Book Review

Risk-Informed, Performance-Based Industrial Fire Protection

by Thomas F. Barry, P.E.

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Risk-Informed, Performance-Based Industrial Fire Protection presents a systematic approach to establish risk-informed or performance-based fire protection solutions for industrial facilities. If followed, the comprehensive approach will result in successful risk-informed or performance-based engineering solutions. Four basic processes are identified; Appraisal, Analysis, Performance, and Assessment. These processes are comprised of one or more engineering steps that are presented in eight working chapters. Each chapter is provided with a description of how the information presented within the specific chapter fits into the analysis and decision-making process. Thus, the book can take the reader from formulation of the problem to the selection of engineering alternatives.

The Appraisal process begins with the establishment of *Program Objectives* as described in Chapter 1, and the formation of *Risk Tolerance Criteria* as described in Chapter 2. In addition to explaining how a project should establish the program objectives, Chapter 1 provides a summary of the overall engineering approach. Chapter 2 explains how to establish a quantitative basis to support the engineering approach and introduces how to compare risk results with the risk tolerance criteria.

There are three steps in the Analysis process, *Loss Scenario Development* (Chapter 3), *Initiating Event Likelihood* (Chapter 4), and *Exposure Profile Modeling* (Chapter 5). Chapter 3 describes the process to be used to establish the loss scenarios to be modeled. These scenarios describe a sequence of events from the initial fire source, the pathway to a specific target, and how the target responds to fire conditions. Chapter 4 suggests methods to quantify the likelihood of an initial fire source. Several techniques are suggested. These include occupancy-based incipient fire frequencies using historical data and equipment-failure-based ignition estimates developed using fault trees. These chapters are fairly comprehensive and provide most readers all of the background necessary to complete the first four stages of the engineering process.

Chapter 5 provides a basic overview of modeling techniques to judge fire and explosion severity and how to judge the response of specific targets (people, equipment, structure, environment, etc.) to these demands. The chapter provides good introductory material for engineers just beginning to be involved in fire modeling and is a good refresher for experienced engineers on the multiple facets that must be considered in modeling. Although the text provides

a wealth of target damage threshold data, most readers will find it necessary to refer to other texts to complete the modeling effort.

The Performance process consists of the evaluation of *Fire Protection System Performance Success Probability*, which is presented in Chapter 6. The chapter introduces the concept of three fire protection reliability parameters, System Availability (Is the system online?), and Mission Time Reliability (Will the system execute its function on demand?), and Mission Time Duration (Will the system continue to function over the required demand time?). The chapter provides performance data for sprinkler systems, water spray systems, water distribution systems, detection systems, fire barriers, and manual intervention. Evaluation techniques are provided to account for variations in inspection, testing, and maintenance programs.

The Assessment process consists of two steps: *Risk Estimate and Comparison* (Chapter 7) and *Cost/Benefit Analysis of Risk Reduction Alternatives* (Chapter 8). Chapter 7 presents a very good explanation of how to blend deterministic modeling results with event tree analysis techniques. All fire risk practitioners would benefit from a review of this chapter. The chapter also provides a good discussion of how event trees may be coupled with Monte Carlo simulations using commercially available spreadsheet software to judge the uncertainty in a risk estimate.

Chapter 8 provides methods to judge the effectiveness of different fire protection strategies, including ignition source controls, failure prevention, and alternative fire protection methods. Techniques to present the results in terms that risk managers and business clients can best understand are provided.

The book closes with a final chapter titled *Moving Forward*. In this chapter, the author summarizes how the fire protection engineering approaches have evolved and the promise of risk-informed, performance-based assessments. It then introduces the Fire Risk Forum, which is an online Internet resource to provide a continuing education platform and information tool on risk-informed, performance-based fire safety.

Risk-Informed, Performance-Based Industrial Fire Protection integrates concepts from a variety of sources, providing a novice fire-risk practitioner with a workable approach to identify successful fire-risk solutions. Experienced fire-risk professionals who set the text on a shelf and consider it a handbook will miss the wealth of useful fire-risk data that is dispersed throughout the chapters along with the insightful references and links to additional information. While it is doubtful that seasoned fire-risk professionals will adopt the complete systematic approach, they would be well served to read *Risk-Informed, Performance-Based Industrial Fire Protection*. It contains several unique tools and presentation techniques that can be used to translate risk analysis results into a form usable by decision-makers.

D. Allan Coutts, Ph.D., P.E.
Resident Engineer
Westinghouse Safety Management Solutions

The foregoing review represents the opinion of the author and does not necessarily provide the views of Westinghouse Safety Management Solutions.