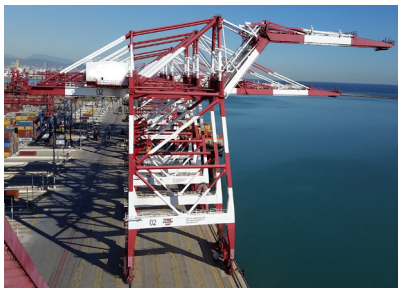
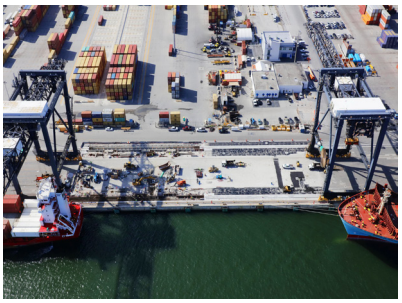
CRANE MODIFICATION SERVICES

Liftech Consultants Inc.





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CRANE MODIFICATION SERVICES

ABOUT US

Liftech Consultants Inc. has provided structural engineering services since 1964. We are at the forefront of marine terminal technology and strive to develop new technology that improves terminal productivity and safety. We are recognized worldwide as experts in the design of container handling cranes and other equipment. Our experience also includes the structural design of wharves, buildings, heavy lift structures, and other special structures. We provide structural, mechanical, and electrical engineering services. Our international clients include owners, engineers, operators, manufacturers, contractors, consultants, riggers, and architects.

ABOUT CRANE MODIFICATIONS

Crane upgrades are often required to service larger vessels, increase productivity, allow for a different terminal operation, or reduce maintenance costs. Upgrading existing cranes is often quicker and often a more economical alternative than purchasing new cranes. Liftech has developed many of the modification concepts that are widely adopted by the industry and has helped many owners modify their cranes.

Common modifications include geometry modification and modernization. Relocation is often involved as well.

Geometry changes, such as increasing the lift height, or increasing the outreach, backreach, or both, are primarily driven by the deployment of large vessels. Other geometry changes include strengthening, changing the gage, and clearance under the portal beam.

Modernization includes replacing obsolete mechanical or electrical systems with new state-of-the-art systems, e.g., drives and control system, to improve reliability and reduce maintenance costs. Performance changes include lift capacity, hoist speeds, drives, and control and power system.

Relocating cranes frequently requires crane modifications, such as strengthening the structure for increased storm winds, adding or strengthening stowage hardware, crane gage changes, and changing the power supply system.

SOLVING THE MODIFICATION CHALLENGES

Disruption to operations, cost, and wheel load capacity are typical challenges that the crane owner faces in deciding if crane modification is the right solution. Frequently, a feasibility study is the first step to evaluate the practicality of the modifications. The feasibility study typically includes estimated wheel loads, a conceptual design, and cost/schedule estimates for the recommended modified crane design.

Sometimes, crane modification options are considered impractical due to the limitation of the existing quay structure capacity. Liftech has developed innovative modification design concepts to achieve the owner's requirements in locations where quay structure capacity is limited. Also, Liftech has evaluated the capacity of existing quay structures and uses modern alternative methods to analyze the crane girders. In some cases, Liftech was able to justify 50% higher capacity.

We often work closely with the contractor developing modification and construction schemes to minimize disruption to the operation and reduce construction cost and schedule. We developed a crane move system that enables the contractor to move the crane out of a busy terminal and developed a jacking frame that enables the contractor to raise cranes in less than a week.

ATTACHMENTS

The following documents related to Liftech's Crane Modification Services are attached. For more information about us, please visit our website: www.Liftech.net

Sample Projects

Selected Crane Modification Projects

Company Overview

Company Principals

CONTACT INFORMATION

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ZPMC Crane Raise and Boom Extension
Modern Terminals Limited, Hong Kong

Modern Terminals Limited planned to increase the lift height of four 2005 ZPMC STS container cranes from 42.5 m to 48 m. They planned to increase the booms of three cranes from an outreach of 62.5 m to 65 m, and one crane from 62.5 m to 63 m. This work is to accommodate larger vessels calling at their terminal in Kwai Chung.

Liftech provided pre-award structural engineering services including preparing technical specifications, analyzing the structure, calculating wheel and tie-down loads, preparing modification concept drawings, and reviewing technical aspects of the tender documents.

Post-award services included:

- Reviewing the contractor's design documents and fabrication drawings
- Performing independent finite element analysis and design review of the crane structure integrity for the raise and boom extension scheme
- Analyzing the structural adequacy of the jacking system and reviewing the jacking procedure
- Reviewing the design and providing design assistance for the boom extension platform
- Providing construction support and fabrication review

Reference:
Modern Terminals Limited
Hong Kong

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Noell Crane Raise and Boom Extension
Modern Terminals Limited, Hong Kong

Modern Terminals Limited planned to increase the lift height of six 2005 Noell STS cranes from 44 m to 50 m. They planned to increase the lift height of another two 2005 Noell STS cranes from 41 m to 48 m and extend the booms from an outreach of 61 m to 65 m. This work is to accommodate larger vessels calling at their T9 terminal.

Liftech provided pre-award structural engineering services including technical specifications, structural analyses, modification design for the 48-m lift height and 50-m lift height geometries, tie-down modification design for the 50-m lift height geometry, and tender document technical evaluations.

Post-award services included:

- Reviewing the contractor's design documents and fabrication drawings
- Performing independent finite element analysis and design review of the crane structure integrity for the raise and boom extension scheme
- Analyzing the structural adequacy of the jacking system and reviewing the jacking procedure
- Reviewing the design and providing design assistance for the boom extension platform
- Providing construction support and fabrication review

Reference:
Modern Terminals Limited
Hong Kong

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Total Terminals International Pier T, Crane Modification
Port of Long Beach, California

Total Terminals planned to increase six of its early 2000s ZPMC STS cranes by 32 feet for its Pier T terminal at Port of Long Beach to accommodate larger vessels.

The Port of Long Beach retained Liftech and McKay to provide structural, mechanical, and electrical engineering services related to the crane modifications, which included performing a feasibility study, developing concept designs, and preparing technical specifications. Special design requirements included two levels of earthquake loadings (operating and contingency), limitations on the wheel loads, and crane natural vibration period for compliance with the port's crane-wharf seismic interaction provisions.

The port transferred the crane ownership to Total Terminals prior to the construction of the crane raises. Total Terminals retained Liftech and McKay to provide engineering services related to submittal review, fabrication QA, and on-site construction support.

Liftech and McKay worked with the contractor to incorporate their suggestions into the raise design and reviewed their shop drawings. We reviewed the proposed jacking frame design, rollback system, wharf loading calculations, and provided fabrication QA and construction support services.

Reference:
Total Terminals International, LLC
Long Beach, California, USA

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SSA Marine ZPMC Crane Raise
Port of Oakland, California

Port of Oakland tenant SSA Marine increased the lift height of four 1999 Port of Oakland ZPMC STS cranes by 26 feet to accommodate the larger vessels calling at the port.

ZPMC fabricated the modification components in China and used their jacking equipment to increase the lift height of the cranes on the crane rails in Oakland.

Liftech provided structural engineering services to support Port of Oakland's review of the crane raise project. Liftech's services included providing structural specifications for the crane raise and jacking frame, performing an independent analysis of the crane structure for the raise and as-modified for operations, calculating wheel loads to determine if the wharf could support the heavier cranes, and reviewing ZPMC's crane raise drawings, jacking frame drawings, and fabrication.

Reference:
Port of Oakland
Oakland, California, USA

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Manzanillo International Terminal Crane Raises
Republic of Panama

Manzanillo International Terminal (MIT) hired Global Rigging and Transport (GRT) to increase the lift height of eight ZPMC ship-to-shore (STS) cranes located in Panama, and potentially for other terminals in Mexico and Chile.

Liftech provided design review for structural modifications to increase the lift height of two STS crane designs.

Earlier, Liftech assisted MIT with the initial procurement of these cranes, including providing technical specifications and structural design review.

MIT decided to build their own jacking system for the raise contractors to use during the crane raise construction.

Liftech worked with GRT to design the jacking frame and connections to the existing crane structures. The jacking frame is designed to raise a 1,650-t upper structure approximately 20 m. The system design considered the size and configuration of several STS crane designs being considered for raises.

Liftech also reviewed the crane raise procedures and jacking frame erection/relocation methods.

Reference:
Manzanillo International Terminal
Colon Free Zone
Republic of Panama

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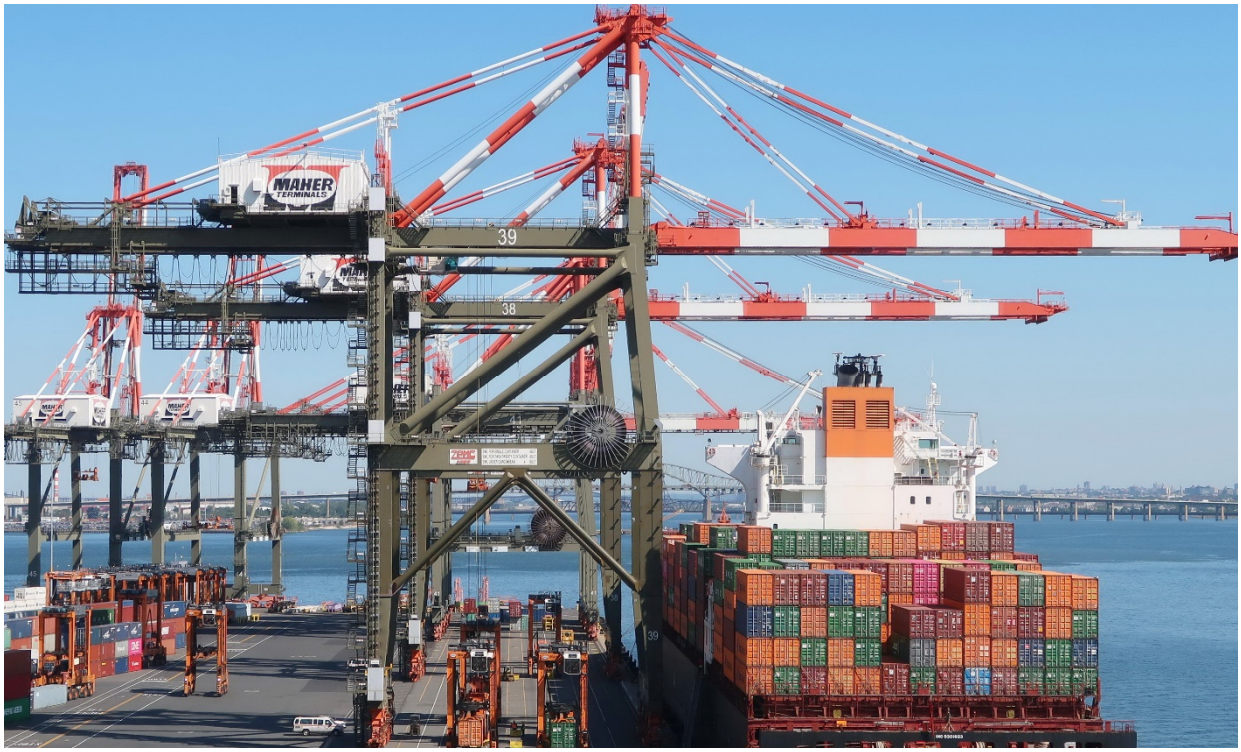

Maher ZPMC Crane Raise
Elizabeth, New Jersey

Maher Terminals planned to increase the lift height of their 2006 ZPMC STS cranes from 120 ft to 165 ft (36.6 m to 50.3 m), an increase of 45 ft (13.7 m), to accommodate larger vessels calling at their Elizabeth, New Jersey, terminal.

Liftech helped Maher by providing structural engineering services including reviewing wheel loads and stability, preparing structural and general portions of the crane raise specifications, reviewing the combined crane and jacking system structure for the raise, evaluating the gantry structure, preparing structural conceptual modification design drawings, and reviewing fabrication in China and installation in New Jersey.

McKay International Engineers, as a subconsultant to Liftech, evaluated selected crane mechanical systems and assisted with preparing the mechanical portion of the crane raise specifications.

Reference:
Maher Terminals, LLC
Elizabeth, New Jersey, USA

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Miami

Seafastening

Transport

Colombia

BCT Low Profile Crane Relocation
Miami, Florida, to Barranquilla, Colombia

Barranquilla Container Terminal S.A. (BCT), Colombia, acting as agent for Sociedad Portuaria del Norte S.A., purchased three Kocks ship-to-shore cranes from the Port of Miami. BCT retained Global Rigging and Transport, LLC (GRT) to relocate the cranes.

For BCT, Liftech provided project management services including bid assistance, coordinating with the Port of Miami, reviewing submittals, and site audit work at both Miami and Barranquilla.

For GRT, Liftech analyzed the cranes for the voyage condition and designed the voyage reinforcing and tie-downs for the cranes to the barge. Liftech also reviewed the wharf structure for loading and unloading the cranes.

References:

Barranquilla Container Terminal S.A.
Barranquilla, Colombia

Global Rigging and Transport, LLC
Virginia Beach, Virginia, USA

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Before Modification

After Modification

APL Noell Crane Modification
Port of Los Angeles, California

APL Limited purchased 12 Noell machinery-on-trolley cranes in the mid-1990s for their Port of Los Angeles Pier 300 terminal. The cranes were rated for 50 LT and have a 50' backreach.

The backreach for all cranes was extended 28' for storing hatch covers. The original girder was sufficiently long to accommodate the additional 28' backreach.

Liftech designed girder reinforcing and a cantilever truss to mount the festoon and walkways. The original festoon backreach structure and access platforms were reused on the new truss. The modified crane met the stability requirements.

Reference:
APL Limited
Oakland, California, USA

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Kocks Crane Modification and Relocation
Port of Oakland to Massachusetts Port Authority

Massachusetts Port Authority (Massport) purchased two Kocks low profile cranes from the Port of Oakland for capacity expansion of their Conley Terminal. The Oakland post-Panamax Kocks cranes were a near-perfect match for the Conley Terminal.

Low profile cranes, also known as shuttle boom cranes, are used where overall height is restricted because of aircraft clearance requirements. Because of their unique nature and limited demand, the cost of new low profile cranes is about 50% more than for a typical quay crane. Reuse of an existing crane is more attractive.

Liftech surveyed the condition of the cranes before the purchase and developed construction documents for modification and transport of the cranes from the Port of Oakland to Massport. We also provided bid review assistance and construction support services.

Structural modifications required for the Massport location were limited to minimal frame strengthening for higher storm winds, addition of a boom latch, installation of an 11.5” riser at the landside equalizer system, gantry bumper modifications, and gantry stowage pin modifications.

Liftech provided the procurement services to the Port of Oakland for the original Kocks crane purchase and assisted with the structural design of the cranes.

Client:
Fay, Spofford & Thorndike, Inc.
Burlington, Massachusetts, USA

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Before Modification

After Modification

MES Crane Modification and Relocation
Taiwan to Alaska

APL modified and relocated a late 1980's MES post-Panamax crane with articulating boom from their Kaohsiung, Taiwan, terminal to their Dutch Harbor, Alaska, terminal.

Liftech provided the structural design for modification and relocation of the crane and reviewed the contractor's work. Crane modifications included changing the gage from 80 ft to 50 ft, adding ballast at waterside, modifying the tie-downs, and strengthening the crane structure to suit the conditions at Dutch Harbor.

Liftech also provided structural design for wharf modifications to accommodate the modified crane. Wharf upgrades included new stowage hardware, strengthening and replacing two crane stops, and modifying and replacing tie-down hardware.

Reference:
APL Limited
USA

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Crane Modification
Vancouver, BC, Canada

To accommodate larger vessels, DP World Vancouver raised two MGM dockside container cranes 20' (6.1 m) and extended the booms 14' (4.3 m). Liftech provided the crane modification design including new leg inserts, boom girder inserts and bracing, forestay inserts, boom hoist modifications, knee bracing, and stairs and walkways. The design increased the crane stiffness in the trolley travel direction. Liftech also provided support services to the contractor, Bickerton Iron Works, during the construction phase.

Reference:
DP World Vancouver
Vancouver, BC, Canada

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Paceco Crane Gage Change and Relocation
Long Beach to Manzanillo, Mexico

SSA Mexico relocated a 50’ gage Paceco crane from the Port of Long Beach, California, to Manzanillo, Mexico.

The crane was built around 1980 and was raised in the late 1980s. Liftech provided engineering to change the gage from 50’ to 55’ and for the associated rigging work. The frame was strengthened for higher wind loads, and new stowage brackets and tie-downs were added.

Reference:
SSA Mexico
Manzanillo, Colima, Mexico

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Hitachi Crane Modification and Relocation
Los Angeles to Guam

Horizon Lines and Matson Navigation purchased three Hitachi cranes located in Los Angeles, California, for relocation to Guam. The cranes were upgraded and strengthened for typhoon winds. Upgrades included a lift height increase of 8 feet, new drives and controls, diesel power, and new tie-downs.

Liftech provided the structural design for upgrade and relocation, assisted with bid evaluations, and reviewed the contractor's work.

Liftech also provided the design of the Guam wharf improvements in the crane stowage area.

References:
Horizon Lines, LLC
San Ramon, California, USA

Matson Navigation Company
Oakland, California, USA

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Long Beach Container Terminal Crane Modification
Long Beach, California

Long Beach Container Terminal wanted to raise five IHI dockside cranes and extend the outreach to accommodate larger vessels. Liftech provided the design of the modifications to Bickerton Iron Works to raise the 1980's container cranes by 10 feet and extend the boom 10 feet. Two years later, Liftech provided the design to raise the cranes an additional 20 feet for a total of 30 feet lift height increase. Liftech also designed a jacking frame for Bickerton Iron Works that allows them to raise each crane in less than a week.

Reference:
Bickerton Iron Works
Torrance, California, USA

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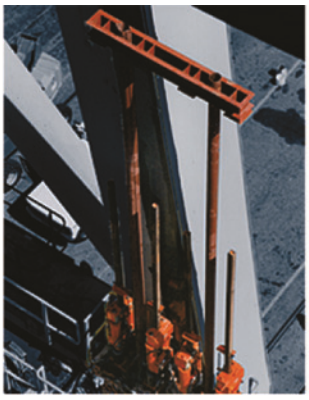

Jacking Frame for Raising Container Cranes
Various Locations

The existing jacking equipment for raising container cranes required a long time to set up and disassemble. Some equipment imposed unacceptable loads on the dock. Liftech designed a jacking frame that enables BIW to raise cranes in less than a week. The frame is capable of raising cranes 30 feet, can withstand up to 75 mph winds with the crane raised, and is supported on crane sill beams.

The assembly is used for projects in the United States and overseas.

Reference:
Bickerton Iron Works
Torrance, California, USA

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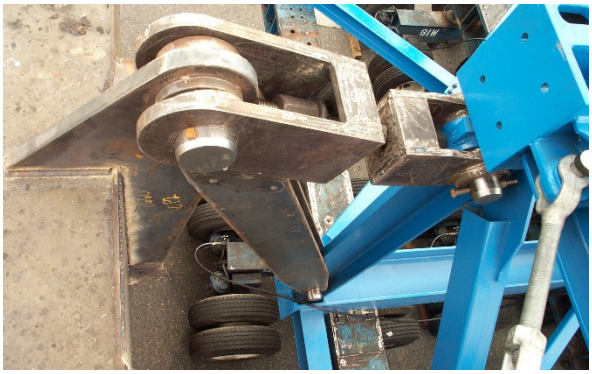

Crane Move System

Liftech designed a crane move system for moving container cranes that was easy to ship and assemble.

Liftech designed a modular system with container sized components for shipping. The system can be assembled away from a crane, allowing the crane to continue working until it is moved. The container crane is secured to the system with four pins and lifted for transport.

The crane move system can move 50 ft to 100 ft gage cranes that weigh up to 1,600 t on wharf decks that are designed for 1,000 psf live loads.

Client:
Bickerton Iron Works
Torrance, California, USA

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SELECTED CRANE MODIFICATION PROJECTS

Client & Location	Mod. Year	Manufacturer & Year	Project Description
Terminal Rio de la Plata Buenos Aires, Argentina	2024	Liebherr, 1 crane, 1996	Structural engineering to increase gantry wheel span from 18.5 m to 31.4 m, extend the boom for two additional containers of outreach, and for crane local relocation. Services included feasibility studies, structural analyses, modifications design, wheel load and stability review, mechanical and electrical review and design for modifying the boom hoist reeving, and reviewing the relocation contractor's concept and procedures.
Mott MacDonald Port of Portland Portland, Oregon	2023	ZPMC, 2 cranes, 2005	As subconsultant to Mott MacDonald, Liftech assisted with engineering services for crane raise feasibility and grant application for increasing the lift height by 6 m, from 29 m to 35 m.
Modern Terminals Hong Kong	2022	ZPMC, 2 cranes, 2016, 2018	Provided design, design review, and fabrication review for increasing the main hoist lift height by 5.5 m, from 42.5 m to 48 m and extending the outreach by 2.5 m, from 62.5 m to 65 m.
Everport Terminal Services Oakland, California	2022	ZPMC, 2 cranes, 2010	Provided feasibility study, and concept design for increasing the main hoist lift height by 12 m, from 40 m to 52 m, with services similar to Everport Tacoma, below.
Terminales Rio de la Plata Buenos Aires, Argentina	2021	ZPMC, 1 crane, 2008	Provided a feasibility study and concept design for extending the boom outreach by 5.5 m, from 50 m to 55.5 m, and extending the lift height by 6.0 m, from 36 m to 42 m. (ongoing project)
Everport Terminal Services Tacoma, Washington	2021	ZPMC, 7 cranes, 2004–2006	Provided structural and limited mechanical services to increase the main hoist lift height by 12 m, from 40 m to 52 m, including: (1) evaluating the main hoist drum, (2) performing a seismic study, structural analysis, and modification concept design drawings to upgrade the seismic design to current standards, (3) developing crane modification technical specifications, (4) reviewing bids for technical compliance, (5) crane structural modification design review and wheel load and stability review for crane during jacking and in service, (6) sensibility review of jacking system and review connections between jacking frame and crane, (7) structural fabrication audit for manufacturing in China and field work in Tacoma, (8) limited mechanical design review for main hoist drum replacement and gantry cable reel, (9) limited electrical review for electrical modifications.
Manzanillo International Terminal Colon, Panama	2019	ZPMC, multiple cranes	Provided structural design review to raise eight STS cranes in Panama to serve larger ships, and potentially for other terminals in Mexico and Chile. Previously assisted with crane procurement, including technical specifications. Also reviewed the crane raise procedures and the jacking frame erection/relocation methods.

Client & Location	Mod. Year	Manufacturer & Year	Project Description
Port of Oakland Oakland, California	2019	ZPMC, late 1990s	Estimated wheel loads to determine feasibility of a 26 ft crane raise. Reviewed design of raise, jacking frame, and fabrication. Periodically visited the site to review fabrication workmanship. Amended original specifications to include raise components.
APM Terminals Tangier, Morocco	2017	ZPMC, 2013	Provided structural design review to raise four STS cranes by 9 m, from 41 m to 50 m.
Maher Terminals Elizabeth, New Jersey	2016	Fantuzzi, 2003	Provided crane raise technical specifications to raise five STS cranes to increase the lift height from 120 ft to 165 ft. Also performed design review for the crane and the jacking system, and limited fabrication review
Maher Terminals Elizabeth, New Jersey	2016	ZPMC, 2006	Provided structural engineering study to increase lift height of STS cranes from 120 ft to 140 ft, 155 ft, and 160 ft. Also provided study for lift height increase of 165 ft with the existing 200 ft outreach and for a 215 ft future outreach.
Barcelona Europe South Terminal Barcelona, Spain	2016	ZPMC, 2012	Provided a feasibility study for a 5 m raise for 11 STS articulated boom cranes. Reviewed specifications, structural design, submittals, and fabrication.
ZPMC/PSA Zeebrugge, Belgium	2015	ZPMC, 2007	Provided a feasibility study for crane modification of a 4 m raise and a 0.5 m gage change.
McKay International Engineers Long Beach, California	2015	ZPMC, 2001	Provided construction documents and bid support for a 32 ft crane raise. Reviewed submittals and fabrication.
APM Terminals Los Angeles, California	2015	Noell, 2000	Provided peer review services for design to modify ten cranes for a 33 ft raise and 15 ft boom extension. Reviewed specifications.
West Basin Container Terminal San Pedro, California	2013	ZPMC, 2011	Designed structural modification concept to raise four STS cranes 26 ft. Reviewed fabrication drawings and provided construction support. Reviewed the jacking frame structural design.
APL Limited Los Angeles, California	2013	Noell, 1995	Designed structural modifications to raise STS cranes 35 ft.
Terminales Rio de la Plata Buenos Aires, Argentina	2013	ZPMC, 2005 & 2007	Designed structural modifications of two STS cranes to extend the boom outreach by 6 m from 45 m to 51 m. The cranes have double trapezoidal box boom girders. Also, reported the revised wheel loads and uplift loads.
McKay International Engineers Port of Long Beach, California	2013	ZPMC	Designed structural modifications to 14 STS cranes to serve larger vessels.
APL Limited Los Angeles, California	2012	Noell, 1995	Designed structural modifications of 12 STS cranes to increase backreach from 50 ft to 75 ft, including new festoon supports and walkways.
Confidential Saudi Arabia	2012	ZPMC, 2009	Designed structural modifications for two types of STS cranes to compensate for 150 mm landside rail settlement.

Client & Location	Mod. Year	Manufacturer & Year	Project Description
Confidential United States	2012	310 t capacity goliath crane, 1969	Studied upgrade and replacement options, including cost and schedule estimates, for an existing goliath crane. Developed repair concepts.
Whitney Bailey Cox & Magnani Dundalk Terminal Maryland	2011	IHI, IMPSA	Studied concepts to raise cranes by 10 ft and extend outreach by 12 ft.
Fay, Spofford & Thorndike Massport, Boston, Massachusetts	2010	Kocks low profile, 1981	Designed crane frame reinforcement for hurricane winds and modifications for crane-wharf interface for relocation from Oakland to Boston. Designed crane voyage bracing.
Yantian International Container Terminals Ltd. Shenzhen, China	2010	SPMP, 2004 & 2006	Designed crane frame reinforcement for typhoon winds, new tie-downs, and crane stowage hardware.
APL Limited Dutch Harbor, Alaska	2010	Mitsui, 1987	Designed structural modifications to change crane gage from 24 m to 15 m and voyage bracing for transport from Taiwan to Alaska.

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COMPANY OVERVIEW

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

Design Philosophy

We design functional, environmentally sound structures for the most economical investment. We believe in converting natural resources and labor into usable facilities that are a blend of aesthetic and functional considerations. We work well with owners, engineers, contractors, and architects.

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, low profile quay cranes, and RTG and RMG 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 provided designs of articulated boom cranes worldwide.

Most recently, we helped design the largest quay crane for ZPMC with a 100-ton capacity and reviewed many of the manufactured DHT40 (dual-hoist-tandem-40) cranes.

Crane Procurement

We provide crane procurement assistance to port authorities, shipping lines, and terminal operators. Our services range from preparing specifications to complete assistance from the initial needs assessment through final acceptance and warranty, including concept design, crane load studies, technical specifications, bid evaluation, comprehensive design review, quality assurance audits, fabrication oversight, voyage bracing review, offload review, and commissioning services.

Liftech created the first comprehensive technical specifications for STS container cranes and has continuously improved them to remain the industry-leading specifications in use today. We have written specifications to assist in procuring hundreds of container cranes. We work with the crane owner to develop site-specific and other requirements tailored to the owner's needs. Our specifications include provisions for structural, mechanical, electrical, controls, automation, reliability, manufacturing, documentation, testing, seismic performance, and other requirements.

Crane Assessment, Maintenance, and Modification

We help clients by assessing crane equipment and providing recommendations for maintenance, modification, or purchase. Our services include condition surveys, useful life assessment, reliability studies, structural maintenance and inspection programs, repair procedures for defects discovered during inspections, and modification design. We design modifications for improving reliability, increasing the lift height, extending the outreach or backreach, increasing the capacity, changing the rail span, improving seismic performance, and others. We design jacking systems used to raise cranes while dramatically decreasing the out-of-service time for the crane.

Liftech helps clients resolve persistent maintenance and reliability issues through improved designs and modifications of existing equipment. Using a combination of experience, analysis, testing, and known good designs, we can help identify the root cause of failures and design practical modifications to reduce or eliminate causes of downtime and ease maintenance burdens.

Crane Relocation / Sea Transportation

We provide engineering for transporting cranes, oil processing modules, offshore oil structure components, bridges, and other miscellaneous equipment on barges and ships. Our services include reviewing the procedures for moving the object onto and off of the vessel, designing attachments to the vessel, designing required reinforcing for the object and/or vessel structures, reviewing the object and vessel structures for voyage forces, and reviewing the wharf (or wharves) for the crane transport loading.

Crane Repair, Failure Analysis, and Expert Witness

We are often called upon for consultations for damaged cranes and accident investigations. Liftech uses our industry leading expert knowledge, familiarity with a wide range of designs, and expert analysis to provide clients with insight into the cause of crane failures and for designing repairs and modifications to prevent reoccurrences.

Our repair services include assessing the situation, designing temporary securing, designing repairs, and reviewing the repair work. Repair projects typically include damage caused by fatigue, crane-to-crane and vessel-to-crane collisions, boom hoist failures, snag, storm wind, tornadoes, earthquakes, and others. Repairs typically involve replacing members, strengthening local areas, and heat straightening. We are occasionally retained as an expert witness to assess crane accidents, evaluate repair estimates, and help resolve disputes.

Crane Transfer Systems

We designed many systems for transferring container cranes between non-linear berths including above ground shuttles, below ground shuttles, turntables, and curved rails with and without switches. We developed a computer program that calculates the near optimal curved rail geometry that typically avoids the need for a side shift mechanism between the crane and its gantry system.

Heavy Lift Design and Review

Liftech provides structural design and review of heavy lift procedures including criteria; lift systems, such as jacking systems and cranes; and various hardware. Projects include nuclear power plants, offshore platforms, blimp hangar repairs, and others.

Our expertise also includes structural design and review of large land-based and floating cranes. We have helped design and review cranes of capacity up to 12,000 t. Examples include assistance with the 1,700 t floating crane that erected the major components of the San Francisco-Oakland Bay Bridge self-anchored suspension span and the Bigge AFRD land-based ringer cranes. We have worked on several other specialized, confidential crane systems that have major impacts in their marketplace.

Material Handling Equipment

Liftech provides design and analysis services for a variety of material handling equipment including loaders, unloaders, stacker reclaimers, and hydraulic excavators. Our services include procurement assistance, design, condition review, repair design and assessment, oversight of repairs, inspection programs, fatigue cracking analysis and reliability studies, and seismic analysis and advice.

Wharf and Pier Structures

We provide design and analysis services for wharf and pier structures. Our experience includes the design of wharf and pier structures for large earthquake loads, including cast-in-place and precast concrete systems, as well as steel systems. Projects include design of the following:

A MOTEMS-compliant wharf. The design permitted continued operations during construction by fabricating most of the structures off-site and installing prefabricated components between vessel calls.

A 426-foot wharf in Redwood City designed to state-of-the-art seismic criteria and to support mobile crane operations.

A 550-foot wharf at the Port of West Sacramento that supports a cement unloader. Over 5,000 feet of wharves at the Port of Oakland that support container cranes.

We evaluated all of the wharves at the Ports of Oakland and Virginia to determine the crane girder capacities to aid the ports in their equipment decisions. We have performed evaluation studies and have justified increased crane girder capacities for over a dozen girder systems. We have performed wharf evaluations for heavy temporary loadings, e.g., moving container cranes over the wharf.

Float Design and Analysis

We provide design and analysis services for float structures, including cranes mounted on barges and ships and floats for ferry terminals and other facilities. Projects include design of the following:

Steel barge support structure for the Left Coast Lifter, a 1,700-t capacity shear leg derrick.

Post-tensioned concrete float system including float, gangway, and piling for the WETA South San Francisco Ferry Terminal.

Two steel floats including piling for the WETA Pier 9 layover berths in San Francisco. Steel float for the WETA Clay Street Ferry Terminal in Oakland.

Pile-supported pier, piling, and concrete float system fendering and mooring systems for berthing up to 12 ferry vessels for the WETA Central Bay Operations & Maintenance Facility in Alameda.

Two new steel floats with associated super structures and mooring berthing systems, three new gangways, and existing float refurbishment for the WETA Downtown San Francisco Ferry Terminal.

Steel float, gangway, prefabricated pier, and piling for a floating fire station in San Francisco.

Steel floats for ferry terminals at Seaplane Lagoon in Alameda and Treasure Island.

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.

Building Design

Our building design experience ranges from one-story and two-story tilt-up concrete buildings with steel or wood framing to multi-story braced frame steel buildings. The buildings are generally for port, office, commercial, and industrial uses. In addition to traditional building structures, we also design miscellaneous structures in port terminals including canopies, light poles, guard booths, and truck wash facilities. During the design process, we review our designs with owners and contractors to ensure the most cost-effective design.

Other Structures

We provide design and review services for a variety of other structures that often require a unique understanding of mechanics and are sometimes not covered by standard building codes. We are well suited to work on these structures due to our familiarity with dynamically loaded structures that undergo their design loading on a regular basis and our unique design experience and understanding of mechanics, load paths, and stability.

Crane Analysis Software

We developed a proprietary program for the design and analysis of quay cranes and other container handling equipment. The program is capable of designing or analyzing cranes for the various international standards. We have licensed the software to select crane manufacturers.

Computers

We take pride in providing all employees with the latest computer technology. We use structural software that was written by Liftech, as well as third party software such as *SAP 2000, RAM, AutoCAD, Autodesk Inventor, Bluebeam Revu, Microsoft Office Suite,* and *Adobe Acrobat.*

More Information

For more information, please visit the Liftech website: www.Liftech.net

Liftech
LIFTECH CONSULTANTS INC.

COMPANY PRINCIPALS

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.

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.

Arun Bhimani
Founding Principal, Past President, 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 container cranes, buildings, and miscellaneous special structures. She has worked on all facets of container crane design including designing new cranes, reviewing crane designs, designing 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.

Nicholas Grebe
Principal, Mechanical Engineer
Mr. Grebe has extensive experience performing conceptual and detailed designs of mechanisms and systems, analyzing dynamic mechanical systems, and developing designs and detailed drawings suitable for manufacture. He is responsible for developing purchase specifications and reviewing contractors' mechanical, hydraulic, and electrical designs for feasibility and contract compliance. He is experienced in reviewing heavy machinery and container crane controls including logic, interlocks, system architecture, and automation features. He provides project management, condition assessment, commissioning, troubleshooting, and acceptance testing of material handling equipment including container cranes and bulk loaders.

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. He specializes in container and floating crane procurement projects and crane modification projects. He is also involved in preparing structural maintenance programs. 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.

Patrick McCarthy
Principal, Professional Engineer
Mr. McCarthy is experienced in ship-to-shore and port yard container crane procurement, modification, reliability, and repairs. His work includes project management, condition assessment, and developing structural maintenance programs and repair procedures. He is Liftech's manager for developing crane technical specifications and helps clients with various aspects of the crane procurement process, including pre-bid assistance, post-award design and fabrication review, and post-delivery structural assessment. He also has expertise in wind provisions, has been involved in wind tunnel and other wind studies, and is an associate member of the Wind Load Subcommittee of ASCE 7.

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.

Anna Dix
Principal, Structural Engineer

Ms. Dix has experience in the design and analysis of various steel and concrete structures. Her focus is on ship-to-shore cranes and other structures that reside next to, in, or on top of the water, such as heavy lift and container handling equipment, wharves, and floating cranes. She likes earthquake and fatigue engineering topics and working with clients.

Leah Olson
Principal, Professional Engineer

Ms. Olson has managed multiple wharf and float projects, and has participated in the design, analysis, and modification of wharf and float structures, container cranes, steel barges, and other rigging structures. She has evaluated the behavior of various concrete and steel structures using finite element analysis (FEA) computer software. Her work includes project management, structural analysis and design, and site inspection and reporting.

Di Liu
Principal, Professional Engineer

Mr. Liu is an experienced designer and project manager. His work includes structural analysis, design review, modification review, and feasibility studies of container cranes, wharves, and other structures.

Tais Shiratsubaki
Principal, Professional Engineer

Ms. Shiratsubaki is experienced in project management and structural design, review, analysis, modification, and repair of various marine structures including container cranes, bulk material handling equipment, and special structures. She is involved in research and development and enjoys collaborating with clients to produce improved designs and solutions.