1. Record Nr.	UNINA9911006614403321
Titolo	Computational fluid dynamics in fire engineering : theory, modelling and practice / / edited by Guan Heng, Yeoh, Kwok Kit Yuen
Pubbl/distr/stampa	Burlington, MA ; ; Oxford, : Butterworth-Heinmann, 2009
ISBN	9786612167454 9781282167452 1282167456 9780080570037 0080570038
Descrizione fisica	1 online resource (545 p.)
Altri autori (Persone)	YeohGuan Heng YuenKwok Kit
Disciplina	620.1064 621.4023
Soggetti	Computational fluid dynamics Fire prevention
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Front Cover; Computational Fluid Dynamics in Fire Engineering: Theory, Modelling and Practice; Copyright; Table of Contents; Preface; Chapter 1: Introduction; 1.1 Historical Development of Fire Modeling; 1.2 Overview of Current Trends in Fire Modeling; 1.3 Review of Major Fire Disasters and Impact on Fire Modeling; 1.3.1 Kings Cross Fire; 1.3.2 World Trade Center Fire; 1.4 Application of Fire Dynamics Tools in Practice; 1.5 Validation and Verification of Fire Dynamics Tools; 1.6 Scope of the Book; Chapter 2: Field Modeling Approach; Part I Mathematical Equations 2.1 Computational Fluid Dynamics: Brief Introduction2.2 Computational Fluid Dynamics in Field Modeling; 2.3 Equation of State; 2.4 Equations of Motion; 2.4.1 Continuity Equation; 2.4.2 Momentum Equation; 2.4.3 Energy Equation; 2.4.4 Scalar Equation; 2.5 Differential and Integral Forms of the Transport Equations; 2.6 Physical Interpretation of Boundary Conditions for Field Modeling; 2.7 Numerical Approximations of Transport Equations for Field Modeling; 2.7.1 Discretisation

Methods; 2.7.1.1 Steady Flows; 2.7.1.2 Unsteady Flows; 2.7.2 Solution Algorithms; 2.7.2.1 Matrix Solvers
2.7.2.2 Pressure-Velocity Linkage Methods2.7.3 Boundary Conditions; 2.8 Summary; Part II Turbulence; 2.9 What Is Turbulence?; 2.10 Overview of Turbulence Modeling Approaches; 2.11 Additional Equations for Turbulent Flow-Standard k-epsi Turbulence Model; 2.12 Other Turbulence Models; 2.12.1 Variant of Standard k-epsi Turbulence Models; 2.12.2 Reynolds Stress Models; 2.13 Near-Wall Treatments; 2.14 Setting Boundary Conditions; 2.15 Guidelines for Setting Turbulence Models in Field Modeling; 2.16. Worked Examples on the Application of Turbulence Models in Field Modeling
2.16.1 Single-Room Compartment Fire2.16.2 Influence of Gaps of Fire Resisting Doors on Smoke Spread; 2.17 Summary; Chapter 3: Additional Considerations in Field Modeling; Part III Combustion; 3.1 Turbulent Combustion in Fires; 3.2 Detailed Chemistry versus Simplified Chemistry; 3.3 Overview of Combustion Modeling Approaches; 3.4 Combustion Models; 3.4.1 Generalized Finite-Rate Formulation; 3.4.1.1 Background Theory; 3.4.1.2 Species Transport Equations; 3.4.1.3 Laminar Finite-Rate Chemistry; 3.4.1.4 Eddy Break-up and Eddy Dissipation; 3.4.2.1 Description of Approach
3.4.2.2 Definition of Mixture Fraction3.4.2.3 Flame Sheet Approximation; 3.4.2.4 State Relationships; 3.4.2.5 Probability Density Function (PDF) of Turbulence-Chemistry; 3.4.2.6 Laminar Flamelet Approach; 3.5 Guidelines for Selecting Combustion Models in Field Modeling; 3.7 Summary; Part IV Radiation; 3.8 Radiation in Fires; 3.10 Radiation Properties of Combustion Products; 3.10.2 Weighted Sum of Gray Gases Model; 3.10.3 Other Models; 3.11.1 Monte Carlo; 3.11.3 Discrete Transfer Radiative Model; 3.11.5 Finite Volume Method; 3.13.2 Two-Room Compartment Fire; 3.14 Summary
Chapter 4: Further Considerations in Field Modeling

Sommario/riassunto	Fire and combustion presents a significant engineering challenge to mechanical, civil and dedicated fire engineers, as well as specialists in the process and chemical, safety, buildings and structural fields. We are reminded of the tragic outcomes of 'untenable' fire disasters such as at King's Cross underground station or Switzerland's St Gotthard tunnel. In these and many other cases, computational fluid dynamics (CFD) is at the forefront of active research into unravelling the probable causes of fires and helping to design structures and systems to ensure that they are less likely in the f