Department store fire Luton, Bedfordshire

A fire which was controlled by sprinklers caused only £315,000 damage to this £5m department store

This report was published in "Fire Prevention" n° 287 , March 1996. Based on this report , a FRAME calculation was made to check if the conclusions of the report are reflected in the risk assessment . The report was generated by the FRAME for Windows program and included in this document. It is clear from the calculation that the use of sprinklers for this kind of occupancy is a proper engineering choice; in addition it proved very valuable as the origin of the fire was probably arson.

FIVE SPRINKLER heads activated and Bedfordshire Fire and Rescue Service were automatically alerted when a fire broke out in this department store.

The FIRE REPORT
Firefighters arrived to see smoke coming from the first floor of the building and made a forced entry. A breathing apparatus team entered the smoke-logged first-floor storage area, a 2000m2 uncompartmented room. Using a thermal imaging camera, the team found the fire in a stack of display material against an external wall. The sprinklers had contained the fIre and the firefighters were able to extinguish it using a hosereel.

They then cleared the area of smoke using a fan carried by the crew to prevent any further damage and began salvage operations. The seat of the fire was below a window, which had been broken. It appears that intruders climbed a fixed-ladder fire escape close to the window in an attempt to enter the building. Investigators believe that they broke the window and then lit the fire because bars inside the window prevented them entering.

The storage area was full of racking which almost reached the low ceiling. It was protected by sprinkler heads at 2m intervals along the aisles between the racks . The brigade believes that the fire might well have spread rapidly throughout the first floor if the sprinkler system had not operated. The combined value of the building and stock, both of which could have been lost, was about £5m. The store was closed for only one day following the fire

F.R.A.M.E. calculation report:

(as generated by the FRAME software)

The calculculation is made for: department_store
location: Luton_UK
The compartiment is: first_floor
The occupancy or use is:: storage
Date of the calculation: 1996.01.02
Version: FPjournal287

CALCULATION of the POTENTIAL RISKS
Data of the compartment :

The fire load 'immobile' Qi is (in MJ/m²) : 100.00
The fire load ' mobile' Qm is (in MJ/m²) : 2500.00
This gives for the fire load factor q : 1.73

The temperature ris T in °C is: 100.00
The average dimension m (in meters) is: 0.30
The combustibility class, M is: 3.00

This gives for fire spread factor i: 1.25

The theoretical length l is: 45.00 meter
The equivalent width b is: 45.00 meter
This gives for the area factor g: 1.35

The level number E is: 1.00
This gives for the level factor e: 1.22

The ceiling heigth h is: 3.00 meter
The flow of the ventilation system is (in Nm^3/h): 0.00
The aerodynamic surface of the smoke vents is (in m^2): 0.00 m^2
The surface of the windows in the roof and upper third of the walls is: 0.00 m^2
The smoke venting ratio is: 0.00
This gives for the venting factor v: 1.18

The heigth difference with the access level is: 4.00 meter
The number of access directions is: 3.00
This gives for access factor z: 1.00

These data give the following results:
The potential risk P for property is: 4.21
The potential risk P1 for the persons is: 3.12
The potential risk P2 for the activities is: 2.44

CALCULATION of the ACCEPTANCE LEVELS
The following elements determine the possibility of starting a fire:
Main activity: Warehouses and similar storage
Heating systems: No heating available: no risk
Electrical installations: In compliance with the rules and regularly checked
Explosion hazards: No explosion hazard
Secondary activities : none
This gives for the activation factor a : 0.00

The following elements interfere with the evacuation of the compartment:
The number of persons to evacuate is: 10.00
The number of exit units is: 2.00
The number of exit paths is: 2.00
The mobility factor p is defined as follows: mobile and independent persons
This gives for evacuation time factor t: 0.05

The following elements define the value of the content:
Replacement factor c1 is: 0.00
The value of the content is estimated at: 8.00 millions EURO
with an inflation correction for 2000 of : 1.00
This gives for content factor c: 0.02

The environment factor r is defined with Qi and M and is: 0.50
The dependency factor d is: 0.30
These data give the following results:

The acceptance level A for the property is: 1.54
The acceptance level A1 for the persons is: 1.05
The acceptance level A2 for the activities is: 1.28

THE ORIENTATION VALUE R_0, The Initial Risk :

The fire resistance of the structure is: 15.00
This gives with the calculated values of P and A, an orientation value Ro of: 2.38

CALCULATION of the PROTECTION LEVELS

The following elements define the value of the water supplies:
Type of storage: Water storage for general use, automatically filled
The available quantity is adequate
Distribution network: Distribution network adequate
Hydrants: The number of outlets is adequate
Pressure on the network: The static pressure is adequate
This gives for factor W: 1.00

The following elements define the value of the normal protection :
Notification: All the elements of the notification chain are present
Manual extinguishment means: Extinguishers adequate
Hose stations adequate
Arrival time for the fire brigade: Arrival after 10 to 15 min.
Training of people: Only a limited number of persons trained
This gives for factor N: 0.81

The following elements define the value of the special protection :
Type of automatic detection: Automatic detection by sprinklers
type of special water supplies : none
type of special protection: Sprinklers with one (public) water supply
type of fire brigade: Large professional public fire brigade
This gives for factor S: 3.07

This factor S and the following elements define the value of the fire resistance :
The fire resistance of the structure is: 30.00
The fire resistance of the exterior walls is: 30.00
The fire resistance of the ceiling or roof is: 30.00
The fire resistance of the internal walls is: 0.00
This gives for factor F : 1.19

The following elements define the value of the escape possibilities:
Detection and signalisation: Automatic detection by sprinklers
Not more than 300 persons to be warned simultaneously
Savegarding of exit paths: Complete evacuation plan with adequate signalling
Protection by:
Sprinklers full protection
Smoke venting actuated by automatic detection
Large professional public fire brigade
This gives for factor U : 4.54

The following elements define the value of the salvage factor :
Protection and organisation:
Repairs possible with minimal help
Immediate restart of activities is possible
This gives for factor Y : 1.28
These data give the following results:

The protection level D for the property is: 2.99
The protection level D1 for the persons is: 3.70
The protection level D2 for the activities is: 3.19

The calculated risk R is for the property: 0.92
The calculated risk R1 is for the persons: 0.80
The calculated risk R2 is for the activities: 0.60

The conclusion of this risk assessment is that the building is adequately protected. The fire report shows that a fire could indeed be limited.