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NATIONAL EXPENDITURE ON SPRINKLER INSTALLATIONS

by

G. RAMACHANDRAN

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DEPARTMENT OF THE ENVIRONMENT AND FIRE OFFICES' COMMITTEE
JOINT FIRE RESEARCH ORGANIZATION

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Introduction

Using data drawn from various sources it has been found possible to make an estimate of how much is spent in installing and maintaining sprinkler systems and an estimate of the national expenditure for 1970 is given in this paper. Estimates of overall expenditure on all fire protection devices put together were attempted by Fry¹, Silcock² and Butcher³ for earlier years.

Average size of building

No statistics are available on the distribution of buildings at risk according to physical size. As mentioned in a previous paper⁴ it is necessary to conduct special surveys for obtaining this information. The frequency of fires may have a power relationship with the size of the building⁵. However, if it is assumed as a first approximation that the frequency is independent of the size, the average size of buildings involved in fire is practically the same as the average size of buildings at risk. In 1967, the average size of non sprinklered buildings involved in fires attended by the fire brigades was about 14,000 sq. ft. in total floor area. For sprinklered buildings the average size was 168,000 sq. ft.

Number of sprinklered buildings at risk

Manufacturing

It is again difficult to estimate the number of sprinklered buildings at risk. But a survey conducted in 1965 revealed that at that time there were about 9,400 establishments employing 11 or more persons in the manufacturing industries provided with sprinklers.⁶ Although establishments employing 10 or less were excluded from the survey, these would be unlikely to need and have sprinkler protection and can therefore be neglected. According to three firms undertaking independent market research projects the overall increase in sprinkler installations may be between 10 and 15 per cent per annum for the period after 1965. Hence, by 1970, the number of sprinklered establishments in manufacturing industries assuming a simple rate of growth of 12½ per cent per annum could have risen to about 15,000. Of these,

about 1,200 were new installations in that year.

Retail

According to the latest census⁷, there were 504,412 establishments in 1966 in Great Britain engaged in the retail distributive trade. Of these, only about 15,000 (3 per cent⁶) were sprinklered. A lower rate of growth, say, 10 per cent per annum, may be assumed for the retail trade because of the preponderance of small shops. This would give a figure of about 21,000 sprinklered establishments in this occupancy in the year 1970 out of which about 1,500 were new installations.

Wholesale

The percentage of sprinklered premises among wholesale distributors was not revealed in the survey mentioned earlier. It may have been about the same order as that of manufacturing industries (15 per cent) though the (less reliable) figure for the storage premises was 25 per cent⁶. According to Board of Trade statistics⁸ there were 41,049 wholesale distributors in 1965. Hence in 1965 there were about 6,200 sprinklered establishments engaged in wholesale distribution, growing to about 9,000 by the year 1970 with about 600 new installations in that year. This assumes a growth rate of 10 per cent per annum.

Other occupancies

It is practically impossible to estimate the sprinklered establishments in the remaining occupancies. But there are not likely to be many sprinkler installations in these buildings.

Adding the figures in the previous paragraphs the best estimates based on the available data would be about 45,000 sprinklered establishments in the year 1970. Of these, 3,300 would have been fitted with sprinklers only in 1970. It ought to be remembered in this connection that an establishment may have more than one building, but due to lack of data it is not possible to take this factor into consideration.

Annual expenditure on sprinklers

The buildings newly provided with sprinklers in the year 1970 did not have sprinklers before that year. Hence they belonged to a population of non sprinklered buildings whose average size was 14,000 sq. ft. according to the 1967 sample. It is possible, however, that the average size of newly sprinklered buildings could be considerably higher than the above figure

since in the same year (1967) sprinklered buildings had an average size of 168,000 sq. ft. The true figure was in between the above two limiting sizes. If it is assumed that the sizes of buildings with new installations had a log normal distribution with an average μ it is not difficult to see that an estimate of μ is given by

$$\begin{aligned} \hat{\mu} &= \frac{1}{2} [\log_e 168,000 + \log_e 14,000] \text{ so that the} \\ \text{median size was} & \\ e^{\hat{\mu}} &= (168 \times 14)^{\frac{1}{2}} \times 1000 \\ &= 49,000 \text{ sq. ft.} \end{aligned}$$

Hence 49,000 sq. ft. is a reasonable estimate for the average size of buildings newly provided with sprinklers in the year 1970.

Allowing for inflation the initial cost of installing sprinklers is about 15 new pence per sq. ft. of floor area⁹ though this could vary from building to building. Hence the initial cost would have been about £7,500 for a building of 49,000 sq. ft. and £25 million for 3,300 such buildings fitted with sprinklers in 1970. According to Burtner¹⁰ the annual maintenance cost of an installed fire protection facility is about 2 per cent of the capital cost. Hence the maintenance cost could be about £200 per annum for a building of 49,000 sq. ft. or about £9 million for all the 45,000 sprinklered establishments. The additional costs in water and general rate for sprinklered buildings are negligible in comparison with the initial and maintenance costs. Therefore, for the year 1970, a national expenditure of about £34 million could be attributed to sprinkler protection.

Discussion

Fry¹ gave an estimate of £30 million towards incremental building costs for fire protection for the year 1962. Projecting this figure and making some refinement Silcock² assumed an expenditure of £63 million for the same item for the year 1965. The corresponding figure for 1967 was £70 million³. Based on these estimates the total national expenditure on fire protection to buildings in the year 1970 could have been of the order of £80 million. But this figure includes structural protection, means of escape requirements, detection equipments etc. apart from sprinklers. A major contribution would be from sprinklers since their cost forms about 2 per cent of the building cost against 5 per cent for total protection cost. Hence a national

expenditure of £34 million on sprinklers in 1970 appears to be a realistic estimate.

The building user derives a number of benefits if his premises are sprinklered. These are mainly in the form of Corporation Tax rebates and reductions in insurance premiums, but may have to pay increased rates. These benefits and costs are not discussed here since this paper is concerned only with the cost to the nation.

Conclusion

It is estimated that the numbers of sprinklered establishments in 1970 were 15,000 in manufacturing industries, 21,000 in the retail distributive trades and 9,000 in the wholesale distributors. Of these, the numbers newly provided with sprinklers in 1970 were 1,200, 1,500 and 600 in the respective occupancy groups. In 1967, the average size of sprinklered buildings was 168,000 sq. ft. of total floor area with 14,000 sq. ft. as the corresponding figure for non sprinklered buildings. The average size of buildings newly provided with sprinklers in 1970 was about 49,000 sq. ft.

In 1970 about £25 million was spent for installing sprinklers in 3,300 establishments and about £9 million towards maintenance costs in all the 45,000 sprinklered establishments. Thus the national expenditure on sprinkler protection in 1970 was of the order of £34 million out of an estimated total of £80 million towards all forms of fire protection in buildings including structural protection.

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