. Cl.2.1.3.5 For aboveground or elevated station, there is no restriction on the unpaid area taken up by shops if they are not located along the means of egress. Cl.2.1.3.6 Clusters of automatic vending machines are allowed in the public (unpaid) area except at platform. Each cluster of vending machines shall consist of not more than two vending machines and clusters of vending machines shall be placed at least 1m apart.	*shop and 1 small shop units, the revision now permits 1 big shop to be further subdivided to smaller units by fire compartments. Vending machines are permitted in the public area except platform.*	
11	Nil	<u>New Clause</u> Cl.2.1.4.1(e) Fire resistant/flame retardant, low smoke zero halogen (LSOH) type cables are permitted to be run exposed in air plenum, provided that:	*As part of harmonizing requirements permitted under Fire Code, this requirement is now included in the SFSRTS. Low-smoke and low-flame rated PVC cables are allowed to be run exposed in the plenum provided it is protected by automatic fire alarm system.*	

		(i) The air plenum shall be protected by fire detection system. (ii) FCU or AHU using plenum for air return and serving more than one room shall be provided with smoke detector(s) at the return air plenum or return air duct to shut down the FCU/AHU upon detection of smoke.		
12	Cl.2.2.2.1 Occupant load for transit station Except as required in Cl.2.2.2.4 and Cl.2.2.2.5, the occupant load for a transit station shall be: (a) The cumulative occupant load for all platforms in the station calculated in accordance with Cl.2.2.2.2 and Cl.2.2.2.3. (b) Based on the peak hour patronage as projected for the design of the transit system.	Cl.2.2.2.1 Occupant load for transit station Except as required in Cl.2.2.2.4, Cl.2.2.4.4 and Cl.2.2.4.5, the occupant load for a transit station shall be the cumulative occupant load for all platforms in the station calculated in accordance with Cl.2.2.2.2, plus a single train-peak load in accordance with Cl.2.1.2.73.	*The current method of computing Occupant Load (OL) i.e. area for boarding and alighting of commuters from the trains) is done by summing the projected 'Entraining Load' and 'Link Load' for each platform in the station. The number of commuters waiting to board the trains is known as the 'Entraining Load' while the number of commuters travelling on the trains and approaching the station is known as the 'Link Load'.*	

13	Cl.2.2.2.2 Maximum occupant load for each platform The maximum occupant load for each platform in a station shall be calculated based on: (a) The greater of the a.m. or p.m. peak period loads. (b) The simultaneous evacuation of the entraining load and the link load. (c) The entraining load and link load for each track shall be based on the entraining load and link load per headway multiplied by the following: (i) The system surge factor, and (ii) In the peak direction, an additional factor of 2 to account for one missed headway. (d) The maximum link load at each track shall be the maximum passenger train capacity.	Cl.2.2.2.2 Maximum occupant load for each platform The maximum occupant load for each platform in a station shall be calculated based on 0.5m^2/person applied across the station platform area as defined in Cl.2.1.2.71.	*This occupant load factor of 0.5m^2/person is based on the Level Of Service (LOS) Concept which is a qualitative measure to relate the quality of traffic service in the transport industry. It is also commonly used in evacuation modelling to assess whether the situation is crowded or congested.* *The Entraining Load and Link Load figures are provided during the design of the station in the 1980s based on projected ridership data from the planning agencies (e.g. Urban Redevelopment Authority (URA) and Land Transport Authority (LTA).* *The proposed method considers the maximum number of commuters to be in the platform and no transient commuters in the concourse.* *This current computation method is dependent on projected train ridership and*	

	See guide in Appendix A.		*has drawbacks. The projected train ridership may underestimate the potential increase in occupant load due to change in public transport needs or expansion of lines in the transit station network over the years. Further, this computation does not take into account the footprint of the transit station, which will limit the number of commuters in the station, even if projected train ridership exceeds what the station can take.* *This revised method in computing occupant load for transit station will address the maximum permissible number of commuters at the platform during peak travel or unforeseen surge in ridership in any particular transit station due to changing travel needs. It reflects the actual situation and shall not compromise life safety during a fire emergency. It is a more reliable measure of the*	

			potential capacity that the platform can hold.	
14	Cl.2.2.3.4 The station shall be designed to permit evacuation from the most remote point of the platform to any one of the following in 6 minutes or less. (See APPENDIX B). (a) A point of safety (b) Concourse level of stations (open stations or where emergency ventilation systems are provided in accordance with Cl.2.6.5). There shall be sufficient exit capacity to evacuate people from the concourse to the external such that there is no waiting time along the egress routes. Stations with interchange-link and stations connected to non-transit occupancies shall comply with the relevant requirements of Section 2.8.	Cl.2.2.3.4 The station shall be designed to permit evacuation from the most remote point of the platform to any one of the following in 6 mins or less. (See Appendix B). (a) A point of safety (b) The safe zone of the concourse level, which is defined as follows: (i) beyond the fare gates; and (ii) has sufficient exit capacity to evacuate people from the concourse to the external such that there is no waiting time along the egress routes. (c) For stations with shared concourse and platform levels, the safe zones are defined as entrances to subways (connecting	*The safe zone of the concourse is deliberated and further expanded.*	

		tunnel passageway) from concourse unpaid area or the foot of the escalators/staircases at the concourse level leading to the upper levels. Smoke barriers shall be placed either at the entrances to subways or at the foot of the escalator stairs at the concourse level leading to the upper levels, whichever is applicable. Stations with interchange-link and stations connected to non-transit occupancies shall comply with the relevant requirements of Section 2.8.		

15	Cl.2.2.4.1 Number of exit staircases or exits Except as permitted by Cl.2.2.4.2 and Cl.2.2.4.4, there shall be at least two independent exit staircases or other exits from every storey or part thereof, and the exit staircases or other exits shall be remotely located in accordance with Cl.2.2.5.16. Where a room or space is required to be provided with two exits, each exit shall be of sufficient width to accommodate not less than one half the total occupant load.	Cl.2.2.4.1 Number of exit staircases or exits Except as permitted by Cl.2.2.4.2, Cl.2.2.4.4, Cl.2.2.4.5 and Cl.2.2.5.20, there shall be at least two independent exit staircases or other exits from every storey or part thereof, and the exit staircases or other exits shall be remotely located in accordance with Cl.2.2.5.16. Where a room or space is required to be provided with two exits, each exit shall be of sufficient width to accommodate at least one-half the total occupant load.	*This clause is expanded to include under-platform services ducts and cable chamber.*	
16	Cl.2.2.4.2 Storeys with rooms which are not high hazard occupancies shall be permitted to have a single means of escape where the maximum travel distance on that storey complies with Cl.2.2.4.7.	Cl.2.2.4.2 Storeys or parts thereof, with rooms that are not high hazard occupancies shall be permitted to have a single means of escape where the maximum travel distance, inclusive of vertical distance complies with Cl.2.2.4.7.	*To include parts of a storey as described in Cl.2.2.4.1 and to include vertical distance in the measure of travel distance.*	

17	Cl.2.2.4.3 Every occupant or tenant shall have direct access to the required exit or exits without the need to pass through rooms or spaces occupied by other occupants or tenants.	Cl.2.2.4.3 Every occupant shall have direct access to the required exit or exits without the need to pass through the spaces or rooms occupied by other occupants, plenums or horizontal ventilation shafts.	*Where any storey of a building is occupied by more than one tenant, it is imperative that each occupant from any of the tenancies shall have direct access to exit staircases without having to enter another tenancy. This should be facilitated via common spaces like corridors or lobbies that are accessible to all occupants on that storey. There are cases where exit is through air shafts, plenums. When an emergency occurs the Tunnel Ventilation System will ramp up and the air flow and noise in these spaces will be very high. As such, it is usually hard to open the doors. Rooms intended for plenums or horizontal ventilation shafts should not be designed as designated means of escape.*	
18	Cl.2.2.4.5 Where cable chamber or underplatform services ducts have a headroom less than 2000mm.	Cl.2.2.4.5 Cable chamber or under-platform services ducts with headroom less than 2m.	*Existing Cl.2.2.4.5 (a) and (b) relocated to Cl.2.2.5.20 for general fixed ladder requirements which could*	

	(a) Fixed ladders complying with ANSI A14.3, American National Standard for Ladder - Fixed - Safety Requirements, or BS 5395 Part 3 - Stairs, Ladders and Walkways - Code of Practice for the Design of Industrial Type Stairs, Permanent Ladders and Walkways, shall be acceptable as a means of escape, and (b) Travel distance on the fixed ladder shall be measured as the vertical distance multiplied by a factor of 2. (c) Access to fixed ladder at platform level should be adjacent to but separated from the direct path of egress. (d) Underplatform services ducts shall be provided with at least two means of escape with exits or exit accesses located near the two ends of the underplatform services ducts. Travel distances in Cl.2.2.4.4 and Cl.2.2.4.7 are not applicable to underplatform	(a) Fixed ladders complying with Cl.2.2.5.21 shall be acceptable as a means of escape, and (b) Access to fixed ladder at platform level shall not impede the direct path of egress. (c) Under-platform services ducts shall be provided with at least two means of escape with exits or exit accesses located near the two ends of the under-platform services ducts. Travel distances in Cl.2.2.4.4 and Cl.2.2.4.7 are not applicable to under-platform services ducts, except that one-way travel to exit or exit access shall not exceed 15m. It is acceptable that exit accesses are provided in the fire-rated wall that separates the under-platform services ducts into two sections as required by Note 8 of Table 2.5A.	*apply to any fixed ladder not just those under the under-platform services ducts.* *Existing Cl.2.2.4.5 (e) relocated to Cl.2.7.1.7 (h) to be together with other exit sign requirements.*	

	services ducts, except that one way travel to exit or exit access shall not exceed 15m. It is acceptable that exit accesses are provided in the fire-rated wall that separates the underplatform services ducts into two sections as required by Note 8 of Table 2.5A. (e) Non-illuminated exit and directional signs (e.g. sticker type) where used in cable chambers and underplatform service ducts shall comply with SS 508. Non-illuminated exit signs shall be fixed on the exit and/or exit access doors.			

Annex A

<table>
<tr><th>S/N</th><th>Existing Clause</th><th>Revised/New Clause</th><th>Public Comment</th></tr>
<tr><td>19</td><td>Cl.2.2.4.7 The maximum travel distance measured in accordance with Cl.2.2.4.8 shall not exceed the following:

<table>
<tr><td rowspan="2">Occupancy</td><td rowspan="2">Means of escape</td><td colspan="2">Maximum travel distance (m)</td></tr>
<tr><td>Sprinklered</td><td>Unsprinklered</td></tr>
<tr><td rowspan="2">Commercial</td><td>One-way</td><td>25</td><td>15</td></tr>
<tr><td>Two-way</td><td>60</td><td>45</td></tr>
<tr><td rowspan="2">Ancillary *</td><td>One-way</td><td>30</td><td>15</td></tr>
<tr><td>Two-way</td><td>75</td><td>60</td></tr>
<tr><td rowspan="2">High hazard</td><td>One-way</td><td>20</td><td>10</td></tr>
<tr><td>Two-way</td><td>35</td><td>20</td></tr>
<tr><td colspan="4">* See Cl.2.2.4.4 for requirements at buffer areas.
In a large floor area sub-divided into rooms, corridors and so forth, the travel distance requirements shall be deemed to be satisfied if the “direct distance” does not exceed 2⁄3 of the maximum travel distance permitted in this table. Furniture, internal partitions and equipment, e.g. air-handling unit, air-con chiller, tunnel ventilation fans, electrical switch board, in rooms may be ignored in determining the direct distance.</td></tr>
</table></td><td>Cl.2.2.4.7 The maximum travel distance measured in accordance with Cl.2.2.4.8 shall not exceed the following:

<table>
<tr><td rowspan="2">Occupancy</td><td rowspan="2">Means of escape</td><td colspan="2">Maximum travel distance (m)</td></tr>
<tr><td>Sprinkler-protected/ Open-to-sky</td><td>Non sprinkler-protected</td></tr>
<tr><td rowspan="2">Commercial</td><td>One-way</td><td>25</td><td>15</td></tr>
<tr><td>Two-way</td><td>60</td><td>45</td></tr>
<tr><td rowspan="2">Ancillary *</td><td>One-way</td><td>30</td><td>15</td></tr>
<tr><td>Two-way</td><td>75</td><td>60</td></tr>
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<tr><td>Two-way</td><td>35</td><td>20</td></tr>
<tr><td colspan="4">* See Cl.2.2.4.4 for requirements at buffer areas.
In a large floor area without sub division of rooms, corridors and so forth, the travel distance can adopt the “direct distance” concept as a guide and shall not exceed two-third of the maximum travel distance permitted in this table. Where the large floor area is subdivided into rooms, corridors, etc. the maximum travel distance shall be in accordance with the above table. Furniture, internal partitions and equipment, e.g. air-handling unit, air-con chiller, tunnel ventilation fans, electrical switch board, in rooms can be ignored in determining the direct distance.</td></tr>
</table>

Rationale: Open-to-sky is relatively safe and the travel distance can adopt sprinkler-protected category.</td><td></td></tr>
</table>

S/N	Existing Clause	Revised/New Clause	Rationale	Public Comment
20	Cl.2.2.5.1(b) A lobby that is separated from the adjoining areas of the station by a wall having a fire resistance of at least 1 hour. The exit door shall have fire resistance of at least half an hour fitted with automatic self-closing device conforming to the requirements of Cl.2.3.9.2. The design of a smoke-stop lobby must be such as not to impede movement of occupants through the escape route. The floor area of a smoke-stop lobby shall be not less than 3m². A smoke-stop lobby shall be ventilated by: (i) Permanent fixed ventilation openings in the external wall of the lobby; such ventilation openings shall have an area of not less than 15 per cent of the floor area of the lobby and located not more than 9m from any part of the lobby, or	Cl.2.2.5.1(b) The exit door to a smoke stop lobby that is separated by a wall having a fire resistance of at least 1 hr shall have fire resistance of at least ½ hr fitted with automatic self-closing device conforming to the requirements of Cl.2.3.9.2. The design of a smoke-stop lobby must not impede movement of occupants through the escape route. The floor area of a smoke-stop lobby shall be not less than 3m². A smoke-stop lobby shall be ventilated by: (i) permanent fixed ventilation openings in the external wall of the lobby. The total area of ventilation openings shall not be less than 15% of the floor area of the lobby. Each opening shall be at least 1m^2, and abut an external space or air-well having (1) a minimum clear area of 93m², (2) minimum width of	*Sub-clause (iii) is omitted as this kind of ventilation is deemed unacceptable and not found in a transit station.*	

	(ii) Mechanical ventilation complying with the requirements in *Section 2.6*, or (iii) Permanently fixed ventilation openings of area not less than 15 per cent of the floor area of the lobby and located not more than 9m from any part of the lobby, opening to an open air well which is open vertically to the sky for its full height. The air-well shall have a horizontal plan area of not less than 10m² or 0.1m² for each 300mm of height of the station, whichever is the greater. The minimum width of such space shall not be less than 3m. The enclosure walls to the air well shall have a minimum fire resistance of 1 hour and have no openings other than ventilation openings for the smoke-stop lobby, exit staircase and toilets, or	6m, and (3) without obstruction vertically throughout the air space for ventilation. No part of the lobby floor area shall be more than 9m to the air-well or external space; or (ii) Mechanical ventilation complying with the requirements in Section 2.6, or (iii) Cross-ventilated corridor having fixed ventilation openings in at least two opposing external walls. The opening of each wall shall be at least 50% of the wall area. No part of the corridor floor area shall be at a distance of more than 12m from any ventilation opening.		

	(iv) Cross-ventilated corridor having fixed ventilation openings in at least two external walls. The openings to each part of the external walls shall not be less than 50 per cent of the superficial area of the wall enclosing the corridors. No part of the floor area of the corridor shall be at a distance of more than 13m from any ventilation openings.			
21	Cl.2.2.5.2 Smoke Free Approach to Exit Staircase and Firemen's Staircase in Basement Occupancy: (a) In a station comprising more than 4 basement storeys, entry to exit staircases serving the basement storeys at every basement storey level shall be through smoke-stop lobbies, and (b) Entry to firemen's staircases at every basement storey level shall be via fire-fighting lobbies	Cl.2.2.5.2 Smoke-free approach to exit staircase and firefighting/exit staircase in basement occupancy: (a) In a station comprising more than four basement storeys, entry to exit staircase and firefighting/exit staircase serving the basement storeys at every basement storey level shall be through smoke-stop lobbies, and (b) Entry to exit staircase and firefighting/exit staircase at every basement storey level shall be via smoke-stop lobby	*The term "Firemen's staircase" will be replaced with "firefighting/exit staircase".*	

	in accordance with Cl.2.4.2.3, and (c) Smoke-stop lobbies and firefighting lobbies shall be required to comply with the relevant provisions under Cl.2.2.5.1(b) and Cl.2.4.2.3(c) respectively. They shall be mechanically ventilated to comply with the requirements in Section 2.6.	and firefighting lobby in accordance with Cl.2.4.2.3, and (c) Smoke-stop lobbies and firefighting lobbies shall be required to comply with the relevant provisions under Cl.2.2.5.1(b) and Cl.2.4.2.3(c) respectively. They shall be mechanically ventilated to comply with the requirements in Section 2.6.		
22	Cl.2.2.5.6(a) Internal Exit Staircase (i) Except as permitted in Cl.2.2.3.2 an internal exit staircase which serves as the required exit of the station shall be enclosed with construction complying with the provisions of Cl.2.3.8, and	Cl.2.2.5.6(a) Internal exit staircase (i) Except as permitted in Cl.2.2.3.2, an internal exit staircase which serves as the required exit of the station shall be enclosed with construction complying with the provisions of Cl.2.3.8. The enclosure walls of an internal exit staircase shall not have more than two exit doors opening into the exit staircase shaft at each storey. The two doors	*To stipulate a maximum of two exit door openings into the exit staircase. Previously, the maximum of two doors requirement is not stipulated except for internal exit passageway. For clarity, the need for two doors are explicitly stated.*	

		shall exclude the final discharge door; and		
23	Cl.2.2.5.6(f) Handrails (i) Every exit staircase shall have handrails on both sides, except that staircases that are 1250mm or less in width may have a handrail on one side only, and	Cl.2.2.5.6(f) Handrails Every exit staircase shall have handrails on both sides. For exit staircases with only 1.25m or less in width, handrail can be provided at one side, i.e. the opposite side shall be either wall, parapet or grilles; and	*This clause will be revised to be in line with similar requirement stipulated under Fire Code.*	
24	Nil	<u>New Clause</u> Cl.2.2.5.6(k) Landings The minimum clear width and length of a landing where there is a change in direction shall not be less than the clear width of the exit staircase. Cl.2.2.5.6(l) Risers and treads The height of riser for any exit staircase shall not be more than 175mm, and depth of tread shall not be less than 275mm. Cl.2.2.5.6(m) Headroom	*BCA does not regulate staircase landing for the under-mentioned spaces:* *(a) plants and equipment rooms;* *(b) the production area of an industrial building;* *(c) attic rooms in residential buildings; and* *(d) houses built by the owners for their own use.* *Cl.2.2.5.6(i) Intermediate landings on straight flight exit staircases should not be limited to be as long as the*	

		The clear headroom shall be at least 2m measured from the pitch line of the exit staircase or finished floor level of the landing to the underside of any obstruction.	*staircases width as the passenger flow is not redirected at the landing.* *Cl.2.2.5.6(j) Latest BCA building code requires minimum 275mm tread size.* *Cl.2.2.5.6(k) To specify clearly so as to avoid difference in interpretation.* *The above requirements was reinstated to ensure accessibility by firefighters to such spaces are not impeded.*	
25	Cl. 2.2.5.11(b) Internal exit passageway (ii) The enclosure walls of an exit passageway shall have not more than two exit doors opening into the exit passageway, and	Cl.2.2.5.11(b) Internal exit passageway (ii) The enclosure walls of an exit passageway shall not have more than two exit doors opening into the exit passageway. The two doors shall exclude the final discharge door and exit staircase door, and	*This existing clause does not mandate which doors can be excluded. The proposed addresses this clarity.*	
26	Cl.2.2.5.13(e) (i) Exit doors opening into exit staircases and exit passageways shall not impede the egress of occupants when such doors are swung	Cl.2.2.5.13(e) (i) Exit doors opening into exit staircases and exit passageways shall not impede the egress of occupants when such doors are swung open	*There is no stipulation on door opening requirement in the SFSRTS. The intent of the revision is to harmonise*	

	open in accordance with Diagram 2.2.5.13(e), and (ii) All exit access doors which open into the corridor shall not hinder movement of occupants. The corridor's clear width shall at least remain to be half of the required clear width as stipulated in Cl. 2.2.5.4 when such door(s) is swung open. Exception: Exit access doors of plant rooms in buffer areas.	in accordance with Diagram 2.2.5.13(e), and (ii) The corridor's clear width shall remain to be at least half of the required clear width as stipulated in Cl.2.2.5.4 when such door(s) is swung open. Exception: Exit access doors of plant rooms in buffer areas. (iii) The maximum exit doors and exit access doors opening force shall be 30N at 0º and 20N at 30º opening.	*the requirement with the Fire Code.*	
27	Nil	<u>New Clause</u> Cl.2.2.5.20 For non-habitable roof described in Cl.2.1.2.41, at least one exit staircase shall be provided. Where the area of non-habitable roof is large and one-way travel distance to the exit cannot be met, an additional fixed ladder in accordance with Cl.2.2.5.21 and adequately separated in accordance with Cl.2.2.5.16 and leading to the circulation area of the floor below shall be acceptable as a means of escape.	*This new clause addresses exit capacity for non-habitable roofs.*	

28	Nil	New Clause Cl.2.2.5.21 Fixed ladders (a) Fixed ladder shall comply with ANSI A14.3, American National Standard for Ladder - Fixed - Safety Requirements, or BS 5395 Part 3 - Stairs, Ladders and Walkways - Code of Practice for the Design of Industrial Type Stairs, Permanent Ladders and Walkways, shall be acceptable as a means of escape, (b) Any access hatches to access the fixed ladder, if provided, shall be readily openable and accessible from both above and below. (c) Access hatch openings shall have a minimum clear width of 1m. (d) The travel distance on the fixed ladder shall be measured as the vertical distance multiplied by a factor of 2.	*This new clause entails fixed ladder and access hatches requirements.*	
29	Cl.2.3.2.4(g) Areas of Special Hazard	Cl.2.3.2.4(g) Areas of Special Hazard	*Room for dry transformer or transformer using non-flammable liquids or generator in underground*	

	(i) Transformer rooms, generator rooms, and any other area of special high risk shall be separated from other parts of the station by compartment walls and floors having fire resistance of not less than 4 hours provided that transformer rooms which do not utilise flammable liquid shall be required to be separated from other parts of the station by compartment walls and compartment floors having fire resistance of not less than 2 hours, and (ii) Rooms housing transformer containing flammable liquid and generator rooms shall be located against an external wall.	(i) Transformer rooms, generator rooms, and any other area of special high risk shall be separated from other parts of the station by compartment walls and floors having fire resistance of at least 4 hrs. However, for transformer rooms which do not utilise flammable liquid, they shall be separated from other parts of the station by compartment walls and floors having fire resistance of at least 2 hrs, and (ii) Where room housing transformer that uses flammable liquid, the room shall be located at ground level against an external wall. (iii) Diesel fuel tank for emergency generator need not be located against an external wall	*stations are not required to be located against an external wall. This is because the flash point of diesel is above 60°C and thus not deemed highly flammable.*	

<table>
<tr>
<td></td>
<td>Exception: Generator rooms containing non-flammable liquids in underground stations are not required to be located against an external wall.</td>
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<tr>
<td>30</td>
<td>Nil</td>
<td><u>New Clause</u>

Cl.2.3.2.4(i) Underground bicycle parking area for transit occupants

Underground bicycle parking area including the bicycle kiosk shall be compartmentalized from the station public area with at least one dedicated exit staircase and bypass door to station subway; sprinkler-protected and provided with smoke purging system. The bicycle kiosk's size shall be limited to 30m^2. Types of trades and services permitted in the stations are given in <u>Table 2.1.3 – Code H</u>

Table 2.1.3 APPROVED TRADES AND SERVICES IN STATIONS

<table>
<tr><th>CODE</th><th>GROUPING</th><th>TYPE</th></tr>
<tr><td>….</td><td></td><td></td></tr>
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<td>The underground bicycle parking area and kiosk are additional spaces and not part of 100m^2 and 15m^2 commercial spaces.

Underground bicycle parking area and bicycle kiosk will be provided for some of the new underground stations. This proposal is to stipulate the fire safety requirements for the proposed underground bicycle parking area and bicycle kiosk in underground stations.

As the fire risk for the underground bicycle parking area and bicycle kiosk is unlikely to be higher than that of underground carpark, its smoke control system can follow that of underground</td>
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			H	Bicycle parking area(3)	- Bicycle kiosk(1,3) with activities confine to bicycle servicing, repairs, cleaning, sale of bicycle accessories and spare parts	*carpark i.e. smoke purging system. Engineered smoke control system is not required.* *The bicycle kiosk is restricted to only servicing, repairs and cleaning of bicycle and also limit to selling of bicycle accessories and spare parts. This kiosk is also not allowed to sell storage paint, solvent, thinner and bicycle batteries. Charging of battery activity for motorised bicycle is strictly not allowed in the bicycle parking area.*	

Conditions:

(1) There shall be no sale or storage of paint, solvent, thinner and bicycle batteries. Charging of bicycle batteries is not allowed in the bicycle parking area or bicycle kiosk.
(2) For the Food and Beverage outlets, there shall be no open flame.
(3) The underground bicycle area is excluded from the 115m^2 aggregated size for shop as permitted in Cl.2.1.3.4.

31	Cl.2.3.9.3 Pipes (a) Pipes which pass through a separating wall, compartment wall or compartment floor shall be kept as small as possible and fire-stopped around the pipe. The nominal internal diameter of the pipe shall be not more than the relevant dimension given in Table 2.3.9A with the exception of pipes having the necessary fire resistance when tested to BS 476: Part 20 or other acceptable standards. Clear spacing between pipes shall be minimum 50mm or ½-diameter of the largest pipe, whichever is the larger. Exception: Emergency standby diesel generator steel exhaust pipes connected directly to the external. (b) In additional to sub-clause (a), fuel and vent pipes for emergency standby diesel	Cl.2.3.9.3 Pipes (a) Pipes passing through ~~a~~ separating wall, compartment wall or compartment floor shall be kept as small as possible and fire-stopped around the pipe. The nominal diameter of the pipe shall not be more than the respective dimension given in Table 2.3.9A These pipe penetrations are permitted only for conveying non-hazardous & non-combustible substances such as air, water, etc., and approved fire-stopping material shall be applied around the pipe penetration. Clear spacing between pipes shall be minimum 50mm or ½ diameter of the largest pipe, whichever is larger. The following are exceptions and conditions where penetration of pipes of non-combustible material with nominal diameter larger than 150mm are permitted. Exception: (i) Emergency standby diesel generator steel exhaust pipes connected directly to the external;	*The revised requirements now permits pipe diameter size greater than 150mm.*	

	generators and fuel tanks located outside the room they served shall be enclosed in construction having fire resistance of not less than 2 hours. They shall not be located in intake/fresh air vent shaft.	(ii) Pipes of non-combustible material (such as cast iron or steel with pipe wall thickness of at least 5mm, and the melting point of at least 1200ºC) are permitted for nominal diameter larger than 150mm; (iii) For thermal insulated pipes with combustible insulation [such as those in chilled water pipes with pipe wall thickness of at least 5mm and in compliance with Cl.2.6.2.2(c)(i)], the metal sheath for insulation material shall be at least 0.6mm thick galvanised steel with the melting point, including pipe support, of at least 1200ºC; (iv) For non sprinkler-protected area, pipe supports within 3m from the pipe penetration shall be strengthened such that the tensile stress generated on the supports shall not exceed 10N/mm^2 and will not be softened or fracture when exposed to temperature of 800ºC. For sprinkler-protected area, the pipe supports and pipe penetrations shall be protected by the sprinkler system;		

		(v) Combustible materials or services (fire resistance or fire retardant materials can be considered as non-combustible for the purpose of this particular sub-clause) are not permitted to be placed within 1m before and after the penetration [except for those thermal insulated pipes constructed under the sub-clause (iii)]; (vi) This penetration shall not pass through fire-rated wall/floor of the following rooms/spaces, i.e. exit staircase, firefighting or smoke-stop lobby, electrical switch room, transformer room, generator room, battery room and fan room serving fire protection system, fire pump room, FCC, fuel tank room, and areas handling hazardous materials. Except for exit staircase, the penetration of pipes through the above-mentioned rooms/spaces is permitted if the pipes are fully enclosed by fire-rated enclosure with the same fire-rating as these fire-rated wall/floor.		

TABLE 2.3.9A MAXIMUM NOMINAL DIAMETER OF PIPES

Situation	Pipe material and maximum nominal diameter [mm]		
	Non-combustible Material[1]	Lead, aluminium or aluminium alloy or uPVC[2]	Any other material
When the pipes *(include pipe supports)* penetrate the structure enclosing a protected shaft which is not an exit stairway or lift shaft	150	100*[3(iii)]*	40*[3(iii)]*
Any other situation	150	100 (stack pipe)[3] 75 (branch pipe)[3]	*40*[3(iii)]

Notes

(1) A non-combustible material (such as for cast iron or steel pipes and the pipe supports with melting point of at least 1200ºC) which if exposed to a temperature of 800ºC will not soften nor fracture to the extent that flame or gases will pass through the wall of the pipe.

(2) uPVC pipes complying with SS 141 or SS 213. Use of PVC pipes shall comply with Cl.2.3.15.11.

(3)(i) Within toilets, wash rooms or external corridors, maximum diameter of uPVC pipes can be increased to double the size given in the above table.
(ii) Within areas of fire risk and adjacent to escape routes, uPVC pipes shall be enclosed by construction having fire resistance of at least $^1/_2$ hr.

		(iii) Where the size of uPVC pipes exceeds that specified under this clause, approved fire collar shall be fitted at all positions where such pipes pass through constructions required to act as a barrier to fire spread.		
32	Cl.2.3.12.3 Material for fire stopping Suitable fire-stopping materials include: (a) Proprietary fire-stopping and sealing systems (including those designed for service penetrations) which have been shown by test to maintain the fire resistance of the wall or other element, and are listed under the Singapore Productivity & Standards Board's Product Listing Scheme. (b) Other fire-stopping materials include: (i) Cement mortar; (ii) Gypsum based plaster; (iii) Cement or gypsum based vermiculite / perlite mixes; (iv) Glass fibre, crushed rock, blast furnace slag or ceramic	Cl.2.3.12.3 Material for fire stopping Suitable fire-stopping materials include: (a) Proprietary fire-stopping and sealing systems (including those designed for service penetrations) which have been shown under test conditions to maintain the fire resistance of the wall or other element, and are listed under Annex A of Appendix 15 of the Fire Code. (b) Other fire-stopping materials include: (i) Cement mortar; (ii) Gypsum based plaster; (iii) Cement or gypsum based vermiculite / perlite mixes; (iv) Glass fibre, crushed rock, blast furnace slag or ceramic based	*Annex A is the list of regulated fire safety products while Appendix 15 is the guidelines on certification of regulated fire safety products & materials.*	

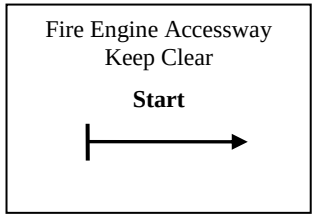
	based products (with or without resin binders); and (v) Intumescent mastics. The method of fire-stopping and choice of materials should be appropriate to the situation and its application.	products (with or without resin binders); and (v) Intumescent mastics. The method of fire-stopping and choice of materials should be appropriate to the situation and its application.		
33	Cl.2.3.13.2 Any reference to a surface being of a class other than Class 0 shall be construed as a requirement that the material which the wall or ceiling is constructed shall comply with the relevant test criteria as to surface spread of flame specified in relation to that class in BS 476:Part 7.	Cl.2.3.13.2 Any reference to a surface being of a class other than Class 0 shall be taken as complying with the relevant test criteria as to surface spread of flame specified in relation to that class in BS 476: Part 7.	*This clause is rephrased for clarity.*	
34	Cl.2.4.2.1 Access openings along external walls of stations, firemen's staircase for underground stations, fire engine accessway and fire engine access road shall be provided for fire fighting and rescue operations. Exception: Access opening and fire engine accessway are not	Cl.2.4.2.1 Fire access openings along external walls of elevated stations, firefighting/exit staircase for underground stations, fire engine accessway and fire engine access road shall be provided for firefighting and rescue operations. Exception: Fire access opening and fire engine accessway are not	*The term "firemen's staircase" will be replaced with "firefighting/exit staircase".*	

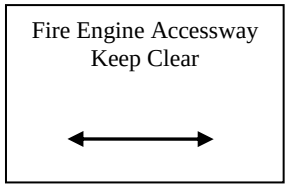
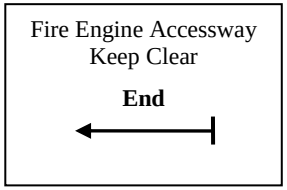
	required for single storey structure of stations above ground level.	required for single storey above ground stations.		
35	Cl.2.4.2.2 ACCESS OPENING Openings on the external wall for external firefighting and rescue operation. Access openings shall include unobstructed external wall openings, windows, glazed wall panels or access panels. Windows, doors, wall panels or access panels must be readily openable from the inside and outside, unless fitted by breakable glazing. Inside and outside of access openings shall be unobstructed at all times during the occupancy of the station.	Cl.2.4.2.2 Fire access opening Fire access openings shall be provided on the external wall for external firefighting and rescue operation. They shall include unobstructed external wall openings, windows, balcony doors, glazed wall panels or access panels. Windows, doors, wall panels or access panels must be readily openable from the inside and outside. Inside and outside of fire access openings shall be unobstructed at all times during the occupancy of the building. There shall be no furniture or any other obstruction within 1m from the fire access openings at the landing inside the building.	*The placement of object after the designated fire access opening is not permitted. In this revision, the unobstructed distance of 1m is stipulated to aid clarity.*	
36	Cl.2.4.2.3 FIREMEN'S STAIRCASE (a) At least one firemen's staircase shall be provided for every underground station.	Cl.2.4.2.3 Firefighting/exit staircase (a) At least one exit staircase shall be designated as a firefighting/exit staircase	*The term "firemen's staircase" will be replaced with "firefighting/exit staircase".*	

	(b) The entrance to firemen's staircase on the ground level shall be visible and within 18m from a fire engine access road. (c) Firemen's staircase shall have access to every basement storey via firefighting lobbies. (d) Fire-fighting lobby shall not be used for any other purposes and the size of the firefighting lobby shall not be smaller than 6m² and with no dimension smaller than 2m. Where the fire-fighting lobby has a fire lift provided under Cl.2.5.7.4(c), the floor shall be graded from the lift door towards the lobby door with a fall not exceeding 1 in 200.	provided for every underground station. (b) The entrance to firefighting/exit staircase on the ground level shall be visible and within 18m from a fire engine access road. (c) Firefighting/exit staircase shall have access to every basement storey via firefighting lobbies. (d) Firefighting/exit staircase shall not be used for any other purposes and the size of the firefighting lobby shall be at least 6m² and with no dimension smaller than 2m. Where the firefighting lobby has a fire lift provided under Cl.2.5.7.5(c), the floor shall be graded from the lift door towards the lobby door with a fall not exceeding 1 in 200.		
37	Cl.2.4.2.4(b)(iii) Accessway Accessway shall be metalled or paved or laid with strengthened perforated slabs to withstand the	Cl.2.4.2.4(b)(iii) Fire engine accessway Fire engine accessway shall be metalled or paved or laid with	*To be more specific on the term used i.e. accessway to be amended and read as fire engine accessway.*	

	loading capacity of stationary 30 tonnes fire engine. (See APPENDIX E for additional information).	strengthened perforated slabs to withstand the loading capacity of stationary 30 tonnes firefighting appliances. For structural loading of 30 tonnes firefighting appliances on fire engine accessway, see Appendix E for additional information.		
38	Cl.2.4.2.4(b)(vii) Overhead clearance Overhead clearance of accessway and fire engine access road shall be at least 4.5m for passage of fire fighting appliances.	Cl.2.4.2.4(b)(vii) Overhead clearance There shall be no overhead structure such as link bridge/way over fire engine accessway. However, overhead structure over fire engine access road is permitted subject to the following: (1) the overhead clearance for passage of firefighting appliances shall be at least 4.5m; (2) the depth of the overhead structure shall not be more than 10m; (3) where more than one overhead structure span across the fire engine access road, the separation distance between two adjacent overhead structures shall be at least 20m apart; and	*The revised clause is intended to address link bridge spanning across the fire engine access road.*	

		(4) length of the end-stretch of the fire engine access road shall be at least 20m with no overhead structure.		
	Cl.2.4.2.4(b)(ix) Obstruction Accessway and fire engine access road shall be kept clear of obstructions and other parts of the building, plants, trees or other fixtures shall not obstruct the path between the accessway and access openings.	Cl.2.4.2.2(b)(ix) Obstruction Fire engine accessway / fire engine access road shall be kept clear of obstructions at all times. Plants, trees or other fixtures shall not obstruct the path between the fire engine accessway and fire access openings.		
39	Cl.2.4.2.4(c) Marking of fire engine accessway (i) All corners of accessway shall be marked. (ii) Marking of corners shall be in contrasting colour to the ground surfaces or finishes. (iii) Accessway provided on turfed area must be marked with contrasting object (preferably reflective) that is visible at night. The markings are to	Cl.2.4.2.4(c) Marking of fire engine accessway (i) All corners of fire engine accessway shall be marked. (ii) Metalled/non-metalled or paved/non-paved surfaces fire engine accessway shall be marked with reflective white or yellow strips of size not less than 100mm (W) x 400mm (L). The markings shall be visible at night and shall be provided on both sides of the fire engine	*The markings serve to guide our firefighters when responding to a fire incident at night.* *The sign posts at the start and end of the fire engine accessway is needed to inform our firefighters. In between sign posts are for reminding public to keep the fire engine accessway clear of obstruction at all times.*	

	be at an interval not more than 3m apart and shall be provided on both sides of the accessway. (iv) Sign post displaying the wordings 'Fire Engine Accessway/Access Road - Keep Clear' shall be provided at the entrance of the accessway. Size of wordings shall not be less than 50mm.	accessway at an interval of not more than 5m apart. (iii) Sign post with red wordings of not less than 50mm in height shall be provided at the start and end of the fire engine accessway. The height measured from the ground to the lowest point of the sign shall be between 1m and 1.5m. The sign post shall be visible at night and shall not be positioned more than 3m from the fire engine accessway. Every part of the fire engine accessway shall not be more than 15m from the nearest sign post (see below illustration). (1) At the start of the fire engine accessway 		

		(2) Along fire engine accessway  (3) At the end of the fire engine accessway  		
40	Cl.2.5.1.4 Air plenums which do not contain combustible materials need not be provided with fire protection.	Cl.2.5.1.4 Air plenums (a) Air plenums which do not contain combustible materials need not be provided with fire protection. (b) Fire resistant/flame retardant, low smoke zero halogen (LSOH) type cables are permitted to be run	*As part of harmonizing requirements permitted under Fire Code, this requirement is now extended to SFSRTS. Low-smoke and low-flame rated PVC cables are permitted to be run exposed in the plenum provided it is protected by automatic fire alarm system.*	

		exposed in air plenum, provided that: (i) The air plenum shall be protected by fire detection system. (ii) FCU or AHU using plenum for air return and serving more than one room shall be provided with smoke detector(s) at the return air plenum or return air duct to shut down the FCU/AHU upon detection of smoke.		
41	Nil	<u>New Clause</u> Cl.2.5.1.6 Under-platform service ducts (UPSD) and cable chambers not exceeding 2m from floor to ceiling height need not be considered as a basement storey (as defined in Cl.2.1.2.8) for purposes of determining fire lift provision. The UPSD shall contain only cables and no mechanical, electrical and plumbing plant.	*To explicitly state that under-platform services ducts and cable chambers are not considered as a storey for clarity.*	

42	Table 2.5A COMPARTMENTATION AND FIRE PROTECTION REQUIREMENTS Usage (1) Transformer room (oil type)[1]	Table 2.5A COMPARTMENTATION AND FIRE PROTECTION REQUIREMENTS Usage (1) Transformer room	*The current term "oil type" give the impression that the transformer without the presence of oil need not be compartmentalized. In all cases, transformer is required to be compartmented from other usages regardless whether with or without oil.*	
43	Cl.2.5.3.3 Basement commercial spaces on commercial floors shall be provided with dry mains in compliance with SS CP29 except as herein modified: (a) Landing valves shall be provided such that any part within the basement commercial spaces is within 38m from a landing valve, the distance to be measured along a route suitable for the hoseline.	Cl.2.5.3.3 Basement commercial spaces on commercial floors shall be provided with dry mains in compliance with SS CP 29. (a) Landing valves shall be provided such that any part within the basement commercial spaces is within 38m (30m hose line length and a jet throw of 8m) from a landing valve, the distance to be measured along a route suitable for the hose line.	*An explanation on how the 38m is derived is added in the revised clause.*	
44	Cl.2.5.3.4 The design of the dry mains in the station shall comply with requirements of SS 574 except as herein modified:	Cl.2.5.3.4 The design of the dry mains in the station shall comply with requirements of SS 574.	*An explanation on how the 68m is derived is added in the revised clause.*	

	(a)(i) Landing valves shall be provided such that every part of each floor is within 68m from a landing valve along a route suitable for the hose line.	(a) (i) Landing valves shall be provided such that every part of each floor is within 68m (2 X 30m hose line length and a jet throw of 8m) from a landing valve along a route suitable for the hose line.		
45	Cl.2.5.4.2 Water supply, location and details of installation for hose reels shall comply with the requirements of SS 575 except as herein modified: (a) Hose reels shall be located in the following order of priority: (i) adjacent to exits and protected lobbies; (ii) along exit routes; and (iii) within rooms.	Cl.2.5.4.2 Water supply, location and details of installation for hose reels shall comply with the requirements of SS 575. (a) Hose reels shall be located in the following order of priority: (i) within a distance of 5m from the exit door but not inside exit staircases. If there are parts of the floor space that are beyond the 36m coverage (30m hose path plus 6m throw) of the hose reel, additional hose reels shall be provided at the common area or at a distance of not more than 5m from the exit access door of a room. (ii) along exit routes; and	*For ease of reference, the term "adjacent" will be replaced with 5m distance for clarify.*	

		(iii) within rooms. Hose reel located within a room shall not be more than 5m from the exit access door of the room and shall not be used for covering the areas outside the room.		
46	Cl.2.5.6.2 Installation of the sprinkler system and its associated water supply, control and testing requirements shall comply with SS CP 52 Code of Practice for Automatic Fire Sprinkler System except as herein modified: (a) Hazard groups for the sprinkler design shall be as follows: (i) Ordinary Hazard 1 for ancillary areas; and (ii) Ordinary Hazard 3 for commercial spaces. (b) Sprinkler pipes passing through the public areas and underplatform services duct need not be	Cl.2.5.6.2 Installation of the sprinkler system and its associated water supply, control and testing requirements shall comply with SS CP 52 Code of Practice for Automatic Fire Sprinkler System. (a) Hazard groups for the sprinkler design shall be as follows: (i) Ordinary Hazard 1 for ancillary areas; and (ii) Ordinary Hazard 3 for commercial spaces. (b) Sprinkler pipes passing through the public areas and under-platform services ducts need not be	*Flexible sprinkler pipe is part of design requirements permitted for proposed sprinkler system.*	

	enclosed within fire rated enclosures; and (c) Tunnel Ventilation Fan room and Smoke Control Fan rooms which also serve as smoke plenums shall be protected by detectors. (d) Cut-off sprinklers are not required above exit doors of staircases and exit passageways if the exit doors are located in the station public areas. (e) Magnetic (short circuit) trips are permitted for use in motor circuits of electric motor driven pumps. (f) The sprinkler control valves and ancillary equipment shall be located in the fire pump / tank room.	enclosed within fire rated enclosures; and (c) Tunnel Ventilation Fan room and Smoke Control Fan rooms which also serve as smoke plenums shall be protected by detectors. (d) Cut-off sprinklers are not required above exit doors of exit staircases and exit passageways if the exit doors are located in the station public areas. (e) Magnetic (short circuit) trips are permitted for use in motor circuits of electric motor driven pumps. (f) The sprinkler control valves and ancillary equipment shall be located in the fire pump / tank room. (g) The flexible tube of metal construction and braided are permitted for connection to individual sprinklers and to rigid		

		pipework above suspended ceiling and shall be of approved/listed type.		
47	Cl. 2.5.7.5 Fire Lift (a) Underground stations exceeding 3 basement storeys shall be provided with at least one fire lift. (b) The fire lift shall be contained within a separate protected shaft or a common protected shaft containing other lifts subject to such other lifts being served at each storey by a fire-fighting lobby. (c) A fire lift shall have access to every habitable floor above or below the designated floor and shall be adjacent and accessible to an exit staircase and be approached by a fire-fighting lobby at each storey. (d) A fire lift shall be provided with an operational feature that would enable firemen to cancel first or earlier call which had been	Cl. 2.5.7.5 Fire Lift (a) Underground stations where the depth between basement 1 finished floor level to the lowest storey finished floor level (cable chamber/under-platform is not considered a storey) exceeds 9m shall be provided with at least one fire lift. (b) The fire lift shall be contained within a separate protected shaft or a common protected shaft containing other lifts subject to such other lifts being served at each storey by a firefighting lobby. Basement 1 (with no retail usage) can be considered as designated firefighters entry floor if the proposed fire lift cannot be extended directly to grade without transfers. For such design, all 'at-grade' entrances with passenger lifts leading to basement 1 shall double up for use by firefighters and be fitted with fire lift switches and emergency supplies.	*To align with the Fire Code on the need for fire lifts to be based on height rather than number of storeys as future stations are getting deeper. This facilitates firefighters bringing equipment down into the station and carrying out rescue works.* *The height can be taken in measurement from basement 1 in recognition where basement 1 is accessible via passenger lifts from multiple entrances and where the entrances, subways and basement 1 public areas are all constructed in non-combustible materials and well ventilated with fresh air supply being drawn in from each of the entrances. The basement 1 can be considered a safe area to reach the fire lift. This provision is an added benefit*	

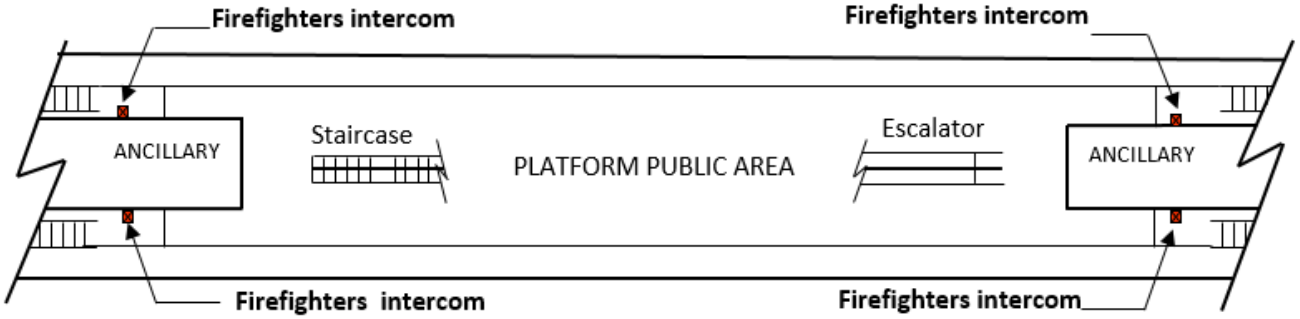
	inadvertently made to the fire lift during an emergency. (e) A lift mainly intended for the transport of goods shall not be designated as a fire lift.	(c) A fire lift shall be located such that the travel distance between the nearest edge of the lift landing door and exit staircase door is not more than 5m and the exit staircase shall be approached through a firefighting lobby at every storey, including first storey. The fire lift shaft shall be continuous throughout the building and serve every storey except non-habitable roof as defined under Cl.2.1.2.41. (d) The fire lift operational features shall be provided and activated via a fire lift switch in accordance with SS 550. (e) A lift mainly intended for the transport of goods shall not be designated as a fire lift. Cargo lift shall not open into a firefighting lobby.	*to the firefighters as they can use any of the station entrance lifts into the station and negates the need to negotiate the road system to locate and access the single firefighting entry normally provided.* *The fire lift shall be located such that any part of every storey shall be accessible by firefighters from the fire lift.*	
48	Nil	<u>New Clause</u> Cl.2.6.7 **REDUNDANCY FOR FIRE PUMP SYSTEM** Cl.2.6.7.1 The pumping system for hose reel, sprinkler and hydrant shall be provided with	*SFSRTS did not stipulate back-up for fire pump system while Cl.5.2 of CP 52 and Cl.5.1.9, 10 & 11 of SS 575 mandate at least 2 pumps. Although this aspect of a duty and standby pumps are stipulated, the requirement of*	

		redundancy such that the system performance is not affected when one of the pumps and/or the associated control system is out of operation due to routine maintenance or break-down.	*its associated control system are not being explicitly highlighted. To avoid confusion, this aspect of redundancy should be reflected in this standard.*	
49	Nil	<u>New Clause</u> Cl.2.7.1.7 (h) Under-platform services ducts and cable chamber can use non-illuminated exit and directional signs (e.g. sticker type) in compliance with SS 508. Non-illuminated exit signs shall be fixed next to the cat ladder access.	*This new clause is relocated from existing Cl.2.2.4.5(e) with an amendment to highlight the location of illuminated exit signs next to cat ladder access.*	
50	Cl.2.7.1.7 Exit and Directional Signs (d) The legends, dimensions, design and installation of the exit signs and directional signs shall comply with SS 563 and SS 508. Externally illuminated exit signs shall comply with Cl.4.3.2.3 of SS 563. Exception: Externally illuminated exit signs in normally not occupied plant rooms need not be lighted at all times. However, during power failure, the emergency lighting in	Cl.2.7.1.7 Exit and Directional Signs (d) The legends, dimensions, design and installation of the exit signs and directional signs shall comply with SS 563 and SS 508. The design of the signage in graphic or text format is acceptable. Externally illuminated exit signs shall comply with SS 563. Exception: Externally illuminated exit signs in normally non-occupied plant rooms need not be lighted at all times. However, during power	*Sub-clause (e) is omitted as this type of radioactive material used to power self-illuminating exit and direction sign are not used in Rapid Transit Station. The sub-clause is thus deleted for purpose of clarity.*	

	the rooms shall provide the required illumination to the signs. (e) The use of self-illuminating exit and direction signs with letters in green and powered by radioactive material may be allowed within the stations. (f) Self-illuminating fire safety signs complying with BS 5499 Pt 2 can be used in lieu of emergency signs powered by electricity.	failure, the emergency lighting in the rooms shall provide the required illumination to the signs. (e) Self-illuminating fire safety signs complying with BS 5499 Pt 2 can be used in lieu of emergency signs powered by electricity.		
51	Cl.2.7.2.1 One and two-way emergency voice communication shall comply with requirements stipulated in SS 546 Code of Practice for Emergency Voice Communication Systems in Buildings. Exception: Locations of remote handsets for two-way emergency voice communication system shall comply with Cl.2.7.2.7.	Cl.2.7.2.1 One and Two-way Emergency Voice Communication shall comply with requirements stipulated in SS 546 Code of Practice for Emergency Voice Communication Systems in Buildings. Exception: (a) Provision of the Two-way Emergency Voice Communication System shall only be required for underground station. Locations of remote handsets for Two-way Emergency Voice	*On top of dual feeder power supply, there is also emergency backup battery. There are two layers of redundancy to ensure the emergency voice communication system will not fail during power failure mode.*	

		Communication System shall comply with Cl.2.7.2.7. (b) The 4-hr backup battery capacity required in SS 546 for the Emergency Voice Communication (EVC) system can be halved if it is supported by a dual feeder power supply.		
52	Cl.2.7.2.6 Emergency fire phones Emergency fire phones (a two-way voice communication system) shall be provided in lieu of manual call points in the station public areas such that a person needs not travel more than 90m to an emergency fire phone on any level to report a fire. The Passenger Service Centre (PSC), where provided, can be considered as a reporting station.	Cl.2.7.2.6 Emergency fire phones Emergency fire phones (a two-way voice communication system) shall be provided in lieu of manual call points in the station public areas such that a person does not need to travel more than 90m to an emergency fire phone on any level except platform to report a fire. The PSC, where provided, can be considered as a reporting station. At platform level, emergency fire phones shall be located one on each side of the platform near or next to all the escalator landings (see illustration below).	*This clause is amended to include the specific location of emergency fire phones at platform level.*	

				
53	Cl.2.7.2.8 Firemen intercom shall be provided for communication between the spaces where the tunnel dry mains breeching inlets are located at ground level and the buffer areas. The intercom unit at the buffer areas shall be located near the access stairs at the platform leading to the track level.	Cl.2.7.2.8 Firefighters intercom shall be provided at the dry mains breeching inlet at the ground level and the landing valves at the buffer areas. The intercom unit at the buffer areas shall be located near the access stairs at the platform leading to the track level.	*The term "firemen" will be replaced with "firefighters".*	

	 Locations of firefighters intercom at platform level			
54	Cl.2.7.5 **PLANS FOR FIREMEN** 2.7.5.1 Two paper sets of plans shall be kept next to the main alarm panel (MAP) in a dedicated plan box marked "BUILDING LAYOUT PLANS FOR FIREMEN" to help firemen to navigate in the station. The plans shall: (d) show the fire lift, firemen's stair, smoke-stop lobbies, fire pump room, landing valves, Two-way Emergency Voice Communication handsets and firemen intercoms in red; and	Cl.2.7.5 **PLANS FOR FIREFIGHTERS** Cl.2.7.5.1 Two paper sets of plans shall be kept next to the main alarm panel (MAP) in a dedicated plan box marked "BUILDING LAYOUT PLANS FOR FIREFIGHTERS" to help firefighters to navigate in the station. The plans shall: (d) indicate the fire lift, firefighting/exit staircase, exit staircase, firefighting lobbies, smoke-stop lobbies, fire pump room, landing valves, Two-way Emergency Voice Communication	*The term "Firemen" will be replaced with "Firefighters". Similarly for the term "firemen's stair", it will be replaced with "firefighting/exit staircase".*	

		handsets and firefighters intercoms in red; and		
55	Cl.2.7.2.9 Underground stations shall be provided with radio communication facilities capable of operating in the frequency band of 470 – 490 MHz range.	Cl.2.7.2.9 Underground stations shall be provided with radio (voice and data) communication facilities capable of operating in the frequency band as allocated and approved by Relevant Authority.	*In view that the frequency band may deviate from that as prescribed in the existing clause, the revised clause accords that flexibility.*	
56	Cl.2.7.6.3 A FCC shall be located adjacent to the fire lift lobby at the designated storey of the building i.e. the lobby of the building on the first storey or immediately adjacent thereto.	Cl.2.7.6.3 A FCC shall be located at grade and within 5m from the nearest edge of the door of the firefighting lobby.	*The term "adjacent" will be replaced with "5m" distance for clarity.*	
57	Nil	New Clause Cl.2.7.8 **REDUNDANCY FOR MECHANICAL VENTILATION AND PRESSURISATION SYSTEMS** Cl.2.7.8.1 The fan and its associated controller for the following system shall be provided with redundancy such that the system performance is not affected when one of the fan and/or controllers is out of operation due to routine maintenance or break-down.	*This aspect of redundancy is not explicitly stated in most Code of Practices. It is stated in this standard to make it explicit.*	

		(a) Mechanical ventilation systems for (i) smoke-stop/firefighting lobbies, (ii) exit staircases, (iii) essential rooms (e.g. sprinkler/hydrant/hose reel pump room, standby generator room, FCC, etc) (b) Engineered smoke control system, (c) Smoke purging system, and (d) Pressurisation systems for smoke-stop/firefighting lobbies and exit staircase.		
58	Cl.2.9.5.1Underground or enclosed trainways shall be provided with radio communication facilities capable of operating in the frequency band of 470 - 490 MHz range.	Cl.2.9.5.1 Underground or enclosed trainways shall be provided with radio communication facilities capable of operating in the frequency band as allocated and approved by Relevant Authority.	*In view that the frequency band may deviate from that as prescribed in the existing clause, the revised clause accords that flexibility.*	

59	Cl.3.1.3 **RADIO COMMUNICATION** Basement storey(s) of depot shall be provided with radio communication facilities capable of operating in the frequency band of 470 – 490 MHz range.	Cl.3.1.3 **RADIO COMMUNICATION** Cl.3.1.3.1 Basement storey(s) of depot shall be provided with radio communication facilities capable of operating in the frequency band as allocated and approved by Relevant Authority.	*In view that the frequency band may deviate from that as prescribed in the existing clause, the revised clause accords that flexibility.*	
60	Nil	<u>New Clause</u> Cl.3.1.1.1 (f) There shall be one FCC to be provided at the depot development, which can consist of more than one building subject to the following: (i) It shall be located at the main building nearest to the front entrance of the depot development, which is part of the ingress of the fire engine accessway/access road; (ii) In the case of multiple railway operators within the same depot development, the fire emergency operation shall be managed by a single lead operator; and (iii) All the fire alarm panels, control and monitoring devices of other fire safety systems e.g.	*Depot development consisting of more than one building is managed by a single railway operator in term of depot control and monitoring, and emergency operation. For the case of multiple railway operators within the same depot development, the fire emergency operation will be still managed by a single lead operator.* *All the alarm panels, control and monitoring devices of other fire safety systems like engineered smoke control system, emergency voice communication system and lift supervisory (if any) from respective buildings will be consolidated and installed*	

		engineered smoke control system, emergency voice communication system and lift supervisory (if any) from respective buildings shall be housed inside this single FCC.	*into this single Fire Command Centre (FCC) for the betterment of SCDF's control & over view of the fire situation & firefighting deployment in the depot development.* *In view of the above arrangement, a single FCC is sufficient to support firefighting operations.* *Further, the buildings in the depot are less than 24m habitable height, thus requiring less fire safety provisions as there is no requirement for fire lift, voice communication system, fire command centre, pressurised exit staircases, etc.*	
61	Appendix J, J.4.8 Except on the designated floor as defined in SS 550, emergency fire phone shall be provided at each lift landing for PWDs to communicate with the Passenger Service Centre (PSC).	Appendix J, J.4.8 Except on the designated floor as defined in SS 550, emergency fire phone shall be provided at each lift landing for PWDs to communicate with the Passenger Service Centre (PSC). In the absence of PSC, the emergency fire phone provided at	*There are no PSC in LRT stations and therefore it is important to state that the emergency fire phone shall be connected to the Operation Control Centre.*	

		each lift landing shall be connected to the Operation Control Centre.		

Note: Please note that the existing clause numbering system will be changed and this may lead to changes in the numbering of above appended revised/new clause nos. Nevertheless, the contents reflected in the revised/new clauses as appended in this table remain unchanged.