

A Practical Approach to

Protection of People with Disabilities In or Near Buildings During a Fire, or Fire Related Incident

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Keywords : Buildings, Fire, Impairment, Disability, Fire Protection, Human Health, Refuge Area, Place of Safety, 'Person-Centred' Design, Sustainable Construction.

1. Introduction

Health can no longer be described as the absence of disease or infirmity, but as a state of physical, mental, psychological, social, cultural and economic well-being. The word 'safe' on the other hand, meaning simply un-injured or out of danger, when used in the context of the protection of people from fires in buildings, is entirely inadequate to properly describe the correct fire safety design objective, i.e. that during and after the process of independent evacuation to a 'place of safety', or partial evacuation to a 'place of relative safety', or protection in place, the **health** of those people involved should be assured.

Notwithstanding the fact that different types of legislation have existed for many years in the European Union which require that buildings and places of work be accessible, a lack of purposeful resolve on the part of politicians and controlling authorities at regional and national levels has ensured that, even today, countless barriers to that accessibility are still being erected in the 'built environment'. Furthermore, however, the lack of comprehensive technical guidance on protection from fire has resulted in the creation of a far more pervasive form of barrier to the full 'inclusion' of people with disabilities into the economic, cultural and social life of the general community. See **Appendix A** - Guideline Framework on social inclusion in the E.U.

The evolution of a coherent philosophy, based on first principles, and derived from meaningful consultation with building users and the observation of 'real' building performance, has been a major factor in formulating a practical and cost-effective approach to the development of new fire safety engineering concepts, which aim to mainstream people with disabilities and assure a proper level of health and safety protection for them in or near buildings.

This issue is one of public health and social justice for every 'person' in the E.U. - its scope and importance is presented in this paper. A new **EuCAN Work Item** is outlined, i.e. the production of a Technical Guidance Document (TGD), which will have widespread application throughout Europe and have, as a solid foundation, existing European Union legislation.

2. Scope & Application of this Paper

At a meeting of the EuCAN Expert Group in Luxembourg on the 3rd - 4th December 1999, it was decided to commence a new work item which specifically related to fire protection in buildings and, accordingly, to expand and develop the definition of 'Accessibility' to mean .....

Ease of independent approach, entry and/or use of a building, by all of the building's potential users ~ with an assurance of individual Health, Safety and Welfare during the course of those activities.

This paper, therefore, marks the beginning of a phased programme of work which will last just over two years .....

Phase I Examination of evacuation from buildings of people with disabilities to a 'place of safety' . Emphasis is placed particularly on building design and management as variables in the equation of health and safety protection.

Review of literature, research, standards and legislation, etc.

Raising of awareness with regard to the issues and concepts involved.

Phase II Development of work extends to include the health and safety protection of those people who, for any number of reasons, cannot or will not be evacuated from buildings, e.g. people in prisons or hospitals.

The issues of assuring the health of building users during a fire incident, and quality of survival afterwards, are more rigorously elaborated.

Drafting of the EuCAN Technical Guidance Document commences.

Phase III Production of first working draft of the Technical Guidance Document, and circulation for comment. Produce second draft, and re-circulate.

Phase IV Publication of Technical Guidance Document (TGD) .

The objective, at every stage during the course of this **EuCAN Work Item**, will be to use a generic language of fire safety design and engineering which is not qualified, or limited, by reference to the legislation or national standards of any individual E.U. Member State. It is intended, rather, that the TGD should have as wide an application as possible throughout Europe.

Concerning wheelchair circulation in buildings, it is important for building designers to note that wheelchairs have not yet been standardized. Attention must be drawn to a significant limitation set out in International Standard ISO 7193 **:** 1985, Wheelchairs - Maximum overall dimensions **:**

> ***' This International Standard lays down the maximum limits of overall dimensions on wheelchairs primarily intended for indoor use. It applies to manual as well as electric wheelchairs in their operational condition, and covers wheelchairs usable by 85% of disabled people. '***

Since 1985, developments in wheelchair design and technology have altered this situation considerably. See **Appendix B** for just one example of a current sportschair which, with a rear wheelbase breadth of up to 1500mm, is more than double the dimension in the ISO Standard.

It is not generally intended to deal in this paper, except in passing, with the use of technical aids, lifting techniques or other means of providing evacuation assistance to people with disabilities. Much good work has already been carried out in this area. The reader should refer to a publication, produced by Ms. Edwina Juillet and Mr. Richard Bukowski for the United States Fire Administration, entitled **:**

Emergency Procedures for Employees with Disabilities in Office Occupations

Publication No. FA 154, June 1995.

3. A Wider Context for Fire Safety Design in the European Union

At a time of unprecedented advances in science and technology and, in the E.U., a stricter legal climate concerning public health and consumer protection, it is no longer acceptable for a person to stagger out of a building, during or after a fire incident, and be considered a 'survivor'. It should, however, be reasonable to expect that people would remain in a state of physical, mental and psychological wellbeing throughout the duration of an incident. To put it more directly, human health should be routinely assured in the development of a building's fire defence plan.

The World Health Organization, in the preamble to its Constitution, defines 'health' as .....

> ***' A state of complete physical, mental and social wellbeing, and not merely the absence of disease or infirmity.'***

Furthermore, social justice now demands that a consideration of the health, safety and welfare of everybody in a 'sustainable built environment' [1][2] (and this does include people with disabilities) should be placed in a wider social, cultural and economic context of 'anti-discrimination', the creation of 'equality of opportunity' for minority groups, and the achievement of full 'social inclusion' [3][4], if desired.

The 1994 Energy Charter Treaty [5] also provides a useful definition of 'environmental impact' .....

> ***' Any effect caused by a given activity on the environment, including human health and safety, flora, fauna, soil, air, water, climate, landscape and historical monuments or other physical structures or the interactions among these factors ; it also includes effects on cultural heritage or socio-economic conditions resulting from alterations to those factors.'***

In engineering a building for fire conditions, therefore, project specific fire safety design objectives should typically cover the following broad spectrum of concerns .....

(a) the protection of the health and safety of all building users, including **people with disabilities**, visitors to the building who may be unfamiliar with its layout, and contractors or product / service suppliers temporarily engaged in work or business transactions on the premises **;**

(b) the protection of property, including the building, its contents, and adjoining or adjacent properties, from loss or damage **;**

(c) the health and safety protection of rescue teams / firefighters [6][7] **;**

(d) protection of the 'natural environment' from harmful impacts [8] **;**

(e) the buildability of necessary re-construction after a fire **;**

(f) sustainability of the 'built environment' - including the proper selection and life cycle assessment [9] of fire safety related materials, products, components, systems, etc., fixed, installed or incorporated in the building.

4. A New Language of Protection from Fire

In order to create the new concepts which are so necessary to produce a quantum leap in the transformation of fire safety design and engineering as a precise, modern and professional discipline in a 'sustainable built environment', terminology has to be re-examined. It must become generic in order to widen and make more 'real' its application, e.g. .....

> ***Fire Resistance :*** *The inherent capability of a building assembly, or an element of construction, to resist the passage of heat, smoke and flame for a specified time during a fire.*

Similarly, when we really mean the word **'evacuation'**, why use the inadequate word 'escape' ?

While there certainly is a **'fire resisting doorset'**, there is no such thing as a 'fire door' !

5. Constructing a Rational Fire Safety Engineering Philosophy

It is re-assuring to see, amongst the international fire community, the beginnings of a more rational approach to the development of a modern fire safety engineering philosophy. To be effective, however, this approach must be flexible, pragmatic, and deal directly with reality. As far as fire safety and protection in buildings is concerned, the realistic end condition remains, and always is, a 'real' fire in a 'real' building which is used by 'real' people, who may or may not be **'disabled'** (see **Appendix C** for definition) at the actual time of a fire incident.

A 'test' fire in a laboratory, on the other hand, gives only a limited indication of .....

(a) the likely performance of a particular building product, material or component when exposed to 'real' fire conditions ;

(b) the suitability of a product, material or component for a particular end use.

Concepts of fire behaviour and of human health and safety in a 'real' fire situation are, therefore, limited in meaning and application if expressed solely in terms of 'test' fires.

Instead, let us return to first principles and, based on direct and meaningful consultation with building users, partnership between key interested parties, and consensus, create a more precise framework which will allow a coherent and comprehensive fire safety engineering philosophy to evolve. The language and concepts of this philosophy must complement, and form part of, the body of language and concepts belonging to mainstream engineering disciplines in construction.

6. Evacuation & Building Design

Building design is the most important variable in the equation of health and safety protection from fire, and should not be regarded as a constant, or beyond change, by those people not directly engaged in the design, construction / de-construction, or maintenance of the 'built environment'.

To work efficiently and be cost-effective, a fire safety strategy should be fully incorporated into the design concept for a new building, i.e. at the very start of the design process - even before sketch drawings are produced, if possible. Grafting fire protection measures onto a completed design, or worse still, onto a building which is nearing completion on site, will always result in compromised solutions, be far more costly, and will place additional, unnecessary burdens on the future building management system.

In considering seriously the protection of people with disabilities .....

(i) a 'person-centred' focus to the fire safety design of buildings should be encouraged and fostered by client and building management individuals / organizations ;

(ii) spaces and functions in a building should be zoned and classified to a far greater degree according to their associated fire hazards and risks - in order to aid the process of creating viable 'places of relative safety' ;

(iii) there should be a clear understanding of what is, or what is not, a **'place of safety'** [10] ;

(iv) evacuation space should no longer be treated as an afterthought, and be compressed into the awkward left-over areas in a building - it should be given new design emphasis, and properly articulated ;

(v) elevators / lifts, travelators and escalators should be fully integrated into evacuation strategies for people with disabilities ;

(vi) greater attention should be paid to smoke resistance, and smoke sub-compartmentation in the development of appropriate fire safety strategies [11] [12] ;

(vii) the existence of serviceability limit states in 'hot form' structural design should be recognised, and taken fully into account - in order that structural and non-structural elements of construction should perform as expected during their more intense interaction in a 'real' fire situation [13] ;

(viii) proper account should be taken, in fire safety design, of how 'real' people behave, and how they perceive and understand buildings.

In the case of those existing buildings of historical, cultural or architectural importance there must be 'flexibility' in relation to compliance with prescriptive and performance requirements - functional requirements with regard to fire safety and protection, however, cannot be compromised.

The series of figures in **Appendix D** highlights issues concerning building design, and commences the exercise of providing practical solutions.

7. Fire Safety Management in Buildings

The starting point in the development of any management system should be proper consultation with all employees (a very clear requirement of E.U. safety at work legislation). Sufficient steps should be taken by senior management to monitor the consultation process, and to ensure that it is effective **;** there is much to learn from this procedure by everyone concerned. One method of formalizing a consultation process with employees is to carry out a questionnaire survey on a one-to-one basis. The questions posed should be in both open and closed formats, and the person posing the questions should be an independent, competent, non-threatening individual. People with disabilities are more than capable of playing an active role in the fire defence plan for a building.

In the context of the upcoming structural revision to the **EN ISO 9000** framework of standards, a radical review of how fire safety management operates in organizations, and of how maintenance is carried out on fire safety related construction and services, should now also be undertaken. It is no longer acceptable that these functions are downgraded to being of minor importance, capable of being performed by people who are less than competent.

8. Protection of People who Remain in a Building

In the different cases of hospitals and nursing homes for the elderly, but also security establishments, prisons, certain research laboratories, very large or complex building types, organizations committed to 'service quality', e.g. hotels, etc. - it is neither practicable, nor desirable, that a building or complex should be entirely evacuated.

Having to consider the protection of people in place during a fire incident, traditional fire safety approaches have several significant limitations .....

(a) people generally do not leave a building immediately, but continue tasks or move around, unsure, seeking information and attempting to locate 'final exits' and 'places of safety' **;**

(b) after the short period (?) required to arrive at the building / complex, rescue teams, i.e. firefighters, are then entering - evacuation space is generally not designed to facilitate contraflow movement **;**

(c) fire development in one part of the building may affect service supply to many or all other parts, resulting in people waiting in darkness, without means of communication, and with management unaware of their numbers or location **;**

(d) having initially complied with legislation intended for simple building types, levels of fire performance were selected on the basis of immediate building evacuation - some additional measures may perhaps have been grafted on later to cover a token element of protection for those who remain in place - original fire safety design objectives were not clearly specified and now in use, therefore, the building's fire safety strategy is ineffective.

Easily located 'final exits', 'places of safety', and 'refuge areas' / 'refuges' / 'places of relative safety', do not just happen by accident in a building - they must be competently designed, reliably constructed, and properly maintained. See again **Appendix D**.

9. Warning & Notification of a Fire Incident

One aspect of the fire safety strategy for all buildings which requires special consideration is that of warning and/or notification of a fire incident. See **Appendix E**. The standard fax forms, which were originally developed by the Brussels Fire Service to answer a practical everyday need and are now distributed on a national basis in Belgium, make a very interesting casestudy.

10. Fire Performance Reliability

In striving to achieve dramatically improved levels of protection from fire for people who remain in a building, one aspect of performance which is critical is that of 'reliability' - can we confidently depend on an installed product, component or building system to perform as expected whenever a fire may occur, at any stage in the life cycle of that building ?

The following are some variables which may influence performance reliability, and should be considered by the fire safety designer in the course of his / her everyday work .....

(i) Precision of fire test methods - is a fire performance rating of '60 minutes' in one laboratory equivalent to a similar rating in another laboratory ?

(ii) Installation alterations on site. Have any changes been made to a product, as originally tested ? Have any of the fixing details been altered on site ? Have any changes been made in order to ensure a proper fit ? If assemblies do not fit, how have resulting larger gaps and clearances been handled by the building contractor ?

(iii) Workmanship - is it good, bad or ugly ? Has it been competently supervised, or not ?

(iv) Interference with a product - by other trades at later stages in the construction process ?

(v) Servicing and maintenance - will any be carried out, by somebody competent to do so ?

(vi) What information do you have about the management system / personnel, and reporting relationships in a building ? Are they efficient / competent / effective ?

(vii) Improper use and abuse by the building's occupants - for example, would you ever expect to find the situation shown below ?

Appendix D / Figure 6 'Reliability' of a Fire Resisting Doorset ?

11. Sustainable Development & The Future of Fire Safety Engineering

The concept of 'sustainable development', i.e. 'development which meets the needs of the present without compromising the ability of future generations to meet their own needs' , has now been incorporated in the primary legislation of the E.U. (1997 Amsterdam Treaty). Fire safety engineering has an important contribution to make to this global goal - by helping to preserve the 'natural environment' and, as a core value, by adopting a 'person-centred' approach to the fire safety design of the 'built environment' and effectively protecting human health.

See **Appendix F - Fundamental Matrix** of sustainability performance indicators. Two examples of completed indicators, directly related to this paper, are contained in **Appendix G**.

The primary purpose of Construction Related Sustainability Performance Indicators is to commence, in earnest, the practical task of implementing a sustainable approach to the future development and modification of the 'built environment'. The Kyoto Protocol [19] has made this a legal imperative.

12. Conclusion

A comprehensive Technical Guidance Document (TGD), relevant to the needs of people with disabilities, building designers, client organizations, building contractors, firefighters, and building managers, is required as soon as is reasonably practicable [10]. The target date for production of the TGD, by a Task Team of the ECA Expert Group, is the first quarter of 2002.

13. Additional Reference Documentation & Sources

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14. Appendices (Available on our WebSite : **www.sustainable-design.com**)

A Guideline Framework - Equality of Opportunity & Social Inclusion in the European Union

B Example of a Current Model of Sportschair, with Wheel Inclination of 22º

C Definition of 'Disabled' / 'People with Disabilities' / 'Disabled People' / 'disABLED'

D Series of Figures Highlighting Building Design Issues & Solutions

E Standard Fax Notification & Confirmation Forms Developed by Brussels Fire Service

F Fundamental Matrix of Construction Related Sustainability Performance Indicators

G Two Examples of Relevant Sustainability Performance Indicators