

# FORENSIC STRUCTURAL ENGINEERING CASE STUDIES

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## FORENSIC STRUCTURAL ENGINEERING – INTRODUCTION

**Forensic Engineering is the application of the art and science of Engineering in the judicial system**, which requires the professional services of legally qualified engineers. May include the investigation of physical causes of accidents and other sources of claims and litigation, preparation of engineering reports, testimony in hearings and trials in administrative or judicial proceedings, and the provision of advisory opinions to assist in the resolution of disputes that affect life or property. *Milton F. Lulich, former General Counsel to the NSPE.*

**The Forensic Engineer is a professional engineer who deals with engineering associated with legal issues.** Activities associated with forensic engineering include determining the physical or technical causes of accidents or failures, preparing reports, and presenting testimonies or advice and opinions that assist in the resolution of related disputes. The Forensic Engineer may also be asked to render an opinion on liability for the accident or failure. *Carper*

## FORENSIC STRUCTURAL ENGINEERING – CASE STUDIES

### Definition of failure:

**When an installation, structure or material does not satisfactorily fulfill the function in the way intended and for which it was created or executed.** Neither partial or total collapse, nor

# Structural Forensic Engineering Case Studies

**Jacob Feld, Kenneth L. Carper**



## **Structural Forensic Engineering Case Studies:**

**Forensic Materials Engineering** Peter Rhys Lewis, Ken Reynolds, Colin Gagg, 2003-09-29 Most books on forensic engineering focus on civil engineering failures rather than consumer or general mechanical products Unique both in scope and style this treatment is built upon case studies of real accidents broadly focused on consumer products and dedicated to problem solving through scientific principles Each well illustrated case stud

**Failure Case Studies** Navid Nastar, Rui Liu (Structural engineer), 2019 This book gives examples of failed civil engineering projects and the lessons learned from the failures The case studies were gathered by ASCE s Forensic Engineering Division

**Case Studies on Failure Investigations in Structural and Geotechnical Engineering** Fabrizio Palmisano, Laurent Rus, 2023-09-14 Failures of structures occur in all parts of the world as the result of design errors construction defects abuse or misuse ageing and deterioration of the structure lack of maintenance as well as environmental effects such as wind flood snow earthquake and of course human errors They can result in catastrophic human costs as well as heavy financial losses to all involved including local economic growth deceleration expensive delays and repairs as well as other repercussions such as legal actions to responsible parties Welcome effects of these unfortunate events include a better understanding of the origins and causes of structural failures their corresponding lessons learnt and a more effective mitigation of their occurrence through changes in codes standards guidelines and practice In several countries the investigation process of the causes of failures responsibilities and resolution of the consequent claims have created an active demanding and specialised field of professional practice often referred to as Forensic Structural Engineering with well defined technical and legal procedures This bulletin is the result of the work lead by the Task Group 5 1 Forensic Structural Engineering It provides understanding of the origins causes and consequences of failures their forensic investigations and the lessons learnt from them The aim of the bulletin is not only to describe different examples but mainly to use emblematic case studies to show procedures that can be used when dealing with structural failures In addition to obtaining a deeper insight into the technical causes for structural failure the reader would be duly informed about the different countries legal issues related to the investigation process The bulletin is aimed at young mid career and experienced structural engineers who want to acquire a better understanding of failure mechanisms towards improving their design inspection construction administrative and other project related practices to avoid pitfalls that may lead to failures It also aims at those wanting to acquire a working knowledge of the challenging professional practice of forensic structural engineering

**Failure Case Studies** AMER. SOC. OF CIVIL ENGINEERS., 2019 This book gives examples of failed civil engineering projects and the lessons learned from the failures The case studies were gathered by ASCE s Forensic Engineering Division

**Case Studies on Forensic Structural Engineering** Chin Seng Nguee, 2006

**Forensic Engineering** Colin R. Gagg, 2020-02-21 Forensic Engineering The Art and Craft of a Failure Detective synthesizes the current academic knowledge with advances in process and techniques developed

in the last several years to bring forensic materials and engineering analysis into the 21st century. The techniques covered in the book are applied to the myriad types of cases the forensic engineer and investigator may face, serving as a working manual for practitioners. Analytical techniques and practical applied engineering principles are illustrated in such cases as patent and intellectual property disputes, building and product failures, faulty design, air and rail disasters, automobile recalls, and civil and criminal cases. Both private and criminal cases are covered, as well as the legal obligation, requirements, and responsibilities under the law, particularly in cases of serious injury or even death. Forensic Engineering will appeal to professionals working in failure analysis, loss adjustment, occupational health and safety, as well as professionals working in a legal capacity in cases of product failure and liability, including criminal cases, fraud investigation, and private consultants in engineering and forensic engineering.

**Perspectives in Civil Engineering** Jeffrey S. Russell, 2003-01-01. This report contains 27 papers that serve as a testament to the state of the art of civil engineering at the outset of the 21st century, as well as to commemorate the ASCE's Sesquicentennial. Written by the leading practitioners, educators, and researchers of civil engineering, each of these peer-reviewed papers explores a particular aspect of civil engineering knowledge and practice. Each paper explores the development of a particular civil engineering specialty, including milestones and future barriers, constraints, and opportunities. The papers celebrate the history, heritage, and accomplishments of the profession in all facets of practice, including construction, facilities, special structures, engineering mechanics, surveying, and mapping, irrigation, and water quality, forensics, computing, materials, geotechnical engineering, hydraulic engineering, and transportation engineering. While each paper is unique, collectively they provide a snapshot of the profession while offering thoughtful predictions of likely developments in the years to come. Together, the papers illuminate the mounting complexity facing civil engineering, stemming from rapid growth in scientific knowledge, technological development, and human populations, especially in the last 50 years. An overarching theme is the need for systems-level approaches and consideration from undergraduate education through advanced engineering materials, processes, technologies, and design methods and tools. These papers speak to the need for civil engineers of all specialties to recognize and embrace the growing interconnectedness of the global infrastructure economy, society, and the need to work for more sustainable, life-cycle-oriented solutions. While embracing the past and the present, the papers collected here clearly have an eye on the future needs of ASCE and the civil engineering profession.

**Construction Failure** Jacob Feld, Kenneth L. Carper, 1996-12-26. First published in 1968, Jacob Feld's *Construction Failure* has long been considered the classic text on the subject. Retaining all of the key components of Feld's comprehensive exploration of the root causes of failure, this Second Edition addresses a multitude of important industry developments to bring this landmark work up to date for a new generation of engineers, architects, and students. In addition to detailed coverage of current design tools, techniques, materials, and construction methods, *Construction Failure*, Second Edition, features an entire chapter on the burgeoning area of construction litigation, including a thorough examination of alternative

dispute resolution techniques Like the original this edition discusses technical and procedural failures of many different types of structures but is now supplemented with new case studies to illustrate the dynamics of failure in action today Jacob Feld knew thirty years ago that in order to learn from our mistakes we must first acknowledge and understand them With this revised volume Kenneth Carper has ensured that Feld's posthumous message will continue to be heard for years to come Jacob Feld's comprehensive work on failure analysis has now been skillfully amended to address current design and construction tools materials and practices Building on the first edition's peerless examination of the causes and lessons of failure Construction Failure Second Edition provides you with expanded coverage of Technical procedural structural and nonstructural failures Natural hazards earthworks soil and foundation problems and more Reinforced precast and prestressed concrete steel timber masonry and other materials Responsibility and litigation concerns dispute avoidance and alternative dispute resolution techniques Construction safety issues Many different types of structures including dams and bridges Construction Failure has as much to teach us today as it did thirty years ago This revised volume is an essential resource for design engineers architects construction managers lawyers and students in all of these fields Forensic Engineering Kenneth L. Carper, 2000-09-28 This edition of Forensic Engineering updates the original work with new case studies and investigative techniques Contributors to the book are the foremost authorities in each area of specialization These specialty areas include fire investigation industrial accidents product liability traffic accidents civil engineering and transportation disasters and environmental systems failures Each chapter includes discussions of guidelines techniques methods and tools employed in accident investigation and analysis In addition the book contains vital information on forensic photogrammetry the planning and writing of reports and the presentation of evidence as an expert witness in traditional litigation The book also analyzes the role of the forensic engineer in the evolving methods of alternate dispute resolution Overall Forensic Engineering is a tremendously valuable reference for forensic experts practicing in all engineering fields as well as design and construction professionals attorneys product manufacturers and insurance professionals It is also an excellent supplemental text for engineering and law students **Forensic Structural Engineering Handbook** Robert Ratay, 2009-11-05 The Most Complete and Up to Date Resource on Forensic Structural Engineering Thoroughly revised and featuring contributions from leading experts this definitive handbook offers comprehensive treatment of forensic structural engineering and expert witness delivery From exploring the possible origins of errors through investigating and analyzing failures to working with the legal profession for assigning responsibilities Forensic Structural Engineering Handbook Second Edition covers every important topic in the field The design and construction process Design and construction safety codes standards and regulations Standard of care and duty to perform First steps and legal concerns after a failure Engineering investigation of failures Origins and causes of failures Loads and hazards Design errors construction defects and project miscommunication Defects deterioration and durability Mechanisms and analyses of failures in steel concrete masonry

timber and temporary structures building envelope and structural foundations Litigation and dispute resolution The expert consultant and witness

**Case Studies on Failure Investigations in Structural and Geotechnical Engineering**

Fabrizio Palmisano, Laurent Rus, 2023-09-20 Failures of structures occur in all parts of the world as the result of design errors construction defects abuse or misuse ageing and deterioration of the structure lack of maintenance as well as environmental effects such as wind flood snow earthquake and of course human errors They can result in catastrophic human costs as well as heavy financial losses to all involved including local economic growth deceleration expensive delays and repairs as well as other repercussions such as legal actions to responsible parties Welcome effects of these unfortunate events include a better understanding of the origins and causes of structural failures their corresponding lessons learnt and a more effective mitigation of their occurrence through changes in codes standards guidelines and practice In several countries the investigation process of the causes of failures responsibilities and resolution of the consequent claims have created an active demanding and specialised field of professional practice often referred to as Forensic Structural Engineering with well defined technical and legal procedures This bulletin is the result of the work lead by the Task Group 5 1 Forensic Structural Engineering It provides understanding of the origins causes and consequences of failures their forensic investigations and the lessons learnt from them The aim of the bulletin is not only to describe different examples but mainly to use emblematic case studies to show procedures that can be used when dealing with structural failures In addition to obtaining a deeper insight into the technical causes for structural failure the reader would be duly informed about the different countries legal issues related to the investigation process The bulletin is aimed at young mid career and experienced structural engineers who want to acquire a better understanding of failure mechanisms towards improving their design inspection construction administrative and other project related practices to avoid pitfalls that may lead to failures It also aims at those wanting to acquire a working knowledge of the challenging professional practice of forensic structural engineering Point of Impact

Roger M. Sherman, 2001 Forensic Engineering Kevin L. Rens, 1997 This collection contains 44 papers presented at the first Forensic Engineering Congress held in Minneapolis Minnesota October 5 8 1997 **Forensic Engineering**, 2006 Proceedings of the Institution of Civil Engineers, 2009 Materials and Product Technologies Zhi Yun Shen, M.N. James, W.D. Li, Y.X. Zhao, 2008-06-12 Selected peer reviewed papers from 2008 International Conference on Advances in Product Development and Reliability August 4 6 2008 Chengdu China PDR 2008 *Civil Engineering Practice*, 1997

**Forensic Engineering** Paul A. Bosela, Norbert J. Delatte, Kevin L. Rens, 2003 This collection contains 55 papers presented at the third Forensic Congress held in San Diego California October 19 21 2003 **Forensic Engineering** Technical Council on Forensic Engineering (American Society of Civil Engineers), 2000 This collection contains papers presented at the second Forensic Congress held in San Juan Puerto Rico May 21 23 2000 **Transactions of the American Society of Civil Engineers** American Society of Civil Engineers, 2003 Vols 29 30 contain papers of the

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web dear recipients name it was a quiet moment for me to learn that you had given me an award for youth leadership i  
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