

Comments on the Consultation Paper on Licensing Control of Karaoke Establishments

**Professor D D Drysdale
University of Edinburgh**

This consultation document is a response to the tragic fire in the Top One Karaoke Club on 25th January 1997 in which 17 people died. It was the result of an arson attack. To my knowledge, there had been no previous fatal fires in Karaoke establishments. This is not evidence that they are “safe”, but it does suggest that they should not be classified as “high risk establishments”. Nevertheless, the arson attack has drawn attention some areas where improvements should be made.

Most of the recommendations which appear in the document are both reasonable and desirable. However, three of requirements suggested by the Buildings Department are very onerous, namely: (i) that the widths of existing means of escape be increased to a minimum of 1.2m; (ii) that travel distances to staircases be restricted; and (iii) that the walls enclosing each Karaoke room be upgraded to one hour fire resistance.

With the exception of (iii), these proposed measures are recognised techniques by which life safety can be improved in the case of an accidental fire. It is relatively easy to meet such requirements in new buildings, but prohibitively expensive in existing establishments. I would argue that they are unnecessary, provided that additional measures are taken. I would also argue that the requirement for one hour’s fire resistance for the internal walls is irrelevant to the life safety issue.

Application of a timeline analysis

My reasoning is best explained using the “timeline analysis” shown in the accompanying diagram. This compares the time it takes for the fire to produce untenable conditions with the time taken for occupants of the Karaoke establishment to move to a place of safety (at the very minimum, into a protected area from which they can escape to the outside). These two timelines are compared in the accompanying diagram. For safe escape, the time to escape must be less than the time for the fire to reach a dangerous stage, known as “flashover”. In the event of fire, life safety can be increased by:

- (a) Reducing the time it takes for an individual to escape; and
- (b) Increasing the time it takes the fire to reach flashover.

Time to reach a place of safety

Both timescales begin at ignition, but the occupants are only aware that a fire exists once it has been detected and the alarm raised. Automatic detection and alarm will reduce this delay. Any further delay will be reduced if the staff are trained in evacuation procedures and know how best to get the customers moving towards a place of safety. Staff awareness and training is essential. The time to reach safety will be reduced if the exit routes are well marked, free of any obstruction and not of excessive length. Again, staff awareness and training are crucial.

Time for the fire to reach flashover

Flashover is a critical period in the development of any fire, representing a transition during which it increases very rapidly in size, leading to the fully developed fire (see diagram). It is a convenient way to identify the point on the timeline when conditions are likely to become untenable for the occupants of the rest of the building (or floor), although the room in which the fire starts will become untenable long before flashover occurs.

The time to flashover depends on how rapidly the fire will grow in size during its early stages. This will be determined by the fire behaviour of the combustible wall linings, the furniture and the fittings. Traditionally, wall lining materials come under strict control as it is known that an easily-ignited lining will spread fire rapidly once it has become involved. Unfortunately, furniture is not controlled at all, yet there is a large body of evidence to show that substantial items of upholstered furniture containing standard grade polyurethane foam can develop fire so rapidly that flashover is reached within a room within a few minutes (in one test carried out by the Fire Research Station in the UK, flashover was attained in only 3 minutes [1]). On the other hand, if the new combustion-modified foams (CMF) are used, the time to flashover can be increased to 10 - 15 minutes, or more (depending on the covering fabric and the nature of the nearby materials).

The principle of “trade-off”

By careful control of the materials used in Karaoke establishments, the time to flashover can be greatly increased, thus giving the occupants much more time to escape safely under the guidance of the staff who will have much greater confidence in their own safety during this critical period. The Building Department have proposed that the minimum width of escape routes is increased by 15 cm: they should be asked to show how much improvement this would provide in escape time. If the time to flashover can be increased by a greater amount by installing CMF furniture (in addition to ensuring proper controls of wall linings, etc.), then this should be accepted as an alternative, or “trade-off”.

By the same token, some flexibility should be permitted regarding escape distances. A distance of 18 m is generally accepted for dead-end situations. In the UK, this may be reduced for “high risk” areas (such as spaces containing switchgear, boilers, etc.), but there is no suggestion that Karaoke establishments are “high risk areas”. Indeed, what risk currently exists will be substantially reduced if the measures proposed by the FSD alone are implemented: if, in addition, strict controls are put in force over the furniture and fittings, then this will reduce the risk even further, providing a much safer environment and the opportunity for relaxing the proposed requirements on corridor width *and* escape distance.

Sprinklers

Sprinklers will operate in the room or fire origin towards the end of the growth period and thus provide additional protection to life by holding the fire in check, or even extinguishing it. They should be considered as an important component in any comprehensive fire safety strategy.

Fire Resistance

Increasing the fire resistance of the individual room boundaries will have absolutely no material influence on the time to flashover, or the ease with which escape can be effected. “Fire resistance” of structural elements is specified to ensure that a *fully developed fire* will not cause structural collapse as a result of prolonged heating of load-bearing structural members (e.g. steel will begin to lose its strength when the steel reaches temperatures above 550°C). It is also specified for fire compartment walls when it is necessary to limit the spread of fire within a building (e.g. from one apartment to another, or - in the industrial context - from the storage area to the production area). It is applied for *property protection* rather than the protection of life. In the “timeline analysis” it is argued that the occupants of the Karaoke establishment must be out of the building well before flashover, i.e. well before the fire resistance of the structure plays any part. If there is anyone remaining in the establishment when flashover occurs, that person is exposed to an unacceptably high risk.

Conclusion

Increasing the fire resistance of the boundaries of the individual rooms in a Karaoke establishment will have no material influence on life safety. While shorter escape distances and wider corridors are desirable, the risk to life can be greatly reduced by careful control of wall linings, furniture and fittings. If strictly applied, the proposed requirements *vis ??? vis* corridor widths and escape distances can be relaxed.

Reference

- 1 Building Research Establishment, Garston, Watford. Video “The Front Room Fire” (1989).

Timeline analysis for life safety in fire

