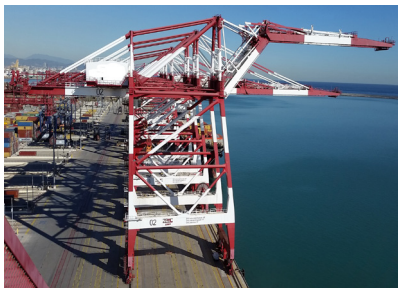
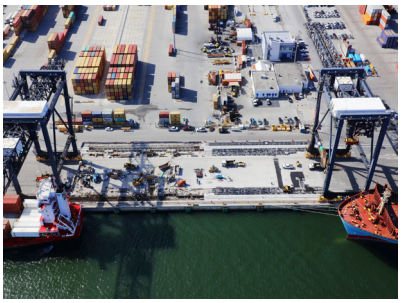
# LIFTECH IN SITU BOOM EXTENSION PROCESS





**Project 9002**
**November 24, 2021**

Liftech
LIFTECH CONSULTANTS INC.

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# LIFTECH IN SITU BOOM EXTENSION PROCESS

**Prepared by Liftech Consultants Inc.**
**November 24, 2021**

**Project No. 9002**

*Quality Assurance Review*
*for Liftech Consultants Inc.*

| | | | |
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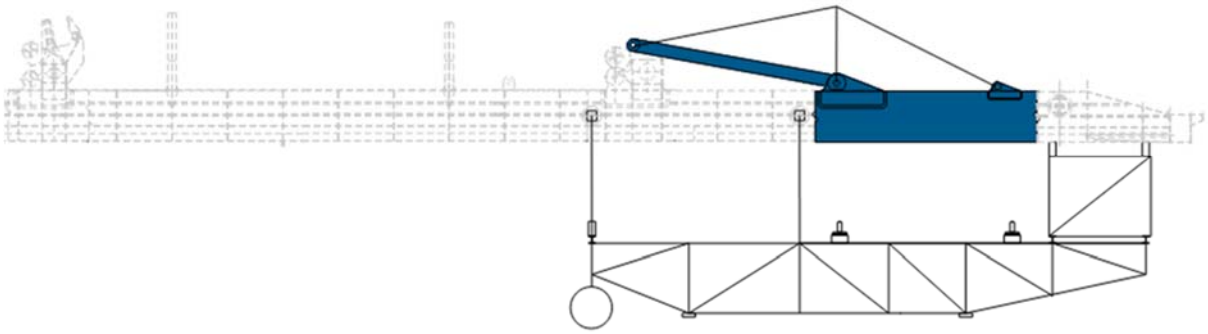

Container ships are getting larger, and many existing ship-to-shore (STS) cranes need increased lift height and boom outreach to service the larger ships.

Many contractors have jacking frames to lift and modify cranes to increase lift heights, but extending the outreach by more than a small amount is not easy. Floating cranes or large shore-based cranes are often needed, and the wharf operations are impacted. The boom may need to be lowered to the wharf so a new section can be inserted and forestays may need to be lengthened.

Liftech has developed a concept rig and procedure to extend a container crane boom up to approximately 8 meters without needing a land-based or floating crane and without removing the boom. Using the Liftech system, new boom sections are installed waterside of the outer forestays near the boom tip using a containerized rig that is assembled on-site. See attached drawings G1 and G2 for an overview of key steps in the usage procedure.

The concept reduces the required amount of existing boom reinforcement. The outer forestays are extended with an extra stay linkage and then reconnected to lugs on the new boom inserts. If the boom hoist is inadequate for the extended boom, an extra part of boom hoist rope with dead ends on the boom insert can be installed.

The rig is assembled on the wharf, with the new boom inserts and outer forestay links placed onto the rig. The rig is then self-hoisted onto the trolley girder and self-moved along the trolley rails to near the waterside end of the boom, using the same motors used for hoisting. After connecting the rig and boom waterside end, workers standing on the rig platforms cut the boom and the rig is moved farther waterside, creating a gap for the new boom inserts. The boom inserts are rolled into position and welded. The rig is removed from the crane and the boom hoist reeving, and the new forestay links are installed.

Some capabilities and features of the rig follow:

The rig can handle all double girder STS cranes, the most common STS cranes in the world. A similar rig is practical for a mono girder crane.

The rig can handle long boom inserts. The developed concept can handle lengths up to 8 meters. Larger may be practical.

The rig is transported in standard containers to the terminal and uses bolted connections for easy assembling and disassembling.

The rig is hoisted onto the trolley girder using winches and custom hoist beams. The same winches can be used to move the rig from the trolley girder along the trolley rails.

The rig will also work for crane gages shorter than 30 meters if the rig is assembled on top of the sill beams.

Some other actions required when extending a boom include:

Verify that the crane stability and wheel loads are acceptable. Ballast can be installed for adequate stability. Often, additional crane rail girder capacity can be justified with analysis.

Verify that other portions of the crane structure are adequate, e.g., trolley girder support beams, waterside legs, A-frame. If needed, external reinforcing is typically practical to install to strengthen.

Cargotec had a similar idea of using a boom extension rig, and though our rig was developed independent from Cargotec's, there are some similarities between the two rigs. We also are aware of one contractor using a similar system. Liftech can design this system including the procedure, design the crane modifications, evaluate wheel loads and, if needed, try justifying additional wharf crane girder capacity.

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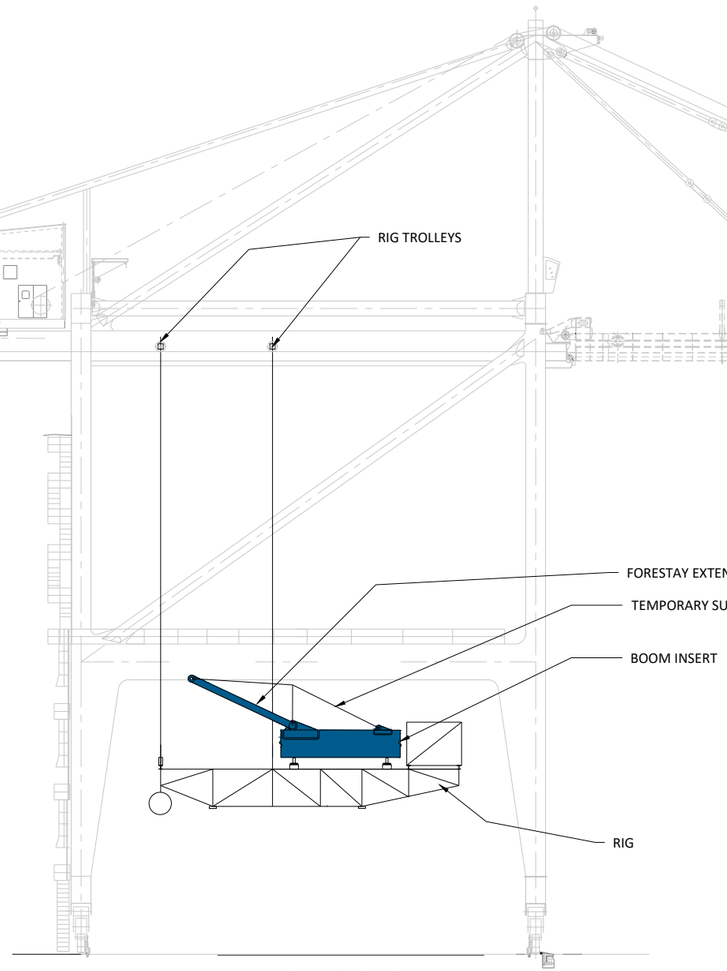
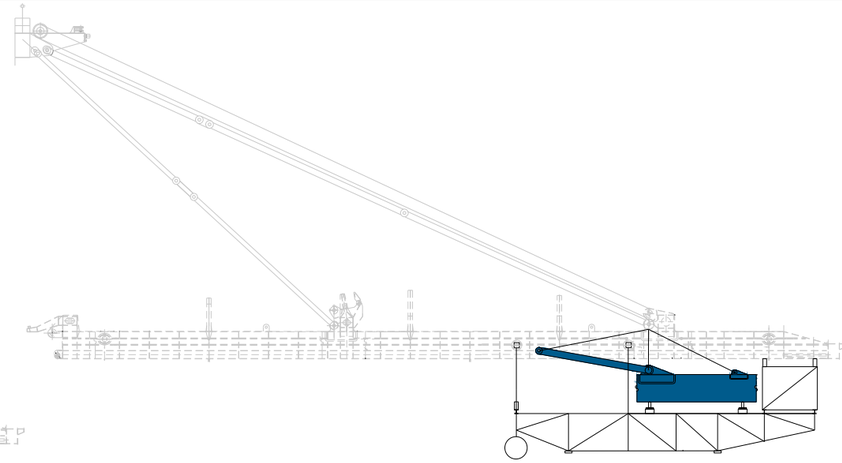


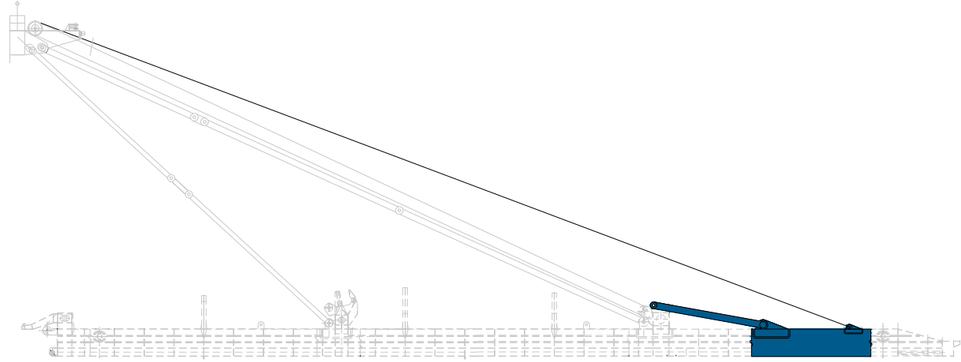

**HOISTING THE RIG**



**BEFORE EXTENSION**



**AFTER EXTENSION**



**NEW BOOM HOIST PART**

| No. | Revision | Date | By | Checked | Approved |
|---|---|---|---|---|---|
| | | | | | |

**PRELIMINARY**
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**BOOM EXTENSION SYSTEM**

BOOM EXTENSION SEQUENCE - 1

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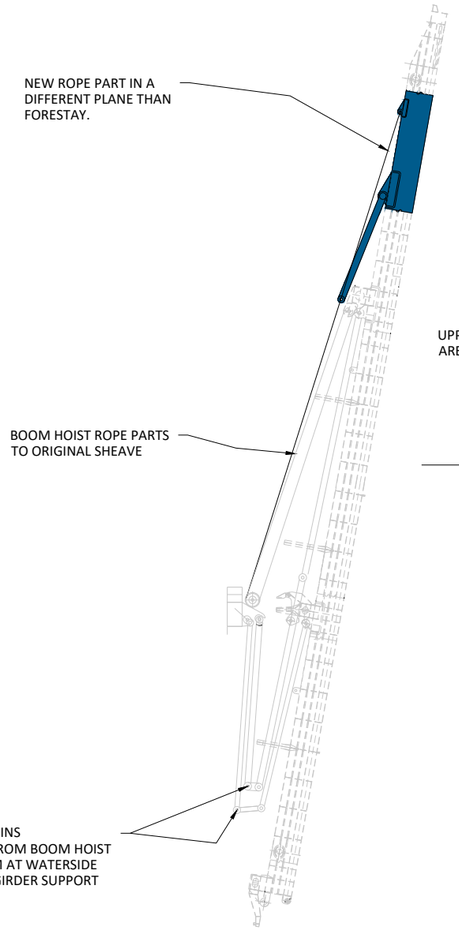
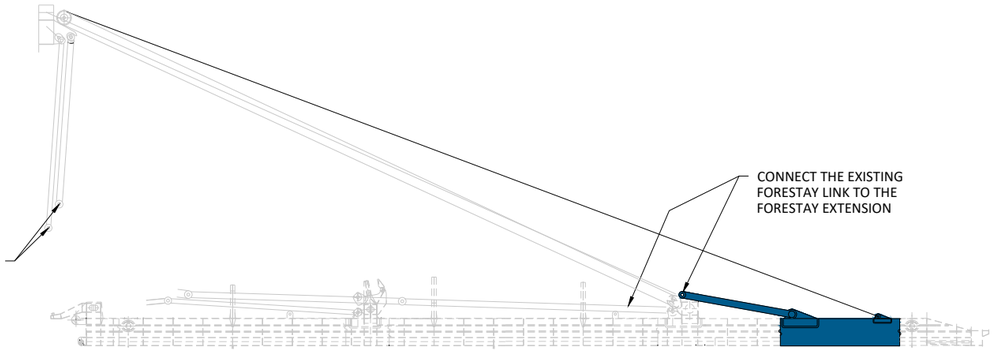
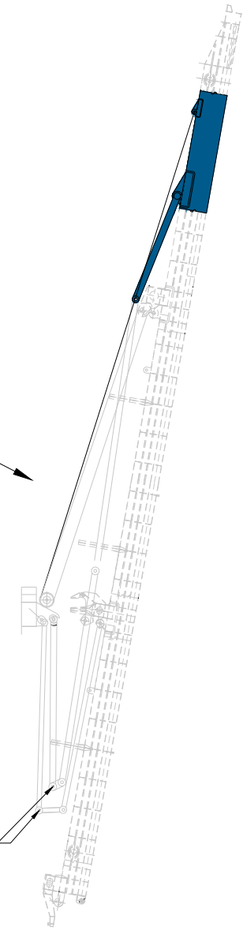
|---|---|---|---|
| Project No. | 9002 | | |
| By KL\AH | Checked KL | Sheet No. | G1 |
| Approved ES | | of | |
| Date 9/21/21 | | Revision | |



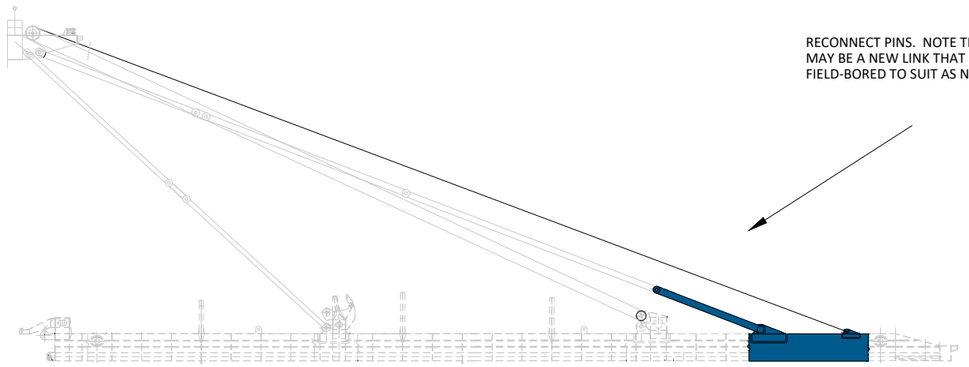

**CONNECT NEW FORESTAY LINK TO EXISTING**

NOTE:
BOOM IS SUPPORTED BY BOOM HOIST






**REMOVE FORESTAY LINKS**



**FINISH UP**




**RECONNECT PINS**

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**BOOM EXTENSION SYSTEM**

BOOM EXTENSION SEQUENCE - 2

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| *Project No.* | 9002 | | |
| *By* KL\AH | *Checked* KL | *Sheet No.* | G2 |
| *Approved* ES | | *of* | |
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