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The approach of BS9999 compared with FRAME

Introduction

In the foreword to the standard, it is said that “the concept behind the development of BS 9999 and BS 7974 is that technical guidance on fire safety is provided at three different levels. This permits a design approach to be adopted that corresponds to the complexity of the building and to the degree of flexibility required.”

BS 9999-2008 “Code of practice for fire safety in the design, management and use of buildings” is aimed as an advanced approach between pure prescriptive fire protection design and a “full” fire safety engineering approach, for which BS 7974 is the governing British Standard.

The FRAME method is also meant to be used for those buildings where the prescriptive regulations cause problems for the designer and where the full FSE approach is often too expensive. So, it might be interesting to compare the BS 9999 approach with FRAME.

BS 9999 is designed as a co-ordinated package covering the four main areas that influence fire safety measures, namely fire safety management, the provisions of means of escape, the structural protection of escape facilities and the structural stability of the building in the event of a fire, and the provision of access and facilities for fire-fighting.

FRAME is first of all a tool for the designer to define the elements required to meet the goal of an inherently fire safe building. It can also be used by managers and officials to establish the level of fire safety in an existing situation, and to define adequate measures in the process of correcting unsafe situations.

General Information in Section 1.

BS 9999 Section 1 gives the basic information needed by the potential user of this standard: the general principles, the scope, normative references, terms and definitions, general recommendations and background.

The general principles underline the need to consider fire safety as a whole of features, which require management and maintenance throughout the life of the building:

“It is now widely acknowledged that the design and engineering put into a building for life safety can only do its job properly if it can be managed, maintained and tested over the whole life of the building, and if the staff are trained to handle incidents and operate effective and tested emergency plans. Once the designer or engineer has handed over the building, then good management of fire safety becomes the key element to fire safety for the life of the building.”

This statement appears to be the main reason for bringing together in the same document a very mixed bag of guidelines for the selection of a good fire safety design, guidelines for the management how to maintain the fire safety level in a building, and rules for good practice in the detail design of fire safety features. The drawback of this approach is that some users may therefore consider several parts of this standard as “lumber”.

Clause 2 gives an extensive list of BS, EN and ISO standards that are used as reference, and in clause 3, there is an even larger list of terms and definitions covering the specific terms used in this document.

The first section is completed with some general considerations on the development of a fire (clause 4.1), on the link between design and management (clause 4.2), on property and business continuity protection (clause 4.3 and Annex A), on the environmental impact of a fire (clause 4.4.), on additional recommendations for specific building types or occupancies (clause 4.5 pointing at the Annexes B to G), and on the need to consider also the need of fire safety of disabled people (clause 4.6).
Regarding business continuity protection, on p.22 it is said that “The guidance and recommendations in this British Standard are primarily concerned with the protection of life. The provision of fire safety systems for life safety does not necessarily give adequate protection to property or to the continuity of the business carried out in the building. It is therefore recommended that the potential for property and business loss is assessed so that such risks are understood and addressed. Such assessment should be carried out in accordance with Annex A.”

BS9999’s scope gives the basic arguments for this standard, and there is a broad similarity with the underlying conditions for FRAME:

- “In both new construction and upgrading existing buildings, the various aspects of fire precautions are interrelated and weaknesses in some areas can be compensated for by strengths in others.”
- BS9999 and FRAME provide a level of flexibility that allows the fire protection measures and the risks to be assessed to enable reasonable practical solutions to be designed.

One noticeable difference is that FRAME aims at the fire safety of people, property and business continuity as a whole, where BS9999’s main goal is to achieve reasonable standards of fire safety for all people in and around buildings.

A confusing feature of this BS9999 is the ongoing of the clauses, mixed with a separate numbering of the sections, without any link between them.

**Assessing risk (clause 5) and Risk Profiles (clause 6).**

BS 9999 section 2 (Clauses 5 & 6) is the heart of the new standard and explains the “new approach” of a fire safety design based on a fire risk assessment.

The basis is the (fire) risk profile that defines the potential for fire risks to people, property and business continuity, taking into account the fire safety provisions in the building and the level of fire prevention management. Clause 5 states that "The risk assessments for property protection, business continuity and environmental damage can be undertaken as an extension to that carried out for life safety.”

Unlike FRAME, which offers a comprehensive method to deal almost simultaneously with the various risk aspects, BS9999 does not give any specific approach how to handle the property risk and refers to Annex A for business continuity.

Table 1 gives the basic factors that should be taken into account during such an assessment and cross-references to the relevant sections 5, 6, 7 and 9 of the standard. In FRAME, the basic factors are linked to one or more factors or sub factors so that the user can give a corresponding value to the presence or absence of risk increasing and risk reducing elements.

But the main elements for the risk profiles in Clause 6 are the occupancy characteristics, defined as a) five occupants classes (Table 2) and b) four types of fire growth.

The occupant classes are:

- A: awake and familiar with the building, e.g. office and industrial premises
- B: awake and unfamiliar with the building, e.g. shops, exhibitions, museums, leisure centres, other assembly buildings, etc.
- C: likely to be asleep, e.g. residential buildings, hotels, ...
- D: receiving medical care: hospitals and similar
- E: in transit: Railway stations, airports
FRAME and BS 9999

The occupancy classes C and D are given for completeness, as they are outside the scope of this standard.

Basically, these classes represent variations in occupancy density, mobility and fire risk awareness. In FRAME, these variations are considered for the evacuation time factor $t$ and mobility sub factor $p$, with the advantage of a much finer subdivision and the possibility to consider mixed occupant groups.

The fire growth rates classes are:
1. Slow, e.g. Banking hall, limited combustible materials
2. Medium, e.g. Stacked cardboard boxes, wooden pallets
3. Fast, e.g. Baled thermoplastic chips, stacked plastic products, baled clothing
4. Ultra-fast: Flammable liquids, expanded cellular plastics and foam

These are again very basic fire growth classes, and some of these combinations are purely theoretical as there is no clue what quantity of the mentioned materials is needed to be relevant for the classification. The standard gives no information or how a mix of objects and materials can be transposed into a heat release or fire growth rate. In many situations there will be a need to select a class between Slow and Medium or between Medium and Fast, and further on, there are no guidelines how to handle in-between situations. To avoid a potentially endless discussion over the fire growth class, table 5 gives a series of predefined risk profile classifications. The list is incomplete, it would be more helpful if typical risk profiles were given for all the occupancy classes that were mentioned in the BS5888 series which are superseded by BS9999.

In FRAME, the fire growth factor $i$ allows a much finer approach as it uses 3 sub factors to calculate the fire growth rate, and the main sub factor $m$ is also used for the environmental factor $r$. The FRAME validation webpage explains how the HRR and the fire growth can be linked to sub factor $i$.

In the comment of table 4 “Risk profiles”, it is said that any occupancy with an ultra-fast fire growth is outside the scope of BS9999, and are only acceptable if sprinkler protection is installed.

Sprinkler protection is mentioned in clause 6.4 as the (only) way to lower the classification of an occupancy by one step. This is based on the fact that once the sprinklers are activated, they will slow down the fire growth, but one might question if this is always justified, as sprinkler activation is not directly related to the fire growth but to the heat output.

In FRAME, sprinkler protection is also part of the risk assessment, not linked to fire growth as such, but as an element that reduces the threat of a catastrophic (multiple death) fire.

The BS9999 standard refers to BS EN 12845, BS 5306-2 for valid sprinkler systems, but in FRAME sprinkler systems according to other national or international standards, such as NFPA 13, are considered as equally valid, provided that the design complies with the occupancy type.

In my opinion, clause 15 “Allocation of risk profile”, which is located in Section 5 “Designing means of escape” should be part of this section, as it explains how to deal with smaller high risk zones in a low risk compartment. Basically, it says that such zones should be enclosed to avoid that the whole compartment needs to be classified as a high risk zone.

In FRAME, the existence of smaller high risk zones is considered as an aggravation in sub factor $a$ of the acceptable risk factor $A$.

**Designing for effective fire protection (clause 7).**
BS9999 follows the usual approach of defining first what to do to protect people according to legal requirements (or alternative designs) and considering afterwards what could be done for property and business continuity.
FRAME and BS 9999

FRAME starts with the fire protection of property. Once this part of the fire safety design is established, the need for additional fire protection for people and business is verified. With my 35 years of experience as fire safety designer, I can confirm that this approach is the most efficient working method, especially for non residential buildings.

In industry and commerce, the operational needs will define most of the characteristics of the building design. A comparison with code requirements and the economic balance between the investment cost for special protection systems and the corresponding (lower) insurance premium rates will then result in the most economic and practical fire safety design.

When the first choice for property is e.g. automatic fire detection or sprinklers, it is easy to understand that this will also benefit for the safety of people and business. And FRAME is a very good tool to make that initial choice and to find out if more is needed for the people and business continuity.

For “residential” buildings, most projects will not select any automatic fire safety system at the beginning, although e.g. international hotel chains have included fire detection and/or sprinklers in their own building standards. In most cases, it will be only after it appears to be difficult to comply with the prescriptive rules, that an alternative design will be considered.

BS9999 section 3 (Clause 7) describes in general terms that an effective protection requires care during the design and construction stages and that it will only remain effective if properly maintained during the lifetime of the building.

For the fire safety professional, most of the content of this section is evident, but as the standard is meant to be a code of (good) practice, it might be justified to include such an extensive description as guidelines for the benefit of the non professional stakeholders.

**Designing for the management? (clauses 8 & 10)**

BS9999 “Section 4 : Managing fire safety” makes a link between the duties of the designer and of the (future) manager of the building.

Clause 8 states that “The crucial factor is knowledge of the management systems that will be in place, since this factor influences all of the others.” Designers will particularly dislike this section, not because they do not care, but because it is almost impossible for them to have any grip on the future management level at the design stage of a project.

When the client is a larger company or organisation with its own safety standards, it is likely that the building operation will be run more or less in accordance with these safety standards and that the operational staff will be aware that fire safety features require as much attention and care as any other essential part of the building.

However, the quality requirements for a level 1 management system as defined in Clause 8.3 are such that a designer cannot suppose in advance that such conditions will exist once the building is in operation. More likely, a level 2 management system can be foreseen for larger projects, while for smaller projects, level 3 is more often to be expected.

When the client has no standards of his own, the designer has to assume that the client will comply with his legal obligations and will hopefully provide the supervision and maintenance to kept the fire safety features operational as they are designed. And even “the willing” may not meet all the requirements for a level 3 fire safety management.

What can a designer do when the risk profile of his project requires a fire safety management level set out by table 6, that his client cannot / does not meet? Luckily, BS9999 does not give any relaxation of requirements or other benefit according to the supposed management level.

The note in the margin of BS 9999 Section, Clause 10, states: “The recommendations given in Clause 10 are based on the assumption that the building is being designed to meet a specific occupancy with a defined management system.” The management input conditions of Clause 10.2
reflect an almost ideal situation and one might wonder how often a designer will have the opportunity to start work in such conditions.

However, the note in the margin continues: “If greater flexibility is required in the future use of the building, the designer might need to provide for greater levels of safety, and to reduce management issues as far as possible. If the systems provided for fire safety, e.g. sprinkler systems and storage systems, are specified for a defined level of risk, this can determine the management requirements of the building.” and the clause says “Where a project is speculative, without a particular occupier in mind, or even a particular use, then level 3 management should be assumed in the design”.

FRAME was developed at a time when management tools were in their infancy, by an engineer (me) who was confronted with clients who hadn’t the slightest idea of how the fire safety of their future buildings would be managed. Later on, as a fire insurance advisor, I had also the experience that maintaining a good level of fire safety management is a continuous struggle for the people in charge. As a result of this, FRAME gives very little credit in the design to those fire safety features that require constant managerial attention to be effective, such as guard services, personnel training, inspection systems, etc. At the most, these features will upgrade or downgrade a little the original fire safety design.

In many cases, the designer will be presented with an incomplete view of how the building will be managed, and might prefer to select simple and sturdy systems that can suffer from some “negligence” without going out of service. In FRAME, the initial risk value Ro was developed to overcome the uncertainties in the concept stage, and to define in what direction the final fire safety concept should go.

The clauses “10.3 Designing for the management of fire prevention” and “10.4 Designing for the management of fire protection” will be considered by experienced designers as part of a job well done. Youngsters may use these clauses as quality control tickler lists for their projects.

The Fire safety manual (clause 9 and annex H).
The fire safety manual (see BS9999, section 4 clause 9 and Annex H) is a living document, that is first produced by the designer and which will give a summary of all design assumptions and work. It is transmitted to the owner when the works are handed over, and the management of the premises has the duty to keep it up to date during the life cycle of the building. It is the type of document that fits into a “cradle to grave” concept of fire safety. Annex H gives an elaborate synopsis of the content and use of such a “fire safety manual”.

FRAME makes no reference to any fire safety manual. Where FRAME is used to define the fire safety design package, it seems logical that the FRAME report would be included in that manual. For any person that has to make a fire risk assessment or design modification afterwards, such an up-to-date fire safety manual will be a goldmine of information, and the information in it will certainly help to define the parameters for any FRAME exercise for an existing situation.

Principles of means of escape (clause 11).
The guidance on means of escape in Section 5 permits variations to be made to travel distances and door and/or stair widths, on the basis that the level of risk can be reduced by the provision of additional fire protection measures. Such measures include an increased level of management of fire safety, the provision of an automatic sprinkler system, the provision of a smoke management system or the provision of an additional level of automatic fire detection.

Clause 11 “Principles of means of escape”, brings the classic theoretical basis of the time line of fire development and the corresponding definition of the available safe egress time (ASET). Some aspects of human behaviour in a fire situation are also considered.
In FRAME, the ASET is represented as sub factor \( r \) (environment factor) of \( A_1 \), the acceptable risk for the occupants, see at “validation/ evacuation time” for more information. Human behaviour is part of the evacuation time factor \( t \), as a correction for the mobility sub factor \( p \).

**Evacuation strategy (clause 12).**

Clause 12 “Evacuation strategy” describes the various possibilities to organize the evacuation of building in case of fire (or eventually an other emergency). Several approaches are distinguished: simultaneous total evacuation, phased total evacuation, progressive horizontal evacuation and zoned evacuation.

Phased evacuation is an approach that is only applicable for buildings with a large number of occupants, which are not all at risk in the developing stage of a fire, and where a total evacuation would probably cause more problems than the fire itself. Examples are high rise office buildings, atria, large shopping centres. The building should be designed and managed for this type of evacuation, with provisions for protected staircases, compartmentation, sprinklers, voice communication systems, management procedures, staff training, etc…

There is no separate factor in FRAME to deal with the evacuation strategy. In buildings or compartment with less than 300 persons to evacuate a small bonus is given for that fact, as this number is considered to be the upper limit for a total evacuation strategy.

Indirectly, the higher evacuation time factor for buildings with a large number of occupants or with less mobile persons, will result in a higher initial risk level \( P_1/A_1 \) which can only be compensated by including a number of protection features in the escape factor \( U \), such as protected staircases and voice communication systems. These can then be used by the management to organize a phased evacuation.

**Internal subdivision (clause 13).**

Clause 13 “Internal subdivision and spatial/visual orientation” describes the possible influence of subdivisions on the escape progress.

The advice given in 13.2 on compartments confirms the FRAME approach to design the fire safety of a building per compartment.

With open storey planning, many of the occupants are likely to be aware of smoke from a fire at the outset and this gives the advantage of early warning, but in most cases it means also that more people are at risk at the same time.

Cellular design has some disadvantages at the detection stage, but offers mostly a barrier to fire development, so that less people are at risk. In FRAME, sub compartmentation is considered in factor \( U \) as an advantage for the safety of the occupants.

**Designing means of escape (clause 14).**

Clause 14 “Designing means of escape” gives the general rules for designing the means of escape according to the risk profile of the occupancy. The decision process is shown on the flowchart given in Fig.3 and starts from a initial choice of a) using the minimum package of fire protection measures or b) using additional fire protection measures.

Clause 14 gives also an overview of acceptable and unacceptable means of escape, which can help to keep the design free of weird ideas. One may question whether the specific recommendations for crèches and the evacuation of disabled people should be included in the general considerations of Clause 14.1.
BS9999  Fig. 3 directs the designer first to clause 16 “Minimum package of fire protection” to find out if he can get away with this type of fire safety design, and if not, redirects him to the alternative of using additional fire protection, given in clause 19 “Additional fire protection measures”.

I have said before that this is not the most efficient way to proceed with the design. The choice of extra fire protection measures depends mainly more on the level of property protection required and the need for additional features to protect people shall depend on what is already foreseen at that stage. That is why FRAME starts with the design of property protection before tackling the peoples’ safety. If a higher initial risk level for property requires automatic smoke detection or sprinkler systems, that decision will also be beneficial for the people’s safety.

**Minimum Package of Fire Protection (Clause 16)**
The minimum package of evacuation protection as defined in Clause 16 is a combination of a reliable fire alarm system, emergency escape lighting, exit signalisation, escape door design, final exit design, and elementary smoke movement control for the escape ways. Although lifts are generally not considered as an acceptable means of escape, some attention is given to the impact they may have on the escape route.

The provisions found in Clause 16 are very similar to what is found in the traditional prescriptive regulations. The “new” part of it is that the type of fire alarm system (Type M, L3, L2 and L1 systems are defined in BS 5839-1:2002+A2:2008) is linked to the risk profile of the occupancy.

In FRAME, all types of evacuation protection are handled in the same way: their deficiencies will result in a penalty and an increased risk level, the more performing and reliable they are, the more bonus points they will yield with a corresponding lower risk level. It is up to designer to compose a package that is adequate for the specific risk level present in the compartment.

**Designing the horizontal exit capacity of a compartment (Clause 17)**
Clause 17 deals with the provision of horizontal means of escape from any point in a storey to the nearest storey exit of the floor in question, for all types of building other than atria and shopping complexes. Means of escape for atria should be provided in accordance with Annex B, and for shopping complexes in accordance with Annex E.

Sub clauses 17.1 and 17.2 give the general principles for designing the exit capacity of a compartment, based on the occupant load. The paragraphs of clause 17.3 are prescriptive requirements for specific aspects of escape routes. These are copies of what can be found in the official building regulations (Approved Document B) and offer no design alternatives as such. Sub clause 17.4 defines the allowable travel distances towards a place of relative safety, and proposes longer travel distances for lower risk profiles than the prescriptive requirements. Sub clause 17.5 treats the particular situation of exit paths of a cellular floor plan design. Sub clause 17.6 deals with the exit width calculation and sub clause 17.7 emphasizes on the benefits of phased and zoned evacuation for the escape of disabled people.

Basically, as any person confronted with a fire should have at least two ways to escape from it, the codes will usually impose two escape routes or alternatives, minimum width for doors, corridors and stairs, and limit the number of persons per escape route.

National codes allow single “regular” escape routes in the following cases:
- when the number of people to evacuate is limited, and ..
- when the travel distance towards exits is short, or
- when rescue by the fire brigade is a viable alternative, e.g. when the building façade is easily accessible to fire brigade vehicles.

Fire safety codes usually do not use travel time limits, but give such requirements for the dimensions of the means of escape that acceptable exit times are possible for each type of occupancy.
These principles can be found in any national fire safety code, but when it comes to designing the exit routes, it appears that every country has developed its own rules for defining the number and the dimensions of escape routes and exits, based on a combination of an occupancy groups with similar risk profiles, occupant densities (floor space factors), exit flow capacity and travel distances.

**Occupant load factors**

There is a wide variation in the national codes for the proposed (or imposed) values of occupant load factors and exit flow capacities. Generally speaking, one group of countries (e.g. Belgium, France, USA) use “upper average” occupant densities in combination with the “average” exit flow capacity. An other group of countries, like the UK, use “maximum” occupant densities in combination with “maximum” exit flow capacities.

FRAME recommends the “high average” occupant loads as found in the US and many other European countries. Using the higher occupant loads given in BS9999 will add an extra margin to the risk assessment, which may not be necessary. E.g. BS9999 defines the occupant load of an office at 1 person per 5 m², where many codes use (and FRAME recommends) 1 person per 10 m².

In many office buildings, for reasons of working space comfort and status the real occupant load is closer to 1 person per 20 m², indicating that there is a considerable built-in safety margin in the codes.

Sub clause 17.2 states that “The capacity of the stairs should not be used as a basis for determining the occupancy capacity of a room, as this might result in an estimated occupancy that could not be controlled in the event of an emergency”. In my opinion, this should also apply to all exit paths and the rule should not be used “backwards” to define the maximum allowable occupant load in function of the available exits, as the safety margin of the high occupant load factors becomes an unsafe overestimation in the reverse process.

**Exit flow capacity**

Where the average exit flow capacity is used in the national codes, the values used are about 60 persons per minute for a single leaf door. The maximum flow capacity used is about 120 persons per minute, which corresponds with an unimpeded flow of 2 persons per m² at a walking speed of 1.25 m/sec, and with the 5 mm/person requirement of Approved Document B.

SFPE Handbook of Fire Protection Engineering Third Edition p.3-346 says: "Expressed quantitatively, when the pedestrian density is less than about 0.5 persons/m2 (21 ft2/person), people are able to move along walkways at about 1.25 m/s (4.1 ft/s), an average unrestricted walking speed."

And: "With greater density, speed decreases, and it decreases very markedly with very high densities, reaching a standstill when density reaches 4 or 5 persons/m2 (2.1 to 2.6 ft2/person), equivalent to a fairly crowded elevator situation. This is also similar to the situation in a closely packed bulk queue of people anxiously waiting or competing to get through an entrance."

BS9999 Clause 17.6, Table 13 and Clause 19.4.3 Table 18 propose narrower door widths per person for lower risk and better protected compartments. The door width of 3.6 mm/person for an “standard” A2 risk corresponds with a density at the last m² before the exit door of 4 persons/m². Table 18 allows even 2.4 mm/person (equal to 5.5 persons/m² near the exit) for a sprinklered A1 type risk.

Using these values creates the possibility of queues near the exits, especially when the travel distances to the exits are short and people reach the exit together, with a consequent risk for panic. Such possibility makes the calculation of the total exit time totally unreliable.

FRAME packs all the occupants in an imaginary exit corridor, as wide as of the available exit units and as long as the sum (b+I) of the compartment, to define the maximum occupant density on the escape route and uses this density to calculate the flow speed by the formula given in the SFPE handbook.
This flow speed is used in the calculation of the time evacuation factor \( t \) and high densities on the exit path will result in high values for \( t \).

**Millimetres or exit units?**

There are two approaches to calculate the available exit capacity, one is dividing the “correct” free door width by a value (\( x \) mm) per person, the other is to reckon with escape width units (usually = 60 cm free width).

The width per person approach requires a proper method of measurement for the door width (see sub clause 17.6.1), but several countries impose the exit unit method, as they want to avoid the use of “wider= non standard” doors, to make peanut savings by reducing the number of doors to be installed.

FRAME uses the escape unit concept as it allows to evaluate the exit capacity based on the number of doors shown on drawings, without having to check the exact width of them.

**Spare capacity for blocked routes.**

Codes include some additional requirements to guarantee that sufficient capacity is left over if one route should be blocked. This can be done by imposing a maximum variance (e.g. of one exit unit) between the distinct escape routes. The UK uses its own specific rule of discounting the largest exit, requiring that the aggregate capacity of the remaining exits is adequate for the total occupant load.

Both approaches, either maximum occupant load with maximum flow capacity, or average occupant load with average flow, will result in almost identical lay-outs when the total exit capacity is grouped at two or three large exits, as can be found in schools, hotels and residential occupancies. However, the UK discounting rule allows to distribute the exit capacity over several smaller (one door) exits, and that gives less guarantees for spare capacity, although this is usually compensated by the high occupant densities.

FRAME has built-in a capacity limit of 120 persons per exit unit, to warn the user for a situation where exit queues could cause panic, and uses that value to calculate sub factor \( K \), the number of distinct exit paths, limited to 4. This means that for FRAME all exits within a 90° angle are taken together as a single escape route.

Generally speaking, FRAME uses often lower values for the occupant load than BS9999, but is more strict in judging the available exit capacity. The following example, for a canteen of 20 m x 20 m = 400 m², will explain the difference.

According to BS9999 table 4, this is a A2 risk. In table 10, we find an occupant load of 1 person per m², which gives a total occupant load of 400 persons, which is a pretty crowded canteen. In table 13 we find that the minimum door width is 3.6 mm per person.

Suppose that the canteen has 3 single exit doors of 800 mm width, each door has then a capacity for 800:3.6 = 222 persons, and with one exit discounted, the available exit capacity is 2x 222 = 444
persons, which is more than the calculated total occupant load and thus in compliance with the requirements.

For FRAME, this would be an unacceptable situation as the numbers of persons exceeds the 120 persons/exit limit:

<table>
<thead>
<tr>
<th>Number of occupants</th>
<th>X</th>
<th>persons/m²</th>
<th>Width of exit (m)</th>
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<tbody>
<tr>
<td>Total of exit units</td>
<td>x</td>
<td>exit units</td>
<td>x is the number of exit units. The minimal width for an exit is 0.6 m (or 2 ft) unless law or practical conditions specify it otherwise.</td>
</tr>
<tr>
<td>400</td>
<td></td>
<td></td>
<td></td>
</tr>
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If the double door exits were used, both should have at least a width of 1440 mm to comply with the 400 persons exit capacity.

For FRAME, this is an acceptable situation, but it will result in a high evacuation time factor \( t = 0.58 \).

In FRAME, the recommended occupant load for the canteen is 0.6 persons per m², giving a total occupant load of 240 persons. With 3 doors of 800 mm wide, there would be 3 exit units, giving an evacuation time factor \( t = 0.29 \).

The alternative with 1440 mm wide double door exits will yield 4 exit units and a corresponding better safety level with an evacuation time factor \( t = 0.08 \), as the double doors are accepted as two distinct exit paths with adequate capacity.

So, it is possible that a compartment with a high occupant load and "distributed" single exit doors, complies with the BS9999 requirements, but it is considered as unacceptable for peoples' fire safety in a FRAME assessment.

**Vertical means of escape (Clause 18).**

The codes of several countries require fire resisting separation between floors and a protected access to the stairs. In consequence, they consider implicitly that, in case of fire in a multi-storey building, only one floor at once will be evacuated, and thus the stair flow capacity can be defined in line with the exit capacity of the largest compartment.

BS9999 follows the traditional split between horizontal and vertical means of escape. The most common form of vertical means of escape is a protected staircase, which offers already some protection from the fire before leaving the building.

Sub clause 18.1 gives the general principles and sub clause 18.2 gives the (prescriptive) requirements for the correct design of a protected escape stairway. These requirements can help FRAME users to classify the stairway(s) for the calculation of the escape factor \( U \) (sub factor \( u3 \)).

Sub clause 18.3 defines the number of escape stairs.
BS9999 clause 18.3.2 follows the British practice to discount one stairway, in case one might not be available due to fire or smoke. This is not required when the stairways are protected by an access lobby or by a by a smoke control system, or if the building is fitted with a sprinkler system. Clause 18.3.3 allows single escape stairs in low risk situations.

In FRAME, the stairway is assumed to be part of the escape route(s) for the calculation of the evacuation time factor t, and when the stair would be narrower than the horizontal escape path, it is the stair wide that will define the number of exit units for that escape route.

The minimum width for stairs for FRAME is also 60 cm free width for a maximum of 120 persons, but the user should use his own national requirements to establish minimum width of a stair, in order to avoid discussions with the authorities. Table 14 of BS9999 is an example of such national requirement.

When a multi-storey building has interconnecting open stairways, all floors shall be considered as part of one compartment and the occupants of all floors shall be considered for the occupant load. This is practically the same as the simultaneous evacuation approach of clause 18.4.3. For buildings with fire separations between floors, phased evacuation will be the more common practice.

In FRAME, the type of stairway is considered in the calculation of the escape factor u, and the better protected stairway types give a higher “protection value”. Single escape stairs will only be adequate to obtain an R1 value below 1, for buildings with a very value for the occupant hazard.

Due to the high value of level factor e for the upper floors of high rise buildings, a low R1 value can only be obtained by the provision of protected or external stairways, eventually in combination with automatic fire detection, smoke management systems and/or sprinklers.

Clause 18.8 deals with the methods of vertical escape for disabled people. FRAME does not foresee a specific risk evaluation for them, although they are considered in the mobility factor p. In a building where there is a significant portion of less mobile occupants, this will result in a higher risk level, which can only be compensated by a higher level of special protection. Apart from special protection, FRAME foresees horizontal exits to adjacent compartments as improvement. This concept is used e.g. for hospital buildings. Refuges in compliance with Annex G of BS9999 can be accepted as horizontal exits for disabled people in FRAME.

**Benefits of automatic detection and sprinklers (Clause 19)**

Clause 19 permits to increase the travel distance and reduce the door widths and stair widths in buildings equipped with automatic detection and informative warning systems (sub clause 19.2), with high ceilings (sub clause 19.3) and with sprinklers (by risk declassification).

The 15% increase in travel distance and the 15% reduction in exit path width for effective automatic detection and warning systems are provided have as effect that the movement time part of the RSET will increase. It can be justified by a shorter delay time to start the evacuation.
As FRAME does not impose criteria for the travel distance and exit path dimensions, the benefit of the shorter delay time is found in the inclusion of automatic detection in the escape factor \( U \).

An additional increase in travel distance and reduction in exit path width is accepted in clause 19.3 for rooms with high ceilings. “This flexibility is only appropriate when a full account is taken of the risk presented, i.e. position, height and nature of fire load.” Such a clause is an open source for discussions.

In FRAME, a high ceiling is only accepted as beneficial (through venting factor \( v \)) when some smoke venting capability is available. BS9999 does not link the benefits of high ceiling with smoke venting, which I believe is an error, as all fire simulation models show that any space without smoke venting will be full of smoke quite fast, even when the ceiling is high and the fire development is slow.

The increase in acceptable travel distance is defendable, as sprinkler protection is currently only used for large compartments where such travel distances may be physically unavoidable, and because of their slow down effect on fire development.

Narrowing the exits is much more debatable: Early detection and warning through the activation of sprinklers depends on a large variety of parameters (ceiling height, sprinkler response time, link to the alarm system) and hence there may be no shortening of the delay time at all. The acceptable door widths given in Table 18 create the possibility of queues and standstills near the exits, with a consequent risk for panic.

The US IBC code also allowed (up to the 2006 edition) narrower exit widths of 0.20”/person for stairways and 0.15”/person for other components for sprinklered buildings. The 2009 edition of the IBC Code has eliminated these reduced egress width capacity factors for sprinklered buildings, and requires now 0.30”/person for stairways and 0.20”/person = 5mm/person for other components, which is now the same as in the Life Safety Code NFPA 101, and which corresponds with the requirements of approved document B.

The tendency is to increase the minimum requirements for exit ways and stairs to reflect the recent findings that the effective walking speed on stairs is much less than what was assumed when the codes were written, and to take care of the growing number of obese (and slow) persons in our society. The figures given in the tables 13 and 18 are contrary to this international trend.

### Access and facilities for fire-fighting (Section 6, Clauses 20 - 29)

In section 6, the provisions for access and facilities for fire fighting are prescribed without any link to the risk profile. This section is a purely prescriptive design guide and is an updated version of BS 5588-5:2004 : “Access and facilities for fire-fighting” which was superseded by BS9999.

For larger buildings, clause 25 requires the existence of a fire control centre from where rescue and fire fighting operations can be organised. In Annex I, recommendations are given how to manage the evacuation from that fire control centre.

In FRAME, there are no specific requirements for building access, but there is an increase in the potential risk by factor \( z \), for compartments which are less accessible, being very wide or located high up or deep down the access level. A much stronger penalty is given for the area factor \( g \) for buildings with narrow frontage. In a future version of FRAME, the provision of fire fighting shafts and of dedicated fire-fighting lift cars could be included as special protection for tall buildings.

### Building structure design (Section 7, Clauses 30 - 38)

Section 7 “Designing the building structure (load-bearing and non-load-bearing elements)” clauses 30 -38 give (prescriptive) requirements for the building construction and installations, in order to
prevent the spread of fire inside and outside the building and to guarantee its structural integrity as needed.

Clause 30 gives the general principles, clause 31 refers to structural fire safety resistance, clause 32 deals with compartmentation, clauses 33 and 34 with controlling fire and smoke spread through openings and cavities, clauses 35 and 36 consider external fire spread.

**Structural fire safety resistance (clause 31)**

Clause 31 gives three reasons for the safety role of structural fire resistance: minimize the risk to occupants remaining in the building, reducing the risk to fire-fighters engaged in rescue operations, and reducing the danger to people in the vicinity, who might be hurt by the collapsing structure.

These reasons are not valid, structural fire resistance offers little or no protection at all for the occupants inside a building, because structural fire resistance is not a “safe time” period, but the value for the thermal attack on the structure after flash-over. A 30 min rating corresponds with a room temperature of 842 °C. In such situation nobody can survive or be rescued at all. And the ISO-834 curve temperatures are defined for a test furnace, in the reality of a building it will take much more time to reach them, and by then nobody should still be in a building on fire.

A valid reason to require structural fire protection for a building is to avoid damage to adjacent property by the collapsing structure. In this perspective it makes sense to require little structural fire resistance for low buildings and high values for high rise buildings, where the risk of collapse by fire should be nearly impossible.

The main benefit of structural fire resistance is compartmentation, proper fire resistive barriers define and limit the size of the property and the number of people directly at risk in case of a fire. The boundaries of such a compartment are the open air and fire resistive barriers such as walls and floors, with a FR rating of 60-120 min. Needless to say that the structural elements that support these barriers shall also be fire resistive.

Property and people outside the compartment on fire are not directly at risk, and will probably never be, when each compartment is adequately protected. Walls and floor with these moderate ratings are adequate to meet the compartmentation goal, and these are used to define the compartments for a FRAME calculation.

Insurance companies sometimes require maximum loss limiting fire walls of superior construction and fire rating, but their primary goal is to limit the monetary values to be insured, even in the case of failure of all (active) protection.

Fire resistive (non-structural) elements of separations protecting escape routes do contribute to the occupants safety, as they shield them from direct exposure to a fire.

Table 24 gives the minimum requirements for fire resistance for the different parts of the building and follows the set-up of the Approved Document B, with a reference to old BS and newer EN standards.

The difference between BS9999 Table 24 and FRAME lay in the way the fire resistance is handled: The standard imposes minimum performances, FRAME evaluates what is available in factor F, and when the performances are substandard, it will result in an inadequate level of fire protection in most cases, unless compensated by the extra protection evaluated by factors S and U.

**Structural fire resistance requirements (Table 25)**

Table 25 gives recommendations for fire resistance based upon the fuel load density and assuming an unventilated fire. Instead of using the risk profile classification (A1, A2, etc.) it refers to the occupancy uses of the prescriptive Approved Document B, and replaces hereby the occupant based
risk profile by a fire load based requirements table. No effort is made to “translate” the occupancy classification into risk profiles.

When looking at these requirements for sprinkled and unsprinkled buildings, there is a mere 30 minutes fire resistance “benefit” allowed for the sprinkler protection, which is in contrast with the statement on p.133 that: "The provision of an automatic sprinkler system significantly reduces the severity of a fire".

In FRAME, the duration of the sprinkler water supply can be taken as the fire rating, but not for more than 60 minutes. Indirectly, Par. 32.2 p.146 admits that this is a correct approach: “A sprinkler system, suitably designed and installed for the hazard to be protected, can be expected to prevent the rate of heat release from significantly exceeding that at the time of sprinkler operation. In most instances it will assist in controlling the fire. The fire resistance of the compartment walls and floors can therefore be reduced in a sprinklered building or compartment.” But it is legally difficult to introduce in BS 9999 a better benefit for sprinklers than is accepted in the APB.

The comment on table 25 says that: “Since there are a number of factors to consider, in some cases it is possible that certain combinations of building and occupancy characteristic might initially appear inconsistent.” It might be more logical to leave out of the table the weird combinations like “unsprinklered residential at basements below 10m”.

**Structural fire resistance for ventilated compartments (table 26)**

Table 26 gives requirements for fire resistance of elements of structure based upon the ventilation conditions given in Table 27. Contrary to table 25, the risk profile classification is used here, and it is probably meant to be a “risk based” complement to Table 25.

In the comment on table 26 it says: “From the Monte Carlo analysis, the cumulative distributions of time equivalent were subsequently analysed based upon the fundamental premise that risk = frequency × probability × consequence of failure. The frequency was linked with the height of the building following the principles of the Building Regulations 2000 [19], and consequence of failure was linked to both the building height and risk profile of the occupancy taking account of the familiarity and mobility of the occupants within the building and whether there is a sleeping risk. The probability of failure is directly related to the cumulative distribution curves that resulted from the Monte Carlo analysis.” An impressive statement that shows that the author(s) have no clear ideas on what risks are.

The expression "Risk = frequency (of what ?) x probability (of what?) x consequence of failure (of what?) is a mix of undefined concepts. Frequency of occurrence of an event is basically an observation of the past, e.g. how often is there a fire in an office building, while the probability of that event is the prospect for the future, whereby we usually assume that it will be same as in the past under the same conditions. A better definition for (discontinuous) risks is given in FRAME : risk = frequency (of occurrence) vs. consequence (damage occurred) vs. exposure (to the fire threat). The mathematical expression is a cumulative product of the three values for a series of events.

The basis of table 26, is a time equivalent approach based upon expressions of EN 1991-1-2, for post-flashover fires. The variables, which determine the level of heating in a real fire, can be linked to the standard fire resistance test conditions by the concept of time equivalency (t-equivalency).

It is true that in a well ventilated room, the fire intensity is less, resulting in a lower equivalent fire duration time, so that in theory the fire resistance requirements can be lower. But in practice, the type of structure (steel, concrete or other) is chosen very early in the design process and the inherent structural fire resistance is defined by that choice. The openings in the façade that can serve for ventilation, like windows, are defined much later and have also to respond to other criteria like providing natural light, energy conservation, and limiting fire spread between floors and external exposure. The designer cannot trust that the conditions of table 27 are met at the time the structural design is fixed, so table 26 is of little practical use.
In FRAME, the distinction between ventilated and non-ventilated compartments is discounted by the ventilation factor $v$, and the height by the level factor $e$. The resulting higher values for the potential risk $R$, can be compensated by a higher protection level $D$, as factor $F$ will increase where FR building elements are used.

**Compartmentation (clauses 32, 33, 34)**

“The spread of fire within a building can be restricted by subdividing the building into compartments, separated from one another by walls and/or floors of fire-resisting construction. The same approach can be applied to prevent fire spread between buildings that are close together. Compartmentation, horizontal or vertical, can also be used as part of an escape strategy to create areas of relative safety."

Clause 32 follows the prescriptive requirements of the ADB with reference to the occupancy risk profile. Compartment sizes should be not more than the maximum sizes given in Table 30 for the appropriate risk profile. Compared with what is practised in other countries, these limits are very large.

Compartmentation is very important for FRAME, as one of the principles of the method is that the risk assessment is made per compartment. Construction criteria as in BS9999 clauses 32.5, 33 and 34 will define the boundaries of the compartmentation, or shall be imposed for those walls and floors that are defined as compartment barriers. The size of the compartment is evaluated by factor $g$ of the Potential Risk factor, and is a major contributing factor in the severity of the property risk.

Clause 33 repeats the prescriptive requirements of the ADB for fire doors, ductwork, piping and other openings in compartment barriers and complements these with a number of rules of good practice. Clause 34 is also in line with the ADB requirements for concealed spaces and cavity barriers.

**Materials and finishes (clause 35)**

Clause 35 states: “In most cases the contents of a building have more influence on the size and growth rate of a fire than the fabric. The choice of materials for walls and ceilings does affect the contribution that the building fabric makes to fire severity, but is more important as an influence over the rate at which flames propagate over the surfaces in question than in determining the magnitude of a fully developed fire ... For life safety purposes the surface flame spread and heat release rate characteristics of the lining material should be of a high class in circulation spaces.”

The clause defines the requirements for materials and finishes, It repeats essentially the rules fixed in the ADB for the classification of linings, for the use of thermoplastics, lighting diffusers, stretched-skin ceilings, insulating core panels, etc. Most of these requirements are very specific for the UK only.

In FRAME, the presence of combustible materials and finishes is evaluated in the fire spread factor $i$ and the environment factor $r$, where the sub factor combustibility class $M$ is used to evaluate the fire propagation characteristics of building and content. A percentage weighed value can be used for a compartment with various types of surface materials. Any unfavourable situation will yield a high risk value. The most efficient measure to reduce the risk is often to select less combustible surface materials.

**External fire spread (clause 36)**

Clause 36 deals with the risk of external fire spread between neighbouring buildings, and is equally a copy of the prescriptive rules used in the UK. In most other countries (except for the Netherlands) the separation rules between buildings are very simple, often a minimum distance between buildings linked to some basic requirements for fire resistance (integrity) of the opposite façades. It is possible that because of other -mainly urban planning- rules fire spread between buildings is not experienced as a real problem.
FRAME does not include specific risk factors to evaluate this risk. The purpose of FRAME is to define an adequate level of fire protection, and when the compartment or building is well protected inside, the risk of external fire spread becomes minimal. However, a calculated value of $R$, the property risk, higher than 2, i.e. a damage potential of more than 100%, is a clear indication that fire spread to adjacent compartments or buildings is possible.

**Ancillary Equipment and Engineering Services (clauses 37 -38)**

Clauses 37 and 38 give guidance for the installation of ancillary equipment such as electrical switchgear rooms, boiler rooms, fuel storage spaces, mechanical ventilation and air conditioning plant rooms, flammable liquid storage, gas services, electrical installations, lifts, escalators, conveyors, etc.

In FRAME, the nature and quality of this equipment is considered as part of the activation factor $a$: Generally speaking they are possible (additional) sources of ignition, certainly when they are not correctly designed, installed or maintained. Such additional sources of ignition increase the probability of exposure and as such they reduce the value of the Acceptable Risk $A$.

**Special risk protection (Section 8, Clause 39)**

This section gives general considerations about special systems such as automatic fixed gas, foam, powder, water spray deluge systems or other purpose-designed extinguishing systems, and indicates the design standards for those systems.

These systems are used almost exclusively to protect vital parts of a production process, and as such they are effective to reduce the overall risk of business interruption. That is why they are part of the calculation of the salvage factor $Y$ in FRAME, but they are nearly insignificant for the overall property protection and for the life safety of the occupants, and they are very seldom used for these purposes.

**Managing occupied buildings (Section 9)**

"This section is concerned with the management of fire safety, ..., addressing the issues that will apply whilst the building is in use or which need to be taken into account when alterations to the building or the use of it are being considered."

After instructing the designer in sections 5 to 8, BS9999 addresses now the duties of the fire safety managers. Clause 40 deals with the transition process of commissioning and hand-over, and after that it is the fire safety managers’ job to keep things working as the designer imagined they should, the other clauses deal with management issues following occupation of a building.

This section is complemented by a number of **good practice guidelines** which can be found in the following annexes. Annex M: Operational information (emergency packs) for the fire and rescue service; Annex N: Commissioning and hand-over of smoke control systems; Annex O: Fire safety training; Annex P: Control of conditions in public areas; Annex Q: Recommendations for owners of multi-occupancy residential buildings; Annex R: Advice to occupiers of dwellings in residential buildings; Annex S: Examples of fire instruction notices; Annex T: Audience/crowd control; Annex U: Hot work; Annex V: Routine inspection and maintenance of fire safety installations; Annex W: Routine inspection and maintenance of ventilation and air conditioning ductwork; Annex X: Phased evacuation; Annex Y: Examples of evacuation strategies; and Annex Z: Example messages for use in a phased evacuation.

The fire manager is likely to be the owner or a caretaker in smaller premises, and a member of senior staff in larger organisations, eventually with a dedicated team to do all the work. In between, all imaginary combinations are possible, the persons in charge with often combine their fire safety duties with other similar duties like security, safe work conditions or environmental safety duties. In a number of countries, legislation requires these persons to have a certain degree of professional
training, and may give them some protection to allow them to inform management without fear of unacceptable situations. It is also necessary that other members of staff are aware of their part in the fire safety plan, be it as origin of possible fires, as user of safety devices, or as participant in evacuations etc.

FRAME is first of all a tool for the designer to define the elements required to meet the goal of an inherently fire safe building. The designer has to assume that systems will be kept in good condition by the management. FRAME gives little credit to organisational practices like training, exercises and maintenance programs to reduce the risk level, as they are subject to all kind of temporary conditions, and thus not “stable during the life cycle” of the building.

FRAME can be used by managers to establish the level of fire safety in existing situations, and to define adequate measures in the process of correcting unsafe circumstances. Inadequately designed or improper maintained or used systems can be evaluated as “inexistent” to show the difference between the risk level in the actual conditions, and what could be achieved by adequate management.

**Specific occupancies: atria (Annexes B and C)**

Annexes B and C gives recommendations for atria and replace BS 5588-7:1997: Code of practice for the incorporation of atria in buildings. Annex B explains the particular characteristics of an atrium fire and the problems encountered for the evacuation and fire fighting in that environment, and gives the general requirements for the construction, the means of escape, evacuation procedures, and active and passive fire protection. As there is a wide variety of situations, Annex C gives a decision tree guidance to what is an acceptable fire safety concept, linked to the occupant classes A, B and C. Each decision tree process is structured to follow a common pattern related to the technical issues that need to be considered.

The decision tree guidance is in fact a risk analysis process leading towards a series of standard acceptable solutions to guarantee an acceptable level of fire safety. The decision tree does not consider the total floor area of the compartment as a selection parameter, which is probably the decisive element for property protection. Some of the design solutions consider “controlling the fire load at the atrium base” as an option. This is a tricky choice for a designer, as there is no guarantee that the strict conditions of par. B.8 can be maintained during the life cycle of the building.

The FRAME manual gives guidelines how to define the values of the sub factors in atrium type compartments. When the adjacent floor are not separated from the atrium by fire resistive construction, they should be considered as part of the atrium compartment and the floor area of the upper levels shall be used to define the level factor a. In the atrium, the value to be used for the ceiling height is the distance between the ceiling and the highest floor which has to be evacuated by a path inside the atrium compartment.

BS9999 makes a distinction between atria of <18m high, between 18 m and 30 m high, and higher than 30 m. FRAME automatically reduces all ceiling heights to a maximum of 15 m to avoid that unrealistic values should be obtained for the ventilation factor v. Smoke clearance systems can be entered in the ventilation factor calculation as mechanical smoke venting systems.

**Specific occupancies: theatres, cinemas and similar venues (Annex D)**

Annex D, as replacement of BS 5588-6, is a detailed design guide for this type of places of assembly, which are a very specific occupancy where tailored requirements as those of Annex D are the most convenient working method. Risk assessments by FRAME can be useful to guide the fire safety selection process, where considerations of property protection and business continuity may conclude that following the legal minimal requirements is not the best overall solution.
Specific occupancies: shopping complexes (Annex E)

A shopping complex is for an occupancy type that has a potential for catastrophes: “The modern shopping complex offers a different set of fire safety problems from those that are common to a single shop, and this annex considers these problems and how to mitigate possible fire hazards.”

The fire safety issues of a shopping complex justify a more elaborate and comprehensive approach, and therefore BS9999 is not the best place for this subject, as this standard is aimed at an advanced approach between pure prescriptive fire protection design and a “full” fire safety engineering.

Basically, shopping complexes fall also outside the scope of FRAME, as it is a good tool for situations where prescriptive fire protection becomes restrictive and where full fire safety engineering is too expensive. It can be useful to use FRAME a part of a full engineering study to define the fire protection concept for secondary compartments, such as storage areas for supermarkets, car parks, e.a. where more elaborate instruments like fire growth simulation models and egress flow simulation are used for the malls and other areas open to the public.

The main justification of the normative annex E, is that the legislative documents like the ABD still refer to BS5588-10, which is superseded by BS9999. Section E.4 requires the full load of a fire alarm system (E.4.1), fire detection systems (E.4.2), public address (E.4.3), sprinkler systems with duplicate water supplies (E.4.4) and smoke control provisions (E.4.5).

But in section E.5 it is admitted that “The recommendations in this annex are, in the main, made in the context of new medium to large shopping complexes with fully or partially covered malls. Although these recommendations can be applied to complexes of all forms and sizes, it might nevertheless be appropriate to consider some variation in the case of uncovered complexes, small shopping developments, refurbishment of existing shopping complexes and covering existing streets … Much will depend on the particular circumstances and a flexible application of the recommendations is therefore needed.”

So, here we are back at square one, where “Any variations made in accordance with this sub clause should be agreed with the enforcing authorities.” In such cases, a FRAME supported risk assessment may be the easiest way to fix the ideas and to define a fire safety concept that gives a correct level of safety at an acceptable cost. When the FRAME risk assessment points to the full load of section E.4, then it is time to switch also to a full fire safety engineering study.

Specific occupancies: process plant and structures (Annex F)

Annex F gives general design considerations for the fire safety of this type of industrial occupancies, often manned by a small number of persons. The fire protection requirements here will be defined mainly by the need for property protection and business continuity, the safety of the occupants is to be guaranteed by the existence of fire alarm systems, automatic protection and maximum travel distances for exits. For those installations which are located in a building, FRAME will give adequate guidance for the selection of the fire protection package. For open air installations, FRAME is not applicable.

Conclusion.

BS9999 appears to be a combination of a prescriptive fire design manual based on the provisions of the Approved Document B, with a touch of a risk based approach and a guideline for fire safety management through the life cycle of a building.

The risk assessment methodology is just elementary, using only two parameters, the occupant type and fire growth, and offers merely an incomplete generic classification for well known buildings uses, were the traditional prescriptive requirements are used most of the time. Unlike FRAME, it offers no
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Instructions or information to handle uncommon situations where the risk profile approach can be useful both for the designer and the approving authority.

Many users, like managers, specialised designers and contractors will only need some parts of this standard and were better off with a set of sub standards focusing on specific subjects, like fire fighting access, atria, shopping complexes or air conditioning.

The idea to replace by one BS9999 standard the BS5588 series may have the benefit of a common approach, but it results in an overloaded document with a “ratatouille” of design concept principles, requirements for a good execution of works, and management guidelines. I liked the dish and the film more than this document.