

Experimental Studies on Fire Engineering Systems for Non-industrial Workplaces

W.K. Chow

BSc, MST, PhD, CEng, FCIBSE, FHKIE, MIFireE
Chair Professor of Architectural Science and Fire Engineering
Principal Investigator, Areas of Strength: Fire Safety Engineering
Director, Research Centre for Fire Engineering
Department of Building Services Engineering
The Hong Kong Polytechnic University, Hong Kong, China
Email: bewkchow@polyu.edu.hk; Fax: (852) 27657198



Introduction

The performance of three types of active fire protection engineering systems in controlling office fires are evaluated through studying the heat release rates in a full-scale burning facility in China as shown in Figure 1.

- sprinkler system
- water mist system
- total gas flooding system with clean agent heptafluoropropane

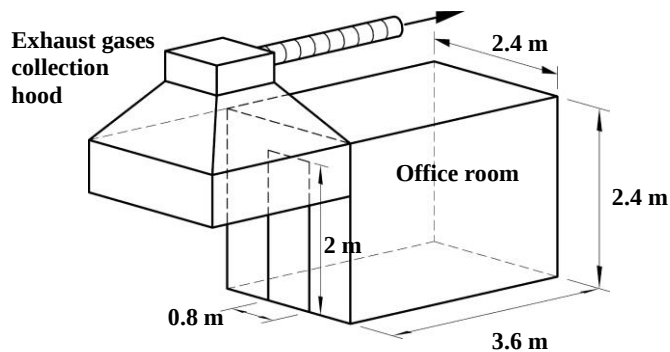


Figure 1: Office fire test



Figure 2: Office fire scenario

Results

It is found that even under a small office fire, the heat release rate cannot be controlled at the value once the system (sprinkler, water mist or total flooding gas protection system) is activated. For water mist, it can even be up to the peak value of the base scenario without operating the system. In using the total flooding gas protection system, the amount of clean agent to be discharged is a key point to consider. Re-ignition is very dangerous when the agent is used up.

Experiments

A typical office arrangement (base scenario) as shown in Figure 2 was ignited by simulated accidental fire conditions and burnt to give flashover. The heat release rate was measured. The test was then repeated with the operation of sprinkler; water mist and total gas flooding system for assessing their performance. The resultant heat release rate curves are shown in Figure 3.

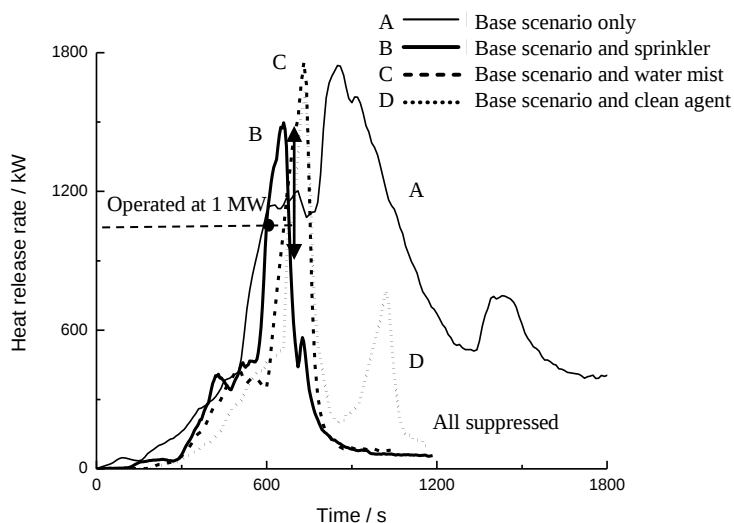


Figure 3: Heat release rate curves

Key References

- Chow, W.K., *Special Issue on full-scale burning tests, International Journal on Engineering Performance-Based Fire Codes*, 6(3), 2004.
- Chow, W.K., *Comment on estimating heat release rate for a design fire in sprinkler protected area, International Journal on Engineering Performance-Based Fire Codes* 7(1), 1-5, 2005.
- Garrad, G. & Smith, D.A., *The characterisation of fires for design*, Interflam'99, Proceedings of 8th International Fire Science & Engineering Conference, 29 June – 1 July, Edinburgh Conference Centre, Scotland, Vol. 1, 555-566, 1999.
- NFPA 13 Standard for the Installation of Sprinkler Systems, 1-4.2, Chapter 1 General Information*, National Fire Protection Association, Quincy, Mass., USA, 1999.
- NFPA 750 Standard on Water Mist Fire Protection Systems, 1-4.8, 1-4 Definitions, Chapter 1 General Information*, National Fire Protection Association, Quincy, Mass., USA, 2000.
- W.K. Chow, "Experimental studies on fire engineering systems for non-industrial workplaces", https://scholar.google.com/scholar?hl=zh-TW&as_sdt=0%2C5&q=Experimental+Studies+on+Fire+Engineering+Systems+for+Non-industrial+Workplaces&btnG=

CIBSENC06-D3-poster

NCIBSE06-1b

Record:

NCIBSE06-1a (opened 13 Jul 2023; from CIBSENC06-D3-poster)

NCIBSE06-1b (opened 19 Jul 2023)