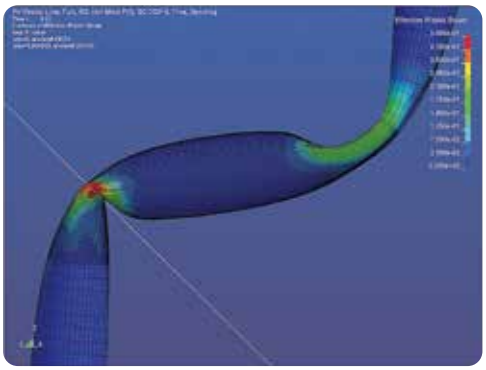
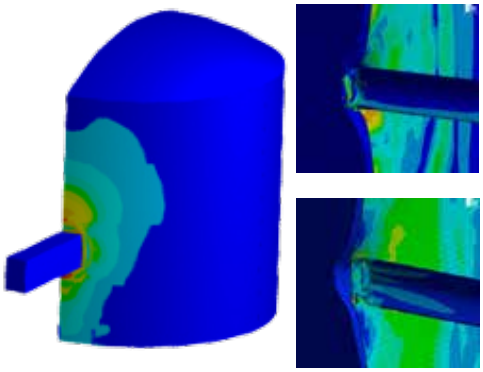
Structural Integrity Associates, Inc.®

STORM HARDENING

ADVANCED STRUCTURAL ENGINEERING & DESIGN SOLUTIONS



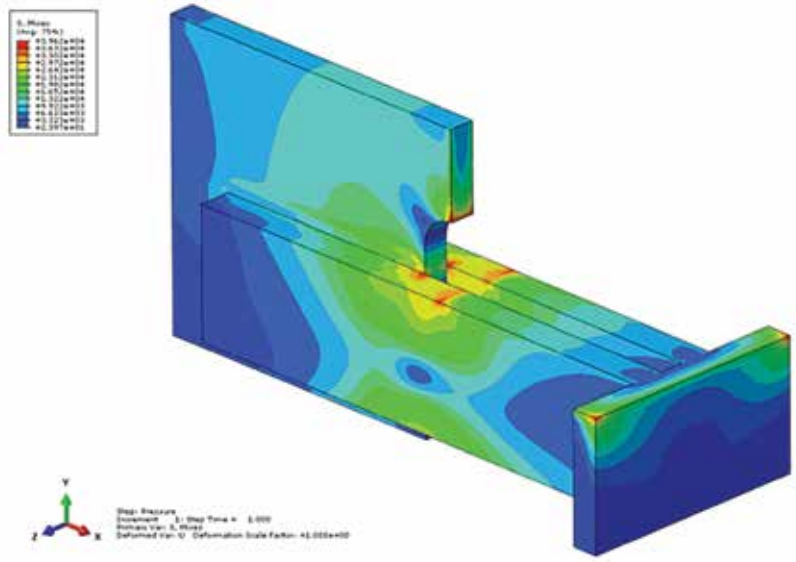


ANSYS Model of Tornado Missile Impact Analysis

Structural Integrity (SI) provides advanced structural engineering evaluations and design solutions for natural events such as tornadoes, hurricanes, flood, and earthquakes. SI evaluates the beyond design code based events and determines a structure's integrity for these extreme loadings. Our structural services include:

- Advanced Structural Analysis
- Non-Linear Material Modeling
- Wind Missiles & Hardening
- Power Transmission Structures & Foundations

Advanced Structural Analysis: Our structural experts create detailed 3D models of complex steel and concrete structures and can evaluate a structure's dynamic behavior to extreme loading conditions. SI utilizes in-house developed solvers (ANACAP, PC-Crack) and advanced commercial solvers such as ANSYS, LSDYNA, and ABAQUS in developing solutions to the most challenging problems. SI can utilize these advanced analysis tools for evaluating wind on new and existing structures. Through our advanced analysis, we can qualify existing structures and foundations for normal and beyond design basis winds by capturing a structure's true structural capacity through in-elastic material finite element analysis. Results from these model runs allow SI to justify existing structures as-is or to cost-effectively upgrade designs to ensure and provide adequate structural safety margins.



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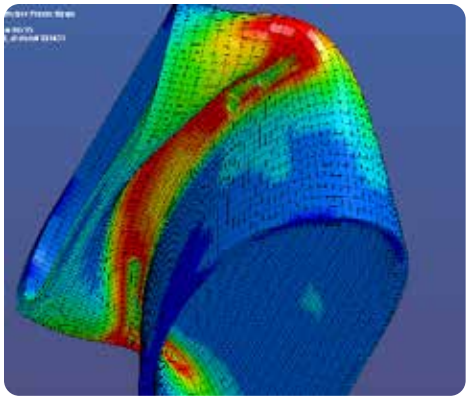
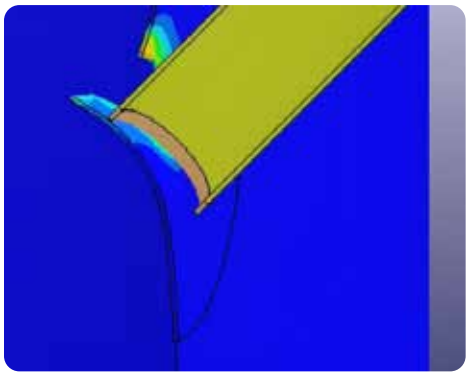
Non-Linear Material Modeling: Some of the largest utility operators and consultants in the world have looked to SI for advanced structural analysis involving non-linear steel and concrete behavior, material aging and degradation effects, dynamic and non-linear seismic analysis, soil-structure-interaction, and equipment/structure fragility analysis. In determining the survivability of valued assets for wind loading that exceed design code forces, SI utilizes elastic-plastic material modeling to determine a structure's capacity through fragility analysis. Only through this type of analysiswill an owner of valued assets know for sure that their structure is capable of withstanding beyond design basis tornado and hurricane force wind events and remain operable.



Wind Borne Missiles & Hardening: SI has evaluated critical structures and facilities for high frequency loadings such as shock, blast, and impact. Our analytical capabilities include explicit software programs that model load drops and associated perforation and concrete scabbing, wind missile impacts, fluid-structure interaction, barrier design, and shock propagation and isolation systems design. It's not enough to know that a structure can survive basic wind events without evaluating for wind borne missile impacts. Wind borne missiles typically used in our analysis and design to harden valued assets include steel balls, steel pipe, wood planks, and automobiles. Wind borne missiles are developed from site risk analysis and applied as applicable for each area under consideration. From the results of our impact analyses, SI can develop cost-effective structure hardening solutions to maintain the serviceability and operability of your valued assets.



Wind Turbine Foundation Design

Power Transmission Structures and Foundations: SI's experience includes the evaluation and effectiveness of power transmission poles, towers and foundation systems for all loading conditions. We are proficient in the analysis, design and detailing of these structures using the latest design codes and standards. Most importantly, we have extensive experience in attenuating vibrations and tuning towers and pole structures to avoid natural frequency resonance with wind driven vortex shedding at higher sustained wind speeds. We are also experience in the analysis and design of centrifugally rotating equipment such as wind turbines. SI recognizes that some of the power transmission structures are aging. We can employ our advanced analytical skills and experience in evaluating the effects of fatigue and aging on concrete and steel and can predict service life or extend service life though structure modifications and repairs.