

Book Review

Hurley and Rosenbaum: Performance-Based Fire Safety Design, CRC Press and SFPE, Boca Raton, 2015 (ISBN: 9781482246551)

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Fire protection and fire safety engineers are somewhat spoiled by the information that is available to them. Not only is there a continuous amount of new research being published, but when it comes to applying the research to a performance-based design, there is guidance available for just about every possible building scenario. Guidance to fire safety practitioners can be found in books, standards' annexes, and codes' commentaries. Additionally, many of the documents are not country-specific and most information is freely available on the web.

Whether you are a student, an authority having jurisdiction (AHJ) or a fire safety practitioner, guidance for the application of performance based fire safety is always readily available. Finding the most relevant and applicable guide is typically more of a challenge. So when a new book is published in the field of performance-based fire safety design, it needs to have an approach that differentiates itself from the somewhat crowded field.

From my experience, there are typically two types of fire safety guides: those that provide a framework for carrying out performance based design (of which Custer and Meacham's "Introduction to Performance Based Fire Safety" is the perennial grandfather); and those guides that provide "design", through worked examples, case studies, data and more specific detail (such as the SFPE Handbook of Fire Protection Engineering or Chartered Institution of Building Services Engineers Guide E). So, as I started reading Hurley and Rosenbaum's "Performance-Based Fire Safety Design", I found the book leaning towards a framework approach to performance based fire safety. The book is an introduction or a primer and as the authors note in the *Preface*, the book is written to assist students and those in the fire safety industry who wish to learn more about the topic.

An initial observation was that the book is written to appeal to a USA-based audience and somewhat disappointingly, has few references to codes, guides and documents outside of the US. The *Preface* explains that the book was "assembled from lecture notes that the authors created for courses on performance-based fire

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safety design” given at US-based universities during the last decade, which may explain the lack of references to fire safety guidance outside of the US. But this is also a missed opportunity, given the history of adoption and implementation of performance-based design in the UK, Europe, Australia, New Zealand and throughout many parts of Asia.

Overall, the book is a relatively easy read, both by introducing the topic of performance-based fire safety design and providing accompanying explanatory examples for added clarity. In doing so, the book provides the reader, who is assumed to have a limited knowledge of performance-based design, with some of the tools and information to help them gain a better grasp of the key fundamentals.

The book is written to assist the reader’s progression through a performance-based project. This is apparent in that the book continually references the existing suite of published Society of Fire Protection Engineers’ (SFPE) guides, using these as the basis for many of the chapters. In essence, the book partly acts as a “guide of guides”. The SFPE suite of guides are a highly valuable source of design information and although this approach is helpful for pointing readers in the direction of further reading, it may also be frustrating for some readers, given the need to purchase the SFPE guides to gain the most from this book.

The content of the book provides coverage of the most relevant topics for a performance based design. The book informs the reader on both *Design Fire Scenarios* and *Design Fires* well, and makes clear the distinction between the two; a difference that some other guides fail to make. The *Design Fire Scenarios* chapter has a useful section explaining that the engineer must ensure the building owner understands any limitations on the building use or occupancy in which an approved performance-based design results. This is a critical aspect of any performance-based design and is one of the key criticisms of performance-based engineering solutions from building owners, operators and managers. Therefore, I agree with the authors—that this topic is worthy of emphasis.

The *Design Fires* chapter provides useful descriptions for the derivation of design fires, but unfortunately also describes a complex process for determining a design fire that is not normally undertaken by most engineers. The difficulty of developing and agreeing on design fires with an Authority Having Jurisdiction (AHJ) is not acknowledged within the book and the inherent conservatism in most typically agreed design fires is not discussed. The book does provide a useful summary of the NFPA 101 “Life Safety Code” fire scenarios.

The chapter on *Fire Dynamics and Hazard Calculations* is limited and whilst it has some correlations and worked examples, it does not fully cover this important engineering aspect in sufficient depth. Potentially, this section could have been better placed to provide more in-depth case studies. Further reading and references would also have benefited the reader for this important section.

The *Human Behavior* chapter provides a very useful primer on human behavior and has a useful collection of relevant data. The chapter on *Detection and Suppression System Design* provides a good introduction to fire detection, but is very limited on suppression. In the suppression section, the authors focus too closely on how the Fire Dynamics Simulator addresses sprinkler discharge, rather than providing information to the reader on the pros, cons and options for fire suppression.

The chapter on *Smoke Control Design* is noticeably short, given its importance to performance based design. The Chapter on *Structural Fire Resistance* is also limited, with a brief overview on methods for providing structural fire resistance and no discussion on the use of mass wood. The book provides an in-depth chapter on *Fire Testing*, in which the authors link the earlier chapters with various fire tests, so as to inform the reader as to how fire testing impacts on both prescriptive and performance-based fire design, an aspect rarely covered in fire safety guidance. This chapter is informative and helpful. The *Fire Testing* chapter also very useful for the summary provided on non-standard fire testing, an issue that many performance based fire designs encounter and an aspect not typically documented in guidance documents.

For any engineer carrying out a performance-based design, the topics of mitigation of fire hazards, human behavior, detection, suppression and smoke control are highly relevant and need to be linked together. Information on how analysis is carried out and the appropriate protection measures to be implemented are important for any person learning about performance based fire safety. This is typically best shown through case studies, such as analysis of available safe egress time (ASET) against required safe egress time (RSET) for fire development and smoke filling, for a specific example building. I was particularly hopeful that this book would provide the reader with some detailed calculations and clear methodology, but unfortunately the relevant chapters miss this opportunity.

On a more positive note, the book does provide a very useful review of the issues associated with documentation and gaining an approval of a performance-based design in the *Performance Based Design Documentation and Management* chapter, a topic which many guides do not cover. This is helpful for engineers to foresee potential approval problems that may arise. The process of regular consultation with the relevant AHJ's and stakeholders is such a vital part of any performance based design and the book emphasizes this aspect well.

As noted previously, the book is prepared for a US-based audience and therefore, should be directly applicable to practicing fire protection engineers in the US. However, the book limits references to the International Code Council (ICC) International Building Code (IBC), which is the model building code adopted and amended throughout the US. The book instead more regularly references NFPA 5000 "Building Construction and Safety Code", NFPA 101 "Life Safety Code" and the ICC "Performance Code for Facilities and Buildings", all of which have limited adoption within the US. With the IBC allowing performance-based approaches under the "alternative materials, design and methods of construction and equipment" clause, the book is still applicable within the US, but this important nuance does require more detailed explanation for the reader.

So, is this book a must have? Certainly as a US-specific guide, it is a very useful for students, AHJ's, fire department personnel, and fire protection engineers, as it provides an introduction to nearly every aspect of fire protection: from hazards and risk, to types of fire protection systems and human behavioral response. Development of a performance-based solution is a complex process for many situations and this book can assist. For fire safety practitioners outside the US, the book will be informative, but the US-centric basis of the book falls short of providing the reader with all the required information.