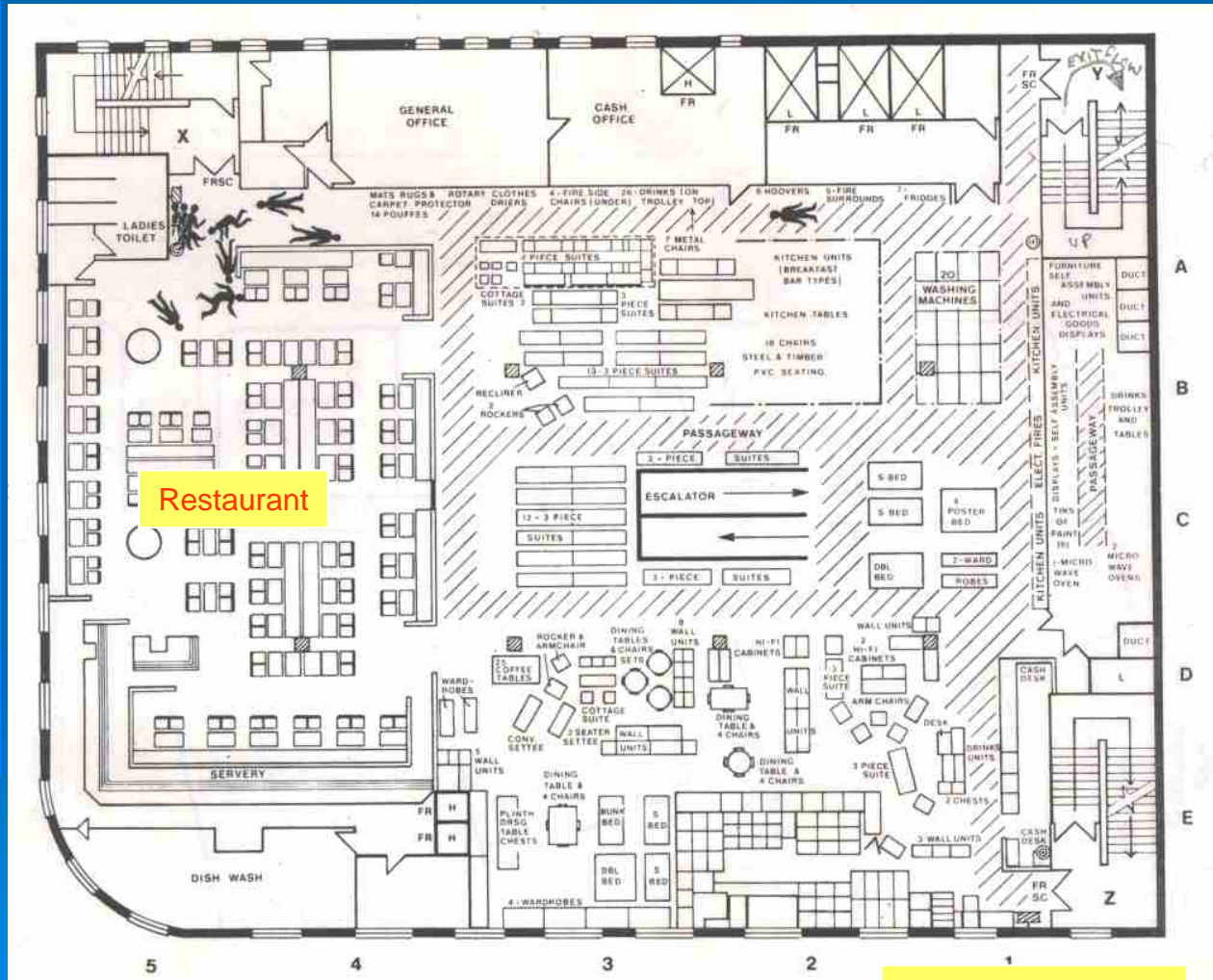


# Woolworth's retail store, Manchester, May 1979

- 10 deaths due to smoke inhalation



# Woolworth's – building plan



First floor plan shows location of bodies surprisingly close to escape stair.

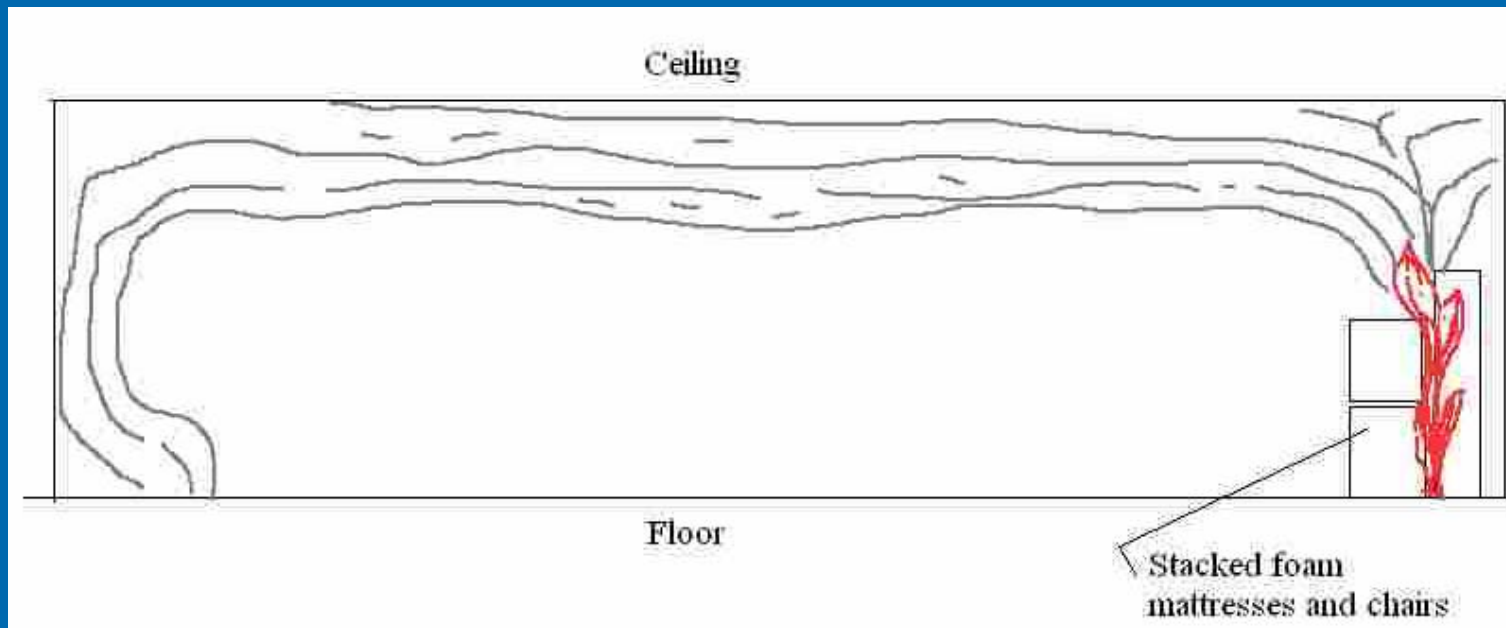
Note restaurant centre left, escalator in centre and 3 well-positioned escape stairs.

Too much furniture on display - most should have been in a fire resisting room.



Courtesy CACFOA

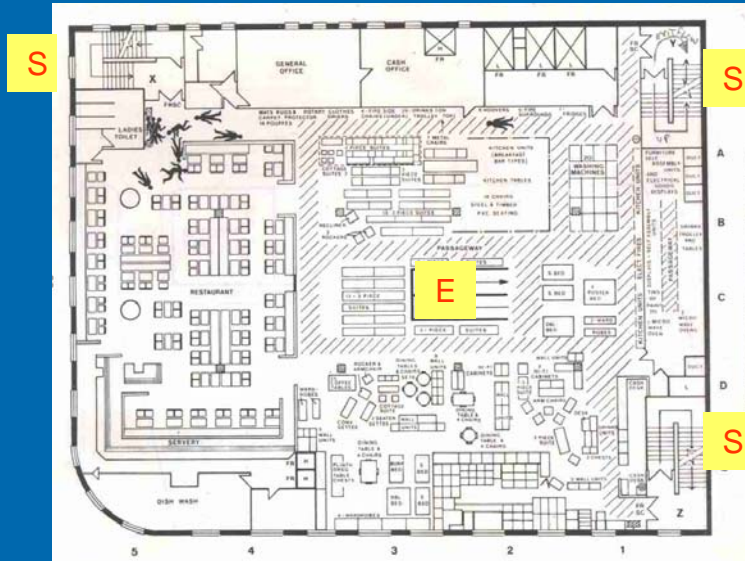
# Woolworth's – fire spread



It is thought that fire spread was so rapid and the polyurethane (PU) fire gases were so lethal that people close to the floor exits could not get out in time.



# Woolworth's – the building



- The store was built in 1929 and comprised 8 floors including 2 basements. It was 42 m x 35 m in plan and was steel framed with concrete floors and concrete stairways.
- The stairways (S) were well positioned for means of escape. A centrally placed escalator (E) communicated with several floors.

- The building was equipped with a mains-fed fire alarm having alarm bells and break-call points on each floor.
- The self service restaurant on the second floor could seat 208 people but at the time of the fire there were 70 to 100 people on the floor of the store.
- The shop operated without a fire certificate required under the legislation, though slow progress was being made to get one.
- At the time, the legislation did not require upholstered furniture to have a low flammability - this was required later in 1980.
- There were no sprinklers and none were required for life safety purposes.





# Woolworth's – the fire

- The fire occurred on 8 May 1979. It started near a wardrobe in the furniture display area between 13.20 and 13.25.
- The floor manager shouted to office staff there was a fire but the telephonist thought he said there was a fight. (There was no trace of a call to the fire brigade from the store at any time).
- Diners were asked to evacuate but were reluctant as they were eating and perhaps because they could not see the fire because of a 1.7 m high screen around parts of the restaurant.
- The floor manager tried to fight the fire with a hose reel with little effect. When the alarm was raised the sounders operated for only 3 to 4 minutes – it appeared that local failure of a call point due to heat from a fire would prevent the rest of the alarms from operating.
- The fire brigade arrived at 13.31



# Woolworth's – the fire

- Women could be seen behind barred windows on the second floor and people in an office there were rescued by the fire brigade who had to cut the bars and help them down the ladders.
- 27 people were rescued by the fire brigade, 6 led to safety, and some people were rescued from the roof.
- The fire caused the loss of ten lives primarily by inhalation of smoke and toxic gases.
- Eye witnesses reported very rapid growth of fire and large amounts of thick, choking smoke. There were four independent escape routes – three staircases and a central escalator. Victims were found very close to, but not in, the protected escape routes.
- Reasons for the rapid spread of fire in single and multiple items of plastic-upholstered furniture were investigated by BRE Fire Research Station to determine ease of ignition and rate of heat release.



# Woolworth's – BRE heat release tests

- After small scale tests, a 5 m x 12 m by 3 m high test compartment with one end open for ventilation was constructed and instrumented by BRE to investigate fire in a stacked furniture arrangement which was representative of the conditions in the store.
- The test furniture included timber-based dressing units, wardrobes, kitchen chairs, and polyurethane foam upholstered settees and mattresses, all in their packaging materials as in the store.
- Mass loss was measured using a 2.5 m square load cell platform.
- The calculated heat output at 2.5 minutes reached a peak of 23MW.



# Woolworth's – BRE heat release tests

- Even with the fire limited to a furniture area of 3 m x 3 m, the experiment indicated that a discharge of about 1700 m<sup>3</sup>/min (at 800 degC) of very dense and toxic smoke may have been present 2 minutes after ignition by a match.
- In a further minute this toxic smoke is likely to have formed a layer under the ceiling over the majority of the compartment floor, with mixing and cooling bringing the smoke down to floor level at the boundary walls





# Woolworth's – BRE sprinkler tests

- Tests were made to see if sprinklers would control such a fire.
- Even though earlier tests with sprinklers suggested that the water discharge density needed for vertically stacked polyurethane foam would be too high to provide, a sprinkler system would at least cause an alarm to be raised.
- In the BRE large scale simulation, bulbs in the mock-up sprinkler installation (which intentionally did not contain water) operated within 30 seconds of ignition.
- BRE made three sprinkler tests using a sprinkler system with 5 mm, 10 mm and lastly 2.3 mm/minute discharge..
- In the first two tests the smoke turned white and descended to floor level, but the volume of smoke was markedly less than in the unsprinklered test.
- With 2.3 mm/minute discharge the fire was not extinguished and produced smoke and gases of appreciably greater volume than in the other two sprinklered tests.
- The sprinkler tests indicated that, if sprinklers had been installed in Woolworth's, people on the 2nd floor (particularly those in the offices and restaurant) would have encountered less arduous conditions when making their escape.



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# Woolworth's - observations

- Polyurethane foam upholstered furniture could burn very rapidly and should not be stored in a retail area. It should preferably be separated from other hazards by compartmentation.
- People were unaware of a) the effect of radiation from the hot gas layer travelling rapidly beneath the ceiling, and b) the toxicity of burning plastics materials
- Woolworth's staff did not immediately raise the alarm
- Fire training was poor and needed improvement (this should include a check that exit doors can be easily opened)



# Woolworth's - observations

- Securing of door with keys which were kept in glass fronted boxes present a greater risk of their not being used than if the doors were secured by other fastenings
- Windows were barred. This makes it difficult for making rescues by the fire brigade. Windows should never be regarded as a means of escape, and they were not intended to be in the Woolworth's escape strategy.
- The fire led to the introduction of The Furniture and Furnishings (Fire) (Safety) Regulations 1988. This has led to a major reduction in fatalities in flexible foam related fires

