Issue 003 - *released 1 November 2010*

Fire Research & Investigation Unit

Heads Up

BACKGROUND

This multi story concrete block building was built circa 1960 and consisted of 7 levels. The ground and 1st floors housed a Tavern, offices and a recreation area. The 2nd floor included a lounge, library, office and kitchen with the remaining upper floors consisting of a managers living area and 48 accommodation units.

The building had varying levels of detection and passive systems installed:

- The ground floor and levels 1 and 2 had thermal detectors and manual call points. This system was connected to the Fire Service which when activated alerted the entire building and closed smoke control doors between each level and the stairwell.
- The remaining floors were fitted with manual call points and ionisation smoke detection in the stairwell, floor landings and corridors. Activation of one of those detectors or a call point would alert the entire building, notify the Fire Service and close smoke control doors.
- The accommodation floors also had photoelectric smoke detection installed in the bedrooms. Activation of any of these would close smoke control doors and result in a local alarm in the room concerned and alert tone in the managers residence.
- There were two alarm panels, one at the main entrance for the call points and thermal and ionisation detection. The second analogue addressable panel was located outside the managers residence on level 3 which covered the local photoelectric smoke detectors.
- Each floor was designed to be a smoke cell. Two stairwells existed, the main one included the lift shaft and another emergency stairwell on the opposite side of the building. These paths were separated at each floor with old style fire doors that either had automatic closers or magnetic hold open devices that were released on alarm activation.
- The building had a current building WOF and an approved evacuation scheme although records of regular trial evacuations had not been submitted to the Fire Service.

INCIDENT DETAILS

During the early hours of a morning in March 2007 a fire started in the library on level 2 of the building. At about 05:10am within a 30 second interval bedroom smoke alarms activated in 3 separate bedrooms all on different levels of the building. These localised alarms not only woke the occupants of those rooms but were also audible to occupants of other rooms. Further activations continued during the coming minutes.

An occupant on the 5th floor entered the hallway and headed towards the main stairwell where he saw smoke. On seeing smoke he activated a manual call point which sounded the whole building alarm and alerted the Fire Service. The alert at the Fire Service communications centre was received at 05:14am.

Following this there were various accounts of differencing levels of smoke on certain floors. Some occupants used the alternate escape route to leave the building, others tried to leave via the main stairwell however due to it containing thick smoke they in turn headed to the roof.

The first fire appliance arrived at the scene at 5:18am to observe smoke issuing from the building and occupants leaning out windows. The main panel showed activations on floors 3 through to 6.

Fire-fighters quickly discovered the fire on the 2nd level and noticed that smoke stop doors to the stairwell were wedged open, they closed these to stop further smoke entering the main stairwell.

Fire-fighters searched the building assisting with evacuations as required, this included carrying down 2 people with mobility problems and using an aerial appliance to rescue people from the roof. One occupant was discovered still asleep in his bedroom who was possibly hearing impaired however this could not be confirmed. In total fire-fighters assisted 28 people from the building, 2 people suffered smoke inhalation.

While the evacuation was in progress, fire crews also extinguished the fire. Not long after they entered to extinguish the fire the fire alarm stopped activating.

FURTHER INFORMATION

It is believed that this was a slow smouldering fire which generated a great deal of smoke however not a lot of heat. There were a number of indicators to support this theory such as smoke staining patterns, the fact a light bulb close to the fire did not distort and that the thermal detection in the room of the fire origin did not activate. Heat detectors set at 57 degrees C were tested later and proved to be working correctly.

A significant amount of work was done to establish smoke travel paths and why certain detectors did/didn't activate. The following conclusions were reached:

- Smoke travel was allowed into the main stairwell due to the doors that were wedged open, however it is believed that wind direction and open windows also allowed smoke emitting from the fire level to re-enter bedrooms on higher levels.
- The sensitivity of the 2 different types of smoke detection in this building meant that differing levels of smoke concentration were required for activation which was reflected by their performance.
- The alarm was non-compliant as the panel had not been upgraded nor was there thermal detection in bedrooms as there should have been for a Type 5 system under the standards at that time.
- Alarm failure just after fire-fighters entered resulted from a sound card short circuiting and the fusing of fire alarm wiring in the room of fire origin.
- While it did not effect the outcome of this fire, there were partial blockages in the alternate stairwell. Some occupants did not use this stairwell due to them being more familiar with the main stairwell despite there being appropriate signage and procedure notices displayed.

LESSONS LEARNED/RECOMMENDATIONS

The following recommendations were included as an outcome from enquiries into this incident:

- Smoke or fire doors frequently used during normal operation of a building should be held open by magnetic hold open devices that release when an alarm activates to discourage the use of wedges to hold them open. They should be tested regularly as part of the building WOF.
- Fire alarm control panels should be designed to operate under fire conditions. Standards at the time of this incident did not require fire alarm wiring to be fire rated. Had this been a building utilising a progressive or staged evacuation strategy the alarm would have needed to be much more robust and reliable than is required by NZS4512:2003.
- Multi criteria smoke detectors or a combination of ionisation & photoelectric smoke detectors should be installed. Not a current requirement under NZS4512:2003.
- As a minimum, alarm systems should be compliant with the relevant standards.
- Escape routes should never be used for storage and extra measures should be taken to ensure occupants who are hearing impaired are alerted to the need to evacuate.
- Analogue addressable systems with pre-recorded evacuation instructions should be promoted where ever possible so that instructions to alternate escape routes are very specific.

INFORMATION SOURCE

New Zealand Fire Service Technical Report/Post Incident Audit, event number A692181.