

Information Paper

Understanding the factors affecting flashover of a fire in modern buildings

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Theoretical and experimental investigations involving flashover have been ongoing since the 1950s, initially using small enclosures and scale models to identify the basic mechanisms in the context of domestic buildings, cellular offices and similar sized enclosures using wall linings and building contents typical of the day. While this work is still relevant today for similar enclosures, different mechanisms may be involved, or become dominant, especially in very large and/or highly insulated spaces encountered in modern buildings.

This Information Paper provides an outline of the process of flashover and the factors that influence its occurrence and development. It will be of value to fire risk assessors, fire safety managers, and other safety managers and building managers with some responsibility for safety, as well as community fire safety officers, firefighters and fire investigators. It will also provide a useful summary for those who are new to fire safety engineering.



Figure 1: Fully developed fire threatening neighbouring buildings

Introduction

Flashover is a key and dramatic event that may occur during an enclosure or room fire. It marks the sudden transition from a localised fire to the ignition of all exposed flammable surfaces within the enclosure, creating conditions where life is no longer tenable. Analysis of fires in enclosures usually considers pre-flashover and post-flashover fire conditions separately, adopting different empirical and theoretical methods for each case.

The time to flashover is an important factor when determining the relative hazards that may occur during the development of a fire and how those hazards impact on escaping occupants, firefighting tactics and the structure of a building.

Development of a fire

The development of a fire in an enclosure can usually be divided into three phases:

- an ignition and growth phase
- the fully developed fire (Figure 1)
- decay and eventual burnout.

Each of these can be subdivided or elaborated on depending on the specific fire scenario. Figure 2 illustrates the different phases of a fire in an open environment or large space.

Ignition and growth phase

Most accidental fires begin as a small fire; this may be due to a hot object (eg an overheating electrical component), a smouldering item (eg smoking materials) or a naked flame. Where there is a smouldering fire, it may take a substantial time