FIRE RISK ASSESSMENT

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INTRODUCTION

Recent studies have shown that when use is made of the risk assessment technique in relation to fire safety then there are improved chances of ensuring that protection measures are more likely to be cost effective.

New legislation which applies to all European Union countries and which will be implemented in the UK on 1 December 1997 means that it there is a now a statutory obligation to carry out fire risk assessments in virtually all work places.

In carrying out an assessment the person responsible is required to consider not only employees but also any other people who might reasonably be expected to be present in the location being survey. This would include those resident in an hotel, the patients in a hospital, visitors to a museum or children working in a public library.

The assessment must necessarily involve two quite distinct factors - the fire hazard and the fire risk, and legislation requires that all the fire hazards are identified and that the associated fire risks are assessed.

If some fire safety measures have already been introduced into the workplace, their effectiveness in reducing the overall fire risk should be taken into account. An example of such a measure would be the existence of a sprinkler system.

THE APPROACH TO THE TASK

This guidance is given in the hope that it will take some of the mystique out of risk assessment.

In the nuclear, chemical, and petrochemical industries, assessing the risks peculiar to these fields of activity can entail the use of quite sophisticated mathematical techniques, and such assessments must be done by expertly trained people.

The fire risk assessment which will be most workplaces is very definitely not in this league. In the vast majority of cases it will be a relatively straightforward and simple task. Indeed there are only three "rules" that should be borne in mind:

There is no single correct way in which the assessment should be made. Put another way, the first rule of risk assessment is that there aren't any rules! The methodology to be adopted should be a practical, structured and, above all, a common sense one.

Whilst the legal responsibility for carrying out the assessment rests with the employer, in large or complex workplaces he is at liberty to seek the help of his own experts or, if necessary, the help of outside consultants.

THE MEANING OF "FIRE HAZARD" AND "FIRE RISK"

FIRE HAZARD

Fire hazards are those elements in the workplace that could start a fire and the harmful consequences of such a fire. Fire hazards that could start a fire might be substances, manufacturing processes, or pieces of equipment, whereas structural features such as poor compartmentation, or bad management practices such as allowing escape routes to become obstructed would be examples of fire hazards that could have harmful consequences in the event of fire.

FIRE RISK

A fire risk is simply the probability(likelihood) of a hazard being realised. Whilst much easier to define than a fire hazard, it is difficult,if not impossible, to assign a precise numerical value to the fire risk. However, as we shall see, that is not what is required by the Regulations.

The fire risk assessment should be seen as a specific part of a wider, overall, assessment of the risk to which people at work are exposed and may be part of an overall program of risk reduction.

A THREE-PART EXERCISE WITH A THREE-FOLD OUTCOME

There are three parts to the fire risk assessment: an initial assessment- identifying the hazards and sizing the risks, followed by a hazard/risk reduction exercise, and then a final assessment.

The final assessment will have three outcomes: it will determine whether the workplace, or parts of it, are to be categorised as being of high, normal, or low risk, this in turn will determine the fire precautions measures required in the workplace, and it will be the starting point in the formulation of an emergency plan.

PRACTICAL CONSIDERATIONS

In carrying out the risk assessment it will be necessary to have in mind the following factors:-

- the people present in the workplace
- the use to which the workplace is put
- the sources of ignition present
- the use of flammable materials
- the contents of the workplace
- the storage of materials
- the furnishings and surface finishes present
- the structural features of the workplace.

In large or complex premises it may simplify the task, and indeed be more appropriate, if all three parts of the exercise are carried out by treating distinct areas such as workshops, offices, kitchens, and warehouses as separate entities.

RISK REDUCTION

Having made the initial assessment, there follows the all important task of reducing the hazards and risks. It will almost certainly be the case that some reductions may be effected immediately, and these short-term measures would include such things as improving the

housekeeping-the management of waste and rubbish, and the implementation of a programme of fire safety training for employees.

Other, long-term measures, would include such things as the installation of a fire suppression system, the rewiring of the workplace, and the substitution of hazardous processes and materials with less hazardous ones.

THE FINAL ASSESSMENT

When the hazards and risks have been reduced to what, at the time, appears to be an irreducible level, there follows a more rigorous final assessment of the risk.

The final assessment will determine the risk categorisation which conventionally will be defined as high, normal, or low. Of course in larger premises it will be quite normal to have different risk categories for different parts of the workplace.

RISK ASSESSMENT METHODS,

While, as has already been noted, there is no single 'correct' way of carrying out the risk assessment, there are three methods which might be useful, each of which makes clear what is to be understood by the terms high, normal, and low risk. These are:-

- the risk category indicator method,
- the risk value matrix method,
- the algorithmic method

THE RISK CATEGORY INDICATOR METHOD

This is a diagnostic method in which the various elements in the workplace are classified in such a way as to indicate that the workplace in which they are found should be categorised as being high, normal, or low risk.

HIGH RISK INDICATORS

Elements which may give rise to high risk indicators include:

- sleeping accommodation,
- people,
- processes or areas,
- materials,
- structural features.

SLEEPING ACCOMMODATION

The presence of sleeping accommodation in the workplace must always indicate the high risk category. When people are asleep their ability to respond to fire is reduced and they are therefore more at risk of being overcome by smoke, fumes, or fire before reaching a place of safety. This response to fire may be further reduced if the people are old, disabled, deaf, or partially sighted.

Consequently, hotels, boarding houses, hospitals, nursing homes, and shelters for the homeless will all be high risk workplaces.

PEOPLE

The presence of people can indicate a high risk if any of the following conditions obtain:

- there is a large number of members of the general public present in a workplace with which they are not familiar, such as airports, shopping malls, museums, and art galleries,
- there is a large number of young members of the public in the workplace, such as may be found in discotheques, leisure centres, and pop concerts,
- there is a high density of people in the workplace, such as in pubs, clubs, and in department stores at the time of sales,
- there are people working in isolated or remote parts of the workplace such as basements, attics, lofts, lift shafts, or service ducts,
- there is a high proportion of old or disabled people in the workplace, such as would be found in hospitals, day centres, and nursing homes,
- there are very low staffing levels available to assist members of the public in evacuating the workplace, as is often the case in hotels or residential care centres where the night-time staffing levels are considerably lower than the daytime ones.

The reason why all of the above situations are considered to be high risk indicators is simply because, in the event of fire, they could seriously jeopardise the chances of evacuating the workplace in the time and manner required in order to ensure that everyone reaches a place of safety before being overcome by the effects of fire.

HIGH RISK PROCESSES AND AREAS

There may be parts of the workplace where there is a greater risk of fires occurring and developing than elsewhere. This greater risk may arise from the nature of particular processes or operations that are carried out in these parts of the workplace, or from areas that contain, or are used to store, flammable or explosive materials.

The high risk processes or areas may be either permanent or temporary. The temporary high risks could arise from work being done by either maintenance staff or outside contractors.

High risk processes would include any which involved:

- the use of highly flammable liquids or gases; this would include processes such as paint spraying, solvent extraction, solvent de-greasing, processes involving the use of adhesives based upon flammable solvents, and oxy-acetylene welding or cutting.
- the use of naked flames; in such activities as glass blowing, ampule sealing, metal forging or smelting, plumbing, and paint stripping.
- the production of excessive heat; by industrial kilns, drying ovens and furnaces; in the fabrication of metals by the use of casting, hot extrusion, or rolling mills.
- the storage or use of highly flammable and/or explosive chemicals.

It is also important to appreciate that substances which on their own pose no fire hazard may, when mixed with others, constitute a serious risk by producing flammable vapours or gases, or even explosive substances.

HIGH RISK MATERIALS

These are materials which are either easily ignited or, when ignited, are likely to cause the rapid spread of fire and smoke. The occurrence of these materials may be extremely widespread; in their place of manufacture, in warehouses, in department stores, hardware stores, and 'do it yourself' stores.

They include such materials as:

- synthetic textiles
- polyurethane foams
- dried or artificial foliage
- paints
- adhesives based upon flammable solvents.

Perhaps some of the less than obvious places in which to find polyurethane and other plastic foams are gymnasia in sports centres, leisure centres, and schools where they are used in landing mats and pits.

HIGH RISK STRUCTURAL FEATURES

These high risk indicators will include such things as:

- a complete lack of, or insufficient, fire-resisting compartmentation;
- vertical or horizontal openings through which the fire could spread, and which would allow the movement of toxic smoke and gases from one part of the workplace to another.
- the use of non fire-resistant glass in separating walls, or in vision panels in fire-doors;
- wooden floors supported upon wooden joists;
- long or complex escape routes;
- large areas of flammable or smoke-producing surfaces on walls and ceilings;

All of these structural features are high risk indicators because they would greatly increase both the speed of and the chances of the spread of fire within the workplace, or because they would reduce the effectiveness of the escape routes in providing a safe means of reaching a place of safety before being overcome by the effects of fire.

In this context, it should be remembered that some floor coverings may liberate large amounts of heat, and large quantities of smoke, when involved in a fire even though they may contribute but slowly to the surface spread of fire.

NORMAL RISK INDICATORS

In general, a workplace will fall into the normal risk category if its buildings are of conventional construction, and where neither the use to which it is put, nor the nature or

disposition of its contents, are likely to present a serious fire hazard to people in the event of fire.

The specific normal risk indicators are that:

- a fire is likely to remain localised or, at least, to spread so slowly as to allow people the escape to a place of safety;
- there is little risk of the building or its contents catching fir so easily, or of producing such large quantities of smoke, as to constitute a serious hazard to life;
- there is in the workplace an effective automatic means for detecting and giving warning of fire, or effective automatic system for the extinguishment, suppression, or containment of fire.
- The presence of such automatic systems allows what would otherwise be a high risk workplace to be categorised as being of normal risk.

It is thought likely that the majority of offices, and shops selling goods that are not easily ignited and which are unlikely to contain large numbers of people, would be categorised as being of normal risk

LOW RISK INDICATORS

The low risk indicators are that:

- there is but minimal risk to life safety and,
- the risk of fire occurring is negligible and,
- the risk of fire, smoke, or fumes spreading is negligible.

The relatively small number of workplaces that are likely to be of low risk would include those used solely for heavy engineering, or those where the only processes involved are wet (aqueous) ones, and where non-combustible materials predominate.

An example of this latter type would be a workshop used for the de-greasing of metal parts in tanks of aqueous detergent.

THE RISK VALUE MATRIX METHOD

Unlike the Risk Category Indicator method, this method attempts to put the risk assessment onto a quantitative basis. However it can not be too strongly stressed that the numbers involved are purely relative, and that therefore they have no absolute significance whatsoever.

Whilst all risks are made up of two elements - the probability that an event will occur and the consequences of that occurrence, the relative contributions that these two elements make to the risk may vary considerably.

To give an everyday example of this point, consider two gambling risks - the tossing of a coin to decide the winner of a wager, and the playing of Russian roulette. In each case the unwanted or harmful consequence is losing the gamble. In the first case the probability of losing is 1 in 2, whereas in the second case it is only 1 in 6 - three times less likely. However,

the consequences of losing are hugely different; the loss of cash in one case and the loss of one's life in the other.

A FORMULA FOR RISK VALUE

Remembering that the two elements of risk are the fire hazard and the fire risk, it would be reasonable to call the overall risk the Risk Value defined by the simple formula :

Risk Value = Fire Hazard Value x Fire Risk Value

If we then express the size of the fire hazard and the fire risk by assigning values to them we could, by applying the formula, obtain a number which would be a measure of the risk value.

The size of the risk value then becomes the basis for categorising the workplace as being of high, normal, or low risk.

QUANTIFYING THE FIRE HAZARD AND THE FIRE RISK

This is easily done if we classify the fire hazards by describing them as being between negligible and very severe, and by assigning a numerical value to each description.

Similarly, we may classify the fire risks by describing them as being between unlikely to very likely, and by assigning a numerical value to each of these descriptions.

CLASSIFICATION

FIRE HAZARD		**FIRE RISK**
Description	Value	Description
Negligible	1	Unlikely
Slight	2	Possible
Moderate	3	Quite Possible
Severe	4	Likely
Very Severe	5	Very Likely

If we apply the risk value formula to all possible combinations of fire hazard values and fire risk values we obtain a set of twenty five numbers - the risk values, which could then be displayed as a two dimensional grid which we could call a Risk Value Matrix.

The final task in this method is to decide the ranges of the risk values that will correspond to our three categories of risk.

THE ALGORITHMIC METHOD

An algorithm is a two dimensional diagrammatic representation of the steps to be undertaken in order to make a decision, solve a problem, or carry out a process. In short, it is a flowchart.

An example of the type of risk assessment algorithm that might be used is shown on the attachment.

HOW TO USE THE ALGORITHM

Starting with box 1, we first identify the most flammable material in the workplace and ask the question: can it be removed ? If the answer is yes, we remove it from the workplace. We can repeat this process until we have reached the point where no more flammable materials may be removed.

Moving on to box 2, we identify the most likely source of ignition and then ask the question: can it be separated from flammable materials ? If the answer is yes we undertake the separation and then identify the next most likely source of ignition and repeat the question. As with box 1, we continue this question and answer process until no further separations may be achieved.

Apart from these first two steps, which constitute cyclical loops, all the other steps in the algorithm form a self-explanatory linear progression which will lead to the conclusion that the workplace is to be categorised as being of high, normal, or low risk.

Conclusions

Risk assessment techniques provide a valuable tool in attempting to categorise the degrees and severity of risk which an organisation might be liable. While no method is infallible, sensible use of risk assessment and application of the lessons drawn can result in more cost-effective introduction of fire protective measures.

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