RISCAuthority

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FPA Fire Protection Association

Fire Engineering Guide for Property Protection and Business Resilience 2020

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Fire engineering project resilience checklist

This checklist may be used to confirm that factors considered important to the protection of business and property have been considered as part of the fire engineering (FE) goal setting process

	Criteria	Yes/No	Comment
1	Has BS 7974 *Application of fire safety engineering principles to the design of buildings – Code of practice* or *CIBSE Guide E Fire Safety Engineering* been referenced and considered as part of this project?		
2	Has the output from the customer's business impact analysis (BIA) been considered during this project during the determination of FE design objectives?		
3	If the customer had not made a BIA: • have they been directed to RISCAuthority's Free ROBUST Business Continuity Software Planning Toolkit? • have they been directed to the assisted approach for property protection and mission resilience documented in Annex B of BS 7974? • are they aware of other published standards such as BS EN ISO 22301? • have the business/property/heritage criticalities been established by another method? (please specify)		
4	Has the customer's insurer been involved with the design process?		
5	How have the design objectives been modified over and above those required in law for life safety? • curtailment of loss to sub critical levels from a single fire event (financial, material, area, capacity or capability) • curtailment of loss to always be within available redundancy • distribution of critical processes or equipment to separate fire compartments • limits placed on the acceptable extent of spread of fire • a means of putting out the fire • timescales for the recovery of the affected space • timescales for the recovery of the affected processes taking place in the space • limits on overall financial impact of a fire event • other (please specify)		
6	Have the following factors been considered within the fire engineering process: • arson, both internally and externally initiated? • fire ingress to the building? • external fire spread over the building? • security and access of personnel and visitors? • potential for, and consequences of, labour relation issues? • flood? • out of hours operation and unattended processes? • secondary uses of the building? • potential future use changes of the building?		

	Criteria	Yes/No	Comment
7	Has the fire engineering process influenced the design of the building in terms of: • selection preference for non combustible materials in structure, cladding and insulation? • inclusion of active fire protection systems? • enhancements to passive fire protection measures? • routing of key services? • reducing the potential for lowering the levels of property protection through changes to the design/products used?		
8	Where protection standards have been used (active, passive or detection systems): • are they used in full, or has engineering judgement been used to adjust them to suit the application? • where the referenced standards have been deviated from, has the adjustment been made by someone with detailed knowledge of the particular discipline? • have *both* performance *and* reliability of protection systems been considered during the selection process?		
9	Have efforts been made in the design to reduce or negate dependencies on: • fire and rescue service (FRS) attendance? • employee intervention in terms of control, detection or fire intervention?		
10	Does the design understand and reference the local FRS response policy to automatic fire alarm systems?		
11	Has the design exploited the benefits of high integrity detection systems for the reduction of false alarms and improvement in identification of true fire events?		
12	Has a proper evaluation of FRS response time been made for a weight of response that is relevant to the preservation of property and business?		

Contents

1 Foreword

This document provides guidance on the key factors in ensuring that property protection and business resilience have been adequately considered during the design stage of a fire engineering solution and accompanying fire strategy.

The consideration of 'resilience' demands the analysis of all possible challenges irrespective of whether their management is a legally mandated requirement or not, and as such can involve a significant extension of scope for practitioners who have solely worked in the compliance sector. Specialist assistance may be required. The goal of resilience is to ensure the building or business survives, in addition to ensuring there is no loss of life and all legal requirements were met.

'Resilience' is considered here in terms of the three major contributing components of susceptibility, vulnerability and recovery, all of which can be influenced by the application of fire engineering methods. This framework also provides a preferential order to the application of control measures: to avoid fire (susceptibility) will always give a greater reward than measures designed to control a fire; measures that limit fire spread (vulnerability) will always give greater reward than measures designed to recover what is lost (recoverability).

Twelve key criteria are proposed, each accompanied by relevant commentary which is then presented as a questionnaire taking the form of a fire engineering design project resilience checklist (see Appendix 1). In summary:

1. use established fire engineering approaches
2. address the risks highlighted in the company's business impact analysis (BIA)
3. if a BIA has not been conducted, one should be created
4. involve the company's insurer
5. be prepared to do more than is required by law
6. consider all risks (external threats, malicious actions, imperfection, human inadequacies, arson and failed systems)
7. consider all solutions that may be presentable within the fire engineering framework
8. do not use standards piecemeal
9. reduce dependencies on human actions and interventions
10. understand local fire and rescue service response policies to automatic alarm systems
11. exploit the benefits of high integrity alarm systems
12. understand local fire and rescue service response times and capability

2 Introduction

There are a number of compliance options in terms of the building regulations. These include:

- following statutory guidance such as *Approved Document B* Volumes 1 and 2
- applying acceptable design codes such as BS 9999 and BS 9991
- using other alternative applicable guidance such as BB 100 *Design for fire safety in schools* and Health Technical Memoranda (HTMs) for healthcare facilities, in particular (HTM) 05-02 *Firecode. Guidance in support of functional provisions (Fire safety in the design of healthcare premises)*
- developing a fire safety engineering (FSE) solution in accordance with the framework outlined in BS 7974 *Application of fire safety engineering principles to the design of buildings. Code of practice* and associated Published Documents (PDs), or the CIBSE Guide E *Fire Safety Engineering*

Statutory guidance and codes such as *ADB*, BS 9999 and BS 9991 are primarily concerned with the protection of life, and may not necessarily address property protection or business continuity concerns unless these have been specifically requested and considered during the design stage. Some guidance is included in annexes to BS 9999 and BS 9991, while property protection guidance in terms of *ADB* is provided in the FPA/RISCAuthority *Approved Document B: Fire Safety – Buildings other than dwellinghouses Incorporating Insurers' Requirement for Property Protection*, volumes 1 and 2 – where the life safety guidance is expanded to include property protection considerations.

The fire safety engineering framework, as indicated in BS 7974, is particularly suited to the inclusion of property protection and business continuity where these have been considered in the early stage of the design process, and where suitable and specific property protection objectives and acceptance criteria have been described. Principles for determining property protection objectives can be taken from the customer's business impact analysis (BIA) or other applicable guidance such as the RISCAuthority *Design Guide for the Fire Protection of Buildings – Essential Principles*.

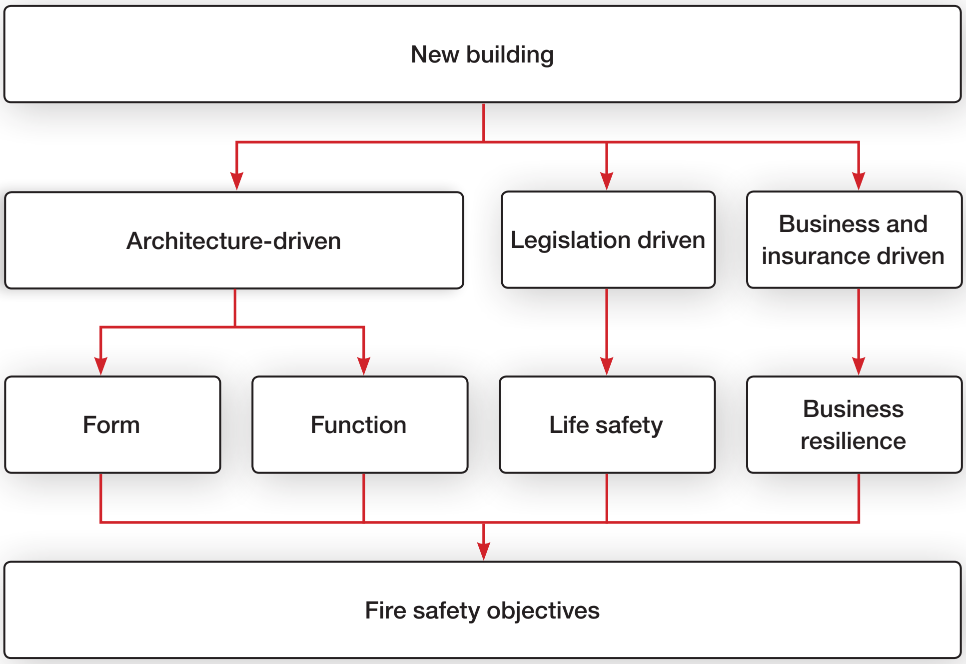

Figure 1: Extract from BS 7974 – Business and insurance driven consideration as an addition to architectural and legislative design drivers

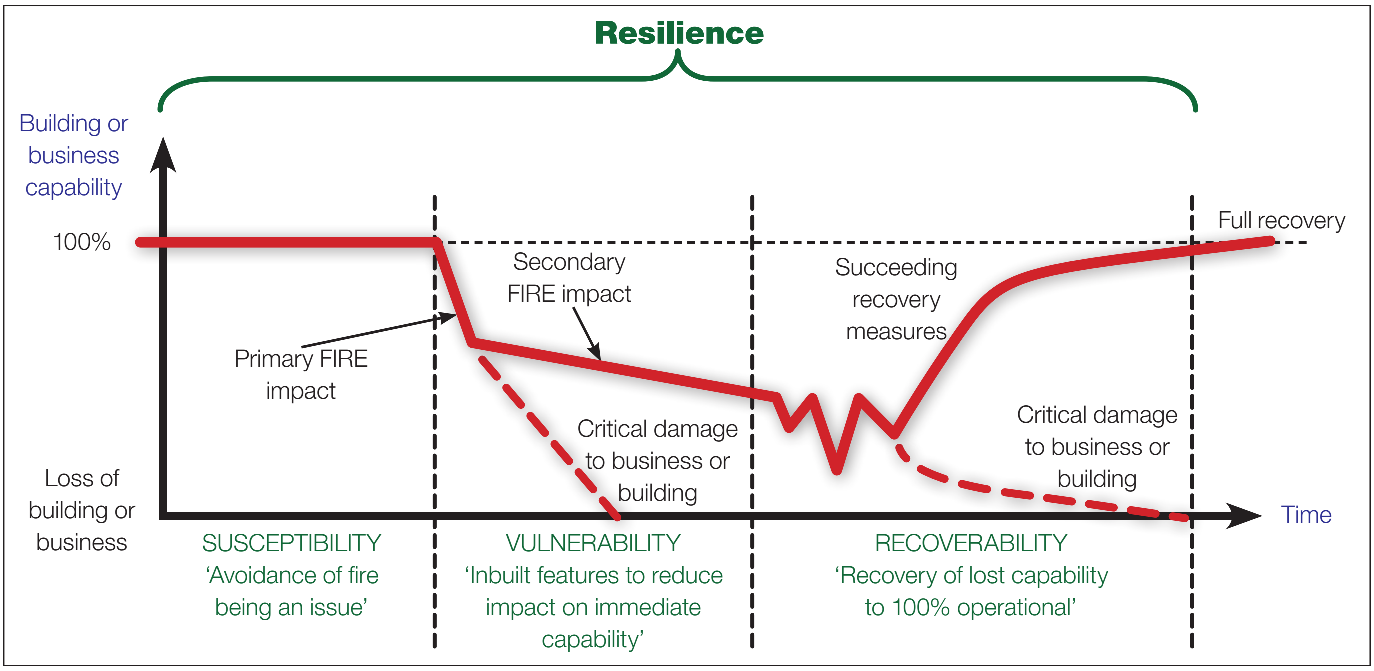

Figure 2

The concept used in this document borrows heavily from military asset protection doctrine and has been suitably modified to address property protection and business resilience. Its application to business protection (financial survival of the business) and to property protection (material survival of the building and the activities conducted within) can result in different solutions, but often both are inherently linked together.

The key considerations which should be addressed to minimise the impact on property loss and business damage are:

- ***Susceptibility:***
  Business protection: reducing the probability of critical financial loss from a single fire event using measures such as capability duplication, separation and good business continuity planning, which may include property protection
  Property protection: reducing the probability of fire occurring through effective design (predominantly via the selection of non combustible materials), fire prevention, security measures and fire safety management
- ***Vulnerability:***
  Business protection: reducing the financial impact of any fire that does start by adopting measures that enable continuity of supply and maintenance of the customer base through asset duplication and separation, which may include property protection
  Property protection: reducing the impact of any fire that does start through early and accurate detection and deployment of active and passive fire protection measures (compartmentation), with effective overall fire safety management
- ***Recoverability:***
  Business protection: facilitating financial recovery through the use of insurance measures and good customer and facilities management planning
  Property protection: facilitating prompt recovery from fire through effective emergency, business continuity and recovery planning

While a fire engineering approach can contribute to all three of these key considerations, the greatest impact will be on susceptibility and vulnerability. The relationship between the key considerations above and the business resilience criteria below has been summarised in Annex 1.

3 Ensuring adequacy of design

The adequacy of the property protection and business resilience measures included in a fire engineering solution (and accompanying fire strategy) and its overall suitability is dependent on the involvement of a competent fire engineer, and ensuring that property protection is considered as part of the initial project brief.

Ensuring that the following criteria has been considered is a good 'litmus test' of the adequacy of the property protection and business resilience provisions incorporated in the design.

3.1 Fire engineering solutions should be based on an acceptable fire engineering design approach such as that outlined in BS 7974 or CIBSE *Guide E*.

Commentary:

The three key stages of the fire engineering framework outlined in BS 7974 and CIBSE Guide E include:

1. The qualitative design review (QDR) process, which involves the gathering of critical information including a review of architectural drawings, occupant characteristics, client requirements and the identification of fire hazards, on which the functional design objectives are based; acceptance criteria for objectives are set; and the development of proposed design options based. The QDR usually involves a design team, which ideally should include insurer representation, and is usually led by a fire engineer.
2. The need for quantitative analysis using engineering methods to verify the adequacy of the design or a specific aspect of the design where this has been identified as necessary.

3. The assessment of the outputs of the quantitative analysis against the acceptance criteria established during the QDR process to ensure suitability.

Business resilience and property protection design objectives should be discussed during the QDR process to ensure that suitable and effective functional objectives are developed and included.

The final fire strategy report and accompanying drawings should clearly state in the introduction the extent of the property protection and business resilience design objectives that are addressed by the fire engineering solution.

To ensure that the ongoing fire risk management of the building supports the FSE design objectives and fire safety provisions outlined in the fire engineering solution, the fire strategy – along with other critical design and installation information – should be passed to the occupier of the building on completion of the project.

3.2 The output from the customer's business impact analysis (BIA) should be taken into consideration when determining the design objectives.

Commentary:

Property protection and business resilience are likely to require separate performance objectives and associated acceptance criteria. The business impact analysis (BIA) is the part of business continuity planning where the consequences of the loss of key resources (including buildings, machinery and operational spaces) are considered and classified in terms of their importance to the survival of the business. At the time of building design there may be opportunities to address vulnerabilities identified in the BIA through the application of fire engineering methods. As a result, the BIA report needs to be interpreted and understood to ensure that these performance aims and acceptance criteria are achieved, with objectives established for the following as deemed necessary:

- Property protection
- Business/mission continuity

Further guidance in this regard is contained in Annex B of BS 7974 and in PAS 911 *Fire strategies – guidance and framework for their formulation*. Reference to the RISCAuthority *Design Guide for the Fire Protection of Buildings – Essential Principles* will also provide valuable guidance when developing functional objectives.

3.3 Where the customer has not conducted a business impact analysis (BIA), there should be evidence that this has been recommended and that they have been referred to:

- **RISCAuthority's Free ROBUST Business Continuity Software Planning Toolkit (including the RISCAuthority Supply Chain Toolkit)**
- **the assisted approach for property protection and mission resilience documented in Annex B of BS 7974**
- **recognised published standards such as BS EN ISO 22301: *Security and resilience. Business continuity management system. Requirements***
- **other methods to establish appropriate business/property/heritage criticalities**

Commentary:

The outcomes from any of the above approaches will need to be reviewed to determine where protection or separation from fire and combustion products would be worthy of consideration, and should form part of the input for the QDR.

Further guidance in this regard, and the setting of property protection and business/mission continuity objectives, are contained in section B.3 of BS 7974.

3.4. The customer's insurer should be involved in the design process.

Commentary:

Early input by the insurer in the fire engineering design process, ideally at the QDR phase, will help ensure that property protection and business resilience are adequately provided for in the final design and fire strategy.

Before the final design options are developed, the entire range of design objectives should be the subject of discussion between the fire engineer, client, architect, enforcing authority and insurer.

3.5. The design objectives should be modified where necessary over and above those required in law for life safety, including:

- **curtailment of loss to sub critical levels from a single fire event (financial, material, area, capacity or capability)**
- **curtailment of loss to always be within available redundancy**
- **distribution of critical processes or equipment into separate fire compartments**
- **limits placed on the acceptable extent of spread of fire**
- **a means of putting out the fire**
- **maximum timescales for the recovery of the affected space**
- **maximum timescales for the recovery of the affected processes taking place in the space**
- **limits on overall financial impact of a fire event**

Example requirement:

- physical damage to equipment, stock and capability shall be contained within the compartment of origin
- the fire shall be detected and extinguished within w minutes
- the compartment shall be recovered within x days
- full business function shall be recovered within y days
- the overall cost of the event will not exceed z % of annual turnover

Commentary:

The extent to which key property protection and objectives have been met will need to be assessed and acceptance determined. This is best achieved by setting targets and acceptance criteria appropriate to the risk such as in Table 1.

3.6. All potential fire hazards should be identified and considered within the fire engineering process, including:

- **deliberate fire setting, both internally and externally initiated, including the potential for terrorist attack**
- **use of the building and any associated activities including process activities and storage**
- **temporary higher risk situations – machinery undergoing maintenance where protection systems may be disabled, or they may be more likely to cause fire (ie oil fryer drain down)**
- **abnormal function of equipment and protection systems**
- **fire ingress to the building from both accidental and deliberately set external sources**
- **external fire spread over the building including the roof**
- **security and access of personnel and visitors**
- **escape of water from automatic fire suppression systems and manual suppression**
- **out of hours operation and unattended processes**

- secondary uses of the building
- potential future use changes of the building
- adequate access to facilitate inspection, service and maintenance of plant, equipment and systems

Commentary:

Fire hazard assessment is an integral part of the QDR process where all fire hazards associated with the expected construction, size and use of the building are identified and considered.

Of particular importance from a property protection perspective is the need to consider what design features – including increased security, access control and exterior lighting – could be used to reduce the potential for deliberate fire setting. Some fitments on the outside of buildings, such as plastic air bricks, are a known source of fire ingress into buildings, particularly where the structure/cladding is of combustible structure, and should be avoided. Equally important is futureproofing the design by considering possible future uses/changes, after hours unattended processes and similar.

It may be prudent to consider the risk of water damage from services, automatic suppression systems or manual intervention in the event of fire and what could be done to help reduce the consequences. Useful information is provided in the RISCAuthority publication *Approved Document G: Sanitation, hot water Safety and water efficiency – Incorporating Insurers' requirements for the reduction of escape of water losses and enhanced safety*.

Objective	Target/s	Acceptance Criteria
Property Protection		
Construction materials/products should not contribute to the early stage developments or spread of fire (Reference: RISCAuthority *Design Guide for the Fire Protection of Buildings Essential Principles*)	• Minimise combustible construction • Use materials that are non combustible or that will not contribute to fire development and spread in the early stages	• Limit combustible construction materials to a maximum of 10% • Use materials/products that are: - non combustible - Class A1 and A2 - approved in accordance with the relevant part of LPS 1181 (sandwich panels and cladding systems)
Minimise the spread of fire and smoke (Reference: *Approved Document B: Fire safety (Volume 2 – Buildings other than dwellings) Incorporating Insurers' requirements for property protection*)	• Limit fire to area of initial involvement and minimise smoke spread beyond initial area of involvement	• Subdivide into compartments of a maximum floor area of 4,000m^2 using 120 minute fire resistant construction, with all openings, penetrations and ductwork suitably protected OR fully sprinkler protect in accordance with the *LPC Rules for automatic sprinkler installations* • Subdivide floor and roof voids with 30 minute fire resistant cavity barriers at 20m intervals
Business Continuity		
Limit business interruption from fire in production facility (based on general risk management principles)	• Limit involvement to a maximum of one production line • Non directly involved, but affected production lines to be fully operational within 48 hours of fire event	• Separate production lines by 60 minute fire rated construction with all openings protected OR fully sprinkler protect in accordance with the *LPC Rules for automatic sprinkler installations* OR provide local fire suppression system/s to protect individual plant/equipment/machinery (depending on the complexity of the risk, one or more of the above may need to be considered)

Table 1: Examples of property protection and business resilience objectives and assessment criteria (note: general example only. Specific objectives, targets and acceptance criteria will need to be developed in terms of the type, size and complexity of the risk under consideration)

3.7 The extent to which the fire engineering process can influence the design of the building should be considered, including:

- **a preference for non combustible materials in structure, cladding and insulation**
- **the inclusion of active fire protection systems**
- **enhancements to passive fire protection measures**
- **routing of key services**
- **minimisation of voids and risers**

Commentary:

When considered at the design stage, it is possible to meaningfully influence the choice of construction products and materials and achieve improvements, such as the routing of services, often at minimal additional cost.

Uncertainties regarding resilience versus sustainability, including measures to reduce the potential for disproportionate loss from a fire or escape of water and access to damaged areas for ease of repair or replacement of components/modules, should all be considered.

3.8 Confirming that protection standards for all active, passive and fire detection systems have been identified and used in full or that engineering judgement has been used to adjust them to suit the application. Where the referenced standards have been deviated from, confirm that all adjustments have been made by someone with detailed knowledge of the particular discipline. It should also be confirmed that *both* performance *and* reliability of protection systems have been considered during the selection process.

Commentary:

Where the fire strategy indicates that active detection and protection systems are to be included (such as sprinklers and automatic fire detection (AFD)), these should be of proven technology and designed, installed and commissioned in accordance with published national standards. There should be no deviations, modifications or exemptions other than that permitted by the relevant standard or associated technical bulletins.

Similarly, passive fire protection systems should be installed and commissioned in accordance with published national standards, for example fire doors and hardware. Wall/floor and other construction materials/products (including fire stopping solutions) should be of a design specification as submitted for fire resistance and reaction to fire testing and classification.

All fire safety systems should be designed, installed and commissioned by competent persons/contractors, who are preferably third party certificated by a UKAS accredited organisation.

Requirements for ongoing inspection, testing and maintenance should be included in the fire strategy and passed on to the building occupier for inclusion in the ongoing fire risk management of the building.

3.9 Efforts should be made in the design to reduce or negate dependencies on:

- fire and rescue service attendance
- availability of water supplies
- employee intervention in terms of control, detection and fire intervention

Commentary:

Comment is included in Section 10 and 12 on the impact of fire and rescue service response policies on the weight and speed of response to fires.

In addition to this, the challenges to fire and rescue service deployment post arrival is worthy of consideration, including the availability of water supplies.

Very complex commercial and industrial buildings may provide challenges regarding access and reach to the seat of the fire for manual intervention. If the risks are too high, a defensive approach is likely to be adopted by responding firefighting crews.

As a result, very large and complex buildings such as highly automated storage and distribution facilities may necessitate additional provisions to reduce the reliance on manual intervention.

The dependence on employees regarding the closing of fire doors, manual raising of the alarm in the event of fire, the manual activation of fixed suppression systems and attempts to extinguish the fire using fire extinguishers or hose reels should be assessed for reliability, and more dependable automatic options considered where deemed necessary to achieve the design objectives. The provision of first aid firefighting equipment such as hose reels and extinguishers can greatly improve chances of managing a fire when very small and is encouraged, but the overall fire safety plan for the building should not be dependent upon this provision.

3.10 The local fire and rescue service response policy to automatic fire alarm (AFA) systems should be considered as a design input and referenced in the design.

Commentary:

Individual fire and rescue services have adopted different policies for their responses to automatically generated fire alarms (call challenging).

Some guidance is provided in the publication *CFOA Guidance for the Reduction of False Alarms and Unwanted Fire Signals*. It is indicated that fire and rescue services assess their response to unreliable fire alarm system signals in terms of a risk assessment, and that response and attendance may vary between three levels.

- **Attendance Level One:** immediate response of initial predetermined attendance
- **Attendance Level Two:** in the absence of confirmation through the 999 system, attendance will be under non emergency conditions, thereby keeping resources available for confirmed emergencies
- **Attendance Level Three:** no response until confirmation through the 999 system or other acceptable source is received

Use of the RISCAuthority Automatic Fire Alarm Analysis Data Toolkit will provide information on individual fire and rescue service AFA response policies.

In fire and rescue service regions where call challenging methods are adopted, the use of high integrity alarm systems (see Section 11) may be accepted as a route towards ensuring a full response is always given. This will need to be discussed with the local fire and rescue service. Alarms raised by the activation of a sprinkler system are considered to be of ‘high integrity’.

3.11 The benefits of high integrity detection systems for the reduction of false alarms and improvement in the identification of true fire events should be fully exploited

Commentary:

High levels of false or unwanted alarms have resulted in fire and rescue services reviewing their policy regarding responses to automatically generated fire alarms (see section 10).

Recent FPA research conducted on behalf of the ABI involved a review and investigation into the levels of false and unwanted activations of signals from automatic fire alarm systems, including:

- the standards, approvals and methodologies being adopted to try to affect change
- an investigation into the reliability of new technology and its potential to contribute towards dramatically reducing the problem

The research report mentions that the overwhelming majority (in excess of 75%) of automatically generated fire alarms in the UK turn out to be 'false or unwanted'.

The impact of false and unwanted alarms includes placing an unnecessary burden on fire and rescue service resources, along with the potential to cause unnecessary and expensive disruption to end users, which can result in the loss of confidence in the systems and has seen some switched off.

The report also indicates that new 'multi sensor' devices are much more discerning with an anticipated performance of 80%.

The attributes of the new technology may have the potential in the longer term to encourage fire and rescue services to review, and perhaps alter, their present response policy and to increase confidence in the systems, both of which have the potential to impact positively on property protection and business resilience.

Assessments and research undertaken by other organisations have reached similar conclusions and support the use of multi sensor technology also.

3.12 The fire and rescue service response time for a weight of response that is relevant to the preservation of property and business should be properly evaluated

Commentary:

The prompt response and deployment of the fire and rescue service can contribute significantly to the reduction of property loss in well designed and managed buildings where an 'offensive' firefighting strategy can be deployed. An offensive strategy usually involves a direct internal attack on a fire where the safety conditions permit. A defensive strategy is usually applied where it is not safe for fire-fighters to mount an internal attack.

Where buildings may have fire safety design and management shortfalls or other complications that necessitate a 'defensive' firefighting strategy by the fire and rescue service, a higher level of loss is to be expected, and the provision of additional automatic fire suppression may need to be considered.

The weight and speed of fire response may also differ from service to service based on the risk profile of the areas they cover, and their individual risk management plans. Response may also be influenced over time due to changes to crewing methods and station distribution.

As a result, an assessment of the likely weight and speed of response will enable additional protection measures to be considered to compensate for any identified response challenges. These compensatory measures could include linking AFD systems to an alarm receiving centre, increasing the duration of water supplies for sprinkler systems and similar.

Use of the RISCAuthority Fire and Rescue Service Response Database will provide a valuable overview of weight and speed of response over varying conditions and times of day, along with crewing policies.

As effective manual intervention by the fire and rescue service is dependent on both response (weight and speed) and effective deployment after arrival (access and firefighting provisions), both need to be considered at the design stage.

Where the assessment indicates a lack of confidence or reliability regarding a response and deployment, it may be prudent to design against a worst case scenario.

Annex 1: Summary of impact considerations and resilience criteria relationships

	Summary of fire engineering resilience criteria	Fire survival/ recovery considerations		
		Susceptibility	Vulnerability	Recovery
1	Fire engineering solutions should be based on an acceptable fire engineering design approach such as that outlined in BS 7974: *Application of fire safety engineering principles to the design of buildings – Code of practice* or *CIBSE Guide E Fire Safety Engineering.*	**X**	**X**	
2	The output from the customer's business impact analysis (BIA) should be taken into consideration when determining the design objectives.	**X**	**X**	**X**
3	Where the customer has not conducted a BIA, there should be evidence that this has been recommended, and that they have been referred to: • RISCAuthority's Free ROBUST Business Continuity Software Planning Toolkit • the assisted approach for property protection and mission resilience documented in Annex B of BS 7974 • other acceptable published standards such as BS EN ISO 22301 • other methods to establish appropriate business/property/heritage criticalities	**X**	**X**	**X**
4	The customers' insurer should be involved in the design process.	**X**	**X**	**X**
5	The design objectives should be modified where necessary over and above those required in law for life safety to include: • curtailment of loss to sub critical levels from a single fire event (financial, material, area, capacity or capability) • curtailment of loss to always be within available redundancy • distribution of critical processes or equipment to separate fire compartments • limits placed on the acceptable extent of spread of fire • a means of putting out the fire • timescales for the recovery of the affected space • timescales for the recovery of the affected processes taking place in the space • limits on overall financial impact of a fire event	**X**	**X**	
6	All potential fire hazards should be identified and considered within the fire engineering process, including: • arson, both internally and externally initiated • fire ingress to the building • external fire spread over the building • security and access of personnel and visitors • potential for, and consequences of, labour relation issues • escape of water from automatic fire suppression systems and manual suppression • out of hours operation and unattended processes • secondary uses of the building • potential future use changes of the building	**X**	**X**	

	Summary of fire engineering resilience criteria	Fire survival/ recovery considerations		
		Susceptibility	Vulnerability	Recovery
7	The extent to which the fire engineering process can influence the design of the building should be considered, including: • a preference for non combustible materials in structure, cladding and insulation • the inclusion of active fire protection systems • enhancements to passive fire protection measures • routing of key services	**X**	**X**	
8	Confirming that protection standards for all active, passive and fire detection systems have been identified and used in full, or that engineering judgement has been used to adjust them to suit the application: • where the referenced standards have been deviated from, have all adjustments been made by someone with detailed knowledge of the particular discipline? • it should also be confirmed that *both* performance *and* reliability of protection systems have been considered during the selection process	**X**	**X**	
9	Efforts should be made in the design to reduce or negate dependencies on: • fire and rescue service attendance • employee intervention in terms of control, detection and fire intervention		**X**	
10	The local fire and rescue service response policy to automatic fire alarm systems should be considered as a design input and referenced in the design		**X**	
11	The benefits of high integrity detection systems for the reduction of false alarms and improvement in the identification of true fire events should be fully exploited		**X**	
12	The fire and rescue service response time for a weight of response that is relevant to the preservation of property and business should be properly evaluated		**X**	**X**

7 References

- BS 7974: *Application of fire safety engineering principles to the design of buildings – Code of practice*, BSI.
- *CIBSE Guide E Fire Safety Engineering*, CIBSE.
- PAS 911: *Fire strategies – guidance and framework for their formulation*, BSI.
- *Design Guide for the Fire Protection of Buildings – Essential Principles*, FPA/ RISCAuthority.
- *Approved Document B: Fire Safety (Volume 2) - Buildings other than dwellinghouses Incorporating Insurers' Requirement for Property Protection*, FPA/RISCAuthority.
- *CFOA Guidance for the Reduction of False Alarms and Unwanted Fire Signals*, NFCC.

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