

The SFPE Handbook of Fire Protection Engineering: Looking Forward for the Next Generation of Fire Protection Engineers

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Abstract

Now in its fifth edition, the *SFPE Handbook of Fire Protection Engineering* is known as the definitive resource for those practicing in the profession. It is regularly used by engineers, fire protection engineering students, researchers and it is an important resource for the development of the Principles and Practice of Engineering (PE) Fire Protection Exam. An SFPE subcommittee reviewed the process that was used to publish the 5th edition and submit a report that made recommendations for the next edition. This subcommittee was asked to make recommendations on how the Handbook was distributed, the process that was used to publish it and the content itself. The purpose of this review was to ensure the next edition would meet the future needs of the next generation of fire protection engineers. As part of this process, the committee solicited formal information through a member survey, and soliciting informal feedback from fire protection engineers throughout the world. As a result, the subcommittee provided 15 recommendations that were related to the format, editorial board roles and content.

Keywords: SFPE Handbook, fire protection engineering, active fire suppression systems, fire alarm and notification systems.

Now in its fifth edition, throughout the world, the *SFPE Handbook of Fire Protection Engineering* is known as the definitive resource for those practicing in the profession. It is considered to be the body-of-knowledge for the fire protection engineering profession, as it is regularly used by engineers, fire protection engineering students, researchers and it is an important resource for the development of the Principles and Practice of Engineering (PE) Fire Protection Exam. Passing this exam is a requirement to become a licensed fire protection engineer in the United States of America. [1]

In 2018, an SFPE subcommittee reviewed the process that was used to publish the 5th edition and submit a report that made recommendations for the next edition. Specifically, this committee was asked to make recommendations on how the Handbook was distributed, the process that was used to publish it and the content itself. The purpose of this review was to ensure the next edition would meet the future needs of the next generation of fire protection engineers. [2]

Subcommittee Scope

As part of this process, the committee solicited formal information by conducting a member survey, soliciting informal feedback through discussions and emails, and holding 10 meetings to review, discuss, and debate the wide-range of feedback obtained. Over 230 engineers and researchers responded to this survey. At that time, it was interesting to note, the survey responses provided the committee with interesting insight on a some of the previous assumptions that were held by the subcommittee at the early stages in the development of the report. As such, the subcommittee was able adjust their recommendations to better understand the perspectives of the larger population.

Subcommittee Recommendations

Specifically, the subcommittee provided 15 recommendations that were related to the format, editorial board (EB) roles and content:

Format Recommendations:

1. Continue to provide both digital (non-eBook format) and print version of the Sixth Edition
2. Review sales figures for printed copies, and complete a survey after the Sixth Edition printing to determine future demand for printed copies.
3. Further explore an eBook option after the Sixth Edition Printing
4. Continue with the 6- to 7-year frequency, and publish as one multi-volume set at one time and consider reducing to two volumes.
5. Consider an online subscription service offering for the Handbook.
6. Suggest that Chapter Authors to submit content in LaTeX but note that submitting in Word will be acceptable.

Development Role Recommendations:

7. Appoint an EB with a charge of correlating and reviewing content between sections.

8. Reinforce the role of the Section Editor with the following responsibilities:
 - Review and coordinate chapters and consolidate chapters with overlapping or redundant content.
 - Develop a consistent nomenclature
 - Develop consistent equation numbering
9. Appoint Deputy Section Editors to assist Section Editors
10. Request that authors develop a succession plan

Content Recommendations:

11. Request Section Editors and Deputy Section Editors conduct a review of chapter content
12. Develop an introductory User's Guide
13. Organize an informal peer review process of the current chapters of the current Fifth Edition to provide authors and editors comments for the Sixth Edition
14. Consider incorporating content from SFPE Engineering Practice Documents and Engineering Guides on a case-by-case basis
15. Content from SFPE Engineering Standards should not be considered for inclusion in the Handbook; however, content related to new methodologies that are published by a standards-making committee should be published.

Outline for 6th Edition

Moving forward, the outline for the new edition has been completed. The handbook will have 11 distinct sections:

Section 1 -- Fire Protection Engineering Practice

The first section will focus on topics related to the practice of fire protection engineering. It will include a user guide that will recommend how the handbook can be used in fire protection engineering design. The section will also include a new chapter that is an introduction to the profession of fire protection engineering. The section also includes chapters related to performance-based design, the building envelope and for the first time there will be a chapter on the role fire protection engineers play in fire investigations.

Section 2 -- Fire Chemistry & Combustion

Section 2 will outline the fundamentals of fire chemistry and combustion. This section will include chapters related to thermochemistry, premixed/diffusion flames, flammability limits, smoldering combustion and spontaneous combustion.

Section 3 -- Fundamentals of Heat Transfer, Ignition and Surface Flame Spread

The third section will discuss the fundamentals of heat transfer, ignition and surface flame spread. There will be content related to the three modes of heat transfer, ignition of liquids/solids and surface flame spread.

Section 4 -- Fire Test Methods for Engineering Data

For the first time, the Handbook will have a separate section on fire test methods. It will include chapters that focus on ignition time predictions, heat release rate calculations, smoke release rate predictions, and toxic potency.

Section 5 -- Fire Dynamics

The content in section 5 will focus on fire dynamics. It will include content related to heat release rate, buoyant flows (Fire Plumes, Ceiling Jets and Vent Flows), empirical correlations for enclosure fires and computer fire models (zone and computational fluid dynamics models).

Section 6 -- Fire Protection Systems

The section on fire protection systems will have 16 chapters that focus on different active fire protection systems (suppression & detection). These chapters will be discussed later in this report.

Section 7 -- Structural Fire Resistance

Section 7 will discuss structural fire resistance. It will be divided into chapters that focus on the prescriptive and the structural fire protection engineering (performance-based) approach to fire resistance. Also, there will be significant changes to the chapter on wood, specifically new content related to mass timber construction.

Section 8 -- Human Behavior

The human behavior section will focus on the fundamentals of how humans behave during fires, how to model human response and toxicity calculations. The section will also have a chapter that includes data that engineers can use in human behavior design and analysis.

Section 9 -- Industrial Fire Hazards

Section 9 will look at a variety of industrial and storage fire hazards. This includes electrical fires, explosions, vehicle tunnels and refrigerants. Several chapters will focus on suppression issues that will be discussed later in this report.

Section 10 -- Risk and Reliability

The fundamental principles of fire risk and reliability will be discussed in Section 10. This will include risk assessment methods, probability,

economics, uncertainty and computer simulation. This section also outlines risk assessments for health care, nuclear, and transportation facilities. It will also have a general discussion on risk assessment for the built environment.

Section 11 -- Wildland Fires and Environmental Impacts

Section 11 will focus on wildland fires and environmental impacts. It will include discussions related to building codes & standards for new construction, environmental issues from wildland fires, evacuation and emergency management in the wildland-urban interface.

Content Related to Suppression & Detection Systems

Many of these 11 sections will include topics related to suppression and detection systems. Most of the active systems content will be discussed in Section 8. The following systems will be discussed:

- Engineering Considerations for Fire Protection System Selection
- Smoke Characterization and Damage Thresholds
- Design of Detection Systems
- Design of Alarm and Notification Systems
- Smoke Control Pressurization Systems
- Smoke Control by Mechanical Exhaust and Natural Venting
- Flame Extinction by Active Suppression
- Hydraulics for Water-Based Fire Protection Systems
- Automatic Sprinkler Systems
- Halon Design Calculations
- Clean Agent Systems
- Carbon Dioxide Systems
- Water Mist & Hybrid Systems
- Foam Agents
- Foam Systems

Additionally, systems related content will be discussed in the Industrial Section in the following chapters:

- Fires in Vehicle Tunnels
- Li-Ion Batteries and Energy Storage
- Refrigerants Warehouse Storage Challenges

Moving Forward

The SFPE Handbook editorial board is currently reviewing the draft chapters. SFPE expects the 6th edition to be published in 2023. It will be published by SFPE's publishing partner Springer in both hard copy and digital formats.

References

- [1] NCEES, "Licensure," [Online]. Available: www.ncees.org. [Accessed 1 July 2021].
- [2] SFPE Subcommittee for Handbook Development, "SFPE Handbook Review Report," SFPE, Gaithersburg, MD, 2018.