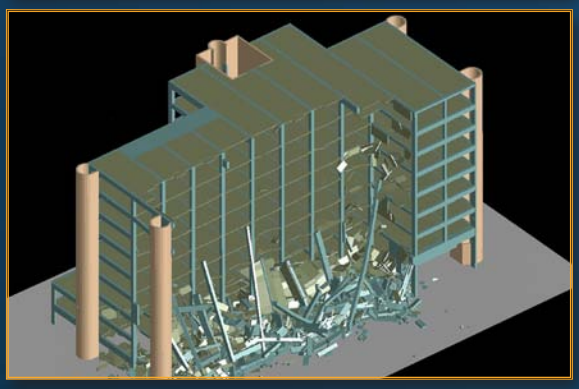
Forensic Engineering, Accident Reconstruction, & Expert Witness Services






When it comes to structural failures, ASI's team of veteran engineers and scientists provides a collective wealth of over 200 years of hands-on experience in engineering research, analysis, and design. Our proprietary Extreme Loading® Technology (ELT) provides superior 3D analysis and visuals to current practices which typically rely on hand calculations, simplified analysis, or artistic renditions of the suspected causes of failure.

APPLIED SCIENCE INTERNATIONAL
WWW.APPLIEDSCIENCEINT.COM

Forensic Engineering, Accident Reconstruction, & Expert Witness Services

Full Service Forensic Engineering Services:

Since 2004, Applied Science International (ASI) has been providing revolutionary insight into the behavior of structures in two core areas, the study of structures under extreme loads with its advanced Extreme Loading® Technology (ELT) and cold formed steel design with its unique SteelSmart® Technology (SST). Our highly talented team of over 75 engineers and scientists at our headquarters in Durham, North Carolina, USA and division office in Cairo, Egypt we provide clients with unique software solutions, support, and advanced analysis.

At ASI, we provide innovative solutions that increase clarity and facilitate the resolution of disputes among parties regarding structural defects, failures, and accidents. When working on a project, we like to have the client involved at all stages. This allows them to see results throughout the investigative process. Results from ELT analysis can effectively display and communicate technical events through video of the scenario to both technical and non-technical audiences.

Actual Event **ELT Analysis** **Presentation Graphics**

Forensic Engineering & Reconstruction Services

Engineering Services

- 3D Structural Analysis
- Blast Engineering
- Civil Engineering
- Expert Testimony
- Field Investigation
- Laboratory Testing
- Laser Scanning
- Litigation Support
- Peer Review
- Structural Engineering
- Structural Assessment

Animation & Support Services

- 2D Graphics and Illustration
- 3D Animated Walk-through
- 3D Imaging / Modeling
- Accident Reconstruction
- Banner Printing
- Graphic Design and Remedial Design
- Movie Compilation for Courtroom Presentation
- Network Rendering
- Video Editing
- Virtual Building Model

Types of Loss Serviced

- Blast / Explosion
- Construction Accident
- Construction / Design Defect
- Corrosion / Deterioration
- Demolition Failure
- Earthquake & Vibration
- Fire
- Machine / Vehicle Accident
- Structural Collapse
- Product Defect / Failure
- Wind Damage

Industries Served

Insurance

- First Party Property & Casualty Insurance
- Third Party Liability Insurance
- Subrogation
- Special Investigation Units
- Workman's Compensation

Law Firms

- Construction Defect
- Construction Accident
- Insurance Defense
- Personal Injury
- Product Liability
- Vehicle Accident
- Workman's Compensation

Corporations

- Cargo & Logistics
- Contractors
- Manufacturing
- Real Estate
- Transportation
- Utilities

Forensic Engineering, Accident Reconstruction, & Expert Witness Services

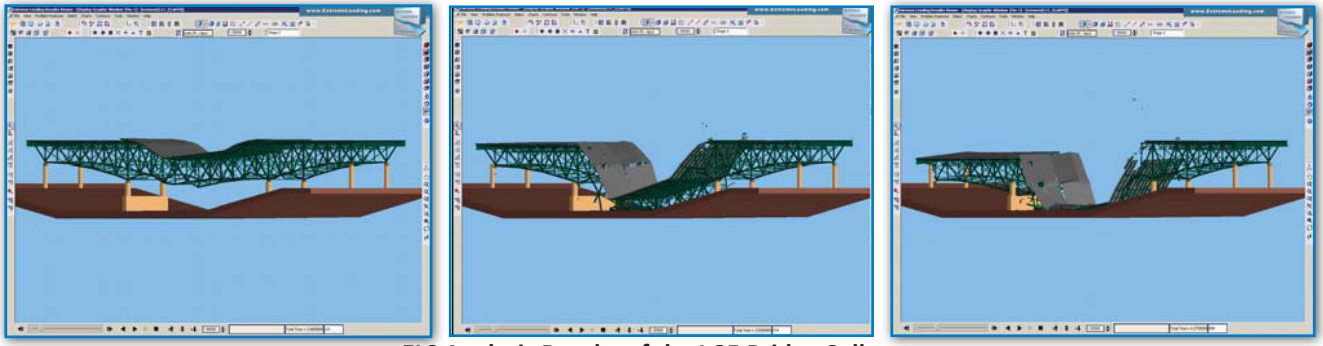
I-35 Bridge

Problem—The I-35 Bridge in Minneapolis, Minnesota was built in 1967. The 8-lane bridge served 140,0000 vehicles per day. The bridge catastrophically failed during the evening rush hour on August 1, 2007. Thirteen people died and 145 were injured. 117 vehicles were damaged including a school bus. Compensation for victims who were on the bridge at the time of the collapse, as well as their family members totaled over $37 million.

Initial Gusset Plate Failure

Analysis—Raths, Raths and Johnson, Inc. tasked ASI to provide analysis of the bridge and to identify the reason for the collapse. The bridge was modeled using original construction drawings. All structural details were modeled in 3D, which included steel truss, connections (gusset plate and bolts), concrete slabs, concrete piers and ramps. All applicable loads were taken into consideration such as gravity, traffic, and construction loads. The model also took into account the weakening of connections due to corrosion.

Conclusion—For this project, the results of these analyses helped identify the cause of failure of the bridge. The mode of failure in the ELS model created by ASI matched closely to the mode of failure observed in the actual failure reported by the National Transportation Safety Board (NTSB) and the Minnesota Department of Transportation (Mn/DOT).



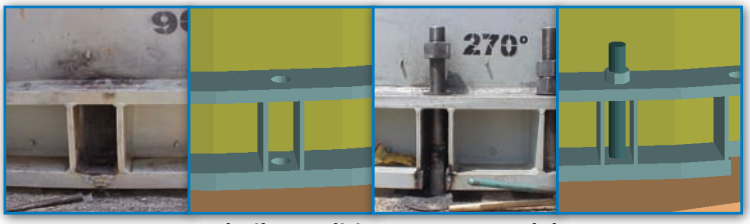
ELS Analysis Results of the I-35 Bridge Collapse

Yanbu Deethanizer

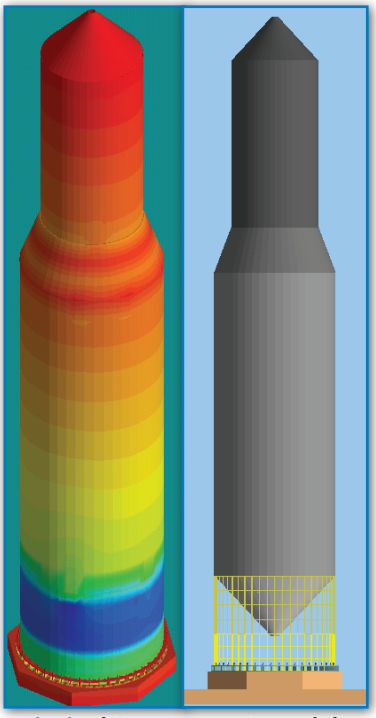
Problem—During the construction process of a deethanizer vessel, several design mismatches between the anchor bolts and base plate holes were observed. To complete the installation process, the vendor widened and slotted nine holes in the base plate and removed three anchor bolts. In addition, several anchor bolts were damaged and several others were subjected to excessive heat during the torching/cutting of several bolts. This raised concern about its safety and structural integrity.

Analysis—ASI was tasked to provide a comparative model and analysis of the structure using our in-house structural analysis software, Extreme Loading® for Structures. The objective was to compare the as-designed case with the damaged as-built case with regard to wind and seismic loading.

Conclusion—ASI created a 3-D model and explicitly modeled all damaged portions and compared the behavior with the designed case. Based on the analysis, ASI was able to assure the client that the as-built structure met project level of safety requirements for design loading conditions.



As-built Conditions vs. ELS Model



Principal Stress ELS Model

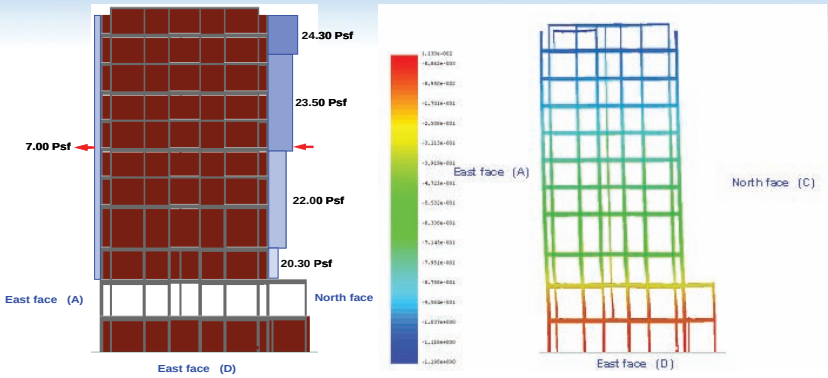
Forensic Engineering, Accident Reconstruction, & Expert Witness Services

St. Francis Central Hospital

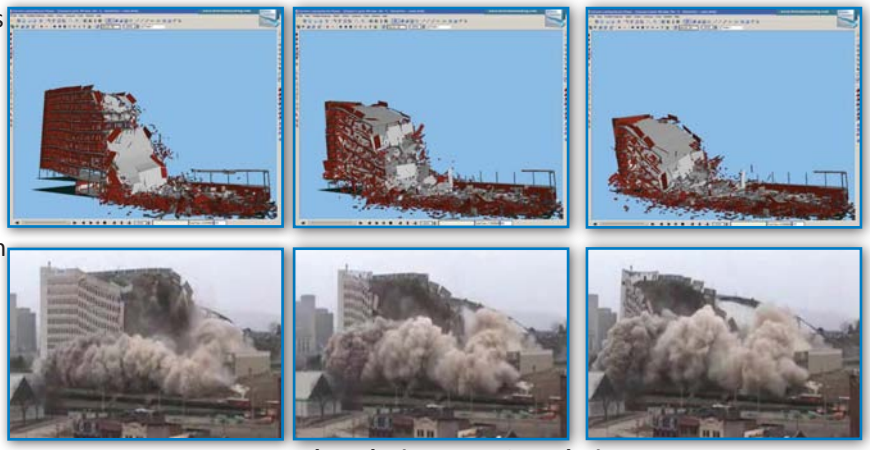
Problem—Demolition workers tried to pull down a gutted 10-story hospital after weakening the structure. During the pull down process, the cables snapped. After several additional attempts, the management called for the services of ASI to perform two tasks; a vulnerability assessment of the existing condition of the structure and demolition analysis based on the new demolition plan.

Analysis— ASI applied a variety of wind loading scenarios to the structure to determine if in its weakened condition to ensure that it would not prematurely collapse. ASI also performed an analysis of the newly proposed implosion plan to assure local authorities, owners, and tenants of neighboring structures that the controlled collapse demolition would go as planned.

Conclusion— ASI determined that even under high wind loading conditions that there was a low potential of failure and that it was safe for demolition workers to enter the building to place explosives to implode the structure. When compared, video of the actual demolition and the predictive analysis of the implosion correlated closely.



Wind Analysis of the Weakened Structure



Actual Implosion vs. ELS Analysis

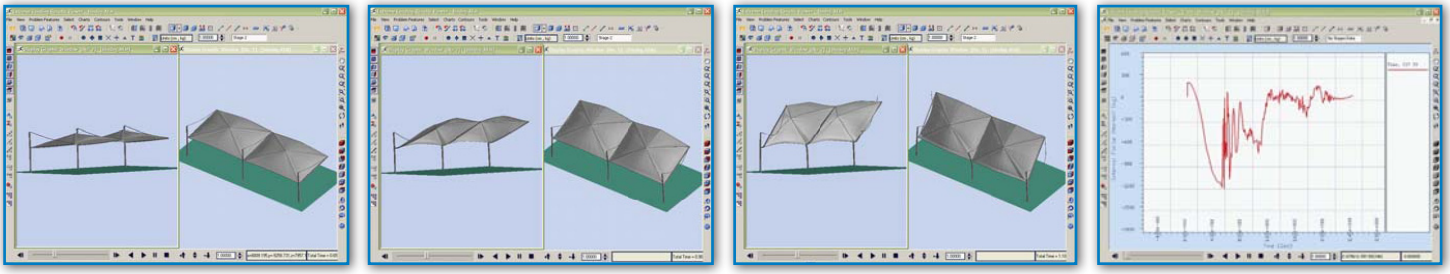
Car Shade Analysis

Problem— Under high wind conditions, a newly designed car shade structural failed catastrophically. The manufacturer of the car shade, who had installed the product at several other locations requested ASI expertise in the forensic investigation of the incident and subsequent design optimization car shade.

Analysis— ASI used created a three-dimensional model for the car-shed taking all construction details and material properties into consideration. ASI engineers performed nonlinear dynamic analysis of the structure under the effects of the wind loading.

Solution—Based on the 3D analysis, ASI showed the sequence of failure for the specified wind load case. ASI engineers provided recommendations to improve the design and prevent future failure.

Wind Damaged Car Shade



Forensic Wind Analysis

Key Personnel:

Edward di Girolamo, PE – CEO

B.Sc Civil/Structural Engineering, University of Buffalo, New York

Current Position and Relevant Experience: Mr. di Girolamo began formal education at the U.S. Naval Academy and received a B.S. in Civil/Structural Engineering from the University of Buffalo in 1980. Mr. di Girolamo has 29 years of experience in building design, manufacturing, construction, demolition and structural analysis software development. His broad experience with structures includes nuclear plants, navy ships, bridges, and commercial and residential structures. To date, he is a named inventor on over twenty construction product patents. During his career, Mr. di Girolamo has founded and owned several companies including The Steel Network, Inc. and Applied Science International, LLC where he currently serves as Chief Executive Officer at both companies.

Hatem Tagel-Din, Ph.D. – Chief Scientist

Ph.D., Civil Engineering, University of Tokyo, Japan

Current Positions and Relevant Experience: Dr. Tagel-Din is the Chief Scientist for Applied Science International, LLC. He developed the concept and mathematical formulation for the Applied Element Method used in the software Extreme Loading® for Structures (ELS). This new method was developed at the International Center for Disaster Mitigation Engineering at Tokyo University, Japan while earning his doctorate in Civil Engineering. He has over a decade of experience in progressive collapse analysis and worked on numerous major progressive collapse analysis projects. Additionally, he is an Assistant Professor of Structural Engineering at Cairo University and a practicing Structural Engineer with dozens of publications in the area of structural engineering analysis and design.

Nabil A. Rahman, Ph.D., P.E. – Director of Research & Development

Ph.D. Civil Engineering, McMaster University, Canada

Current Position and Relevant Experience: Dr. Rahman is the Director of Research and Development at Applied Science International in Durham, NC. Dr. Rahman also serves as an Adjunct Associate Professor at the Civil Engineering Dept. of NC State University. He is currently a member of the Committee on Framing Standards and the Committee on Specification of the American Iron and Steel Institute (AISI). These two committees write the design standards for the use of cold-formed steel in construction under the International Building Code (IBC) and the Canadian National Building Code (CAN NBC). Dr. Rahman experience includes engineering design work, development of engineering software tools and analysis and design of structures against progressive collapse. He has presented on design and building techniques and analyses methods to structural engineering associations and engineering firms in several states.

Hamed Salem, Ph.D. – Director of Engineering Consultation

Ph.D., Civil Engineering, University of Tokyo, Japan

Current Position and Relevant Experience: Dr. Salem is the Manager of the Consultation team at ASI supervising more than 22 major projects. Additionally, he is an Associate Professor at Cairo University, Egypt and has an experience of more than 19 years in the field of reinforced concrete analysis and design. He teaches reinforced concrete design to both undergraduate and graduate students at Cairo University and has supervised numerous doctoral and master students. He has numerous publications in the field of structural engineering. Dr. Salem is a member of the committee of the Egyptian design code for reinforced concrete structures and a reviewer of ACI journal.

Ahmed Amir Khalil, Ph.D. – Senior Structural Consultant

Ph.D., Civil Engineering, McMaster University, Canada

Current Position and Relevant Experience: Dr. Khalil is a Senior Structural Consultant with ASI. Currently, he is an Assistant Professor at the Department of Structural Engineering, Cairo University and has an experience of more than a decade in the field of structural analysis and design. He has several publications in the area of progressive collapse analysis, rehabilitation of structures, and earthquake engineering analysis and design. He participated in several projects for the vulnerability assessment of bridges, towers, and special industrial structures against extreme loading.

Michael Hahn, M.S. – Senior Blast Consultant

M.S., Civil Engineering, Mississippi State University, USA

Current Position and Relevant Experience: Mr. Hahn is a Senior Blast Consultant with ASI, with a strong background in structural engineering applications. He has a proven track record of developing practical engineering solutions on technically challenging and deadline-intense government and private-sector projects that range from very small to multi-millions of dollars. He has experience in the areas of business development, structural industrial design, threat and vulnerability assessments, risk analysis, emergency management planning, training, progressive collapse, and blast mitigation. He is also the author of many technical reports.