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Estimating the Flammable Mass of a Vapor Cloud Guidelines for Evaluating the Characteristics of Vapor Cloud Explosions, Flash Fires, and BLEVEs *Guidelines for Vapor Cloud Explosion, Pressure Vessel Burst, BLEVE, and Flash Fire Hazards* **Unconfined Vapor Cloud Explosions Risk Analysis of Vapour Cloud Explosions for Oil and Gas Facilities** Understanding vapour cloud explosions **Guidelines for Evaluating the Characteristics of Vapor Cloud Explosions, Flash Fires, and BLEVEs** *Guidelines for Vapor Cloud Explosion, Pressure Vessel Burst, BLEVE and Flash Fire Hazards* **Partial Confinement** *Experimental Investigation of the Unconfined Vapour-cloud Explosions of Hydrocarbons* **On the Scaling of Vapour Cloud Explosion Experiments** *Comments on Gugan's Book 'Unconfined Vapour Cloud Explosions' in the Light of More Recent Studies* **Rapid Deflagration in Unconfined Vapour Cloud Explosions Novel Propagation Mechanisms of Vapour Cloud Explosions Structural Response to Vapour Cloud Explosions** On the Adequacy of Numerical Coades for the Simulation of Vapour Cloud Explosions Part 1 Guidelines for Use of Vapor Cloud Dispersion Models *Uncofined Vapour Cloud Explosions* **The Generation of Destructive Blast in Unconfined Vapour Cloud Explosions** *A Mathematical Model for Unconfined Vapour Cloud Explosions The diffusion of a vapour cloud in a ventilated roadway* **On the Adequacy of Numerical Codes for the Simulation of Vapour Cloud Explosions** Wind Flow and Vapor Cloud Dispersion at Industrial and Urban Sites *The Multy-energy Method Guidelines for Use of Vapor Cloud Dispersion Models On the Adequacy of numerical codes for the simulation of vapour cloud explosions* Mitigation of Gas and Vapour Cloud Explosions Using Fine Water Sprays **UK Research Into Unconfined Vapour Cloud Explosions Guidelines for Use of Vapor Cloud Dispersion Models** *Simulation of Flame Acceleration in Unconfined Vapour Cloud Explosions* **Unconfined Vapor Cloud Explosions- an Overview** *Current HSE Research on Vapour Cloud Explosions and Related UK Research* **Developmental of a Vapor Cloud Explosion Risk Analysis Tool Using Exceedance Methodology On the Possibility of Vapour Cloud Detonation** *Synergistic Approach to Internal Vapor Cloud Explosion Predictions Modeling Unconfined Vapor Cloud Explosions for Risk Assessment Calculations* The Significance of Vapour Cloud Modelling in the Assessment of Major Toxic Hazards Investigation Report - Confined Vapor Cloud Explosion **Numerical Modelling of Inhomogeneous Liquefied Natural Gas (LNG) Vapour Cloud Explosions Scaling of Vapor Cloud Explosions After Turbulent Jet Release**

The serious consequences of vapor cloud explosions, flash fires, and BLEVEs are very well known. Better understanding of the characteristics of these phenomena and models to calculate their consequences are key to effective prevention and mitigation. Cited by EPA in its 1996 document, "Off-site Consequence Analysis Guidance, " the first half of the book describes the characteristics of these phenomena and gives an overview of past experimental and theoretical research and methods to estimate consequences. The second part focuses on methods for consequence estimating by presenting sample problems. The entire book is heavily illustrated with photos, charts, tables, and diagrams, and each chapter has a full set of references for additional reading. This guide provides an overview of methods for estimating the characteristics of vapor cloud explosions, flash fires, and boiling-liquid-expanding-vapor explosions (BLEVEs) for practicing engineers. It has been updated to include advanced modeling technology, especially with respect to vapor cloud modeling and the use of computational fluid dynamics. The text also reviews past experimental and theoretical research and methods to estimate consequences. Heavily illustrated with photos, charts, tables, and diagrams, this manual is an essential tool for safety, insurance, regulatory, and engineering students and professionals. This guide provides an overview of methods for estimating the characteristics of vapor cloud explosions, flash fires, and boiling-liquid-expanding-vapor explosions (BLEVEs) for practicing engineers. It has been updated to include advanced modeling technology, especially with respect to vapor cloud modeling and the use of computational fluid dynamics. The text also reviews past experimental and theoretical research and methods to estimate consequences. Heavily illustrated with photos, charts, tables, and diagrams, this manual is an essential tool for safety, insurance, regulatory, and engineering students and professionals. On November 22, 2006, at about 2:45 am, a violent explosion at the CAI/Arnel manufacturing facility rocked the town of Danvers, MA. The explosion and subsequent fire destroyed the facility, heavily damaged dozens of nearby homes and businesses, and shattered windows as far away as two miles. At least 10 residents required hospital treatment for cuts and bruises. Twenty-four homes and six businesses were damaged beyond repair. Dozens of boats at the nearby marina were heavily damaged by blast overpressure and debris strikes. The fire department ordered the evacuation of more than 300 residents within a half-mile radius of the facility. Numerous residents could not return for many months while they waited for their houses to be rebuilt or repaired. Seventeen months after the explosion, six homes had yet to be reoccupied as repairs were not complete. The U.S. Chemical Safety and Hazard Investigation Board (CSB) determined that the explosion was fueled by vapor released from a 2000-gallon tank of highly flammable liquid. An open steam valve on the tank heater most likely caused the flammable liquid to overheat and accumulate in the building production area to what is calculated to have been a near-ideal vapor-air concentration. An unknown ignition source ignited the flammable atmosphere, causing the explosion. The rapidly expanding ignited vapor inside the building created a pressure wave that shattered the rigid, brittle brick walls—disintegrating the structure—and ignited thousands of gallons of flammable liquids stored inside the building and some 51,000 pounds of industrial-grade nitrocellulose material stored nearby. The resultant fire burned for more than 17 hours.On November 22, 2006, at about 2:45 am, a violent explosion at the CAI/Arnel manufacturing facility rocked the town of Danvers, MA. The explosion and subsequent fire destroyed the facility, heavily damaged dozens of nearby homes and businesses, and shattered windows as far away as two miles. At least 10 residents required hospital treatment for cuts and bruises. Twenty-four homes and six businesses were damaged beyond repair. Dozens of boats at the nearby marina were heavily damaged by blast overpressure and debris strikes. The fire department ordered the evacuation of more than 300 residents within a half-mile radius of the facility. Numerous residents could not return for many months while they waited for their houses to be rebuilt or repaired. Seventeen months after the explosion, six homes had yet to be reoccupied as repairs were not complete. 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This CCPS Concept book shows designers and operators of chemical facilities how to realistically estimate the flammable mass in a cloud of accidentally released material that is capable of igniting. It provides information on industry experience with flammable vapor clouds, basic concepts of fires and explosions, and an overview of related computer programs. This book focuses on describing and applying risk analysis of vapour cloud explosions (VCEs) in various oil and gas facilities, such as petrol stations, processing plants, and offshore platforms. Discussing most of the complicated features of gas explosion accidents, the book studies in detail the gas explosion risk analysis approaches of different oil and gas facilities in order to develop more accurate, detailed, efficient and reliable risk analysis methods for

VCEs under different conditions. Moreover, it introduces an advanced overpressure approach to predict VCEs using computational fluid dynamics (CFD) modelling, and details applications of CFD using a FLame ACceleration Simulator (FLACS). The book is intended for researchers and organisations engaged in risk and safety assessments of VCEs in the oil and gas industry. The second edition of this essential reference updates and combines two earlier titles to capture the many technological advances for predicting the "footprint" of a vapor cloud release. Cited by EPA in its 1996 document, "Off-Site Consequence Analysis Guidance," the aim of the book is to encourage and facilitate the development and use of dispersion modeling as an everyday tool, providing practical understanding of basic physical and chemical principles, guidance in selecting release scenarios and the best available models, and information and examples on how to run some models and interpret outputs. Equally useful to beginners and experts, it compares 22 programs based on input from model developers, and presents 7 examples of typical accidental release scenarios. The book comes with a disk providing input and output data for scenarios. This book is intended to help designers, operators, and emergency response officials estimate the effects of on-site and proximate plant structures, process equipment, and buildings on the transport and dispersion of hazardous materials. Chapters cover meteorology and atmospheric dispersion, methods for characterizing the effects of surface roughness, the integration of roughness into dispersion models, and worked examples for seven industrial and urban scenarios. The worked exercises also appear on a companion CD-ROM. Hanna is a consultant. Britter teaches at the University of Cambridge. Annotation copyrighted by Book News, Inc., Portland, OR. The serious consequences of vapor cloud explosions, flash fires, and BLEVEs are very well known. Better understanding of the characteristics of these phenomena and models to calculate their consequences are key to effective prevention and mitigation. Cited by EPA in its 1996 document, "Off-site Consequence Analysis Guidance, " the first half of the book describes the characteristics of these phenomena and gives an overview of past experimental and theoretical research and methods to estimate consequences. The second part focuses on methods for consequence estimating by presenting sample problems. The entire book is heavily illustrated with photos, charts, tables, and diagrams, and each chapter has a full set of references for additional reading. In development projects, designers should take into consideration the possibility of a vapor cloud explosion in the siting and design of a process plant from day one. The most important decisions pertinent to the location of different process areas, separation between different areas, location of occupied buildings and overall layout may be made at the conceptual stage of the project. During the detailed design engineering stage the final calculation of gas explosion loads is an important activity. However, decisions related to the layout and location of occupied buildings at this stage could be very costly. Therefore, at the conceptual phase of the development project for a hydrocarbon facility, it would be helpful to get a picture of possible vapor cloud explosion loads to be used in studying various options. This thesis presents the analytical parameters that are used in vapor cloud explosion risk analysis. It proposes a model structure for the analysis of vapor cloud explosion risks to buildings based on exceedance methodology. This methodology was developed in a computer program which is used to support this thesis. The proposed model considers all possible gas release scenarios through the use of the Monte Carlo simulation. The risk of vapor cloud explosions can be displayed using exceedance curves. The resulting model provides a predictive tool for vapor cloud explosion problems at the early stages of development projects, particularly in siting occupied buildings in onshore hydrocarbon facilities. It can also be used as a quick analytical tool for investigating various aspects of vapor cloud explosions. This model has been applied to a case study, a debutanizer process unit. The model was used to explore the different alternatives of locating a building near the facility. The results from the model were compared to the results of other existing software to determine the model validity. The results show that the model can effectively examine the risk of vapor cloud explosions. A new edition of the guidelines facilitating the use of computer modeling to prevent or mitigate the accidental releases of hazardous or toxic materials. The manual provides a practical understanding of the basic physical and chemical principles, guidance on how to select release scenarios, information on the best available model (computer program) for a situation, and directions on how to run and interpret select model outputs. Seven examples of typical accidental chemical release scenarios are described and commonly used vapor cloud models are applied to the scenarios. The accompanying diskette contains the model input and output files for the scenarios. Annotation copyrighted by Book News, Inc., Portland, OR

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