Fire Research & Investigation Unit

BACKGROUND

Ventilation systems that allow the removal of products of combustion (heat, smoke and toxic gases) during a fire are a common feature of many buildings fire protection systems.

By exhausting combustion products ventilation assists in:

Heads

- delaying or preventing flashover and the resulting fire development in a compartment
- reducing damage to building contents
- reducing thermal damage to structural components
- reducing hazards encountered by fire-fighters while undertaking rescue and fire suppression activities.

Simple ventilation systems commonly rely on the effects of heat from a fire to activate a fusible link securing a panel or melt a building product, such as plastic sheeting, to create an opening allowing fire products to be exhausted naturally. This document summarises two fires where reliance on this type of ventilation proved to be ineffective.

INCIDENT DETAILS

Case study #1

Shortly before the end of a business day a fire broke out near the front of a large hardware retailer. The building was approximately 60m x 60m and the stock was displayed in typical 2.4m high display rack shelving. Fire travelled vertically then across the underside of the roof spreading to stock across the entire area of the store. The roof was asbestos Fibrolite (typical of the building period) with skylights, the plastic skylights did not melt despite the spread of fire beneath them.



Plastic sheeting panels forcibly opened by NZFS crews on roof



For more information, or to contribute to 'Heads Up' e-mail fireinvestigation@fire.org.nz

Case Study #2

A worker in a factory unit observed a developing fire coming out of a carton used for discarded rubbish in the area he had been working. An attempt to extinguish the fire failed and the worker witnessed flames reaching stored cartons on the top high bay racking as he evacuated. A rapid fire spread was then observed.

While a plastic skylight panel immediately above the seat of the fire collapsed, the remaining panels stayed intact. Modern construction of concrete tilt slab walls and long run iron roofing and limited ventilation led to significant build up of heat and smoke in the building. Fire Service operations used aerial appliances (Cherry Pickers etc) to forcibly open the plastic sheeting components in the roof to allow ventilation to occur and assist with fire suppression.



Plastic sheeting forcibly opened by NZFS using aerial appliances

LESSONS LEARNED/RECOMMENDATIONS

In order to create an opening allowing fire products to be exhausted naturally by convection currents created by a fire, simple ventilation systems commonly rely on the effects of heat from a fire to activate a fusible link securing a panel or melt a building product, such as plastic sheeting. However experience at fires has revealed that unless these systems are specifically designed for purpose, they may be unpredictable in operating and their effectiveness limited.

Fire-fighters are frequently required to access roof areas and use tools to forcibly open plastic skylights to create exhaust ports.

In many instances plastic sheeting has been under-laid by wire mesh used to support building paper and as a safety net for people working on roofs. The mesh has been observed supporting plastic sheeting and preventing its collapse.

Experience at large fires in New Zealand shows the unpredictability of plastic sheeting in fire conditions makes it an unreliable form of effective fire ventilation. Due to this unpredictability, it can not be relied upon to effectively achieve its intended purpose.

INFORMATION SOURCE

New Zealand Fire Service Fire Investigation reports F0305577 and F0845692



For more information, or to contribute to 'Heads Up' e-mail fireinvestigation@fire.org.nz