



### Technical Talk on “Passive Fire Protection for Tunnel and Underground Space Development

by Ir. Frankie Cheah

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Mr. Tony Koo and Ir. Sean Lee both speakers for the evening talk

A technical talk was organised by Tunnelling and Underground Space Technical Division (TUSTD) on a topic entitled “Passive Fire Protection for Tunnel and Underground Space Development.” The talk was held at the Tan Sri Professor Chin Fung Kee Auditorium in Wisma IEM Petaling Jaya at 5.30pm on 17 October 2019. The talk was attended by 31 participants.

Fire and Life Safety is paramount for a railway metro system as the prime objective is to minimise / to mitigate any risks of casualty / damages to human lives and assets through implementation of effective preventive and protective measures right from the outset of planning stage, through design, construction and operation. Mr. Tony Koo (left) & Ir. Sean Lee (right) who is both the director of AECOM Perunding Sdn Bhd started the talk by outlining the key considerations for tunnel and underground fire safety measures include design, regulatory compliance and operation requirement. Summary descriptions for each of the key design considerations are consolidated accordingly in Table 1 .

Table 1: Key Design Considerations for Tunnel and Underground Space Development

Design Requirement	Regulatory Compliance (Authority and Standard Compliance)	Operation Requirement
Functional Needs Criterion Operation Requirement Ridership Guidance/Reference for system design	Similarities – Provision for fire safety system for active protection, escape/evacuation and emergency access Differences – code written specifically for the respective infrastructure which adopt the related condition of the respective system and provision. Example as below: - Singapore (SCDF) – Fire Safety in Rapid Transit System (SFSRTS) Hong Kong (FSD) – Fire Safety Requirements for New Railway Infrastructures cover FSI Malaysia (JBPM) – Uniform Building by Law (UBBL)	System capacity (i.e. ridership and mass-carrying capacity) Type of rolling stocks and train’s power source Fire Size Platform screen door Operation procedure Safety provision Type of signaling control for train Ventilation/Fire Detection zones Air control movement

Projects covered in the talk by both speakers are Sungai Buloh-Kajang (SBK) and Sungai Buloh-Serdang-Putrajaya (SSP) MRT Lines. The principle design objectives are as followed:

- i. To minimise risk of fire outbreak
- ii. To minimise spread of smoke and fire to adjacent areas
- iii. To maximise survivability of occupants, intimate with a fire location.
- iv. To ensure that occupants remote from fire location are protected and provided with efficient means of evacuation / escape provision.
- v. To provide safe access for fire officers attending a fire incident

Typical types of exit provision within the tunnel alignment are Exit Points and Cross Passageways as shown in Figure 2.

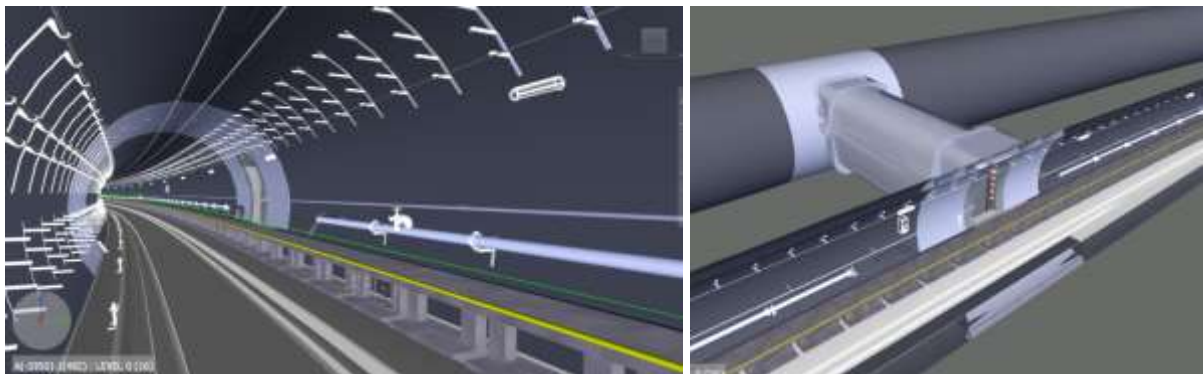


Figure 1: Side detrainment along tunnel walkway and Cross Passage are the exit and escape points at fire scenario

The fire train size adopted in both SBK and SSP Lines is 6.2MW in accordance with the design clause in BS6853:1999 Code of Practice for fire precautions. The general requirements in BS6853:1999 are in respect to the following principles:

- Requirements on level of flammability, smoke emission and its toxicity, spread of flame for all materials used in the construction of the train.
- Control of spread of fire from undercar to saloon with minimum of 20 minutes fire integrity (both SBK and SSP are with 30 minutes fire integrity)
- Evacuation with comprehensive on emergency exit provisions.

Apart from fire precaution, tunnel ventilation is another major contribution for tunnel and underground space development as shown in Figure 3.

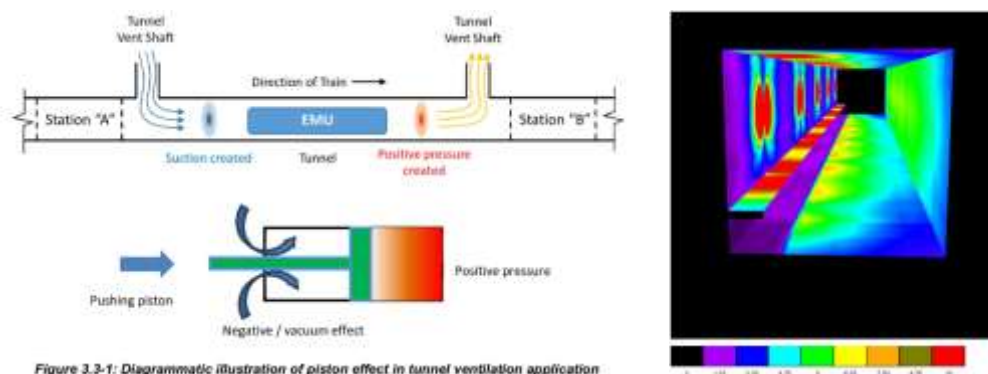


Figure 3.3-1: Diagrammatic illustration of piston effect in tunnel ventilation application

Figure 2: Diagram Illustration of Tunnel Ventilation Concept and Emergency lighting illumination

Fire Detection and Protection System in accordance with BS EN54 / MS 1489 and MS1210 for linear heat detection are required as mentioned by both speakers. Further to both detection and protection, emergency lightings and exit signages in accordance with the NFPA clauses are relatively vital in order to provide lightings for a period of evacuation and illumination on the walkway during emergency.

All provision and design requirements presented by the speakers in the talk is to ensure that the tunnel design and underground space development is able to provide a good evacuation coverage during emergency for the public to escape to a safe zone. Besides, minimum provision for evacuation coverage such as escape staircases, fireman access, sprinkle protection together with passive provision such as fire compartmentation for 2-4hrs with nonflammable and combustibile building materials help to minimise fire size/risk.

The talk ended with a Q & A session and followed by the presentation of certificates to both speakers at 7.30pm.