



Research Needs for the Fire Safety Engineering Profession: The SFPE Roadmap

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Introduction

In 2016 SFPE reorganized its committee structure. The purpose of this re-organization was to organize like activities into a more effective structure. A key objective of this reorganization was arranged around professional recognition. As such a new Standing Committee on Research, Tools & Methods (RTM) was chartered. The RTM was asked to:

Identify, develop, and oversee SFPE's technical products and research work, review new innovations, and help to establish the research agenda for the fire safety engineering profession.

As part of the RTM structure, the Subcommittee on Research & Innovation (SCRI) was asked to chart future research priorities for the profession, and work with other groups, companies, and associations to obtain input for, and communicate back, SFPE research priorities and directions for the future. Once this Subcommittee was established, a working group (Roadmap Working Group) was asked to facilitate the development and implementation of a research roadmap for fire safety engineering profession. This report will outline the process implemented by the Roadmap Working Group to develop a roadmap that outlines the research needs for the Fire Safety Engineering profession.

Previous Work

In 2000 SFPE published the results of a workshop that focused on the needs of the fire protection engineering profession that led to the development of a research agenda [1]. Workshop participants included FPE consultants, industrial facility owners, materials and equipment suppliers, insurance companies, government laboratories and facility operators, code bodies, academics, and the fire service. The objective of the workshop was to identify research needed to develop innovative approaches that could be implemented to reduce direct and indirect fire related costs, improve life safety, improve international competitiveness and facilitate regulatory reform. Four areas were identified as the most urgent need of attention:

- Fire phenomena
- Human behavior
- Risk
- Data collection

The workshop participants agreed that successful development and implementation of the research program required collaborations and partnerships (including with organizations not traditionally involved in fire research); and identification of a champion to advocate the agenda, break down inter-organizational barriers, and oversee and monitor completion of agenda topics.

Similar research agendas were published by the United Foundation Engineering Conference in 2001 [2], [3], the FORUM of Fire Research Laboratory Directors in 2006 [4], [5] and BRANZ [6].

Vision for a Research Roadmap

This research roadmap will be the definitive document and will be central to defining the future of SFPEs technical initiatives. At the same time, the main focus of this research roadmap will be on what is needed by practicing fire safety/protection engineers. Its purpose is to serve as a roadmap that will:

- Be a living document
- Have a long-term focus on advancing fire safety engineering
- A means of coordinating research initiatives
- A basis for forming partnerships with research organizations
- Act as a bridge between research and practice
- Become a subtheme of future SFPE conferences

Roadmap Working Group Members

SFPE would like to thank and acknowledge the following working group members who assisted with the development of this research roadmap:

Brian Meacham (Chair of the SFPE Standing Committee on Research, Tools & Methods) – Meacham Associates

Greg Baker (Chair of the SFPE Subcommittee for Research & Innovation) – BRANZ, New Zealand

Bryan Hoskins (Group Leader of the Research Roadmap Working Group) – OSU

Adam Barowy – UL

David Charters – Chartered Fire Engineering, Middle East

Albert V. Condello III -- Banda Group

Luca Fiorentini – TESCA, Italy

Jason Floyd – JENSEN HUGHES

Dan Gorham, NFPA

Gavin Horn -- University of Illinois Fire Service Institute

Chris LaFleur -- Sandia National Laboratories

James Lords – JENSEN HUGHES

Guillermo Rein, Imperial College London

Aixi Zhou -- UNC Charlotte

Amanda Kimball (Special Expert to Working Group) -- NFPA

Chris Jelenewicz – (SFPE Technical Director)

Drafting the Roadmap

When the Working Group started the process of developing this roadmap, it was determined that obtaining global feedback and ensuring transparency were key factors that would enable the success of this roadmap. The Subcommittee originally developed a list of topics (see Appendix A). To ensure transparency and obtaining global feedback the Subcommittee held a series of workshops (see Appendix B and Appendix C) and made presentations to fire safety organizations throughout the world. The Subcommittee also conducted a survey to obtain additional feedback. Over 370 engineers, researchers and educators participated in this survey. Based on this feedback, the Subcommittee formed the content of the roadmap.

Original List of Topics

To get the process started, the Subcommittee completed a brainstorming session to develop an original list of possible topics to be included in the roadmap. This list can be found in Appendix A.

Workshops

SFPE Performance-Based Design Conference in Warsaw, Poland. On May 26, 2016 a workshop was held in Warsaw Poland as part of the SFPE 11th International Conference on Performance-Based Design Codes and Fire Safety Design Methods. During this workshop the vision of the roadmap was discussed and the original list of topics outlined by the working group was prioritized. The full report from this workshop can be found in Appendix B.

SFPE North America Conference in Denver, Colorado. On September 28, 2016 a workshop was held in Denver as part of the 2016 SFPE North America Conference and Expo. During this workshop participants identified three areas of concern: a) Fire Service, b) Developing Countries and c) Structures in Fire. The participants in this workshop provided important feedback related to these three topics. The full report from this workshop can be found in Appendix C.

12th International Symposium on Fire Safety Science in Lund, Sweden. In June 2017, a workshop “Better Linking Fire Safety Science and Fire Safety Engineering Research Priorities for Fire Safety Engineering” was held at the 12th IAFSS Symposium at Lund University in Sweden [7]. The aim of this workshop was to bring fire scientists and engineers together to better understand what research is needed in support of fire safety engineering. The outcomes from this workshop were considered by the Roadmap Working Group and worked into the research roadmap.

A separate workshop related to Large Outdoor Fires and the Built Environment was also held at the 12th IAFSS Symposium [8]. As an outcome from this workshop, Working Group members added a section on wildland urban interface (WUI) fires [8].

Survey

In October 2016 the Subcommittee engaged the fire safety engineering community in a three-question survey. The survey asked the participants to their feedback on the original list of research topics. Participants were also asked to prioritize the list of topics. The survey questions can be found in Appendix D.

Over 370 engineers, researchers and educators participated in this survey. The survey results can be found in Appendix E.

Industry Input

Throughout the process additional feedback was obtained by making presentations at the following events:

- November 2, 2016 -- SFPE Asia Oceana Chapters Coordinating Group (AOCCG) in Taipei Taiwan
- March 22, 2017 -- SFPE Middle East Conference in Dubai UAE
- April 18, 2017 – NEMA Fire, Life Safety, Security and Emergency Communication Section Meeting in Santa Fe, New Mexico
- April 26, 2017 -- Fire Suppression Systems Association (FSSA) Technical Committee Meeting

Roadmap

Based on this feedback from the workshops, survey and industry, the Subcommittee formed the content of the roadmap. The Subcommittee wanted the roadmap to be graphically represented, as opposed to one that is part of a large report that users may not take time to read. Therefore, the roadmap was represented as a matrix (See Table 1), which outlines nine major themes (represented in the vertical axis of Table 1. For each theme, four cells (horizontal axis) are provided that relate to tools, applications, and methods applicable to the practice of fire safety engineering. Specifically, the research needs related to data; innovative technology/materials, design tools, and risk/probabilistic methods are represented as individual cells for each theme.

Research Needs for the Fire Safety Engineering Profession

		TOOL, APPLICATIONS, & METHODS			
		Data	Innovative Technology /Materials	Design Tools	Risk /Probabilistic Approaches
THREADS	Human Behavior	✓	✓	✓	✓
	Building Fires	✓	✓	✓	✓
	Resilience/Sustainability	✓	✓	✓	✓
	Fire Service	✓	✓	✓	✓
	Fire Dynamics	✓	✓	✓	✓
	Fire Safety Systems	✓	✓	✓	✓
	Forensics/Investigations	✓	✓	✓	✓
	Wildland/WUI Fires	✓	✓	✓	✓
	Non-Building Fires	✓	✓	✓	✓

Table 1: SFPE Roadmap Matrix

For each cell in the matrix, a set of research topics is recommended. The listings for each cell based on each theme can be found in Tables 2 through 10. Additionally, the Subcommittee looked at different prioritization schemes to highlight research topics that should receive the highest priority. During these discussions, the Subcommittee decided to provide a prioritized topic for each theme and one priority per cell. Once again, the Subcommittee used its judgment on the prioritization of topics based on the input collected from the global workshops and the survey.

For each theme, the following research topics were identified. In Tables 2 through 10, items highlighted in **RED** are identified as the highest priority for each theme. Items highlighted in **BOLD** are identified as the highest priority for each cell.

LIST OF ACRONYMS

BIM – Building Information Modeling
CFD – Computational Fluid Dynamics
ESS – Emergency Storage System
FP – Fire Protection

IoT – Internet of Things
ITM – Inspection, Testing and Maintenance
LED – Light Emitting Diode
PBD – Performance-Based Design

PPE – Personal Protective Equipment
PV – Photovoltaic
WUI – Wildland Urban Interface

Theme 1 - Human Behavior

Theme Priority:

Demographics (Vulnerable populations, Anthropometry, Cultural differences) -- Data

Secondary Priorities:

- Smart Egress Systems – Innovative Technology/Materials
- Design Egress Scenarios – Design Tools
- Residential Buildings – Risk/Probabilistic Approaches

	Data	Innovative Technology/ Materials	Design Tools	Risk/Probabilistic Approaches
Human Behavior	Demographics ▶ Vulnerable populations ▶ Anthropometry ▶ Cultural differences	Smart egress systems ▶ Cameras ▶ Cell phones ▶ Exit usage ▶ Other	Design egress scenarios	Residential buildings
	Basis for numbers in codes	LED strobes	Behavior based models ▶ Cultural ▶ Pre-evacuation time ▶ Actions other than evacuating	Large populations
	Response to notification	Occupant evacuation elevators	Combined fire and evacuation models	Community level
				High-challenge environments
			Quantify level of “life safety” in a building	
			Effects of fire ▶ Visibility ▶ Gases	
			Impact of public education on fire risk	

Table 2: Research Priorities for Human Behavior Theme

Theme 2 -- Building Fires

Theme Priority:

Standardization of Design Fires and Analysis Approaches – Design Tools

Secondary Priorities:

- Combustibility of External Cladding Systems -- Data
- Building Information Modeling – Innovative Technology/Materials
- High-rise Building Design – Risk/Probabilistic Approaches

TOOLS, APPLICATIONS, AND METHODS

	Data	Innovative Technology/ Materials	Design Tools	Risk/Probabilistic Approaches
Building Fires	Combustibility of external cladding systems	Building information modeling	Standardization of design fires and analysis approaches	High-rise building design
	Fire loads for structural fire engineering	Smart buildings	Best practices for retrofitting existing buildings to achieve equivalent level of safety	Risk-informed PBD
	Material testing data (new materials)	Big data		Single family homes
	Effectiveness of existing/new fire safety solutions	Improved test methods		Risk assessment/management systems
	Quantification of building code performance criteria			Structural FP performance

Table 3: Research Priorities for Building Fires Theme

Theme 3 -- Resilience/Sustainability

Theme Priority:

Environmental Impact of Fire and Fire Suppression Activities -- Data

Secondary Priorities:

- Assess Fire Hazard of New Sustainable Building Materials/Practices – Innovative Technology/Materials
- Development of Design Tools/Best Practices for Fire Safety Engineering for Resilient Systems/Buildings – Design Tools
- Development of Risk-Based Analysis to Compare Hazards of Fire to Long Term Health Impacts of Fire Mitigation Measures – Risk/Probabilistic Approaches

TOOLS, APPLICATIONS, AND METHODS				
	Data	Innovative Technology/ Materials	Design Tools	Risk/Probabilistic Approaches
Resilience/Sustainability	Environmental impact of fire and fire suppression activities	Assess fire hazard of new sustainable building materials/practices	Development of design tools/best practices for fire safety engineering for resilient systems/buildings	Development of risk-based analysis to compare hazards of fire to long-term health impacts of fire mitigation measures
	Cost of fire events	Identify/quantify sustainability benefits of smoke control systems and natural ventilation	Analysis of impact of climate change on fire safety	Risk- and reliability-based methods for ITM of fire protection systems ▶ Preventative and predictive maintenance ▶ Human impact on ITM reliability ▶ Reliability of water supplies ▶ Reliability of installed equipment
	Cost/benefit of different types and multiple levels of FP measures	Evaluate fire hazards of new sustainable energy technologies	Cost-effective and resilient FP practices for developing countries	
	Environmental impact of fire testing	Evaluate fire hazards of flammable refrigerants	Post-fire seismic behavior	
	Quantification of structural fire resilience	Life expectancy of installed fire protection systems	Identification of critical fire protection aspects for disaster reliability	
	Flame retardant toxicity	Determine appropriate suppression systems for new technologies		

Table 4: Research Priorities for Resilience/Sustainability Theme

Theme 4 -- Fire Service

Theme Priority:

Smart Firefighting – Innovative Technology/Materials

Secondary Priorities:

- Exposure Tracking From Incidents -- Data
- Model Fire Department Response – Design Tools
- Evolving Building Technology and Fire Suppression Tactics – Risk/Probabilistic Approaches

TOOLS, APPLICATIONS, AND METHODS

	Data	Innovative Technology/ Materials	Design Tools	Risk/Probabilistic Approaches
Fire Service	Exposure tracking from incidents	Smart firefighting <ul style="list-style-type: none"> ▶ IoT integration ▶ Mechanical augmentation ▶ Fire department communication with BIM ▶ Firefighter tracking and location 	Model fire department response leading to better models of <ul style="list-style-type: none"> ▶ Reverse evacuation ▶ Egress/ingress ▶ Duration of water for FP systems ▶ Structural collapse ▶ Firefighter response recreation and training aids 	Evolving building technology and fire suppression tactics (effect of smoke/heat ventilation)
	Data-driven fire inspection scheduling			
	Improved injury, holistic fatality data collection and economic analysis	Firefighting PPE and tools <ul style="list-style-type: none"> ▶ Firefighting and fire apparatus cameras for investigation/debrief 	Compare/contrast tactics internationally to determine impact of firefighting/construction differences on fire growth/severity	Effect of firefighting interventions on occupant risk
	Impact of WUI on fire service			New vehicle technology and fire suppression tactics
	Naturally occurring events <ul style="list-style-type: none"> ▶ Rate, severity ▶ Fire as a secondary impact 			Lessons learned to reduce risks in developing countries
			Tactics and training for emerging technologies	

Table 5: Research Priorities for Fire Service Theme

Theme 5 -- Fire Dynamics

Theme Priority:

Practical Models – Design Tools

Secondary Priorities:

- Material Properties -- Data
- Standardized/Accepted Approach for Developing Material Properties – Innovative Technology/Materials
- Ignition Frequencies – Risk/Probabilistic Approaches

TOOLS, APPLICATIONS, AND METHODS

	Data	Innovative Technology/ Materials	Design Tools	Risk/Probabilistic Approaches
Fire Dynamics	Material properties	Standardized/accepted approach for developing material properties	Practical models for: ▶ Pyrolysis of complex materials ▶ Extinction and reignition ▶ Sprinkler suppression ▶ Underventilated combustion ▶ Glass breakage ▶ Human consequences ▶ Deflagrations/detonations Realism in test standards	Ignition frequencies
	Fire dynamics of large compartments	Retardant behavior		Probabilistic distributions of heat-release rate curves
	Test data archiving	Massively parallel computing		Fire spread models
	Model stewardship	Mesoscale		Fire frequencies
	Toxicity data	Extreme ambient conditions		
	Sprinkler data			

Table 6: Research Priorities for Fire Dynamics Theme

Theme 6 -- Fire Safety Systems

Theme Priority:

Impact of ITM Requirements on System Reliability -- Data

Secondary Priorities:

- Integrated FP Systems and Building Connectivity – Innovative Technology/Materials
- Corrosion Protection Design Best Practices – Design Tools
- Adequacy of Passive Fire Resistive Construction – Risk/Probabilistic Approaches

TOOLS, APPLICATIONS, AND METHODS

	Data	Innovative Technology/ Materials	Design Tools	Risk/Probabilistic Approaches
Fire Safety Systems	Impact of ITM requirements on system reliability	Integrated FP systems and building connectivity	Corrosion protection design best practices	Adequacy of passive fire resistive construction
	FP systems performance data	Efficacy of detection, alarm, communication systems	Guidelines on suppression effectiveness at various heights	Evaluation of <ul style="list-style-type: none"> ▶ Smoke control systems impact on reduction of risk of losses ▶ Adequacy of passive fire resistive construction ▶ Effectiveness of fire stop installation by multiple trades versus certified technicians ▶ Life quality indices to assess FP performance
	Evaluation of new and existing active FP systems efficacy <ul style="list-style-type: none"> ▶ Suppression of unique and emerging hazards ▶ System design criteria ▶ Smoke control system 	Protection of storage <ul style="list-style-type: none"> ▶ Automated ▶ High challenge 	FP System design <ul style="list-style-type: none"> ▶ Atrium protection and modeling ▶ Smoke control systems ▶ Passive FP system design and test methods 	Reliability of <ul style="list-style-type: none"> ▶ Water supplies ▶ Suppression systems failure modes, aging, and complex systems
	Evaluation of passive FP systems efficacy	Reliability of detection/alarm/communication <ul style="list-style-type: none"> ▶ False positives ▶ Failure on demand ▶ Failure modes due to extreme environments 		Relationship between safety, security, and routine operations
	Evaluation of durability of FP systems			Matching reliability of installed systems with risk assessment
	Gaseous fire suppression systems applied to high air flow environments			

Table 7: Research Priorities for Fire Safety Systems Theme

Theme 7 -- Forensics/Investigations

Theme Priority:

Improved Guidance for Quantifying Measurement and Calculation Uncertainty – Risk/Probabilistic Approaches

Secondary Priorities:

- Persistence of Burn Patterns Under Different Compartment Fire Conditions -- Data
- Improved Tools for Obtaining Building Dimensions from Photographs and Videos – Innovative Technology/Materials
- Improved Software to Create Multiple-Source Dynamic Event Timelines – Design Tools

TOOLS, APPLICATIONS, AND METHODS				
	Data	Innovative Technology/ Materials	Design Tools	Risk/Probabilistic Approaches
Forensics/Investigations	Persistence of burn patterns under different compartment fire conditions	Improved tools for obtaining building dimensions and fire sizes from photographs and video	Improved software to create multiple-source dynamic event timelines	Improved guidance for quantifying measurement and calculation uncertainty
	Building material properties as inputs for fire models	Use of cloud-based home/consumer devices to pinpoint fire origin	Tools to evaluate impact of ventilation on compartment fires	Repeatability of fire test measurements
	Fire effects on building electrical systems/components	Linking of 3D scanning technology with computer fire models	Simulation tools to recreate process conditions in chemical plants	Root cause analysis methods and tools
	Evaluation of incident heat-flux profiles from non-standard fuels	Overview of large scenes from drones	Advanced calculation methods to evaluate hypothesis	Causes and causal mechanism analysis
	Damage resulting from heat radiation and blast waves on buildings, industrial assets, etc.	Data mining to identify chemical process deviations	Tools to estimate damage effects	Human error assessment methods and tools
	Digital recordings of distributed control systems and programmable logic controllers	Methods to preserve evidence	Virtual reality/augmented reality to describe and test scenarios	
	Digital data collection (black boxes)	Tools to extract data from digital sources		
	Status and data related to availability of FP measures during event			

Table 8: Research Priorities for Forensics/Investigations Theme

Theme 8 -- Wildland Urban Interface

Theme Priority:

Risk Assessment for WUI Structures – Risk/Probabilistic Approaches

Secondary Priorities:

- Impact of Firebrands -- Data
- Building Fire Protection in WUI – Innovative Technology/Materials
- Design Against Exterior Building Fires – Design Tools

TOOLS, APPLICATIONS, AND METHODS

	Data	Innovative Technology/ Materials	Design Tools	Risk/Probabilistic Approaches
Wildland/WUI Fires	Impact of firebrands	Building fire protection in WUI	Design against exterior building fires	Risk assessment of WUI structures
	Fire hazard identification and quantification	Wildland/WUI fire damage mitigation	Wildland/WUI fire modeling	Risk of combustible fuels in WUI/wildland
	Ignition of WUI materials	Warning and notification	Firebrand ignition prevention	Assessment of risk, effectiveness, and economics
	Fire behavior and fire spread	Remote sensing and communications	Fire behavior prediction tools	
	Emissions and health effects		Resilience design tools	
	Fire ecology and long-term effect		Landscape planning tools	
	Data to support WUI codes and standards			

Table 9: Research Priorities for Wildland/WUI Fires Theme

Theme 9 -- Non-Building Fires

Theme Priority:

Energy Storage – Innovative Technology/Materials

Secondary Priorities:

- Data for Hazard Identification/Reliability/Severity/Frequency (Industrial) -- Data
- Product Safety Standards – Design Tools
- Improved Identification of High Risk Industrial Facilities – Risk/Probabilistic Approaches

TOOLS, APPLICATIONS, AND METHODS				
	Data	Innovative Technology/ Materials	Design Tools	Risk/Probabilistic Approaches
Non-Building Fires	Data for hazard identification/reliability/severity/frequency (industrial)	Energy Storage ▶ Containment for new products/damaged products ▶ Higher reliability manufacturing/more resilient product design ▶ Safer energy storage chemistries ▶ New inspection techniques ▶ Self-monitoring of equipment ▶ Safe transportation	Product safety standards	Improved identification of high-risk industrial facilities
	Alternative energy generation	Improvements to petrochemical equipment safety	Installation Standards ▶ ESS ▶ Oil/gas drilling	Improvement of risk management practices at chemical facilities
	PV installation fire spread	Tunnel fire suppression	CFD fire models (tunnels/underground, tank fires)	
	Petrochemical fire incident frequency		Design considering first responders (ESS, vehicles, tunnels)	
	Causes of vehicle fires		Heat transfer models for energy storage cell design	
			Tunnel evacuation/fire models	
			Models for use in siting and design of tank farms	
			Tunnel design fires	

Note: Items highlighted in **RED** are identified as the highest priority for each thread. Items highlighted in **BOLD** are identified as the highest priority for each cell.

Table 10: Research Priorities for Non-Building Fires Theme

Moving Forward

The Subcommittee prepared a communication strategy to promote the roadmap with the fire safety engineering community and research organizations. This communication strategy includes a) coordinating the roadmap with the SFPE Foundation, b) making presentations at international fire safety engineering conferences, c) having articles published in fire safety publications, d) publicizing on social media sites, e) engagement with funding organizations and f) targeting research providers. Additionally, the Subcommittee will continue to update the roadmap based on the changes in the industry and the latest trends in the fire safety engineering profession.

Reference Documents

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- [6] "Societal Impact of Building Fires: The Reduction of Social, Economic and Environmental Impacts of Fires in New Zealand. Can be found at:
https://www.branz.co.nz/cms_show_download.php?id=4e38ac499a3dee9cdbfc1e6fc1191695061f1e1c
- [7] B. Mecham, "12th IAFSS Workshop Minutes "Better Linking Fire Safety Science and Fire Safety Engineering Research Priorities for Fire Safety Engineering". 11 June 2017," Unpublished Report, Lund, Sweden, 2017.
- [8] S. Manzello, "Summary of Workshop Large Outdoor Fires and the Built Environment," NIST, Gaithersburg, MD, 2017.

Appendix A – Original List of Working Group Topics

The following is the original list of research topics that was drafted by the Roadmap Working Group in May, 2016:

1. Structures in fire
 - a. Tall timber buildings
2. Human behaviour
3. Environmental protection and sustainability
 - a. Tall timber buildings
 - b. Hazards of new building materials
 - c. Batteries and energy storage
 - d. PV arrays
 - e. Impact of fire on the environment
 - f. Eco-impact of FP
 - g. Toxicity of fire retardants
4. Big data and FP
 - a. Smart fire fighting
 - b. Smart buildings
 - c. Smart enforcement
5. Economic impact of fire
 - a. Value of Fire Departments to community
 - b. Cost/benefit of proposed code/standards changes
6. Demographics
 - a. Aging population
 - b. Mobility
 - c. Accessibility
 - d. Aging in place and home healthcare
7. Health and wellbeing of FS personnel
 - a. Risk of cancer
8. Resiliency
 - a. Reliability of FP Systems
9. Wildland fires
10. Tunnels and underground FP
11. Risk management
12. Models
 - a. Things that models can't do today
13. Data
 - a. Gaps in the Data
 - b. Data accessibility
14. Fire Protection Systems
 - a. Smoke Detection Nuisance
 - b. New system technologies (i.e. O2 reduction)
 - c. Reliability of systems/aging of systems

Appendix B – Warsaw Workshop Report

SFPE Subcommittee on Research & Innovation

Report from Fire Safety Engineering Research Agenda Workshop

Warsaw, Poland -- 26 May 2016

Present: Greg Baker (SCRI, Chair), Mike Crowley, Luca Fiorentini, Mike Madden, Milosh Puchovsky, Piotr Tofilo, Christopher Wieczorek, Brian Meacham (RTM Chair), Nicole Boston (Staff) and Chris Jelenewicz (Staff).

The following items were discussed:

Welcome: Greg Baker welcomed the workshop participants. He indicated the purpose of the workshop is to provide data to the SFPE Subcommittee on Research & Innovation (SCRI) that is tasked with developing a research agenda for the fire protection engineering profession.

SFPEs Vision: Brian Meacham made a presentation on SFPEs vision in the area of research, tools and methods. He indicated SFPE recently reorganized its committee structure. The purpose of this reorganization was to organize like activities into a more effective structure. A key objective of this reorganization was arranged around professional recognition.

The Research, Tools & Methods Committee (RTM) is working on defining the information and knowledge the profession needs and where should it reside. Specifically, the RTM is managing SFPEs Intellectual property

In the early 2000s SFPE, the United Foundation, and FORUM of Fire Research Laboratory Directors all developed research agendas. Currently, several research agendas have been published.

Specifically, he indicated the research agenda should ask the following questions:

Where do we need to advance to help our profession advance?

What are the topics where we should be directing the research community?

What do we need to support education and competency?

Subcommittee's Vision: Greg Baker presented his vision for the SCRI. He indicated that the research agenda will be a living document and have a long-term focus. Moreover, the research agenda will be the definitive document that will be central to defining the future of SFPEs technical initiatives. He indicated the main focus of the research agenda will always be on what is needed by practicing fire safety/protection engineers and will serve as a road-map that will a) coordinate future SFPE research initiatives, b) serves as a means to form partnership with research providers, c) act as a bridge between research & practice and d) serve as a guide for subthemes for future SFPE conferences.

In March 2016 the SCRI held its first meeting. During this meeting three working groups were formed:

- **Scope Working Group** will define the subcommittee's scope.

- **Roadmap Working Group** will develop the plan for the research agenda.
- **Workshop Working Group** will plan any workshops.

Proposed List of Research Topics: Greg noted that the SCRI Roadmap Working group brainstormed a list of possible research topics to include in the research agenda. The purpose of this list was to provide a means to start discussion.

1. Structures in fire
 - a. Tall timber buildings
2. Human behaviour
3. Environmental protection and sustainability
 - a. Tall timber buildings
 - b. Hazards of new building materials
 - c. Batteries and energy storage
 - d. PV arrays
 - e. Impact of fire on the environment
 - f. Eco-impact of FP
 - g. Toxicity of fire retardants
4. Big data and FP
 - a. Smart fire fighting
 - b. Smart buildings
 - c. Smart enforcement
5. Economic impact of fire – does not have a direct impact on FSE design
 - a. Value of Fire Depts to community – does not have a direct impact on FSE design
 - b. Cost/benefit of proposed code/standards changes
6. Demographics
 - a. Aging population
 - b. Mobility
 - c. Accessibility
 - d. Aging in place and home healthcare
7. Health and wellbeing of FS personnel
 - a. Risk of cancer
8. Resiliency
 - a. Reliability of FP Systems
9. Wildland fires
10. Tunnels and underground FP
11. Risk management
12. Models
 - a. Things that models can't do today
13. Data
 - a. Gaps in the Data
 - b. Data accessibility
14. FP Systems
 - a. Smoke Detection Nuisance
 - b. New system technologies (i.e. O2 reduction)
 - c. Reliability of systems/aging of systems

The workshop participants were asked if any important topics were missing from the original list. The following topics were suggested:

- Fire initiation & Development (fire dynamics)
- V&V methods/models
- Acceptance criteria
- Correlations that are used by engineers
- Guidance on simple vs complex tools for fire safety engineers
- Toxicity
- Fire service operations
- Risk informed PBD
- Industrial fire protection
- BIM
- Fire test methods linked to a usable data
- Applying technology to the practice of FSE
- Tools for emerging countries

Prioritization Exercise: Following the generating of topics, Greg Baker led the workshop participants through a prioritization exercise. Each participant was asked to prioritize 3 to 5 topics from both of the above lists. The following is the results of this exercise:

Prioritization Exercise Results

Risk Informed PBD – 5

Human Behavior – 5

Data – 4

Environment – 3

Fire Dynamics – 3

Resiliency – 3

Validation – 3

Demographics – 2

Fire Protection Systems – 2

Guidance on the use of tools – 2

New Test Methods – 2

Tools for other countries – 2

Big Data – 1

Industrial FP – 1

Models - 1

Additionally, the workshop participants were asked if any of the topics should not be included on the list. The participants recommended that the item related to the risk of cancer and the economic impact of fire be deleted from the list.

Final Thoughts: Greg Baker indicated that the information from this workshop will be reviewed by the SCRI. He also indicated he will ask the subcommittee to ensure that anything that is part of the research agenda should link to the profession of fire safety engineering.

End of Report

Appendix C – Denver Workshop Report

SFPE Subcommittee on Research & Innovation Report from Fire Safety Engineering Research Agenda Workshop Denver, Colorado -- 28 September 2016

The following were in attendance:

Bryan Hoskins (SFPE Subcommittee for Research & Innovation) – Oklahoma State University
Karen Carpenter – SWRI
Kenneth Fuglee -- Ken Fuglee & Assoc., Inc.
Grant Gebhardt -- AMEC Foster Wheeler
Dan Goldberg -- Incandescence Life Safety
Brian Grove – ATF
Steve Gwynne -- NRC
JC Harrington -- FM Global
Aoife Hunt -- AECOM
Nils Johansson -- LUND University, Sweden
Vanessa Lung -- U.S. Airforce
Jeremy McDonald – SWRI
Tony Militello -- U.S. Navy
Patrick Phelan – DMFD
Guillermo Rein -- Imperial College London
Michael Strömgren -- SP
Bob Till – CUNY
Carl Wren -- City of Austin, TX
Julie Bryant – SFPE Staff
Chris Jelenewicz – SFPE Staff

Welcome: Chris Jelenewicz welcomed the workshop participants. The purpose of the workshop is to provide data to the SFPE Subcommittee on Research & Innovation (SCRI) that was tasked with developing a research agenda for the fire protection engineering profession.

SFPEs Vision: Chris also discussed SFPEs vision in the area of research, tools and methods. He indicated SFPE recently reorganized its committee structure. The purpose of this re-organization was to organize like activities into a more effective structure. The Research, Tools & Methods Committee (RTM) is working on defining the information and knowledge the profession needs.

The Subcommittee for Research & Innovation that is part of the RTM will publish a research roadmap for the profession. Specifically, this roadmap will:

- Be a living document
- Have a long-term focus on advancing fire safety engineering
- Central to informing future of SFPE
- A means of coordinating research initiatives
- A basis for forming partnerships with research organizations
- Act as a bridge between research and practice
- Become a subtheme of future SFPE conferences

Previous Subcommittee Activities: One of the Subcommittee's goals is to get as much feedback as possible from the global fire safety engineering community and make the process transparent with the SFPE membership. To accomplish this goal, the Subcommittee has already held a similar workshop in Warsaw as part of the SFPE conference in May 2016. Additionally, the Subcommittee has initiated a survey that will be open until October 20, 2016 that can be found at <https://www.surveymonkey.com/r/SFPERoadmap>.

The roadmap will also be discussed at an upcoming ISO TC92/SC04 meeting in October 2016 and at the SFPE Asia Oceania Chapters Coordinating Group meeting in November 2016. Subcommittee member David Charters will also be making a presentation at the SFPE Dubai Conference in March 2016.

Proposed List of Research Topics: Bryan Hoskins moderated the workshop. He presented the following list of possible research topics that was originally brainstormed by the Subcommittee and adjusted based on the feedback from the Warsaw Workshop:

1. **Applying technology to the practice of fire safety engineering** (Examples: building information modeling, data)
2. **Big data and fire protection** (Examples: smart fire fighting, smart buildings, smart enforcement for communities)
3. **Changing demographics and impact on fire safety** (Examples: aging population, mobility, accessibility, aging in place and home healthcare)
4. **Data used in fire safety engineering** (Examples: gaps in the data, data accessibility)
5. **Economic impact of fire** (Examples: cost of fire events, value of fire departments to community, cost/benefit of proposed changes/additions to code and standards)
6. **Environmental protection and sustainability and impact on fire safety** (Examples: tall timber buildings, hazards of new sustainable building materials, batteries and energy storage, PV arrays, impact of fire on the environment, eco-impact of fire protection, toxicity of fire retardants)
7. **Fire initiation and development** (Example: fire dynamics, hazards of new materials (e.g. combustible facades), toxicity)
8. **Health and safety of fire service personnel and first responders** (Example: risk of cancer, advances in personal protective equipment, new hazards and fire fighting)
9. **Human behavior in fire**
10. **Industrial fire protection**
11. **Informing fire service operations** (Examples: tactics for new hazards)
12. **Methods used in fire safety engineering** (Examples: validation and verification of methods, acceptance criteria, correlations used by engineers, guidance on tools for fire safety engineers, tools for emerging countries, fire test methods)
13. **Models used in fire safety engineering** (Examples: things that models cannot do today, verification and validation of models)
14. **Performance of fire protection systems** (Examples: smoke detection nuisance, new system technologies (e.g. O2 reduction), reliability of systems/aging of systems)
15. **Resiliency and role of fire protection** (Examples: fire safety engineering for resilient systems/buildings, reliability of fire protection systems)
16. **Risk and fire safety engineering** (Examples: risk informed performance based design, risk management)
17. **Structures in fire** (Examples: tall timber buildings, high rise buildings)
18. **Tunnels and underground fire protection**
19. **Wildland fires**

The workshop participants were asked if any important topics were missing from the above list or if anything should be deleted? To answer this question, the workshop participants were divided into five groups. The feedback from these group discussions is outlined in Appendix #1.

Final Exercise: Based on the discussions during the workshop, it appeared there was confusion regarding three topic areas: a) Fire Service, b) Developing Countries and c) Structures in Fire. It was decided that the workshop participants would be placed in three groups based on the above topic areas. Each group was asked to list items that should be discussed in the associated topic areas. The results of these discussions are listed in Appendix B.

Final Thoughts: Bryan indicated that the information from this workshop will be reviewed by the SCRI as it builds the roadmap and thanked the participants for their input.

End of Report

Appendix D – Survey Questions

The following questions were asked in the survey that was issued in October, 2016:

1. **An initial list of fire safety engineering research topics have been developed. Please review and provide up to three additional research topics that may be missing from this list:**
 - a. **Applying technology to the practice of fire safety engineering** (Examples: building information modeling, data)
 - b. **Big data and fire protection** (Examples: smart fire fighting, smart buildings, smart enforcement for communities)
 - c. **Changing demographics and impact on fire safety** (Examples: aging population, mobility, accessibility, aging in place and home healthcare)
 - d. **Data used in fire safety engineering** (Examples: gaps in the data, data accessibility)
 - e. **Economic impact of fire** (Examples: cost of fire events, value of fire departments to community, cost/benefit of proposed changes/additions to code and standards)
 - f. **Environmental protection and sustainability and impact on fire safety** (Examples: tall timber buildings, hazards of new sustainable building materials, batteries and energy storage, PV arrays, impact of fire on the environment, eco-impact of fire protection, toxicity of fire retardants)
 - g. **Fire initiation and development** (Example: fire dynamics, hazards of new materials (e.g. combustible facades), toxicity)
 - h. **Health and safety of fire service personnel and first responders** (Example: risk of cancer, advances in personal protective equipment, new hazards and fire fighting)
 - i. **Human behaviour in fire**
 - j. **Industrial fire protection**
 - k. **Informing fire service operations** (Examples: tactics for new hazards)
 - l. **Methods used in fire safety engineering** (Examples: validation and verification of methods, acceptance criteria, correlations used by engineers, guidance on tools for fire safety engineers, tools for emerging countries, fire test methods)
 - m. **Models used in fire safety engineering** (Examples: things that models cannot do today, verification and validation of models)
 - n. **Performance of fire protection systems** (Examples: smoke detection nuisance, new system technologies (e.g. O₂ reduction), reliability of systems/aging of systems)
 - o. **Resiliency and role of fire protection** (Examples: fire safety engineering for resilient systems/buildings, reliability of fire protection systems)
 - p. **Risk and fire safety engineering** (Examples: risk informed performance based design, risk management)
 - q. **Structures in fire** (Examples: tall timber buildings, high rise buildings)
 - r. **Tunnels and underground fire protection**
 - s. **Wildland fires**
 - t. **Other** (as specified by respondent)
 - u. **Other** (as specified by respondent)
 - v. **Other** (as specified by respondent)

2. Based on the list of research needs, please choose your top five research priorities in fire safety engineering (FSE) and rank each of them from 1 to 5 (with one having the highest priority) using the table below.

Topics	Priority Ranking (from 1 to 5). Please select up to 5 topics.				
	1	2	3	4	5
a) Applying technology to the practice of FSE					
b) Big data and fire protection					
c) Changing demographics and impact on fire safety					
d) Data used in FSE					
e) Economic impact of fire					
f) Environmental protection and sustainability and impact on fire safety					
g) Fire initiation and development					
h) Health and safety of fire service personnel and first responders					
i) Human behaviour in fire					
j) Industrial fire protection					
k) Informing fire service operations					
l) Methods used in FSE					
m) Models used in FSE					
n) Performance of fire protection systems					
o) Resiliency and role of fire protection					
p) Risk and fire safety engineering					
q) Structures in fire					
r) Tunnels and underground fire protection					
s) Wildland fires					

3. Please let us know any other thoughts that you have related to the research needs of fire safety engineering.

4. What is your profession?

- a. Fire protection or fire safety engineer
- b. Fire service
- c. Insurer or loss control professional
- d. Fire marshal, building official, or other Authority Having Jurisdiction/enforcer
- e. Professor, researcher, or academic
- f. Fire protection system designer, installer, or maintainer
- g. Fire protection manufacturer
- h. Fire protection/fire research student
- i. Other (please specify)

Appendix D – Survey Results

Question 1

1st Additional Topic	Date
Use of BIM in fire protection design and modeling	11/13/2016 11:50 PM
Fire behavior of concrete with RCA	11/7/2016 2:04 AM
Fire investigation source data documentation standardization	11/3/2016 11:39 PM
Climate change and impact on fire safety	11/2/2016 3:48 PM
Sustainability Building Design and Fire Protection Systems	10/29/2016 6:59 PM
Inspection, Maintenance & Testing of fire protection systems in the 21st century (methods needed for today's concerns like water water shortage)	10/27/2016 2:23 PM
Burn patterns and fire damage	10/26/2016 3:04 PM
Large assembly buildings (stadia, transport interchanges...etc.)	10/26/2016 9:55 AM
Industrial - Special hazard fixed suppression systems	10/25/2016 12:53 PM
Means of egress	10/24/2016 2:54 PM
smoke control system design	10/24/2016 2:15 PM
New fire suppressants (if not in 14)	10/24/2016 12:48 PM
Reduction of unwanted alarms	10/24/2016 9:26 AM
Manual Fire Fighting Systems, Procedures, and Training	10/21/2016 5:15 PM
The importance of municipal water supplies in automatic sprinkler system designs.	10/20/2016 2:09 PM
Actual field failure and reliability data collection that then drives a reliability and risk base model for conducting inspections	10/20/2016 12:51 PM
Validate existing sprinkler design criteria	10/20/2016 10:20 AM
Fire protection for commercial space ports/launch facilities	10/20/2016 8:18 AM
Radiant heat exposure/damage to equipment and structures	10/20/2016 6:46 AM
research data access from central focal point	10/20/2016 6:33 AM
Relationship between safety, security and routine operations.	10/19/2016 5:00 PM

	Open cast mining protection	10/19/2016 2:19 PM
	Fire Protection Lifecycle (pre, during, and post incident)	10/19/2016 11:38 AM
	Train car evacuation	10/19/2016 9:37 AM
	Effects / impacts of lightweight timber construction	10/19/2016 9:25 AM
	Database of HHRs for fuels such as baled cardboard, etc.	10/19/2016 9:16 AM
	Fire Safety in Facade design	10/19/2016 3:39 AM
	Cost/benefit of different fire protection systems Example: sprinkler system versus higher fire resistance	10/19/2016 2:51 AM
	Risk Based Revision of Fire Codes - updating, revising and deleting code clauses so codes reflect current risk not past ones	10/18/2016 10:34 PM
	1	10/18/2016 8:47 PM
	IOT(Internet of things) in fire systems	10/18/2016 7:44 PM
	The use of aerial photography for scene evaluation	10/18/2016 5:51 PM
	Industrial Fire Protection in terms of land-use and set back distances	10/18/2016 5:37 PM
	Combustible loading in fire prevention	10/18/2016 4:41 PM
	None	10/18/2016 3:50 PM
	Education of "non engineer" fire safety professional	10/18/2016 3:28 PM
	Environmental impact of fire	10/18/2016 2:48 PM
	Performance of penetration seals in fire barriers	10/18/2016 2:04 PM
	structures in fire	10/18/2016 1:31 PM
	Impact of energy saving measures to fire safety level (i.e. better insulating houses, triple glass, etc.)	10/18/2016 1:29 PM
	For Topic 14, add the effect of temps lower than -60F on notification and detection devices, and suppression systems. Those temps (down to -90F) are frequent in arctic, and Antarctic environments. In such environments, losing a facility to fire and emergency monitoring does mean life or death. Such remote areas are not recoverable or accessible until a very small "summer" window. Reliability is priceless for such sites, once occupied.	10/18/2016 1:27 PM
	Statistical Database for industrial equipment fire cause and effect (i.e. electrical MCC fire cause, hydraulic system fire cause)	10/18/2016 1:16 PM
	Changing demographics	10/18/2016 12:05 PM
	Water supplies - reliability	10/18/2016 11:25 AM
	Fire pump performance / reliability as a function of real world installation practices	10/18/2016 10:52 AM

Reliability of humans in performing inspection, testing, maintenance and repairs of fire protection systems.	10/18/2016 10:44 AM
Fire safety and security	10/18/2016 10:26 AM
The deleterious effect of permitting all sub trades to perform fire stopping work, instead of having one firestop contractor do all fire stopping in a building.	10/18/2016 10:16 AM
Fire hazard characterization in non-terrestrial environments	10/18/2016 10:13 AM
Water Spray Systems used for vapor mitigation on flammable gas/liquid storage tanks	10/18/2016 10:11 AM
Not just wildland fires, but Urban-Interface Wildland Fires	10/18/2016 10:02 AM
Home/Commercial Energy Systems (i.e. Tesla Battery Packs)	10/18/2016 9:59 AM
Installation Documentation and Records	10/18/2016 9:49 AM
Fire Data Trends - comb through actual fire data to provide unbiased data (e.g., benefits/costs of home sprinklers)	10/18/2016 9:48 AM
Difference on fire protection approach between the countries	10/18/2016 9:45 AM
Extinguishing hydrocarbon pool fires	10/18/2016 9:34 AM
Passive fire protection	10/18/2016 9:26 AM
Determine heat release rates (HRR) of industrial fire ignition sources, i.e., electrical motors, electrical cabinets, ordinary combustibles, transformers, batteries, etc.	10/18/2016 9:24 AM
Using "Lessons Learned" as a research tool	10/18/2016 9:17 AM
Performance Basis Alternative Techniques Used for Building Code Requirements	10/18/2016 9:15 AM
Use actual fire departments to validate new molding and tactics FDNY & others?	10/18/2016 9:13 AM
Environmental Concerns when using suppression agents	10/18/2016 8:59 AM
Fire Service Operations in ASRS and Warehouse Ventilation (these are not new hazards as in #11 but needs to be addressed. Insurance industry has had several recent major losses due to ventilation at large warehouses and premature closing of sprinkler valves)	10/18/2016 8:58 AM
Lifetime of installed fire protection systems	10/18/2016 8:57 AM
impulse spray fire protection systems	10/18/2016 8:56 AM
Analysis of computation and design software for fluid delivery time calculations of dry pipe sprinkler systems, grate nozzle foam suppression systems, and other such systems.	10/18/2016 8:52 AM
high rise buildings fire protection new technologies	10/18/2016 8:46 AM
Structures in fire	10/18/2016 8:02 AM

Keeping the Research Animals Alive: Vivarium Fires	10/18/2016 7:55 AM
Structures in fire	10/18/2016 7:48 AM
Data used in fire safety engineering	10/18/2016 7:42 AM
Novel Fire Safety Technologies (examples nanomaterials, - technologies, -sensors, Internet of Everything/Digital Fire Safety etc.)	10/18/2016 7:34 AM
Fire Prevention	10/18/2016 7:31 AM
Industry process fire safety: need to develop methods to better understand fire behavior for small industrial settings. Light manicuring and support operations.	10/18/2016 7:27 AM
Economic impact of fire	10/18/2016 7:25 AM
Cost optimization of tank farm firefighting measures and systems	10/18/2016 6:56 AM
Risk and fire safety engineering	10/18/2016 6:29 AM
Fire loss investigations	10/18/2016 6:25 AM
Protecting vulnerable people	10/18/2016 6:21 AM
Role(s) of testing and maintenance	10/18/2016 6:20 AM
Integrated Fire Protection Systems (Impact on PDB and Testing)	10/18/2016 6:15 AM
Maintenance of fire protection systems	10/18/2016 6:12 AM
Fires at the Wildland-Urban Interface (WUI) (Examples: ember-caused ignition of building materials, scientific evaluation of safety distance recommendations, interaction of wildland and enclosure fire dynamics)	10/17/2016 6:59 AM
Better definition and determination of RTI numbers for reproducible RTI ratings for sprinklers.	10/14/2016 2:22 PM
Fires in Oil and Gas plants	10/14/2016 7:13 AM
Smoke control systems	10/11/2016 2:50 AM
Engineering test methods for passive fire protection	10/11/2016 2:34 AM
(Extension of item 6) Impact of fire testing on the environment and environmental management of fire research	10/10/2016 5:22 PM
FSE in transport means (ships, trains, etc.)	10/10/2016 5:03 AM
antagonistic effects of energy efficient buildings and fire scenario	10/10/2016 4:14 AM
Life Safety in Large Events/Festivals	10/3/2016 12:55 PM
Fire Dynamics in Rural Farm Structures and Animal Behavior	9/29/2016 11:00 PM

	Statistical analysis of real fire temperatures for different occupancies	9/29/2016 8:08 AM
	Focus, focus, focus	9/29/2016 3:35 AM
	Impact of environmental factors such ambient wind and temperature on fire development.	9/28/2016 8:04 AM
	Climate change and fire safety	9/26/2016 3:16 AM
	Proper selection of fire suppression systems	9/25/2016 7:57 PM
	Fire suppression systems preventive and predictive maintenance	9/25/2016 7:15 AM
	Design of Passive Smoke Control Systems	9/22/2016 1:35 PM
	Protection of private property - shouldn't this be the responsibility of a building owner rather than an objective of building regulation	9/21/2016 10:44 PM
	Education of approving authorities to not assume codes are a panacea for safety (possibly include a survey to understand what current perceptions of PBD are)	9/21/2016 9:28 PM
	Egress lighting, exit signage technologies - benefits	9/21/2016 5:17 PM
	are we using technology cost effectively- too much redundancy	9/21/2016 4:42 PM
	Input values for quantitative risk assessment	9/21/2016 2:50 PM
	Data used in fire safety engineering	9/20/2016 2:36 PM
	Punch listing and Commissioning of fire protection systems	9/20/2016 10:47 AM
	1	9/20/2016 7:04 AM
	Wildland-Urban Interface Fires (not the same as wildfires!!!)	9/20/2016 1:27 AM
	The potential opportunities for smart materials development.	9/18/2016 9:46 AM
	fire initiation and development	9/18/2016 8:50 AM
	Blind-prediction studies for evaluating the performance of models to realistic full-scale fire scenarios.	9/18/2016 6:28 AM
	Fire safety of new energy car	9/17/2016 3:48 AM
	Streamlining performance based fire engineering	9/16/2016 10:34 AM
	Smart sprinkler systems	9/15/2016 8:09 PM
	17	9/15/2016 2:53 PM
	Design fire for available egress time	9/15/2016 7:29 AM
	Experience with applied safety measures (statistical evidence of compartmentation, exits, protection of penetrations, active systems++)	9/14/2016 2:02 PM

Explosions	9/14/2016 1:59 PM
new techniques for fire fighting	9/14/2016 12:13 PM
Prioritizing retrofit of existing buildings to achieve equivalent levels of safety. (screening methods to identify retrofit possibilities and financial incentives)	9/14/2016 11:54 AM
Thin combustible ceilings and interaction with sprinklers	9/14/2016 11:15 AM
10	9/14/2016 11:03 AM
13	9/14/2016 9:46 AM
Wind Turbine fire prevention	9/14/2016 9:12 AM
Reconstruction of fire events for forensic purpose	9/14/2016 9:09 AM
Smart cities and fire protection	9/14/2016 7:12 AM
Theoretical framework for fire safety engineering	9/14/2016 2:13 AM
Performance based design in building fire protection (combined active & passive)	9/14/2016 1:52 AM
Fire safety management	9/13/2016 11:39 PM
Application of Material Science on Fire safety product Design	9/13/2016 10:23 PM
Effectiveness of 'fire hardening' techniques	9/13/2016 9:29 PM
Risk communication on fires of large facilities	9/13/2016 9:08 PM
Development of cheaper non-combustible facades	9/13/2016 8:09 PM
Assessment methodology for evaluating responses to fire emergencies, starting with literature review, with aim of proposing model(s) and experimental validation process.	9/13/2016 6:59 PM
Quantify Impact of fire losses on communities (e.g. a hospital, school or factory fire is more than just a loss of insured property)	9/13/2016 5:59 PM
transportation fires (e.g. EVs, movement of dangerous goods)	9/13/2016 5:07 PM
Alternatives to standard fire testing for structural performance to reflect more realistic conditions	9/13/2016 4:46 PM
Fire fighter intervention and engineering	9/13/2016 4:35 PM
Material Chemistry/Physics and Fire Behavior	9/13/2016 4:13 PM
Economic value of home fire sprinkler systems.	9/13/2016 2:38 PM

Part of item 4, need for international data in a format that can be compared with US data and other databases. Countries with small populations desperately need to be able to 'adjust' their database using more comprehensive databases	9/13/2016 2:26 PM
tool to overcome differences in national fire regulation, mainly those based on prescriptive rules	9/13/2016 2:09 PM
pyrolysis modelling	9/13/2016 1:23 PM
Fire Chemistry	9/13/2016 12:13 PM
Uncertainty in measurements of fire phenomena	9/13/2016 12:03 PM
Personal risk & accidents- burn injuries and deaths	9/13/2016 11:58 AM
Interaction between content and construction products in fire performance of buildings	9/13/2016 11:32 AM
residential fire protection	9/13/2016 11:10 AM
Fire Protection in the Green Built Environment	9/13/2016 11:08 AM
Cost-benefit-analyze to prevent environmental pollution because of firewater	9/13/2016 10:58 AM
Fire investigation	9/13/2016 10:46 AM
Development of web-based databases	9/13/2016 10:43 AM
Integrated Risk Management ,i.e. .prevention, engineered protection, suppression	9/13/2016 10:41 AM
Materials testing (education to manufacturers)	9/13/2016 10:40 AM
Development of modern building codes with regards to risk acceptance	9/13/2016 10:39 AM
Public Education effectiveness Studies	9/13/2016 10:38 AM
Performance based design	9/13/2016 10:38 AM
Installing fire suppression systems (sprinklers or water mist) in all new construction.	9/13/2016 10:26 AM
Design of structures/materials used to prevent spread of fire	9/13/2016 10:22 AM
chemistry of combustion	9/13/2016 10:21 AM
Applying technology to the practice of fire safety engineering	9/13/2016 8:43 AM
Fire Fighter safety and residential sprinklers	9/13/2016 8:43 AM
Quantification of Structural Fire Resilience	9/13/2016 8:32 AM
Understanding toxic products effects and interactions, immediate, short term, and long term. To allow better risk assessment.	9/13/2016 6:11 AM

	Updating anthropomorphic data and research used as basis for much of the dimensional criteria in NFPA 101	9/13/2016 3:45 AM
	Human safety in low rise buildings in relation to structural fire safety design	9/13/2016 2:58 AM
	12	9/13/2016 2:42 AM
	Big data and fire protection	9/13/2016 1:44 AM
	Ensuring reliability and suitability of system installed in a building on par with the risk assessment and development	9/13/2016 1:18 AM
	Evacuation Tenability and Point of Safety in underground metro stations	9/12/2016 10:12 PM
	The Response Time Index of automatic fire sprinklers heads and its relationship with assumptions made about "fire size", "sprinkler-controlled fire", "spread of hot smoke across ceilings", "how many sprinklers have operated" with respect to the designed capacity of the sprinkler system to provide adequate water to only a limited number of sprinklers.	9/12/2016 8:27 PM
	Converting Research results into viable code language	9/12/2016 8:10 PM
	Fire development and protection for transport vehicles	9/12/2016 7:55 PM
	HVAC use in automatic and manual operation for the control of smoke and fire.	9/12/2016 7:33 PM
	Fire Engineering Informed Antiterrorism Design of Structures	9/12/2016 7:08 PM
	Relates to existing topics - better probabilistic determination of building collapse during fires. Tying together building sensors, preplans, models to help keep responders safe	9/12/2016 6:16 PM
	Role and impact of emergency power in firefighting	9/12/2016 4:26 PM
	What fire sprinkler design systems provide the most cost effective life safety 13-R, 13-D, 13.	9/12/2016 4:19 PM
	implementation of new technology	9/12/2016 3:55 PM
	Post-fire seismic behavior of RC buildings	9/12/2016 3:19 PM
	Statistical Data (Probabilistic Risk Assessment)	9/12/2016 3:10 PM
	microgravity combustion/spacecraft fire safety	9/12/2016 3:07 PM
	Plans signed by P.E. vs Differed Submittal by Contractor	9/12/2016 2:55 PM
	WUI (Wildland-Urban Interface) (modern testing for structural protection of suburban sprawl)	9/12/2016 2:50 PM
	New technology fire suppression agents	9/12/2016 2:47 PM
	Surge analysis in fire suppression systems	9/12/2016 2:45 PM
	Long term toxic effects of smoke - building occupants and fire fighters	9/12/2016 2:44 PM
	Automotive Fire Protection for Electric and non internal combustion vehicles	9/12/2016 2:02 PM

None	9/12/2016 1:51 PM
Green buildings and fire safety considerations	9/12/2016 1:50 PM
Vulnerable occupancies and fire risk (Care, detention)	9/12/2016 1:38 PM
Fire behavior in multi-story, multi-building wood framed construction under construction	9/12/2016 1:37 PM
FPE in developing countries	9/12/2016 1:36 PM
Realistic numbers for probabilities of events: What percent of fires activate sprinklers? What percent of fires with fire detection going off activate sprinklers? What's the real probability of a fire in an office building/warehouse/data center/etc. that activates sprinklers? Etc.	9/12/2016 1:34 PM
5	9/12/2016 1:31 PM
Risk and fire safety engineering (Examples: mathematical modeling and calculation of fire risk)	9/12/2016 1:31 PM
Human Behavior	9/12/2016 12:53 PM
Analysis of funding fire suppression v. prevention in the fire service	9/12/2016 12:47 PM
Fire in informal settlements (slums, ghettos) and poor areas	9/12/2016 12:41 PM
Human factors of fire safety engineering	9/12/2016 12:39 PM
Passive fire and life safety systems, materials & practices.	9/12/2016 12:34 PM
Process Safety and Fire Protection's Importance	9/12/2016 12:32 PM
Open Modelling - Provide a library of models which can be easily used and in which input variables can be easily changed to test different conditions with the end result being more options put in the model codes.	9/12/2016 12:29 PM
Fire flow a design that is based on fire load possibly modeling	9/12/2016 12:28 PM
Evaluation of effectiveness of engineering approaches (Example: is smoke control truly effective in reducing injury, death and property loss)	9/12/2016 12:19 PM
The Global Fire Risk Today	9/12/2016 12:16 PM
Structural Fire Protection	9/12/2016 12:11 PM
How the fire community can use economic theories on behavior to determine their relationship to fire safety.	9/12/2016 12:07 PM
15	9/12/2016 12:02 PM
Human behavior in fire emergencies	9/12/2016 12:01 PM
Fire Investigation and Forensic Engineering; Including technology applications, Lessons learned, interface with law enforcement and Medical Examiner/Coroner investigations, and methods and data used (and shared) in Fire Engineering.	9/12/2016 12:00 PM

Industrial fire Protection	9/12/2016 11:58 AM
Basis for Specific numbers in NFPA codes	9/12/2016 11:56 AM
Large losses (fires, equipment breakdown)	9/12/2016 11:49 AM
Egress modeling - variations based on population anthropometry	9/12/2016 11:49 AM
Fire safety awareness in the general population	9/12/2016 11:48 AM
Mission Critical Facilities	9/12/2016 11:43 AM
Changes in construction materials and construction methodology	9/12/2016 11:40 AM
Battery fires	9/12/2016 11:40 AM
Sprinkler protection for movable shelf storage	9/12/2016 11:36 AM
Determine if there is a relationship between fire protection system ITM and system performance.	9/12/2016 11:36 AM
Identify/quantify sustainability benefits of smoke control systems. (Similar to sustainability benefits of sprinklers completed by FM Approvals, indicating savings from not having to replace smoke-damaged building contents remote from the fire.)	9/12/2016 11:36 AM
Impact of new materials on current fire protection systems/codes	9/12/2016 11:32 AM
Fire communications in the built environment	9/12/2016 11:31 AM
High-risk fire protection of manufacturing processes	9/12/2016 11:30 AM
5	9/12/2016 11:27 AM
Improving Forensic Fire Investigations	9/12/2016 11:26 AM
jet fuel	9/12/2016 11:26 AM
15	9/12/2016 11:25 AM
Various Fire Experience	9/12/2016 11:23 AM
Statistical data for use in FSE	9/12/2016 2:16 AM
Nuclear fire protection engineering	9/10/2016 6:35 PM
Smoldering fires	9/9/2016 6:18 AM
"Solution Approaches" that are competition based	9/8/2016 9:10 PM
Engineering roles in fire forensics and arson investigation	9/8/2016 8:59 PM
Similar to 4 and 16, risk and cost data to support performance based design process	9/8/2016 6:41 PM

Fire risk of high-density energy storage devices (e.g. Lithium-ion batteries)	9/8/2016 6:16 PM
Structural Fire Engineering	9/8/2016 4:35 PM
2nd Additional Topic	Date
Flammable and combustible liquids in IBC containers	11/13/2016 11:50 PM
Fire behavior of green concrete (fly ashes)	11/7/2016 2:04 AM
Graphical fire data integration to show all interactions	11/3/2016 11:39 PM
Fire incident mapping using high-end technologies	11/2/2016 3:48 PM
Battery/DC Power Propulsion Fire Protection	10/29/2016 6:59 PM
Efficient fire protection system design for corrosion prevention (Use of gridded systems, high point vents, elimination of dead legs)	10/27/2016 2:23 PM
Failures (typically electrical) leading to ignition	10/26/2016 3:04 PM
Inclusive design (e.g. evacuation of people whose ability to self-rescue is reduced).	10/26/2016 9:55 AM
Industrial - Portable extinguisher technologies	10/25/2016 12:53 PM
passive fire protection system design	10/24/2016 2:15 PM
Heritage structures and contents	10/24/2016 12:48 PM
Marine Structures Fire Fighting	10/21/2016 5:15 PM
Copying sections of NFPA-13 into specifications is not Fire Protection Engineering!	10/20/2016 2:09 PM
Reliability of complex systems such as special hazard and double interlock pre-action systems	10/20/2016 12:51 PM
Develop specific toxicity levels for use in performance base design	10/20/2016 10:20 AM
Impact of intelligible design on mass notification systems - quantitative vs. qualitative performance metrics	10/20/2016 8:18 AM
fire protection system design (material, practice limitations)	10/20/2016 6:33 AM
Impact of climate change	10/19/2016 5:00 PM
fire safety risk assessment	10/19/2016 2:19 PM
Facades and floor-to-floor flame spread	10/19/2016 9:37 AM
Fire department access (street width, etc.)	10/19/2016 9:25 AM
Electrical requirements for Fire Pumps (Disconnect switches, cabling, etc.)	10/19/2016 3:39 AM
Fire safety of agricultural buildings (Examples: stables)	10/19/2016 2:51 AM

Fire Spread Between Buildings - development of probabilistic models	10/18/2016 10:34 PM
4	10/18/2016 8:47 PM
Smoke management systems and zones	10/18/2016 7:44 PM
Localized Industrial Fire Notifications and Trend Analysis	10/18/2016 5:37 PM
maintenance vs reliability of fire systems	10/18/2016 4:41 PM
Breaking the prescriptive building/fire code model	10/18/2016 3:28 PM
Statistical analysis of NFPA 25 requirements	10/18/2016 2:48 PM
Correlation of fire hazard analysis and fire performance	10/18/2016 2:04 PM
risk and fire safety engineering	10/18/2016 1:31 PM
methods used in fire engineering	10/18/2016 12:05 PM
When is a dry pipe sprinkler system really required? To many dry systems are being installed. Only when subject to freezing. Calculations need to be provided.	10/18/2016 10:52 AM
Importance of evacuation and/or defend in place strategies	10/18/2016 10:26 AM
Absence of mandatory product certification in passive fire protection systems in occupancies that don't fall under municipal building or fire regulations.	10/18/2016 10:16 AM
Incidental plastic IBC storage of combustible liquids	10/18/2016 10:11 AM
Fire Alarm and sprinkler testing procedures	10/18/2016 9:49 AM
effect of value engineering on achieving compliance; e.g., certain insulation foams with intumescent paint are listed for exposure to occupied space - but much cheaper, non-listed foam gets value-engineered in after permit	10/18/2016 9:48 AM
Maintenance of fire safety systems	10/18/2016 9:26 AM
Determine industrial failure probabilities of fire protection features and systems, i.e., fire barriers, fire dampers, fire seals, fire suppression and detection systems, etc.	10/18/2016 9:24 AM
Replacement and/or removal of Halon 1301 systems	10/18/2016 8:59 AM
The value and impact of 3rd party safety certifications for fire protection systems	10/18/2016 8:57 AM
Analysis of various jurisdictions' requirements regarding the use of qualified fire protection engineers to perform fire protection engineering.	10/18/2016 8:52 AM
atruim protection and modeling	10/18/2016 8:46 AM
Performance of fire protection systems	10/18/2016 8:02 AM

Radiological Glove Box Fire Protection	10/18/2016 7:55 AM
Resiliency and role of fire protection	10/18/2016 7:48 AM
Human behavior in fire	10/18/2016 7:42 AM
Fire Safety in a Sustainable Development Goals Perspective	10/18/2016 7:34 AM
Environmental protection and sustainability	10/18/2016 7:25 AM
Standard method for evaluating efficiency of road tunnel firefighting fixed systems (sprinkler, water mist, foam)	10/18/2016 6:56 AM
Methods used in fire safety engineering	10/18/2016 6:29 AM
Fire protection equipment failure analysis	10/18/2016 6:25 AM
Impact of airtight buildings on fire behavior and safety measures provided	10/18/2016 6:21 AM
Performance based alternatives	10/18/2016 6:20 AM
Periodic inspections of fire protection systems	10/18/2016 6:12 AM
New technologies to assist emergency responders (Examples: decision support systems, unmanned vehicles and systems)	10/17/2016 6:59 AM
Fires in Power Plants	10/14/2016 7:13 AM
Fire protection in shopping malls (cooperation between fire protection systems and organization issue)	10/11/2016 2:50 AM
Ensuring Continuation of operation in industry	10/10/2016 5:03 AM
Inventory, Review and Comparison of Modeling Tools	10/3/2016 12:55 PM
Utilization of UAS in the Fire Service and Potential Problems	9/29/2016 11:00 PM
Stop widening the scope	9/29/2016 3:35 AM
Development of new control and suppression agents and technology.	9/28/2016 8:04 AM
BIM and automatic rule checking	9/26/2016 3:16 AM
Toxicity and compatibility of fire suppression agents	9/25/2016 7:57 PM
Special environment fire suppression (airplanes, submarines, offshore wind farms)	9/25/2016 7:15 AM
Fire Protection in Super Tall High Rise Buildings	9/22/2016 1:35 PM
Cost of fire brigade services - are they worth the cost to the community?	9/21/2016 10:44 PM
Egress for all (developing better guidance for designing for disabled people). Note this is not a 'changing demographics topic' as this is a problem we have now.	9/21/2016 9:28 PM

	Notification technologies and their impact on human response	9/21/2016 5:17 PM
	robotic technologies	9/21/2016 4:42 PM
	Fire initiation and development (hazards of new materials, toxicity)	9/20/2016 2:36 PM
	4	9/20/2016 7:04 AM
	Development of product fire tests whose results can be translated to "in-use" scale and behavior	9/18/2016 9:46 AM
	methods used in fire safety engineering	9/18/2016 8:50 AM
	Large-scale jet and pool fires in the petroleum industry: effect of complex geometries on large-scale fire scenarios.	9/18/2016 6:28 AM
	Fire safety education	9/17/2016 3:48 AM
	7	9/15/2016 2:53 PM
	Fire safety design based on statistical performance of safety measures	9/14/2016 2:02 PM
	Investigations	9/14/2016 1:59 PM
	Fire protection techniques for developing countries that may not have sufficient supporting infrastructure for traditional approaches.	9/14/2016 11:54 AM
	Exterior decorative combustible features in assembly uses	9/14/2016 11:15 AM
	18	9/14/2016 11:03 AM
	7	9/14/2016 9:46 AM
	Solar panel fire protection roof and ground mount	9/14/2016 9:12 AM
	Item 9 to be shared in life safety and in human behavior with effect on fire development and propagation	9/14/2016 9:09 AM
	The hydrogen economy and fire safety engineering	9/14/2016 7:12 AM
	Alternative approaches to fire safety, e.g. vision zero to engineer inherently or fail-safe structure rather than "acceptable" or "safe enough"	9/14/2016 2:13 AM
	Research on Modern fire safety vs Traditional	9/13/2016 10:23 PM
	Identification of critical fire protection aspects for disaster sustainability	9/13/2016 9:29 PM
	Fire behavior and resistance of post-tensioned concrete floors	9/13/2016 8:09 PM
	Investigation and valuation of alternative fire investigation methodologies, with aim of producing improved investigation efficacy, efficiency, consistency and utility or compatibility with user needs.	9/13/2016 6:59 PM

Means of getting US fire loss statistics to improve to meet or exceed foreign statistics, perhaps based on foreign best practices that are not applied in the US.	9/13/2016 5:59 PM
application to codes and standards development, regulation and policy	9/13/2016 5:07 PM
Facades - the conflict between insulation and fire safety requirements. Specifically, innovative and easy fire stopping / cavity barrier solutions	9/13/2016 4:46 PM
Fire Safe Material Selection in Fire Safety Engineering	9/13/2016 4:13 PM
Performance of light-weight wood constructed buildings in fire	9/13/2016 2:38 PM
scaling of pyrolysis models	9/13/2016 1:23 PM
Fire Toxicity	9/13/2016 12:13 PM
Validation of procedures of forensic analysis	9/13/2016 12:03 PM
Clothing, textiles, furnishing fires and deaths	9/13/2016 11:58 AM
Are present modelling tools applicable to buildings with modern methods of construction	9/13/2016 11:32 AM
Fire Protection for Commercial Cannabis Production	9/13/2016 11:08 AM
Modelling firefighting processes to improve fire human factors	9/13/2016 10:58 AM
fire emergency signage design	9/13/2016 10:46 AM
Explosion	9/13/2016 10:43 AM
Strategic plans for fire engineering of high rise buildings	9/13/2016 10:41 AM
Competencies of individuals within the fire engineering sector (from risk assessments to installation)	9/13/2016 10:40 AM
Expand on human behavior - response to initial alarms/events vs. movement vs. after effects (PTSD)	9/13/2016 10:39 AM
wildland-urban interface fires	9/13/2016 10:38 AM
fire engineering services design	9/13/2016 10:21 AM
Performance of fire protection systems	9/13/2016 8:43 AM
Age of fire protection systems and failures	9/13/2016 8:43 AM
Societal fire safety expectations	9/13/2016 8:32 AM
Comprehensive analysis of the changes in toxic products as a result of the use of new Building materials	9/13/2016 6:11 AM
Media/marketing study into making fire protection as desired feature of building design, not a requirement forced upon the customer. (e.g. the Nest smoke detector)	9/13/2016 3:45 AM

14		9/13/2016 2:42 AM
Industrial fire protection		9/13/2016 1:44 AM
Gap reduction between fire engineering and human engineering practices		9/13/2016 1:18 AM
Tunnel Ventilation Systems for Underground Metro Stations		9/12/2016 10:12 PM
Effect of extended water transit time for dry-pipe water-spray deluge systems, particularly with respect to Road Tunnels.		9/12/2016 8:27 PM
Fire protection for mines		9/12/2016 7:55 PM
The impact of attaching items to structural elements which are protected with sprayed on fireproofing. i.e. often when pointed out, additional material is placed over the clamp or bracket but often there is a large amount of metallic material not protected leading into the structural element. What thermal transmission occurs or doesn't with such an arrangement and does it provide exposure to the structure?		9/12/2016 7:33 PM
Extreme Mass Evacuation		9/12/2016 7:08 PM
Does passive fire resistive construction provide adequate life safety		9/12/2016 4:19 PM
Retrofitting of fire damaged RC members against earthquake loading		9/12/2016 3:19 PM
Performance Based Applications (Testing Large Oil Fires)		9/12/2016 3:10 PM
airplane/train/personal vehicle fire safety		9/12/2016 3:07 PM
Video flame detection testing and criteria development		9/12/2016 2:50 PM
Variable frequency (speed) controls for motor driven fire pumps		9/12/2016 2:47 PM
Smoke migration through untampered ducts		9/12/2016 2:44 PM
Automated fire detection and extinguishing systems and internet of things		9/12/2016 2:02 PM
none		9/12/2016 1:51 PM
Fire fighting tactics in sprinklered buildings with high fire loads (e.g. warehouses)		9/12/2016 1:50 PM
Realistic data center white space fire testing		9/12/2016 1:34 PM
2		9/12/2016 1:31 PM
Fire extinguishing media (Examples: calculation of required quantity)		9/12/2016 1:31 PM
Performance of fire protection systems		9/12/2016 12:53 PM
Human behavior related to Inspection, Testing & Maintenance of fire and life safety systems.		9/12/2016 12:34 PM
Flammable Liquids		9/12/2016 12:32 PM

	High-rise timber buildings	9/12/2016 12:28 PM
	Determination of better quantitative parameters for design of sprinkler systems (Example: better determine heat release rate for determination of minimum density to control/extinguish fire)	9/12/2016 12:19 PM
	Smoke Control Systems design	9/12/2016 12:11 PM
	Using passive fire/smoke designs in residential structures	9/12/2016 12:07 PM
	3	9/12/2016 12:02 PM
	Fire fighting tactics for new green/lightweight construction and how modern fire protection engineering can assist with tactical consideration	9/12/2016 12:01 PM
	Interfacing with and impact of physical security requirements (crime and anti-terrorism/counter-terrorism. Including interface with risk management and risk communication, human behavior in fire, and data used fire engineering	9/12/2016 12:00 PM
	HFCs	9/12/2016 11:58 AM
	Dust explosions and their risk mitigation	9/12/2016 11:49 AM
	Enforcement of fire safety regulations	9/12/2016 11:48 AM
	Photo Voltaic Panels on Roof Assemblies	9/12/2016 11:43 AM
	Education in FPE	9/12/2016 11:40 AM
	Explore likelihood of a performance-based intent statement for prescriptive building codes: "The intent of this code shall be to return property operations to normal within X hours of an event with fewer than X deaths and X injuries per thousand."	9/12/2016 11:36 AM
	ADA requirements	9/12/2016 11:31 AM
	Fire protection options for reactive metal processing facilities	9/12/2016 11:30 AM
	7	9/12/2016 11:27 AM
	vehicles in structures	9/12/2016 11:26 AM
	5	9/12/2016 11:25 AM
	Fire codes various states	9/12/2016 11:23 AM
	Input data base/bank for models used in FSE	9/12/2016 2:16 AM
	Design fire scenarios data	9/10/2016 6:35 PM
	"Solution Approaches" that are proof-of-concept based	9/8/2016 9:10 PM
	Fire protection methods for alternate energy sources	9/8/2016 8:59 PM
	Standardization or consensus on design and analysis best practice methodologies	9/8/2016 6:41 PM

Controlling fires and performing rescues in major flooding events	9/8/2016 6:16 PM
3rd Additional Topic	Date
3D Printing	11/13/2016 11:50 PM
Fore behavior of 3D printed parts	11/7/2016 2:04 AM
Assessment of emergency response intervention effectiveness	11/3/2016 11:39 PM
Useful Life Calculation Procedures for Fire Alarm Equipment	10/29/2016 6:59 PM
11, should include situational awareness using BMS	10/26/2016 9:55 AM
Industrial - Heavy duty vehicles	10/25/2016 12:53 PM
Research into the reduction of keep it simple stupid designs in favor of more expensive less reliable complex designs	10/20/2016 12:51 PM
Reliability Centered Maintenance (RCM) for fire protection and life safety systems	10/20/2016 8:18 AM
rail fire suppression protection	10/19/2016 2:19 PM
Effects of high density residential development	10/19/2016 9:25 AM
Wireless Fire Alarm technology	10/19/2016 3:39 AM
Durability of fire protection systems (Examples: impregnation, intumescent paint, chemical additions to materials)	10/19/2016 2:51 AM
Realistic Fire Scenarios for Design	10/18/2016 10:34 PM
18	10/18/2016 8:47 PM
Rating system of fire safety of buildings	10/18/2016 7:44 PM
Prediction of fires	10/18/2016 5:37 PM
Fire hazard analysis before design and not before design	10/18/2016 4:41 PM
performance of HVAC ductwork in fire barriers	10/18/2016 2:04 PM
models used in fire safety engineering	10/18/2016 1:31 PM
performance of fire protection systems	10/18/2016 12:05 PM
Water supply analysis with respect to adjustments for future supplies. See Research Foundation report.	10/18/2016 10:52 AM
fire safety engineering for fire brigades	10/18/2016 10:26 AM
Effect of the low tender system on fire protection quality.	10/18/2016 10:16 AM
Water mist in steam turbine bearing protection	10/18/2016 10:11 AM

sprinkler criteria for wooden barrel storage in distilleries	10/18/2016 9:48 AM
Effects of HFC's to the environment	10/18/2016 8:59 AM
Handling the convergence of the technology within the security and fire sectors	10/18/2016 8:57 AM
water treatment options for fire protection systems	10/18/2016 8:46 AM
Economic impact of fire	10/18/2016 8:02 AM
Fire Service Resources Optimum Allocation	10/18/2016 7:55 AM
Wildland fires	10/18/2016 7:48 AM
Methods used in fire safety engineering	10/18/2016 7:42 AM
Fire Safety in Vehicles (Trains, Buses, Planes, Ferries, Cars)	10/18/2016 7:34 AM
Date used in fire safety engineering	10/18/2016 7:25 AM
Fire initiation and development	10/18/2016 6:29 AM
Fire protection equipment usability/complexity	10/18/2016 6:25 AM
Setting universally agreed tenability criteria	10/18/2016 6:21 AM
Critical systems interaction (i.e. Fire and Security)	10/18/2016 6:20 AM
Public awareness and training regarding importance and use	10/18/2016 6:12 AM
Fires in Metal and Mining plants	10/14/2016 7:13 AM
Fire protection in underground car parks	10/11/2016 2:50 AM
Cultural Heritage and property protection	10/10/2016 5:03 AM
Digital Library of Materials Data for use in Modeling	10/3/2016 12:55 PM
Proof the FSE concept by wide acceptance of promising topics	9/29/2016 3:35 AM
Impact of container design and construction on safe transportation and storage of flammable and hazardous materials.	9/28/2016 8:04 AM
Building methods and building products	9/26/2016 3:16 AM
Fire Safety Education (primary, high school, engineering and physics Msc)	9/25/2016 7:15 AM
Occupant Evacuation Elevators	9/22/2016 1:35 PM
Who should be responsible for collecting and maintain data for use in probabilistic analysis	9/21/2016 10:44 PM

	Understanding the basis of evacuation code requirement 'magic numbers' and when they are and are not appropriate to apply.	9/21/2016 9:28 PM
	Culture considerations for fire safety engineering	9/21/2016 5:17 PM
	how to get better cost effective fire protection into developing countries	9/21/2016 4:42 PM
	Models used in fire safety engineering	9/20/2016 2:36 PM
	14	9/20/2016 7:04 AM
	models used in fire safety engineering	9/18/2016 8:50 AM
	Escalating accident scenarios involving fires and explosions.	9/18/2016 6:28 AM
	19	9/15/2016 2:53 PM
	Validity of qualitative analyses (when shortcomings of quantitative analyses)	9/14/2016 2:02 PM
	Education	9/14/2016 1:59 PM
	Impacts of culture on fire protection systems performance.	9/14/2016 11:54 AM
	Recommended fire protection approaches for cities that can't be evacuated	9/14/2016 11:15 AM
	5	9/14/2016 11:03 AM
	14	9/14/2016 9:46 AM
	To deal with sprinkler effect and/or firefighter action for modeling fire development	9/14/2016 9:09 AM
	Impact of climate change on fire safety	9/14/2016 7:12 AM
	To develop Guideline on Effectiveness of Sprinklers in Fire suppression at varying heights	9/13/2016 10:23 PM
	Modelling failure of protection materials and consequences (example of 13)	9/13/2016 8:09 PM
	Calculation methods to model harm from smoke to occupants that is not lethal, yet that needs to be considered in fire protection design. It seems that all performance based design is relying only on fatalities as the performance benchmark. Avoiding permanent health damage should also be a target performance, if it could be quantified.	9/13/2016 5:59 PM
	instrumentation used for fire measurements	9/13/2016 5:07 PM
	flame spread	9/13/2016 1:23 PM
	Counter measures for dwellings in urban/wildland areas	9/13/2016 12:03 PM
	Continuous fire performance - moving on from reaction to fire and fire resistance categories for building products	9/13/2016 11:32 AM
	developing generic models to include loss of control hazards next tot combustion hazards	9/13/2016 10:58 AM

	High Rise Building facade protection engineering	9/13/2016 10:41 AM
	Fire stopping control and competencies	9/13/2016 10:40 AM
	Expand on BIM - currently there are no programs that can neatly incorporate travel distance, fire resistance requirements of occupancies, etc.	9/13/2016 10:39 AM
	next generation reduced ignition propensity cigarettes	9/13/2016 10:38 AM
	practical application of fire engineering design (practical module)	9/13/2016 10:21 AM
	Risk and fire safety engineering	9/13/2016 8:43 AM
	Use of life quality indices to assess fire safety performance	9/13/2016 8:32 AM
	Detailed chemistry modelling in predictive fire simulations	9/13/2016 6:11 AM
	A public health type approach to address the US as being the most prosperous nation with the worst fire record.	9/13/2016 3:45 AM
	15	9/13/2016 2:42 AM
	Structures in fire	9/13/2016 1:44 AM
	Enhancement of building escape mechanism in the event of extreme hazard events such as terrorism events	9/13/2016 1:18 AM
	Reasonable worst case scenario to assess the evacuation load for Train-on-fire	9/12/2016 10:12 PM
	Appropriate water-droplet size signatures for particular fire types.	9/12/2016 8:27 PM
	Fire risk of new fuels	9/12/2016 7:55 PM
	Expand tunnels to include utility tunnels between buildings in which pedestrians also are found...	9/12/2016 7:33 PM
	Alternative Uses of Smoke Control in Buildings to prevent the ingress of unwanted pollutants in emergencies	9/12/2016 7:08 PM
	do fire alarms and smoke control systems provide adequate life safety without fire sprinklers	9/12/2016 4:19 PM
	Impact of fire damage on the behavior of precast industrial buildings	9/12/2016 3:19 PM
	solar/green energy fire safety	9/12/2016 3:07 PM
	Best practices for smoke extraction from a sprinklered area	9/12/2016 2:44 PM
	Consumer product fire safety in a free trade world.	9/12/2016 2:02 PM
	none	9/12/2016 1:51 PM
	13	9/12/2016 1:31 PM
	Methods used in fire safety engineering	9/12/2016 12:53 PM

	Rogues Gallery of the worst or least effective ideas for improving fire and life safety.	9/12/2016 12:34 PM
	Fire Behavior in Low Oxygen Environments	9/12/2016 12:32 PM
	Vehicle storage systems	9/12/2016 12:28 PM
	Smoke Control systems Commissioning and ongoing Validation	9/12/2016 12:11 PM
	Examine how the fire community can utilize high tech accelerators/incubator to take a fresh look a common fire hazards.	9/12/2016 12:07 PM
	6	9/12/2016 12:02 PM
	Amalgamation and coordination between building and fire codes	9/12/2016 12:01 PM
	Fire Service Response, SOP, and Fire Ground Operations with Roof Mounted Photo Voltaic Panels	9/12/2016 11:43 AM
	Flame retardancy (fire risk vs. health risk)	9/12/2016 11:40 AM
	Overcoming the "it won't happen to me" resistance to fire protection.	9/12/2016 11:36 AM
	10	9/12/2016 11:27 AM
	Propane storage	9/12/2016 11:26 AM
	9	9/12/2016 11:25 AM
	Review case studies	9/12/2016 11:23 AM
	A review of different fire causes	9/12/2016 2:16 AM
	Exposure analysis data	9/10/2016 6:35 PM
	Data Analytics	9/8/2016 9:10 PM
	Effective means of mass communication of emergency conditions	9/8/2016 8:59 PM
	Use of robots to replace firefighters in dangerous entries	9/8/2016 6:16 PM

Question 2

	1st Priority	2nd Priority	3rd Priority	4th Priority	5th Priority	Total	Weighted Average
1. Applying technology to the practice of fire safety engineering	39.76% 66	15.06% 25	12.65% 21	14.46% 24	18.07% 30	166	3.44
2. Big data and fire protection	16.46% 13	20.25% 16	27.85% 22	17.72% 14	17.72% 14	79	3.00
3. Changing demographics and impact on fire safety	21.62% 16	27.03% 20	18.92% 14	16.22% 12	16.22% 12	74	3.22
4. Data used in fire safety engineering	20.93% 27	22.48% 29	23.26% 30	24.03% 31	9.30% 12	129	3.22
5. Economic impact of fire	15.49% 11	19.72% 14	22.54% 16	19.72% 14	22.54% 16	71	2.86
6. Environmental protection and sustainability and impact on fire safety	16.44% 12	21.92% 16	19.18% 14	13.70% 10	28.77% 21	73	2.84
7. Fire initiation and development	19.61% 20	28.43% 29	25.49% 26	17.65% 18	8.82% 9	102	3.32
8. Health and safety of fire service personnel and first responders	22.81% 13	17.54% 10	21.05% 12	19.30% 11	19.30% 11	57	3.05
9. Human behavior in fire	19.67% 24	27.05% 33	22.95% 28	17.21% 21	13.11% 16	122	3.23
10. Industrial fire protection	28.00% 21	12.00% 9	13.33% 10	24.00% 18	22.67% 17	75	2.99
11. Informing fire service operations	11.11% 3	18.52% 5	11.11% 3	22.22% 6	37.04% 10	27	2.44
12. Methods used in fire safety engineering	10.00% 12	22.50% 27	20.00% 24	23.33% 28	24.17% 29	120	2.71
13. Models used in fire safety engineering	15.32% 19	22.58% 28	20.97% 26	23.39% 29	17.74% 22	124	2.94
14. Performance of fire protection systems	21.28% 30	23.40% 33	21.28% 30	20.57% 29	13.48% 19	141	3.18
15. Resiliency and role of fire protection	14.04% 8	12.28% 7	19.30% 11	22.81% 13	31.58% 18	57	2.54
16. Risk and fire safety engineering	19.01% 27	16.90% 24	22.54% 32	20.42% 29	21.13% 30	142	2.92

17. Structures in fire	25.00% 22	13.64% 12	15.91% 14	21.59% 19	23.86% 21	88	2.94
18. Tunnels and underground fire protection	7.32% 3	24.39% 10	12.20% 5	17.07% 7	39.02% 16	41	2.44
19. Wildland fires	15.25% 9	10.17% 6	23.73% 14	20.34% 12	30.51% 18	59	2.59

Question 3

Responses	Date
We need to harvest information from all sources doing research and extract the information so that it is usable to everyday applications. We should also aid in fire protection research on a world wide basis.	11/13/2016 11:54 PM
Broader Use of Semi-quantitative method like T/La to assess value of fire dept. response performance by local fire departments.	11/3/2016 11:47 PM
The integration of fire protection engineering as it relates to life safety and personal safety is becoming more important as building designs and building systems continue to handle all kinds of perils, hazards and risks.	11/1/2016 12:34 PM
I feel that the maintenance and testing of fire sprinkler system (in particular) has not kept up with the rest of the world. In an attempt to be competitive, there are fewer \$\$ and fewer hours available for all preventative maintenance and yet FP is still doing the same thing we've always done. Water and personnel shortages demand a revamping of the age-old methods that can easily be submitted to an AHJ (so that we're not all reinventing the wheel).	10/27/2016 2:36 PM
Public awareness of fire risks in the home and ways to reduce same	10/25/2016 12:54 PM
Validation and standardization of methods of fire safety engineering	10/25/2016 2:59 AM
My prior input refers to engineered buildings, e.g., not ordinary detached housing.	10/24/2016 12:51 PM
If we want to step up our game in relation to the changing built and wild environments, we need to invest more in fundamental research to better understand the rising issues but we still need to drive this research with what is meaningful for society, public safety, and our first responders.	10/23/2016 10:18 AM
A broad scope issue is the entire subject of human behavior during an emergency condition within a structure. We must find ways to effectively communicate with a varied audience to allow relocation away from sources of personal harm. Big task with many variables but loaded with opportunity for improvement.	10/21/2016 11:40 AM
none	10/20/2016 12:54 PM
Outside of the ever present need for funding, the fast changing world of products and building materials sometimes leaves research lagging to address fire related issues to those particular new products and materials.	10/20/2016 10:25 AM
I think you have too many items on your list!	10/20/2016 10:23 AM
Develop radiant heat exposure limits based on field testing.	10/20/2016 6:48 AM
More and easier access to research data for fire protection engineers in the field.	10/20/2016 6:36 AM
Although it needs to keep its focus, the area needs to absorb information from / be applicable to adjacent areas of engineering.	10/19/2016 5:02 PM
Expand theorizes with and accommodate Africans.	10/19/2016 2:21 PM
Allow for online presentations and trainings after the research is completed	10/19/2016 3:43 AM
I have concerns that fire safety requirements only ever get added and never taken away, despite changes in hazards over time. For example in a hotel with highly reliable sprinklers and smoke detection is a high level of passive protection between rooms still necessary?	10/18/2016 10:38 PM

	It would be good to have a central database of fire, experimental result and other papers	10/18/2016 8:49 PM
	A mass awareness/ education campaign about fire safety is highly essential and shall develop training videos for the same	10/18/2016 7:47 PM
	Applying codes and standards to fire safety engineering	10/18/2016 5:54 PM
	None at this time.	10/18/2016 3:51 PM
	increase of tenability by smoke venting	10/18/2016 1:34 PM
	Explore the effect of temps lower than -60F on notification and detection devices, and suppression systems. Those temps (down to -90F) are frequent in arctic, and Antarctic environments. In such environments, losing a facility to fire and emergency monitoring does mean life or death. Such remote areas are not recoverable or accessible until a very small "summer" window. Reliability is priceless for such sites, once occupied.	10/18/2016 1:30 PM
	None	10/18/2016 1:18 PM
	I hate the words "smart" and "big". they are meaningless buzz words that add no value, subjective, and are whatever the person wants it to be.	10/18/2016 11:48 AM
	Need real world topics that we can use today.	10/18/2016 10:55 AM
	Please keep up the good work!	10/18/2016 10:45 AM
	just encourage research. Who knows what will come out of it...	10/18/2016 10:28 AM
	It would be interesting to have a discussion of the effect of economic pressure on fire safety engineering, whereby FPEs are called upon to justify the lowest cost systems as opposed to raising the bar.	10/18/2016 10:23 AM
	I would like to see more engineering efforts devoted to residential single family homes. Currently, little engineering efforts are addressed to our number one fire problems. I work for State Farm Insurance as a researcher.	10/18/2016 10:01 AM
	From my first response it should be clear that my interest is in the development of accurate fire modeling parameters that can be used to build more accurate fire models. The Nuclear Regulatory Commission (NRC) is pursuing expansion of this knowledge. Potentially SFPE could assist in this effort.	10/18/2016 9:27 AM
	Please involve knowable & experienced senior fire service personnel.	10/18/2016 9:19 AM
	SFPE should be more involved in testing or manufacturers products	10/18/2016 8:59 AM
	no other thoughts come to mind.	10/18/2016 8:54 AM
	Extinguishing combustible fissile and fissionable materials	10/18/2016 7:58 AM
	Need to apply new technology to system components	10/18/2016 7:55 AM
	I see need for good tools for small or light industry. Tools trained safety people can apply to understand fire hazards.	10/18/2016 7:30 AM
	None	10/18/2016 7:26 AM

To improve consistency of interpretation and application research needs to feed into the guidance documents utilized by the fire community. These documents need to establish fire safety goals and objectives, acceptance criteria, fire scenarios, design basis fires, occupant profiles and the like. They should also consider such factors as sensitivity of output to input parameters, reliability of systems, and robustness of designs.	10/18/2016 6:38 AM
Papers about Fire Dynamics Simulator	10/18/2016 6:31 AM
Research on whatever level has to be 'relatable' to the problems in the field...research for research sake has little impact.	10/18/2016 6:30 AM
How integration of needs in an event are handled.	10/18/2016 6:25 AM
24/7 monitoring of fire protection systems may also be one topic to consider for research	10/18/2016 6:16 AM
No	10/14/2016 7:14 AM
A global collaboration of research efforts would be more cost effective and thorough.	10/11/2016 2:36 AM
A research road map should also contain the different key players with which SFPE can cooperate in research e.g. organizations such as IAFSS.	10/10/2016 5:06 AM
thermomechanical behavior of material used in structures	10/10/2016 4:18 AM
NIST has been looking at the impact (or lack thereof) in fire retardants in furnishings. Since this tends to be the primary combustible material in occupied spaces, it would be good to understand how potential removal of fire retardants from materials might impact fire development and spread.	10/3/2016 12:59 PM
Insuring laboratory simulations reflect actual real life situations.	9/29/2016 11:03 PM
Focus, focus, focus! Create proof of the viability of FSE. Proof the gains by FSE instead of just applying descriptive methods; gains in concrete terms: handling complexity, reduced costs at equal safety or increased safety at equal costs.	9/29/2016 3:39 AM
I just want to be clear that I thought some of the research needs that I didn't select in Q2 are extremely important, but I don't see them as being a particular research need of FSE.	9/23/2016 4:07 PM
While we have the means to think and work outside the norms of standard practice, we do not have data on the historic performance of fire safety measures. Therefore, innovation is being stifled, which is the preferred outcome for the ultra conservative fire brigades.	9/21/2016 10:52 PM
We need research which is focused not only focused around the subject matter of understanding fire/people, but to engage with approving authorities so that fire engineers are granted the much needed flexibility to use appropriate tools (beyond codes) which the subject matter experts are developing. Its no good funding more subject matter research if approving authorities do not allow them to be used in most situations.	9/21/2016 9:32 PM
We still kill most people in residential fires and almost no one in commercial buildings. I see no specific discussion on this topic. I think the cost benefit of all of this should be much higher priority. When do we say enough is enough? Take the fire service for example, most deaths are self inflicted heart attacks, 2nd most common is poor driving practice so why do we spend so much on other 1st responder fatalities?	9/21/2016 2:59 PM
Development of engineering tools to design fire protection, bridging gap between simple prescriptive formulae, at one end, and CFD models, at the other.	9/20/2016 1:12 PM

	Wildfires that spread into communities, known as Wildland-Urban Interface (WUI) Fires, are an emerging area of fire safety science research. WUI fires present far more challenges to fire safety science, and should not be simply listed as wildfires.	9/20/2016 1:36 AM
	See, if you haven't already: THE TECHNICAL BASIS FOR PERFORMANCE BASED FIRE REGULATIONS A discussion of capabilities, needs and benefits of fire safety engineering UNITED ENGINEERING FOUNDATION CONFERENCE San Diego, January 7-11 2001 Edited by Geoff Cox Conference Chair BRE/FRS UK	9/18/2016 9:50 AM
	to combine different fire codes and standards	9/18/2016 8:57 AM
	It is important to identify the phenomena that governs large-scale fire scenarios in realistic geometries, and to verify the performance of consequence models for full-scale scenarios.	9/18/2016 6:33 AM
	Smart fire alarm	9/17/2016 3:58 AM

<p>Please find attached the views of the Benelux Chapter: The following is a modified, extended and prioritized list of research topics. Top 10</p> <ol style="list-style-type: none"> 1. Changing demographics and impact on fire safety (Examples: aging population, mobility, accessibility, aging in place and home healthcare) 2. Data used in fire safety engineering (Examples: gaps in the data, data accessibility) 3. Define quantify societal needs in restricting businesses wrt fire safety (we can with some trouble quantify target performance for loss of life; insurance companies can – or should be able to – calculate optimum investments in prevention in relation to property loss. We lack models and limits to argue, let alone quantify, how much smoke emission in the atmosphere is allowed in relation to fire compartmentation/sprinkler. The same for weighing other societal damages of a fire: mass evacuation of buildings or city quarters, temporary closure of vital infrastructure, job losses. 4. Economic impact of fire (Examples: cost of fire events, value of fire departments to community, cost/benefit of proposed changes/additions to code and standards) 5. Environmental protection and sustainability and impact on fire safety (Examples: tall timber buildings, hazards of new sustainable building materials, batteries and energy storage, PV arrays, impact of fire on the environment, eco-impact of fire protection, toxicity of fire retardants) 6. Fire initiation and development (Example: facades, fire dynamics, hazards of new materials (e.g. combustible facades), toxicity) 7. Health and safety of fire service personnel and first responders (Example: risk of cancer, advances in personal protective equipment, new hazards and fire fighting) (+more risk-adverse attitude on scene; no risks accepted for property protection) 8. Human behavior in fire (relevant, but needs some more specification, e.g. evacuation in smoke / under smoke layers, ...) 9. Industrial fire protection (relevant, but needs some more specification, e.g. on- and offshore, oil gas related and/or non-oil&gas related (storage/handling/manufacturing/...), 10. Methods used in fire safety engineering (Examples: validation and verification of methods, acceptance criteria, correlations used by engineers, guidance on tools for fire safety engineers, tools for emerging countries, fire test methods) Resilience and role of fire protection (Examples: fire safety engineering for resilient systems/buildings, reliability of fire protection systems) <p>Less relevant issues, in arbitrary sequence</p> <ol style="list-style-type: none"> 11. Applying technology to the practice of fire safety engineering (Examples: building information modeling, data) 12. Big data and fire protection (Examples: smart fire fighting, smart buildings, smart enforcement for communities) 13. Informing fire service operations (Examples: tactics for new hazards) 14. Models used in fire safety engineering (Examples: things that models cannot do today, verification and validation of models) 15. Performance of fire protection systems (Examples: smoke detection nuisance, new system technologies (e.g. O2 reduction), reliability of systems/aging of systems) 16. Risk and fire safety engineering (Examples: risk informed performance based design, risk management) 17. Structures in fire (Examples: tall timber buildings, high rise buildings) 18. Tunnels and underground fire protection 19. Wildland fires 20. Harmonization of fire safety regulations (explain national differences; retain sensible ones, broaden & harmonies' others) 21. Underpin risk based analyses: couple fire safety measures to safety targets; allot targets & measures to appropriate problem owner 22. Evacuate or stay in place. Where, when is each appropriate; which factors contribute and how. 23. Well thought through fire safety concept as the major component of fire engineered solution, with calculations to support the design. Not: intimidating calculation results to start and end the discussion. 24. Who is the client, who is the boss? Professional ethics and national mores (can SFPE provide common recommendations/protocol that helps consultants and control officials to deal with pressures) 25. Reappraisal of ASET/RSET (premovement time when ASET < 3 minutes; long waiting times OK?) 	<p>9/17/2016 2:59 AM</p>
<p>I have ideas about design fire for available egress time. A rough outlined method to evaluate a reasonable maximum fire size has been developed. Please contact Johannes Almás, johannes.almás@norconsult.com</p>	<p>9/15/2016 7:35 AM</p>
<p>Although it may not be true research. A methodology for disseminating information and educating other parties on fire safety engineering is needed at times more so than research. In additional, a "library" of sorts to easier access much of the research that has been done related to fire safety would be useful.</p>	<p>9/14/2016 2:54 PM</p>
<p>The big gap: Between full analytical methods and lack of parameters that can be modeled. Perhaps just 1 out of 15 FSEs are inherently born with a mind that actually can do systematic analyses and especially qualitative analyses. A huge problem is thos other 14 engineers trying to do analyses. The hypothesis part 1 is they do more harm than good. The hypothesis part 2 is using those scarce capable FSEs to analyze only; might put us back on track to safety.</p>	<p>9/14/2016 2:13 PM</p>
<p>Proposed retrofit approaches to the world wide issue of exterior facade fires on existing inventory.</p>	<p>9/14/2016 11:20 AM</p>
<p>more industrial practices in the model of hazardous (classified) areas extension</p>	<p>9/14/2016 11:07 AM</p>

	to get accurate detailed statistical data from real fire events	9/14/2016 9:14 AM
	probabilistic behavior of fire or structures during fire needs deeper investigation	9/14/2016 8:19 AM
	There is ever-growing gap between the science and practical engineering, and another gap between "practical engineering solutions" and what is built in the buildings. This gap often changes solutions that seemed great on the paper into untenable. I have the feeling, that our current model of work does not include this discrepancy - too many things we take for granted. With the shift towards more risk-based assessment, such factors as probability of good execution of the design, probability that the solution will be maintained as it should and that it will not be intentionally damaged (e.g. self closing devices on doors that are always open). Sometimes a little more expensive, but maintenance/user free solution will yield much better effect in a real fire, than beautifully engineered system that is too hard to make it real, and collapses after few years of use.	9/14/2016 3:32 AM
	I believe that the fire safety engineering and performance-based design framework is ill-suited to engineer really good solutions. The problem context should be acknowledged and decision theory tools be employed to structure the problem. Next tools are used to solve the problem and not the other way around that the problem is adapted to the tools.	9/14/2016 2:18 AM
	I have few as listed below, 1. The present day fire safety engineering is based on software used to design fire safety in buildings. In current practice the companies don't have enough knowledge on how to use appropriate inputs to come up with a safe design. So a study has to be conducted on those software and how to apply it so that SFPE can shower knowledge on how to use those software. 2. A study to be done on countries which implement Fire safety and which do not. By doing this a new area will be opened and SFPE can play a major role in implementing fire safety in such areas. 3. Even now prescriptive designs following BRE, NFPA based calculations are predominant in fire safety engineering. But after the invention of new models like new software used for performance based design it is known that soot yield is an important factor in designing fire safety requirement. But the prescriptive design calculation does not use soot yield as a factor. This discrepancy has to be sorted out.	9/13/2016 10:43 PM
	The need for wildfire response training	9/13/2016 8:18 PM
	Past research must be freely available to avoid repetition - IAFSS making their archives available is an invaluable resource	9/13/2016 8:11 PM
	A major unmet need is objective methods for developing a comprehensive understanding, verification and standardized documentation of fire loss processes that enables systematic identification of all behaviors of people, objects and energies that could be changed to reduce future losses, and facilitates objective assessment of the performance of loss amelioration actions.	9/13/2016 7:13 PM
	There continues to be a large disconnect between FSE training and how the chemistry of the materials involved in fire affect the FSE approach. More material science and chemistry training is needed, especially as more synthetic materials are inserted into the modern built environment.	9/13/2016 4:16 PM
	Home furnishings to be more fire safe. Advanced technology in detecting home fires.	9/13/2016 2:43 PM
	The fuel load and how it has changed from the 1940 till 2016	9/13/2016 1:46 PM
	All topics in the previous list are important and very hard to select only 5 of highest priority. I would like to see more SFPE guides of specific topics.	9/13/2016 12:10 PM
	More focus on people and public in fires, burn injuries and deaths - less on structures	9/13/2016 12:00 PM

	FSE is the only option for designing modern buildings yet the basic tools and models of FSE have not kept up with the development in the construction industry. Modern buildings are designed based on models and data developed for "old" buildings. This gap needs to be closed.	9/13/2016 11:37 AM
	Thinking of firefighters, emergency personal, and other professionals coping with accidents, I think fire-hazard is a minor threat (because evident) in comparison with traffic accidents, loss of control, natural hazards, etc. I would prefer to develop generic (proces) models of the emergency practices in relation to the (already) known fire, smoke, evacuation, and other models that affect the profession of firefighters and their partners in the fight.	9/13/2016 11:10 AM
	Need to provide a research-community-level framework for coordination	9/13/2016 10:45 AM
	SFPE ought to have a bigger presence in fire protection engineering research to ensure that its community's priorities are being addressed. This may require establishment of a subsidiary organization like NFPA's Fire Protection Research Foundation.	9/13/2016 10:44 AM
	I would like to see more research on response to alarms, affordable sprinkler retrofitting for residential applications, structural defense for wildfire.	9/13/2016 10:41 AM
	can you or should you develop research in this centralized fashion	9/13/2016 10:23 AM
	Significant gaps in our understanding remain to be addressed. The inclusion of technology and big data could be useful once our understanding is more comprehensive and robust.	9/13/2016 6:13 AM
	Ideally, research should benefit the broadest audience and not be so specific as to only benefit a small group or special interest.	9/13/2016 3:48 AM
	Specialization of fire engineering by type of buildings is high priority. The application of fire safety takes into account multiple factors that need to be mastered and balanced by the practitioners.	9/12/2016 10:20 PM
	Performance of sliding fire doors in road and rail tunnels subjected to cycling of intense air-pressure buffeting from vehicle/train movement. Durability. Fit for purpose. Test method and acceptance criteria.	9/12/2016 8:33 PM
	As some countries are looking to start to quantify performance requirements in building regulations using F-N curves or other risk data, then research into quantitative risk assessment methods and availability of quality data becomes ever more critical	9/12/2016 7:59 PM
	The list is very large but I didn't see anything I disagreed with. (Good job!) This could take us into the next generation!	9/12/2016 7:36 PM
	The fire safety/fire protection engineering fraternity needs to seriously consider design that deters or at least 'hardens' against terrorist and arsonist actions.	9/12/2016 7:10 PM
	Sprinklers are evaluated at minimum operating pressures but what happens to their performance when used with fire pumps operating at higher pressure. What happens with when halocarbons are applied to Class C fires where the power is not shut down and arcing occurs, the gas won't prevent an arc and due to the heat HF is generated. Digging into what codes allow but maybe shouldn't	9/12/2016 4:09 PM
	Fire and earthquake combination, in the scope of "disaster engineering" should be considered. This context needs expertise on both structural and fire safety engineering. Apart from fire following earthquakes, impact of fire damage on the structural behavior needs to be investigated as well. In Kobe earthquake, more than 500 people were killed because of fires after earthquakes. Furthermore, after a fire, an investigation process is carried out on determining the residual structural behavior and the service life should be clarified considering potential earthquake risk particularly in earthquake prone countries.	9/12/2016 3:46 PM

Corporate interest in risk management and recognition of loss potential for potential risks. This would include present and future potential exposures, including events related to natural weather exposures.	9/12/2016 3:41 PM
Who performs this work? Is there an opportunity to join panels?	9/12/2016 3:11 PM
Research should be global in outlook and combine existing research and talent across all SFPE members.	9/12/2016 2:49 PM
Dangers of smoke seem to be ignored in US - cyanide compounds in particular	9/12/2016 2:47 PM
None at this time. Looks like a good list of topics.	9/12/2016 1:53 PM
Are there ways to prevent large conflagrations of wood framed construction during the construction phase? Are there practices that can be put in place prior to a fire to prevent a large conflagration once a fire has started?	9/12/2016 1:46 PM
Theoretical fire protection engineering is great, but we need to remember that real life usefulness and effectiveness is based on cost effectiveness - and an essential component of understanding real cost effectiveness is event probability. We need to stop glossing that over because real probabilities are a lot less than what we like to imply (to justify expenditures for our services).	9/12/2016 1:36 PM
In field of risk calculation is big hole. Industrial plants are very bad covered with detailed instructions about risk calculation.	9/12/2016 1:36 PM
We need to keep "education of the public" as a major focus on making sure fire protection basics are included in all new construction and major remodels.	9/12/2016 1:34 PM
I am currently working on fire engineering applied to informal settlements (where a significant portion of the fires in poor countries occur) yet almost nothing has been done in this field worldwide.	9/12/2016 12:44 PM
Thank you. What you do is important.	9/12/2016 12:37 PM
Fire Safety Engineering Professionals should concentrate on becoming better communicators so that the value, economics, and business case for fire protection can be made.	9/12/2016 12:35 PM
Focus on robust design and reliability	9/12/2016 12:31 PM
Dynamic Signage System with intelligent computational navigation in real-time.	9/12/2016 12:25 PM
I work for State Farm Insurance as a fire research analyst. I would be happy to provide our perspective on residential fire hazards if you desire. Patrick Boyer 309.766.0776 : pat.boyer.a0iv@statefarm.com	9/12/2016 12:11 PM
Sprinklers are a good but old technology. In what ways can we encourage development of new creative solutions that save lives and property and money?	9/12/2016 12:09 PM
We need to start looking at future trends and stop looking back on past trends, and keep up with emerging technology and building construction techniques and adjust our thought processes to getting people outside structures and protecting the structures long enough to allow that to occur as well as providing a safer environment for first responders inside a structure to conduct any necessary rescue and fire attack operations	9/12/2016 12:05 PM
Need to identify and change fire reporting data to support and provide specific information and data for applying risk management numerical methods - both North America and Internationally; we lack data on fire systems operational successes too.	9/12/2016 12:04 PM
Need to closely coordinate with security and Law Enforcement	9/12/2016 12:03 PM

<p>The list of topics presented here is rather ambiguous and many headings can be interpreted in very differing ways. Next edition of topics for the survey should be normalized.</p>	<p>9/12/2016 11:43 AM</p>
<p>Fire system corrosion, causes, identification and prevention.</p>	<p>9/12/2016 11:42 AM</p>
<p>How to encourage more women and minorities in the field to take advantage of their viewpoints.</p>	<p>9/12/2016 11:41 AM</p>
<p>none</p>	<p>9/12/2016 11:25 AM</p>
<p>The greatest limitation is data - we need a big research push towards this area.</p>	<p>9/12/2016 11:22 AM</p>
<p>You will probably guess from this response that this is Kevin McGrattan of NIST. The SFPE plays a vital role in fire science and engineering as the single authoritative source of technical information (data, methods, models). This is a unique role that is different from NFPA and other code writing organizations. In the past, organizations like NIST, SP, VTT Finland, BRI Japan, FRS in the UK have shared this role, but these organizations are mostly privatizing, shrinking, or have disappeared altogether. I work at NIST, and I can tell you that except for our modeling work, we cannot be relied upon to support or further develop much of what we have done in the past. There are still a handful of people at NIST who remain committed to maintaining FDS and CFAST, but the FPE community seems to take it for granted that this will remain so indefinitely. That we will always be able to download these models for free from the Internet. SFPE research priorities should look to provide support for these models by working with us at NIST to support our open source modeling efforts, or with the SFPE directly to improve and better maintain the Handbook. These three things -- the Handbook and its very valuable collection of methods and data, a zone model like CFAST, and a CFD model like FDS, should be very high priorities. These things are now taken for granted, but I know from my experience working with each that they need constant attention. You cannot just write a handbook or model and walk away.</p>	<p>9/9/2016 8:49 AM</p>
<p>Risk based performance based design will be the next phase of development of the FPE profession.</p>	<p>9/8/2016 6:41 PM</p>
<p>This committee must focus on one specific area/path relevant to Fire Safety Engineering. The time-scales, and analysis are completely shift depending on what the committee intends to look at.</p>	<p>9/8/2016 6:38 PM</p>
<p>Sponsor PhD candidates and provide them with opportunities for experience while earning their degree.</p>	<p>9/8/2016 6:18 PM</p>

Question 4

Response Choices	Responses
Consultant/Design Engineer	48.57% 170
Fire Service	7.71% 27
Insurer or loss control professional	7.71% 27
Fire marshal, building official, or Authority Having Jurisdiction	12.57% 44
Professor, researcher, or academic	24.86% 87
Fire protection system technician, installer, or maintainer	5.14% 18
Fire protection system manufacturer	5.71% 20
Fire protection/fire research student	2.86% 10
Other	10.86% 38
Respondents: 350	
If other (please specify)	Date
Retired	11/3/2016 11:48 PM
Hazardous materials program management	11/1/2016 12:35 PM
Industrial fire protection (owner's representative)	10/27/2016 2:40 PM
Federal Government, post fire analysis	10/26/2016 3:09 PM
fire sprinkler contractor engineer	10/24/2016 2:17 PM
fire safety engineering instructor	10/19/2016 2:24 PM
FPE for government facility	10/19/2016 9:28 AM
Federal Government Oversight	10/19/2016 8:05 AM
Inspection	10/19/2016 3:43 AM
persuing Ph D	10/18/2016 1:35 PM

Industrial FPE	10/18/2016 1:18 PM
Corporate Loss Control	10/18/2016 11:49 AM
Manufacturer	10/18/2016 10:24 AM
Editor of a Construction Cost Database	10/18/2016 9:20 AM
Fire protection systems ancilliary equipment manufacturer	10/18/2016 9:00 AM
U.S. Federal Government Fire Protection Oversight	10/18/2016 7:59 AM
Fire Protection Facility Engineer	10/18/2016 7:55 AM
Fire consequences and hazard identification In chemical and manufacturing	10/18/2016 7:32 AM
Government regulator	10/18/2016 6:39 AM
Risk control/Fire Investigation	10/18/2016 6:31 AM
Fire and evacuation modeling software development	10/3/2016 1:00 PM
Industry association	9/29/2016 3:40 AM
standards development organization	9/28/2016 10:43 AM
Multinational manufacturer	9/25/2016 8:00 PM
Building code writer	9/21/2016 10:53 PM
Researcher and ISO Chair, retired	9/18/2016 9:51 AM
SFPE Benelux Board of Directors consolidated views	9/17/2016 2:59 AM
consultant fire science	9/16/2016 3:33 PM
Trade Association	9/14/2016 2:54 PM
Inventor	9/14/2016 2:14 PM
forensic expert attached to a court of justice	9/14/2016 9:15 AM
Structural Fire Engineering / research student	9/14/2016 8:20 AM
Fire Research Laboratory specialist	9/14/2016 3:33 AM
Contract researcher / material scientist	9/13/2016 4:16 PM
Fire Investigator	9/13/2016 2:44 PM
Insulation product manufacturer	9/13/2016 11:37 AM

formerly Dutch participant of ISO 223 'societal security' committee	9/13/2016 11:13 AM
Railway	9/13/2016 10:41 AM
Fire safety assessor	9/13/2016 10:30 AM
Fire suppression estimator and project manager	9/13/2016 9:35 AM
Government Fire Protection Engineer	9/12/2016 7:37 PM
Supplier/advisor to engineers in construction industry	9/12/2016 4:30 PM
Fire and smoke control damper actuators	9/12/2016 2:48 PM
>10 years AHJ, now a Fire Safety Officer at a hospital	9/12/2016 1:40 PM
Manufacturer of life safety systems.	9/12/2016 12:38 PM
Retired (military- Safety Engineering & law enforcement)	9/12/2016 12:05 PM
Consulting FPE	9/12/2016 12:04 PM
Government, Fire Investigation	9/12/2016 11:30 AM
Fire Investigator	9/12/2016 11:28 AM
Third party product certification	9/12/2016 11:27 AM
Fire research	9/12/2016 2:24 AM