

Continuing Professional Development Course

'External Fire Spread Risk in Tall Building Design'

Edition: 3rd Edition

Location: Advanced Engineering Building, The University of Queensland, St. Lucia Campus, 4072 QLD, Australia

Dates: 29th April – 3rd May 2019

Contact Hours: 35 hours, five (5) days 8:00AM – 5:00PM

Cost: AU\$5,000 (not including GST)

Website: <http://www.civil.uq.edu.au/fire-externalspreadcpd>

Registration: [Application form](#) and 2-page CV/Resume via email ugfirecpd@civil.uq.edu.au

Background

Recent fire events in buildings involving cladding systems in the United Kingdom and the United Arab Emirates have raised concerns regarding the fire risk that these systems can pose. An adequate engineering approach to guarantee the safety of buildings' occupants during evacuation and a safe environment for the fire service operations requires understanding the performance of all systems involved. Therefore, a detailed quantitative assessment of the performance of cladding systems is necessary to establish design criteria that can be used by practising engineers. This is particularly important with cladding systems that exhibit any level of combustibility. External flame spread has a critical influence on the fire safety strategy of buildings and, therefore, the role of cladding systems is one of particular importance. The evaluation of solutions for these buildings requires for competent fire engineers to understand key fundamental principles regarding the fire safety strategy, façade design, and the interactions between a façade and the building in the event of a fire.

This document presents an overview of a CPD course programme for engineers towards acquiring the specific knowledge required to assess the fire safety strategy of buildings and understanding the potential implications of using combustible cladding materials. This CPD programme is not an introductory course and is only intended for experienced professionals that already understand the different aspects of building design and fire safety.

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Purpose

The purpose of this course is to provide practising engineers with the specialist knowledge to address the fire safety strategy of buildings and understand the implications of using cladding products capable of supporting vertical flame spread. The provision of design solutions for buildings requires competent fire engineers with the understanding of the key fundamental processes regarding the fire safety strategy, cladding design, and the interactions between the cladding of a façade and the building in the event of a fire.

The course uses a combination of lectures, laboratory sessions, and case studies to deliver a comprehensive review of the fire safety strategy, the fire performance of cladding systems, and the implications of potentially combustible cladding products such as aluminium composite panels (ACP) or insulation materials to the fire safety strategy of buildings. This course programme has been developed in close collaboration between The University of Queensland, the University of Edinburgh (UK), and University College London (UK).

Learning Objectives

Upon the completion of the course, the participant should be able:

1. To explicitly define and describe the fire safety strategy for a given building in the context of external fire spread;
2. To interpret the inherent links and interdependence of fire safety systems and phenomena with respect to code based solutions and external fire spread;
3. To describe the fire dynamics and fluid dynamics behind vertical fire growth;
4. To recognise the distinction between construction typologies with respect to the fundamental phenomena that control fire spread;
5. To comprehend the mechanical behaviours that are relevant to external fire spread in common cladding typologies;
6. To create fire safety engineering solutions that explicitly link the governing phenomena of vertical fire spread, common cladding typologies, and the fire safety strategy.

Who Should Participate?

Experienced fire safety engineer professionals interested in acquiring knowledge to address the fire safety strategy of buildings and the potential implications of using cladding materials capable of sustaining vertical flame spread. This course is not an introductory course, and it is only intended for experienced professionals who are familiar with the different aspects of building design and fire safety engineering.

Prerequisites

- Accredited engineering degree (4-year minimum) or equivalent.
- Practising fire safety engineer with demonstrated experience.
- Registered professional engineer standing or ability to become one.

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Course Programme

The course programme proposed for the CPD course is structured in the following modules:

- **Module 1 – Analysis of the fire strategy of a building.**
[Day 1] (7 hours)

This module covers an analysis of the fire strategy of the building based on the solutions for an implicit (prescriptive-based) and an explicit (performance-based) design. The objective of this section is to highlight the relationship between an implicit design and vertical flame spread, and the consequences of vertical flame spread related to main objectives inherent to the fire safety strategy (occupants' life safety and fire-fighting intervention).

- **Module 2 – Fundamentals of vertical fire spread.**
[Days 2 and 4] (11 hours)

This module aims to establish the fundamentals of fire spread, identifying the main parameters that govern flame spread and characterising the conditions required to enable vertical fire spread.

On day 2, this module covers fundamentals relevant to the flammability of materials such as material composition, ignition, flame spread, burning behaviour and fire retardants. A discussion on fire testing methods and their relevance, and the differences between the material and system behaviour is included. A series of case studies consisting of different façade systems are used to illustrate the risk of external fire spread.

On day 4, research developed by The University of Queensland to generate a [Material Library](#) of insulation materials and ACPs based on fundamental flammability criteria is presented. The Material Library is intended to complement the quantitative assessment of the performance of cladding systems. Additionally, this module includes a briefing on fundamentals of external fire plumes to complement the assessment of vertical fire spread.

- **Module 3 – Mechanics of the coupled structure-façade system during fire.**
[Day 3] (4 hours)

This module covers the mechanical behaviour of façade elements when exposed to severe conditions of heat exposure. The module is split into two sections: the first reviews current drivers for the mechanical design of facades, including current fire test methods; the second gives an introduction to structural mechanics at high temperature and links this to the overall mechanical response of curtain walls in fire.

- **Module 4 – Reformulation of the fire safety strategy.**
[Days 3 and 4] (6 hours)

This module consists of two case studies in which the fire safety strategy of real tall buildings is reformulated based on the risk of external fire spread. The first case study covers the case of a tall building with a classical façade system where no combustible/flammable cladding materials are used; thus, the risk of vertical fire spread

is represented by the mechanical displacement of the façade and the geometrical constraints of openings. The second case study covers the case of a tall building with a modern façade system where potentially combustible/flammable cladding materials are used.

- **Module 5 – Laboratory sessions.**
[Day 5] (4 hours)

A series of laboratory sessions will be carried out at The University of Queensland's fire laboratory. These sessions will consist of multi-scale experiments applied to ACPs, and correspond to part of the experimental protocol proposed by The University of Queensland to develop the [Material Library](#) with data regarding the fire performance of different ACPs.

- **Module 6 – Examination.**
[Day 5] (3 hours)

A final examination takes place to assess the concepts learnt by the course participants. In order to obtain a certificate of completion, the course participants are required to pass the test according to UQ policies regarding marking and scoring.

Course Schedule

- Day 1: Analysis of the fire safety strategy of buildings.
- Day 2: Fundamentals of vertical flame spread.
- Day 3: Mechanics of the coupled structure-façade system during fire / Reformulation of the fire safety strategy (case study).
- Day 4: Fundamentals of vertical flame spread / Reformulation of the fire safety strategy (case study).
- Day 5: Laboratory session / Examination.

Day	Morning session				Afternoon session		
1	Explicit fire safety strategy				Implicit fire safety strategy	Implicit strategy and vertical flame spread	
2	Material composition	Thermal degradation	Ignition fundamentals	Flame spread fundamentals	HRR of cladding materials	Fire retardants	Case study 1 discussion
3	Mechanics of the structure-façade system				Case study 2		
4	Material library		External fires		Case study 3		
5	Laboratory session				Examination		

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Examination and Certificate of Completion

Participants who pass the exam will be awarded a Certificate of Completion stating participation and successful completion of the CPD course. Participants not passing the exam on the first attempt will be given the opportunity to revise their exam for reassessment by the course teachers. Participants not passing the exam will be awarded a certificate of attendance.

Registration Process

Interested professionals must complete the [application form](#) and submit it with a 2-page Curriculum Vitae or Resume via email at uqfirecpd@civil.uq.edu.au no later than April 1st, 2019. Registration does not require payment.

All enrolments must be finalised by April 8th, 2019. Payment details will be provided with enrolment invitations after registration submission.

Course Staff

The course programme has been developed by The University of Queensland, the University of Edinburgh and the University of College London. All three institutions will use the content of this course as the single curriculum that reflects the minimum necessary knowledge in this matter.

The course is taught by:

- [Prof Jose L. Torero \(CEng\)](#)
Head, Department of Civil, Environmental & Geomatic Engineering
University College London
- [Dr Juan P. Hidalgo](#), [Dr Cristian Maluk](#), [Dr Andres F. Osorio](#), [Dr David Lange](#), [Dr Martyn McLaggan](#), [Mr Jeronimo Carrascal](#)
School of Civil Engineering – Fire Safety Engineering Research Group
The University of Queensland
- [Dr Rory M. Hadden](#)
Rushbrook Senior Lecturer in Fire Investigation
University of Edinburgh

The course also counts with the support of course assistants to support the participants

Minimum Enrolment

This course requires a minimum enrolment of 20 participants. The University of Queensland reserves the right to cancel the course if the minimum enrolment is not achieved.

Catering

This course includes a catering service during the five days of the course.