SFPE European Chapters Coordination Group (ECCG)

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SFPE ECCG: White Paper for Professional Recognition for Fire Safety Engineering

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FOREWORD

This paper has been produced by the SFPE European Chapters Coordination Group (ECCG). The SFPE ECCG is a body comprised of presidents of the European Chapters of SFPE and the elected ECCG president, which has been formed to facilitate collaboration on issues which are common to the chapters. The aims of this document are to present a current snapshot of the state of recognition of fire safety engineering professionals in Europe, and to articulate a set of initiatives intended to help gain a common understanding of qualifications, educational requirements and further advance recognition of fire safety engineering professions within Europe. It is noted that the situation will change with time, and that this White Paper may not completely address the wide breadth of issues which currently exist. The ECCG would like to thank Woodrow, Bisby and Torero who have made a significant contribution to the contents of this white paper [1], particularly in the area of educational needs. The ECCG also recognizes the efforts of Jonsson and Stromgren for their efforts on data collection on the status of fire safety engineering in Europe. The directions outlined in this report align with the strategic directions of the SFPE Board of Directors, which endorses the initiatives outlined in this report.

OBJECTIVE

This White Paper highlights the need for appropriate qualification of fire safety engineering practitioners in Europe, and identifies initiatives for proceeding toward this objective.

The paper primarily focuses on competency requirements for fire safety engineering in developing performance based fire solutions, i.e., the front end of the design and construction solutions. Prescriptive or code-based design is not included. The focus has been put on performance based design as it is considered to be the main basis to be able to develop and achieve professional recognition for the profession. In this paper, fire safety engineering and fire protection engineering is considered to be basically identical.

The main target group is the consultancy sector, but the conclusions are also transferrable and valid for a broader range of sectors. It is vital to examine what constitutes a qualified fire safety engineer, including what sort of background, qualifications and training they should have to ensure fire safety strategies and that their developed solutions are robust.

It should be mentioned that the situation in Europe will inevitably be changing. It is not realistic to expect that this White Paper can fulfill every national objective for each member state. The document should be looked upon as a guidance document that

forms the basis for a discussion. The ECCG should also consider periodic revisions of this paper to ensure that it is up to date.

The idea is also that this White Paper may be inspirational for other White Papers on specific topics, such as minimum education requirements, accreditation schemes/procedures, best practice, etc. for which all the details cannot and should not be in this White Paper.

INTRODUCTION

The need for fire safety engineers in Europe is obvious. In a small country like Sweden there's still more than 300 university educated fire safety engineers work as consultants so our belief is that similar conditions could be valid in every country.

It is considered that there is a need for European recognized diplomas and a European approach to accreditation and to establishing registration or certification of fire safety engineers and other fire safety practitioners in Europe. The approach needs to be based on established levels of competency appropriate to their roles. Qualification of practitioners has been identified by SFPE[1] as an important part of the professional recognition of fire safety engineers worldwide. If fire safety engineering design can find ways to synergize with other disciplines that drive the construction industry, fire safety engineering) could experience a rapid and positive evolution consistent with other engineering disciplines. This will lead to tremendous opportunities. For this to occur it is essential for fire safety engineering as a profession to evolve towards true performance-based design. While it must be recognized that the many sectors involved in fire safety engineering need to evolve in a consistent manner, this will never happen if the evolution does not start within the educational systems charged with delivering the next generation of fire safety engineers. There is a clear need for educational 'programs' which are capable of pushing forward the boundaries of fire safety engineering, rather than simply perpetuating the status quo.

The growing need for fire safety engineering design around the world has led to a growing number of short courses and higher education degrees based mostly on technology rather than design. It is our belief that some of those programs are able to exist because they are delivering professionals into an industry that has not (yet) adequately defined competence. At a seminar held by Lloyd's Register Educational Trust (LRET), attendees pointed to programs and courses internationally where graduates were not targeted by top firms. The global seminar was held at Edinburgh University 2011 and is accounted for in Fire Safety Journal [1].

[1] On the 17th of April 2013 Society of Fire Protection Engineers, Board of Directors, Endorsed a Strategy to Increasing Professional Recognition of Fire Protection Engineering Internationally.

Furthermore, this lack of a competence definition is confusing other professionals with who fire safety engineers must collaborate: this isolates the fire safety engineering profession. The transformation of fire safety engineering is therefore slow, mistakes are sometimes made, and hidden, poorly quantified risks are taken. There is confusion about the requisite training and experience needed to perform adequate performance-based design for fire. Indeed, in some jurisdictions regulators are turning their backs on performance-based design and retreating into prescriptive design, citing the fact that the engineers are not capable, their regulatory process is not good enough, and performance-based design does not work in practice. Similar moves are underway in New Zealand, which has historically been at the forefront of promoting performance-based building codes but is now seeking to prescribe performance [2].

Whilst building failures, large fires and litigation may highlight some of the weaknesses in the performance based building code system and in some aspect of fire safety design, it must be said that there are many very sound fire safety engineers operating in Europe who:

- demonstrate competence
- have professional registration, i.e. certification or similar
- maintain their continuous education
- understand and operate within the engineering code of ethics
- produce fire safety designs for some great buildings around Europe

While the building codes and regulations may affect this, it is possible to judge from the experience in many countries that this is not the sole issue. Other factors probably have a bigger impact. Better education and a certification system for fire safety engineering could clearly help fire safety engineering to move forward into innovation and be beneficial for the construction industry.

FIRE SAFETY ENGINEERING STATUS IN EUROPE

In 2013, a survey was completed concerning the status of fire safety engineering in Europe and is published in an article. The survey was conducted on behalf of the ECCG. The report highlights areas such as qualification of practitioners, education, and legal framework and builds regulations concerning fire safety engineering. In the following sub-chapters a summary of the survey findings is presented [3].

Qualification of practitioners

Only a few countries have requirements, for example a university degree or a diploma in Fire Protection Engineering, for qualification of practitioners (Figure 1). However, while fire safety engineering is allowed in all countries there are limitations in many countries i.e. fire safety engineering is very seldom accepted and a pure prescriptive approach is

necessary. In some countries prescriptive design deviations (for example extended travel distances or reduced structural fire protection, etc.) must be accepted by authorities on national, regional or local level. In other countries, only certain organizations may perform fire safety engineering. A minority of countries has some form of certification program, and not all of these are mandatory.

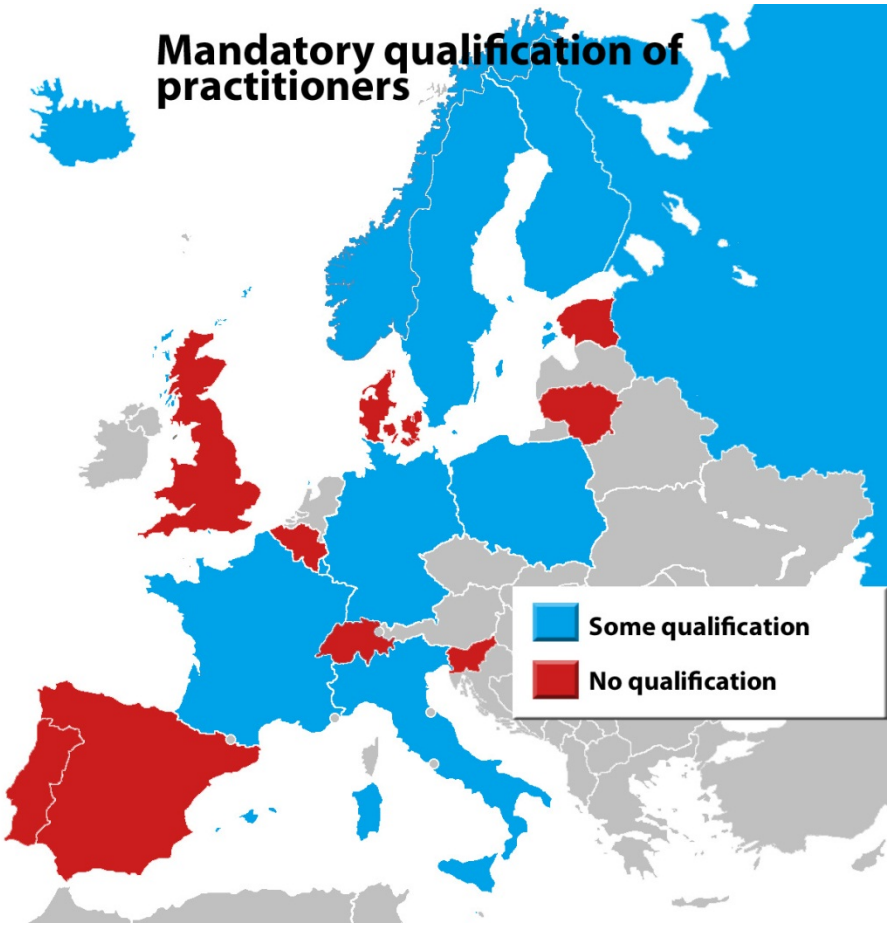

Figure 1 Qualification of practitioners by education, certification or other means.

Educational levels

In Figure 2 three levels of education have been investigated in the survey. The classification of educational levels is made according to the SFPE[2] and a list of universities and other schools can be found at http://careers.sfpe.org/colleges/.

The first group "Fire Safety Engineering" consists of Bachelor of Science and Master of Science degrees in safety engineering. These programs prepare graduates to use the principles of science and engineering to protect people, property and the environment

[2] SFPE encourages universities and others to examine the lists and see if they are correct or anything is missing. As the educational landscape changes, it cannot be claimed to be complete.

from fire. These programs are geared toward the development of theoretical skills, and consist of a sequence of courses on engineering fundamentals and design, built on a foundation of mathematics and science courses.

For this first group the technical content and to some extent what skills and competence that constitutes a fire safety engineer is reported in great detail by Magnusson et al. [4]. The technical content of a bachelor degree is outlined by SFPE in [5] and for a master degree in [6]. Details on these are shown in Table 1 and Table 2 in the Annex.

The second group "Fire Safety Technology" consist of Bachelor's of Science/ Engineering & Master's of Science/Engineering degrees in fire protection/safety technology. The technology programs prepare graduates with the technical skills necessary to enter careers in the application, installation, operation and maintenance of built-in life or fire safety systems. These programs are oriented toward application, and provide their students introductory mathematics and science courses.

The third group consist of a variety of programs and short courses.

Some colleges and universities offer programs related to fire protection that do not lead to a BSc or MSc degree in fire protection engineering or fire protection engineering technology. Some engineering programs do not offer degree programs in fire protection engineering, but offer individual courses in topics related to fire protection engineering. These courses can be used to satisfy elective requirements for a degree in another engineering discipline or as transfer credits towards a fire protection engineering degree at another university.

Figure 2 Type of education in Europe based on the definitions by SFPE.

THE FIRE SAFETY ENGINEERING FIELD

Background

In the 1970s, fire safety engineering began as a discipline of individuals capable of interpreting and rationally applying mostly prescriptive fire safety codes. The codes presented design solutions that, if applied correctly, offered a solution with an assumed 'guaranteed' acceptable level of safety. In parallel, a second group of professionals, mainly scientists, structured the underpinning science behind fire safety engineering [7-11]. The acquired technical and scientific knowledge enabled a considerable evolution of the codes, the development of engineering tools (i.e. tests, analytical models, empirical (and semi-empirical) correlations, computer based models, etc.) and the increasing acceptance of performance-based design as a viable methodology.

Immaturity

Fire safety engineering, as are all engineering disciplines to varying extents, is by definition immature. Building codes and standards, and buildings designed to those regulatory documents, can only achieve a 'reasonable' or 'adequate' level of safety. There is no such thing as zero-risk or absolute safety. We set acceptable distances between buildings, we provide limited heights for spandrels to minimize the risk of

vertical fire spread, and we set maximum travel distances to exits. However, we know in each case that fire spread and smoke filling can occur in a limited number of less likely scenarios, and people‘s lives may be lost as result, but the risk is acceptably low. To make these requirements more stringent (greater safety) would make buildings more costly, and there is a community trade-off between risk and cost. In response, engineers have learned to accept their ignorance, to err on the side of caution, and to apply appropriate safety factors. Thus, the quantification of immaturity in a technical discipline is associated to some extent with safety factors and gaps of knowledge.

The size of the safety factor is intimately linked to our understanding of the problem. For fire safety, the demand for optimized solutions has grown as design has evolved and other demands such as sustainability, novel materials, energy conservation and cost have become more important. Furthermore, modern construction practices are delivering new problems that in many cases have never been addressed, and therefore might not be sufficiently understood.

The gap between current knowledge and required knowledge for design can therefore be considered to be growing. The optimization process for fire safety now requires decisions and engineering judgment that might be beyond that which is available from a typical fire safety engineer. In other words fire safety engineering is at risk of losing maturity.

Fire Safety Engineering position in the building design team

The fire safety engineering discipline is relatively small, isolated, and can sometimes be poorly integrated within the overall building design team. This could result in poor communication between fire safety engineering designers and other stakeholders in the design process, and in poorly conceived fire safety engineering merely being an add-on or ‘value engineering’ measure. Poor integration permeates into the engineering education community in that most engineering (civil, structural, mechanical, electrical) or architecture students are rarely exposed, even at surface level, to the goals and practice of fire safety engineering design.

Competency Awareness

Poor individual awareness of competence is a critical issue in the fire safety engineering community. Dunning et al. [12] provide a discussion of the sociological phenomenon known as competency awareness. The available research in this area clearly shows that people tend to hold overly favorable views of their abilities in their intellectual domains, and that as a consequence not only do they reach erroneous conclusions and make unfortunate choices, but their lack of competence robs them of the ability to recognize it.

Poor competency awareness within fire safety engineering is partly a consequence of

- the small size of the discipline and the lack of support for initial or continuing education, which necessitates the utilization of poorly educated practitioners to fill available positions;
- the lack of recognized diplomas and rigorous accreditation procedures for practitioners;
- our reliance on prescriptive approaches to design, which permit (and indeed promote) a lack of fundamental understanding of the principles upon which an integrated fire safety strategy should be based, and
- educational programs which support all of the above.

Strong competency awareness must therefore be promoted and nurtured within the fire safety engineering educational system, and this can be best accomplished by focusing on fire safety science fundamentals rather than prescriptive compliance, and by creating a learning environment in which open-minded, project based learning is the norm.

Education 'System' Issues

The design and construction, industry and technology and fire safety design are all changing rapidly. Therefore good teaching faculty who are also at the forefront of research are often featured in the best programs. The curriculum needs to have a good foundation of mathematics, physics, chemistry and engineering practice. These feed into good skills in fluid mechanics, thermodynamics, heat transfer, etc. which in term underpins fire dynamics and the understanding of fire and smoke spread which is fundamental to producing fire safety engineers who are good; flexible, adaptable problem solvers. Concepts of risk, human behavior and egress are also amongst the key subjects required to be taught, again with some rigor. In order to get good fire safety education graduates who are demanded by the best employers, generally the courses need to attract the best entry level students. The Lund University program in Sweden for fire engineering and risk management was at the LRET seminar highlighted as the exemplar [13].

Finally, given that the main academic driver is research, the drastic reduction in support for fire research in most parts of the world has resulted in a decreased number of academics with a true competency in fire safety engineering research – let alone fire safety engineering design practice; it may be argued that good academic researchers do not necessarily make good fire safety engineering or good teachers of design.

As good a place as any to end the discussion is with a series of "keys to success" which were proposed by Prof Björn Karlsson during the LRET Seminar in relation to the

necessary characteristics of a first class fire safety engineering education program. These are food for thought and are as follows:

1) Support for and from research, both basic and multidisciplinary.
2) General demand for graduates in both industry and research.
3) Broad educational scope but with a good technical core curriculum.
4) Good students.
5) Good staff.

THE SPECIAL ROLE OF THE FIRE AND RESCUE SERVICES

In most jurisdictions it has historically been the case that ensuring provision of adequate fire safety in buildings was the responsibility of the architect. This worked reasonably well under a prescriptive fire safety engineering framework, since simple rules were able to ensure that the required risk was appropriately accounted for.

However, with the advancements of both building and fire safety technologies, most architects or engineers (structural, mechanical, electrical, etc.) no longer have the technical knowledge or requisite skills to adequately address the issues, and this had led to the emergence of the fire safety engineer during the past few decades. However, in many cases the responsibility for fire safety still rests with architects, despite their almost complete lack of technical knowledge in this area. One outcome of this situation is that the role of ‘competent authority’ in the realm of fire safety is poorly defined in many jurisdictions.

During fire safety engineering design discussions, or in disputes between consultants, clients, regulators, architects, etc., a situation has arisen wherein the fire brigades – seen by the general public as the custodians of fire safety in the built environment despite not generally having a strictly defined legislative or legal role in the fire safety engineering design process and without the proper knowledge and skills needed to perform the task – are seen as the de-facto competent authority.

DEFINITION OF FIRE SAFETY ENGINEERING IN EUROPE

The ECCG has discussed what the understanding of fire safety engineering in Europe is and how it can be defined; the conclusion was that it is not clear at all and there is a lack of definition for fire safety engineering.

In some countries, predominantly where a strong educational base exists, there is clear and definable role for the fire safety engineer and the profession as a whole. On the contrary, in countries where this does not exist there is a wide range of interpretations/ thoughts what the fire safety engineering profession comprise of. But in general the indication was that the fire safety engineering discipline is “segmented” i.e. it was not

seen as one discipline that would include a holistic view of fire safety but as specific areas relatively isolated from each other. The views ranged from pure code consultancy (interpreting building regulations), fire protection systems design (design of detection, alarm, extinction, etc.) to advanced simulations regarding smoke movement (CFD-modelling), to mention the most common ones.

It is clear that in Europe some kind of definition regarding the fire safety engineering as a discipline is necessary and maybe more importantly a general job description (including competency requirements) for a fire safety engineer is needed. Europe consists of many countries and to define this in detail would not be practical. However, to develop these issues at a general level should be possible. They way forward to be able to achieve this is probably to look at countries where the profession has reached a certain level of recognition and forms part of an overall building design process i.e. fire safety engineers are involved in the whole design process and not only specific parts of the same.

If a parallel is drawn to other professions there are in most cases a requirement to hold evidence of that you as a practitioner has the required skill and experience (for example by a university degree or a certification) needed to be able to work within that profession. Fire safety engineering today lack this for most countries i.e. there is no specific skill or experience required to be able to work as a fire safety engineer. Depending on the service provided this could potentially lead to dangerous building designs due to the lack of competence and knowledge by the practitioner.

It is clear that this “initiative” of defining the profession and the requirements needed by the practitioners would be of benefit not only to the profession but to the building industry as a whole. Requiring a defined level of knowledge and experience from the practitioners would possibly indirectly create safer building designs.

This is something that is seen as very important and is therefore one of the main recommendations of this white paper.

CONCLUSIONS

Performance-based design for fire safety is here to stay. Performance-based design has many acknowledged problems, but paramount among those is the way that we, as a global engineering profession, educate and nurture competent professionals.

To positively generate purpose we must generate – out of our successes, our professionals, and our failures – positive exemplars that show the true, exciting, innovative, and complex nature of fire safety engineering design.

The following are specific recommendations which arose during the LRET seminar.

Academics and Universities.

There is a clear need for educational 'programs' which are capable of pushing forward the boundaries of fire safety engineering, rather than simply perpetuating the status quo. Fundamental scientific knowledge should be taught, as much as possible, within context rather than as a precondition to understanding the context; this will help students solve the difficult and ill-defined problems associated with real design projects. Academics should also more actively engage with industry and with the fire services, both to identify deficiencies in graduate skills and knowledge.

Consultants

Fire engineering consultancies can significantly improve education, both by directly influencing university curricula and by offering opportunities for exposure of undergraduates to the real world of fire safety engineering (through undergraduate internships, guest lectures, etc.).

Architects

Architects integrate fire safety into design by either consulting fire safety engineers early on or employing them as part of the overall design team. Architecture firms should assist universities in creating architecture-style design courses for fire safety engineers.

Fire Brigades

Fire brigades should seek to be more involved in university curricula, to assist in creating university courses that develop skills in fire investigation and fire safety auditing, and to provide opportunities for students to develop heuristic knowledge on the behaviour of fire and materials in fire.

Governmental Agencies and National Authorities

It is of great importance that fire safety engineering is nurtured and lifted as an important aspect when developing building regulations. Of equal importance, is to ensure that qualification procedures of practitioners are considered. Fire safety engineering is necessary and important tools in society, but also requires high levels of competence. Agencies and authorities should therefore stress the need for education and certification procedures to maintain a high quality in fire safety engineering work.

Research and Professional Organisations

Research and professional organisations should actively engage with fire safety engineering education by reaching out to the world-wide fire safety engineering

education community with research opportunities. Research and professional organizations should also proactively engage with fire safety engineering educators to define research needs that might serve as suitable student projects – master's level, independent study. Professional organizations need to work harder at developing proper accreditation and competency standards within fire safety engineering. There is widespread agreement that lack of accreditation remains a damaging and on-going problem in fire safety engineering. Accreditation is a prerequisite to the development of a lasting, defensible, valuable and meaningful professional identity.

INITIATIVES

With this White Paper as a basis and with the aim to further continue what is considered to be the necessary work that would create a common understanding in Europe of what fire safety engineering is and what the necessary competency requirements for its practitioners should be the ECCG has developed a series of initiatives to pursue. It should be noted that some of these initiatives are already underway and some are in the planning stage. These initiatives are aligned with the SFPE Board of Directors (BoD) strategic vision. It should be noted that some of these initiatives refer to actions of the SFPE BoD to expand global recognition and develop certified educational programs to support this [14].

Initiative 1 -- The SFPE Global Recognition Task Group will be expanded to represent a more diverse group, including non- SFPE BoD members from outside of the USA, and will move forward with helping to define core competencies for professional recognition of a fire safety engineering professional.

Initiative 2 -- Prepare a document that defines fire safety engineering from the European perspective.

Initiative 3 -- Develop occupational standards for fire safety engineering (i.e., job descriptions) for use in EU countries. This will be important in establishing common criteria and acceptance across the EU.

Initiative 4 -- SFPE will consider specialty certifications for areas such as computational modelling.

Initiative 5 -- SFPE will continue progress to have the *SFPE Handbook* serve as the primary reference for PE exam, which will also help in benchmarking internationally.

Initiative 6 -- Promote good fire safety engineering practice within the profession and the general public. Within the profession, pursue the use of case studies as a good way to promote the value of fire safety engineering.

Initiative 7 -- Promote the need for increased funding for fire safety engineering research and education in Europe.

Initiative 8 -- Develop a strategy to increase the dialogue between European universities to accommodate high quality programmes and to encourage development of new programmes.

Initiative 9 -- Develop a series of short courses that form the basis for a continuing education program for fire safety engineering based on the framework outlined by the SFPE BoD [14]. There should be a consideration on a mixture of online, classroom, and/or an SFPE week of courses. The use of European instructors and implementation of a few courses across Europe is required.

Initiative 10 – For the courses identified under Initiative 9, some type of certificate (set of continuing education units or other) indicating completion of the comprehensive course of study should be developed.

Initiative 11 – Identify and work with qualified organizations to develop a certification program for fire safety engineers in Europe.

Initiative 12 – SFPE should encourage production of mini-webinars (10 to 20 minutes each, like TED, Khan Academy, etc.) and similar media that promote fire safety engineering.

Initiative 13 -- Develop a plan to reach out to decision makers regarding recognition of the field of fire safety engineering in Europe.

Initiative 14 – Establish formal liaison between SFPE and CEN (European Committee for Standardization), specifically the TC127/TG1 initiative, and with ISO TC 92 SC 4, as well as other fire engineer standardization or committee groups in the region.

ACKNOWLEDGEMENTS

The following people are attributed for their great contributions to this document:

Michael Woodrow, Luke Bisby and Jose Torero, The BRE Centre for Fire Safety Engineering, School of Engineering, University of Edinburgh, UK for their paper in Fire Safety Journal [1].

Peter Johnson for his paper [13].

Attendees of the SFPE European Chapters Workshop on Recognition of Fire Safety Engineering on the 8th of October 2013 (see Annex, table 3).

Members of the SFPE European Chapters Coordination Group.

Members of the SFPE Board of Directors.

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ANNEX

Table 1 Core FPE Topics

Topic	Subject Information
Fire Dynamics and Fire Chemistry	The objective is to understand the various stages of fire, to provide a knowledge base concerning the different methods and techniques applied in the analysis of a fire sequence and develop ability to critically examine those methods in terms of practical application. Fire Chemistry may be taught within a Fire Dynamics course to provide further background knowledge regarding combustion reactions and heat transport. Collectively, information should increase FPE-related skills.
Fire Risk/Hazard Analysis	The objective is to provide knowledge in the areas of probability and statistics, of the concepts, tools and methods of hazard assessment and risk analysis, and of the use and application of these in fire related scenarios. A general understanding of how fire

	impacts people (including egress), property and society as a whole should be provided.
Performance-Based Design	The objective of this course is to provide knowledge regarding development of fire safety engineering solutions from first principles to achieve fire performance objectives. Requires skills developed from previous fundamental fire safety engineering coursework. Various levels of design and consequences should be discussed as well as the specification of all key parameters that are the basis for the performance-based design.
Building Fire Safety	The objective is to provide a general understanding of building fire protection, code and standard concerns, and may include fundamental concepts of equivalencies and/or performance-based design.
Fire Protection Systems	The objective is to provide a general understanding of fire mitigation, including water and non-water based suppression; detection systems; fire modeling; fire testing and code and standard concerns.

Table 2 Additional "Application" Focused Topics or Courses

Topics	Objectives
Fire Modeling	The objective is to provide knowledge of zone and field (CFD) models, including the technical basis for enclosure fire model elements, the limitations of computer-based fire models and the use of current computer-based fire models for practical FPE problems.
Fire Testing	The objective is to provide knowledge of test apparatus, methodologies, processes and data analysis related to fire hazards and flammability assessment methods for engineering and research.
Water-Based Suppression	The objective is to provide knowledge of fundamental principles, design criteria and installation requirements for water-based fire suppression systems, including, classification of occupancy hazards in order to establish the proper sprinkler design criteria, the design of a sprinkler and mist systems for the specific construction features and occupancy involved, and the effects of various forms of heat transfer and oxygen displacement characteristics relating to water-based suppression.
Special Hazards - Non-water Based Suppression	The objective is to provide knowledge of fundamental principles, design criteria and installation requirements for non-water based fire suppression (including clean agent, halon, carbon dioxide, inert gas, dry chemical and foam fire suppression agents) used in total flooding, direct application & explosion suppression.
Detection, Alarm & Smoke Control	The objective is to provide knowledge of fundamental principles, design criteria and installation requirements for fire detection, occupant notification and smoke control systems, including how to analyze, evaluate, and specify these systems. Computer based analysis of detection systems/techniques.
Explosion Prevention & Protection	The objective is to provide knowledge related to deflagrations and detonations and methods used to prevent ignition and limit the effects of deflagrations, including explosion suppressions systems and pressure resistant & pressure relieving construction; BLEVE theory and prevention.
Structural Fire Protection	The objective is to provide knowledge regarding the impact of fire exposure on materials used in construction assemblies, the role various construction features play in the fire resistance of the assembly and the application of mechanics and heat transfer engineering principles. Computer based analysis of structures exposed to fire.
Fire Investigation	The objective is to provide knowledge of fire investigation with regard to gathering and interpreting fire scene evidence; utilizing laboratory forensic testing; researching related codes, standards & technical reports and re-construction of the fire scenario with physical and numerical models.

Fire Protection Related Codes & Standards	The objective is to provide knowledge of the use and application of building codes and related reference standards, including for both active and passive fire protection. This topic may be covered within another separate course.
Egress and Life Safety Analysis	The objective is to provide knowledge of human behavior in fire, including physiological and psychological response, decision-making and movement, and of approaches, tools and methods to integrate this knowledge with knowledge gained from other courses to evaluate life safety issues in the event of fire. While a basic knowledge may be provided within several other separate courses, focused applications level course work is helpful for those students that will design egress systems, including special situations using performance-based designs with complicated occupancies that potentially modify human behavior.
Storage & Transportation of Hazardous Materials	The objective is to provide knowledge of the handling, transportation and storage of hazardous materials including limitations of amounts stored, determination of needed separation distances and proper identification. Such information may be of particular interest to those that would work in public service or are responsible for public transportation of such materials.
Fire Risk Management	The objective is to provide knowledge of risk management concepts (avoid, accept, mitigate, transfer) and associated strategies, and of the application of these concepts and strategies during facility design and operation so that processes, equipment and storage can be located and managed so as to minimize risk of unacceptable loss.
Management of Wildland-Urban Interface fires	The objective is to provide knowledge regarding technological, economic, social and political issues affecting fire management in the interface of wildlands and urban areas. Includes related codes and standards, fire risk analysis, evacuation and incident response planning.
Industrial Fire Safety	The objective of this course is to use principles of fire dynamics, heat transfer and thermodynamics are combined with a general knowledge of automatic detection and suppression systems to analyze fire protection requirements for generic industrial hazards. Topics covered include safe separation distances, plant layout, hazard isolation, smoke control, warehouse storage, and flammable liquid processing and storage. Historic industrial fires influencing current practice on these topics can also be discussed.
Consequence Analysis	The course will provide an introduction to the field of consequence estimations, within the FPE operational field. It will also form a valuable complement to the course, Fire Risk Analysis, insofar as the consequences of undesirable leakages of gases and liquids are concerned.
Risk Based Land Use Planning	The course will provide the FPE with sufficient knowledge to allow him/her to collaborate at early stages in the planning process so that risk analyses can be included and used to create a base at a strategic stage of the planning work where the objective is a robust and sustainable society.
Degree Project in Fire Safety /Protection Engineering	The aim of the degree project is to allow the student to develop and demonstrate the knowledge and skills required to work independently as a fire engineer by acquiring new knowledge and by applying this and the knowledge previously acquired to a problem in fire protection engineering and then resolving it independently and in a manner conducive to good engineering practice.

Table 3 Participants at the Workshop on 8 October 2013

- Jean-Claude De Smedt -- Benelux Chapter
- Rory Hadden -- Edinburgh Student Chapter
- Christian Häfelfinger – Switzerland
- Jimmy Jönsson – IberoAmerica Chapter
- Robert Jönsson – Swedish Chapter
- Armelle Muller – French Chapter
- Michael Strömgren – Swedish Chapter
- Piotr Tofiło -- Polish Chapter
- Sue Tyler – CFA UK
- Gabriele Vigne – IberoAmerica Chapter
- Professor Chow – Hong Kong Chapter
- Bill Koffel – USA
- Brian Meacham – SFPE Board of Directors
- Chris Jelenewicz -- SFPE Staff

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