



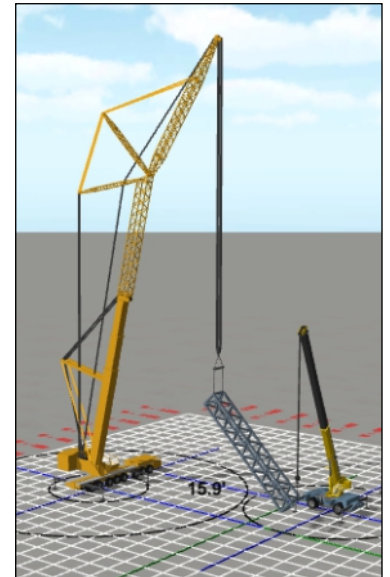
# LIFTING & RIGGING ENGINEERING



ESI's Lifting & Rigging Engineering Team provides safe, practical, and efficient engineered plans and solutions for crane lifts and complex rigging applications.

ESI is experienced in the development of lift plans for a variety of different load types, including:

- Highway bridge components
- Prestressed concrete panels and girders
- Pressure vessels
- Rooftop equipment
- Pipe bridges
- Modular buildings
- Tanks
- Derailed rail cars
- Phased demolition of structures
- Personnel baskets



## KEY CAPABILITIES

- Coordination with client and equipment suppliers
- Review and/or specification of lifting equipment and rigging
- Analysis of existing structures subjected to loads during lifting operations
- Construction load sequencing
- Design of temporary shoring/stabilization
- Review and/or specification of site preparation
- 3D modeling of intricate lifting activities to verify site and equipment clearances and identify and address risks in advance
- Calculation of wind loads and ground bearing pressures
- Design and/or specification of complex rigging
- Foundation analysis and crane mat specification
- Design of lifting points and analysis of lifted components subjected to static and dynamic stresses during lifting
- Site verification prior to/during lifting activities
- Third party review and verification of lifting/rigging plans and calculations



[www.engsys.com](http://www.engsys.com)

### Contact ESI

To get in touch with the ESI Lifting & Rigging Team, please contact Kevin Mesyef, P.E., S.E., C.W.I. at (630) 851-4566 or [kkmesyef@engsys.com](mailto:kkmesyef@engsys.com).

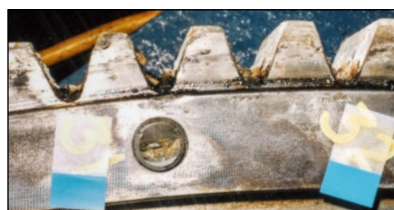
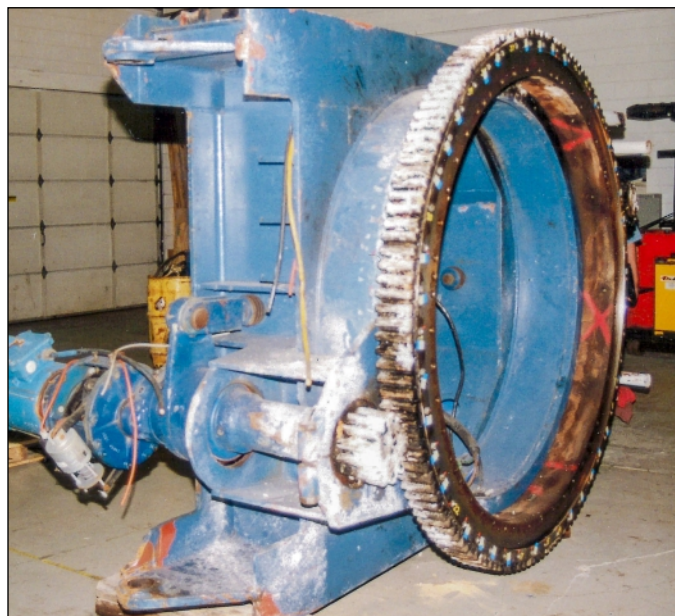


# LIFTING & RIGGING ENGINEERING

## COLLAPSE AND FAILURE INVESTIGATIONS

Proper lift planning mitigates risk of failure of equipment and rigging during lifting operations. However, today's construction industry still experiences avoidable crane and/or rigging failures due to improper, or lack of, lift planning. ESi is qualified and experienced with investigations of failures including crane collapses and rigging failures. ESi's investigations are tailored to the specific project needs and circumstances but generally include the following capabilities:

- Site inspections, field measurements, and photo documentation
- State-of-the-art digital analysis and exhibits, and 3D measurement, imaging, and realization technology
- Simulation of lifting operations, including the use of animation
- Calculation of loads and stresses during lifting operations
- Structural modeling and analysis of failed components
- Finite Element Analysis (FEA)
- In-house material testing including determination of material properties (metals and synthetics), strength testing, microstructure evaluation, and fractography using SEM (Scanning Electron Microscopy)
- Expert testimony



## FAILURE INVESTIGATION EXAMPLE

### Big Blue Crane Collapse at Miller Park Stadium

In order to construct the retractable roof for the Miller Park baseball stadium in Milwaukee, WI a large, heavy-lift crane was required. The crane chosen for the job, "Big Blue," was over five hundred feet tall, had two crawlers, 2.4 million pounds of counterweights and three operators. On July 14, 1999, while placing a nearly 1-million-pound section of the right field roof, "Big Blue" collapsed, resulting in three fatalities and extensive damage to the stadium and construction equipment.

ESi was called on to investigate the cause of the collapse. Initial work included on-site inspection, survey, and documentation of the on-site wreckage in the weeks after the collapse. ESi then collaborated with other interested parties and government agencies to facilitate documentation and removal of key pieces of evidence for later laboratory examination and testing.



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