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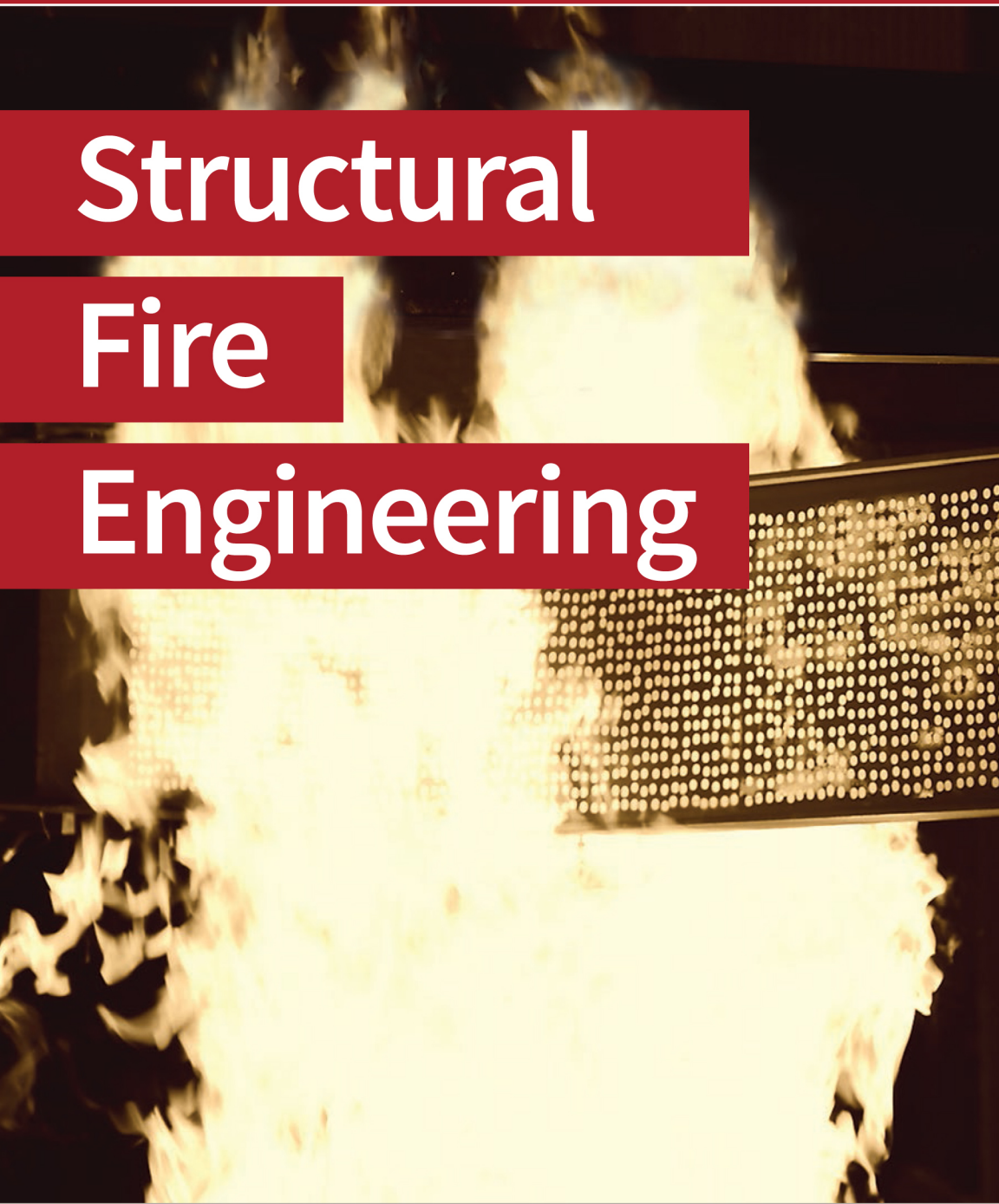
Structural Fire Engineering



Fire Protection Committee

Edited by Kevin J. LaMalva, P.E.

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Structural Fire Engineering

Prepared by the Fire Protection Committee of the Structures Engineering Institute of the American Society of Civil Engineers and Edited by Kevin J. LaMalva, P.E.

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PREFACE

Uncontrolled fire within a contemporary building is an extraordinary event that can have severe consequences. When structural systems are heated by fire, they experience thermal effects that are not contemplated by conventional structural engineering design. Since the early 20th century, building codes have primarily adopted standard fire resistance design. This design option is based on furnace testing of isolated structural components and relies almost exclusively on insulation for structural fire protection. Using this approach, designers select qualified assemblies from available listings to meet prescribed levels of fire resistance. As an alternative approach, structural fire engineering design explicitly evaluates the performance of structural systems under fire exposure, in a similar manner as other design loads are treated in structural engineering practice.

The 2016 edition of ASCE/SEI 7 (*Minimum Design Loads and Associated Criteria for Buildings and Other Structures*) includes a new Chapter 1, Section 1.3.7, "Fire Resistance." In addition to being the first time that fire resistance has ever been addressed in this standard, this section is intended to commence a new industry-consensus standard of care for structural fire protection. The default option is for the designer to strictly adhere to the requirements and restrictions of standard fire resistance design per the applicable building code without exception or extrapolation. As an alternative, ASCE/SEI 7-16 permits the designer to adopt a structural fire engineering approach as constituted in the standard's new Appendix E, "Performance-Based Design Procedures for Fire Effects on Structures." Notably, the inclusion of Appendix E in ASCE/SEI 7 marks the first time that fire effects are considered as an explicit design load in a U.S. structural engineering standard.

The main objective of the manual is to provide best practices when a structural fire engineering design approach is adopted, as permitted by ASCE/SEI 7 Chapter 1, Section 1.3.7, and as constituted in Appendix E. Because standard fire resistance design does not contemplate structural