BULK EQUIPMENT SERVICES

Liftech Consultants Inc.
Liftech Consultants Inc. is a consulting engineering firm, founded in 1964, with special expertise in the design of dockside container handling cranes and other complex structures. Our experience includes structural design for container and material handling equipment, wharves and wharf structures, heavy lift structures, buildings, and container yard structures. Our national and international clients include owners, engineers, operators, manufacturers, and riggers.

Design Philosophy
Liftech is at the forefront of marine terminal technology and strives to develop new technology that improves terminal productivity and safety. We design functional, environmentally sound structures for the most economical investment. The firm considers its service to be one of converting natural resources and labor into usable facilities that are a blend of aesthetic, structural, and functional considerations. We work well with owners, engineers, contractors, and architects.

Material Handling Equipment
Liftech has provided design and analysis services for material handling equipment including loaders, unloaders, and hydraulic excavators since the 1970s. Our services include design, review and design assistance, condition assessment, repair assessment, oversight of repairs, inspection program, fatigue crack analysis, and seismic analysis.

Crane Design
We design cranes for most of the world’s container crane manufacturers. For Paceco, we developed the original standard A-frame, modified A-frame, and low profile quay cranes and RTG frame structures that have become the industry standard. For Mitsubishi, we provided structural design for the first machinery-on-trolley cranes to meet the strict stiffness criteria of the Port of Singapore Authority. For Paceco, Italimpianti, and Samsung, we designed the then largest low profile cranes, and we provided designs of the articulated booms for all of the quay cranes in Kaohsiung, Taiwan. Most recently, we designed the largest dockside crane with a 100 ton capacity and reviewed many of the manufactured DHT40 (dual hoist tandem 40) cranes.

Heavy Lift Design and Review
Liftech has provided structural design and review of heavy lift and crane structures for nuclear power plants, offshore platforms, and other special structures since the 1970s. Our expertise also includes structural design and review of floating cranes of capacity up to 12,000 t and a 1,700 t floating crane that will be used to erect the major components of the San Francisco-Oakland Bay Bridge self-anchored suspension span. The barge mounted 1,700 t floating crane was built by ZPMC in the PRC and is suitable for handling large bridge components.

Equipment Transportation
We provide engineering for the transportation of cranes, oil processing modules, offshore oil structure components, and miscellaneous equipment on barges and ships. Our services include checking the structures and the vessels for voyage forces, designing any required reinforcing for the structure and/or vessel, and designing the attachments to the vessel.

Seismic Design
Our experience with seismic design includes evaluation and design of buildings, container cranes, unloaders, and wharf structures. After the Loma Prieta earthquake, we provided structural evaluation of several buildings. After the Guam and Kobe earthquakes, we evaluated crane and wharf structures and helped owners determine the future of their structures. We provided the design reconstruction of a portion of the wharf at Guam. For new cranes, buildings, and other structures, we provide innovative and
economical earthquake-sound designs using the latest technology. We have performed seismic studies using finite element time history analysis to evaluate the performance of several container crane and unloader structures.

More Information
For more information, please visit the Liftech website: www.Liftech.net
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<th>Manufacturer &amp; Equip. Type</th>
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Coal Loader Crane Assembly and Transportation
Los Angeles, California

The crane was designed by Krupp, built in Malaysia, and shipped in pieces to Los Angeles. Bickerton Iron Works was responsible for assembling the crane and transporting it from the assembly site to the LAXT terminal.

Liftech provided engineering assistance for the assembly of the crane and devised a scheme to connect two barges and roll the crane onto them.

The crane was supported on beams and dollies and rolled onto two 242 x 60 x 16 ft barges. The barges were connected with two hinged spacer beams and two hinged braces.

The flexible connection allowed the barges to move relative to each other in the vertical direction while minimizing the load transfer between them.

Reference:
Bickerton Iron Works
Torrance, California, USA
Repair of Fire Damaged Coal Loader  
Berth 301, Port of Los Angeles, California

Repair of damage from September 2000 fire, February 2001 fire, and April 2001 ship collision.

The coal loader built by Krupp was severely damaged in two fires and suffered significant damage during a ship collision.

After each incident, Liftech provided on-site engineering to assist with repairs. Repairs consisted of replacement or stiffening of buckled sections, restoring the geometry of the boom and shuttle structures to mitigate operational problems, and development of a structural maintenance program to ensure long-term reliability of the repaired structure.

The loader was returned to operation within five weeks of the first fire, within four weeks of the second fire, and within days of the ship collision.

Reference:  
Bickerton Iron Works  
Torrance, California, USA
Log Boom Cranes
Various Locations

Liftech provided structural analysis and design for various rotating log boom cranes. The latest was for a 170-foot, 45-ton crane in Valliant, Oklahoma. Liftech also designed and prepared drawings for cranes with radii of 125 feet and 155 feet and capacities ranging from 25 tons to 60 tons. The grapples are either at a fixed radius or mounted on a moving trolley.

Reference:
Price Systems, Inc.
Malvern, Arkansas, USA
Bauxite Unloader Study

Two bauxite unloaders of identical design have been operating for over 50 years. The operator wished to continue operations for another 15 years.

Liftech analyzed the crane structure to assess the fatigue life for continued operations. The study showed that the crane structure can perform reliably for another 15 years with repair and strengthening of some members and implementation of a structural maintenance program.

Reference:
Hoist & Crane Service Group
Charlotte, North Carolina, USA
Unloader Seismic Study  
Sacramento, California

Liftech performed a seismic response study of a ship unloader on a stiff wharf structure and a flexible wharf structure.

The study included a finite element time history analysis and a pushover analysis for three design Operating Level Earthquakes and three Contingency Level Earthquakes used for design by a port on the West Coast of the United States.

The study provided an understanding of the seismic response of the structure including displacements, dynamic characteristics, stability, and forces and moments within the structure. Time history results included maximum forces and moments and their concurrent forces and moments at key locations on the structure.

Liftech also provided recommendations to improve the structure’s seismic performance.
Liftech provided structural design review of an IMPSA unloader in Brazil.

We reviewed the workmanship of the primary structure, performed finite element analyses, reviewed design drawings, and provided wheel load and stability calculations.

Liftech provided a report of the significant findings of our review and recommendations for improvements. We also provided a comprehensive structural maintenance program based on cumulative fatigue damage analysis.

IMPSA Unloader
Structural Design Review

Client:
McKay International Engineers
Benicia, California, USA

Owner:
Confidential
Torque Unloader  
Structural Condition Survey

A Paceco Torque unloader, DM-11, has been operating at a bauxite refinery facility in Brazil since it was built in 1983.

Liftech performed a structural condition survey of the unloader structure and presented significant findings and recommendations in the structural assessment report.

Liftech identified cracks in the boom and other critical members during the observations and assisted with emergency repairs of the boom so the unloader could resume operation.

Client: McKay International Engineers  
Benicia, California, USA

Owner: Confidential
Unloader Structure Assessment
Montreal, Quebec, Canada

The owner of two 40-year-old bauxite unloaders in Quebec, Canada, was evaluating whether to continue operating, to upgrade, or to replace the existing unloaders. As part of the feasibility study, the owner needed a condition assessment of the unloaders by an independent consultant.

Liftech performed an on-site visual assessment of the structural condition of the unloaders. The report included suggestions to improve the structural reliability and extend the structural life. Various modification options for future productivity demand were presented.

Reference:
Rio Tinto Alcan
Montreal, Quebec, Canada
Esperance Port Authority Hybrid Crane Review
Esperance, Australia

Esperance Port Authority purchased a hybrid crane from ZPMC to handle containers and bulk material. Robert Reid & Associates and Liftech Consultants Inc. provided procurement services.

Liftech reviewed the structure design, helped resolve design issues, and audited the structural fabrication in China. Liftech also reviewed the crane wheel loads and helped coordinate the crane interface issues with Esperance Port Authority.

Reference:
Robert Reid & Associates
Port Melbourne
Victoria, Australia
Erik Soderberg  
President, Structural Engineer  
Mr. Soderberg is a skilled designer and project manager. He is experienced in the design, review, repair, and modification of a variety of structural and crane related systems including wharves, container cranes, and bulk loader structures. Other structures include crane lift and transfer systems and concrete and steel floats. He oversees the technical and contractual aspects of Liftech’s projects in addition to his design work.

Michael Jordan  
Technical Director, Structural Engineer  
Mr. Jordan is an internationally recognized expert in the container crane industry. He has been involved in the evolution of the container industry since participating in the structural design of the first dockside container crane for Matson in 1958. Since then, he has designed the structures of thousands of duty-cycle cranes, prepared numerous specifications for the design of duty-cycle cranes, and investigated fatigue damage problems and major failures caused by fatigue crack growth and brittle fracture. Mike is Liftech’s founding principal.

Arun Bhimani  
Chairman of the Board, Structural Engineer  
Mr. Bhimani is an expert in all phases of container crane and wharf design. He has developed innovative solutions to container crane design problems, including a technique for combining analysis with heat straightening for repairing damaged container crane booms, the first seafastening design for transporting fully erected container cranes on barges, and a structural maintenance program used to periodically inspect cranes.

Catherine Morris  
Vice President, Structural Engineer  
Ms. Morris has a wide range of experience in the design of buildings, container cranes, and miscellaneous special structures. She is the principal in charge of most of Liftech's building projects. She has worked on all facets of container crane design including the design of new cranes, review of crane designs, design of modifications, and voyage bracing. She has also reviewed and designed reinforcing for barge structures for transport of various equipment, designed chassis storage racks, and analyzed and designed equipment to lift and replace steam generators in nuclear power plants.

Jonathan Hsieh  
Vice President, Structural Engineer  
Mr. Hsieh is experienced in design, review, analysis, and modification of container cranes, bulk handling cranes, and special structures. His expertise includes crane procurement, fatigue failure investigation and repair, and computer modeling and analysis. He has also worked on structural maintenance programs, seismic design of container cranes, crane instrumentation, and voyage bracing.
Sugiarto Loni  
**Principal, Structural Engineer**  
Mr. Loni has extensive management experience and design expertise with marine terminal structures including crane-wharf interface, container and intermodal yard structures, building facilities, and marine structures. He is responsible for contract negotiations, technical oversight, and quality assurance of project deliverables. His work includes managing a variety of engineering projects ranging from small projects with short duration to large projects with multi-discipline coordination. As project engineer, he performs civil and structural design of marine terminal facilities, seismic retrofit design of existing building structures, and civil and structural design of wharves and marine structures.

Kenton Lee  
**Principal, Structural Engineer**  
Mr. Lee is experienced in design, analysis, and project management of container cranes, floating cranes, rigging, and special structures. Container and floating crane procurement projects and crane modification projects are his specialty, but he is also deeply involved in other types of engineering projects, such as the preparation of structural maintenance programs and project management of wharf projects and baffle/burner structures in power plant ducts. Some of the technical aspects of his work that are of special interest to him are steel connection design, wind effects on structures, wind tunnel testing, and structural fatigue of steel structures.

Derrick Lind  
**Principal, Structural Engineer**  
Mr. Lind is experienced with project management, design, review, analysis, and modification of many types of structures, including container cranes, unique industrial equipment, buildings, wharves, and bridges. He specializes in all facets of crane modification, including crane raises, boom extensions, capacity upgrades, and wheel load feasibility studies. His work has included crane procurement, structural analysis and design, checking shop drawings, developing construction documents, and managing design teams and project budgets and schedules.

Patrick McCarthy  
**Principal, Professional Engineer**  
Mr. McCarthy is a Liftech principal and registered professional engineer. He is experienced in container crane procurement, modification, design, structural life assessment, and writing technical specifications. He has been involved in wind tunnel and numerous other wind-related studies and is an associate member of the Wind Load Subcommittee of ASCE-7.